

ABERDEEN HARBOUR EXPANSION PROJECT November 2015

> Volume 3: Technical Appendices

# APPENDIX 6-C GROUND INVESTIGATION REPORT FOR BAY OF NIGG HARBOUR DEVELOPMENT









| REPORT QUALITY ASSURANCE SHEET |  |  |  |  |  |  |
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# **GROUND INVESTIGATION REPORT**

# **FOR**

# BAY OF NIGG HARBOUR DEVELOPMENT ABERDEEN VOLUME ONE

| Report Status: | Description: | Date:      | Written By:   | Checked By: | Approved By: |
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Report No. SE-RRG-F-002 Issue. Revision Number 1.01 Issue Date 16/01/2012



# **GROUND INVESTIGATION REPORT: BAY OF NIGG HARBOUR DEVELOPMENT, ABERDEEN**

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#### **EXECUTIVE SUMMARY**

This summary contains an over view of the key findings and conclusions of this report. It is emphasised however that no reliance should be placed on any part of this summary without referring to the relevant sections of the report. These sections within the main body of the report, together with linking laboratory data and plans etc., may contain information which puts into context findings which are highlighted within this summary.

Soil Engineering Geoservices Limited were instructed by Arch Henderson LLP (The Engineer) acting for and on behalf of Aberdeen Harbour Board (The Employer), to provide a geotechnical assessment for the proposed new Bay of Nigg Harbour Development at Aberdeen. This assessment in the form of a ground investigation report (GIR) was to be based on the ground investigation also carried out by Soil Engineering between June and November 2013, together with previous borehole information provided by the British Geological Survey.

It is proposed to develop Nigg Bay as a new harbour facility with the construction of new breakwaters, quays and a navigation channel and harbour area. The construction of the navigation channel and harbour area will involve dredging of parts of Nigg Bay to reduce its level to approximately -9.0mchart datum with the approach channel at -10.5mchart datum.

Nigg Bay is located at the eastern end of St Fittick's Road, some 6km to the south-east of Aberdeen city centre (centred on approximate National Grid reference NJ 970 046). The site is irregular in shape and comprises the over water and inter tidal area of Nigg Bay between the headlands occupied by Balnagask Golf Course to the north and Loirston Country Park to the south.

Geological maps show that the land adjacent to the site is underlain by superficial Pleistocene deposits comprising glacial meltwater deposits (sand and gravels with lenses of silt and clay) and glacial till (clay, sandy clay or sand with a significant gravel, cobble and boulder content). At greater depth, the adjacent land is shown to be underlain by metasedimentary rocks (psammites, semipelites and subsidiary pelites) of the Aberdeen Formation of the Dalradian supergroup of Precambrian age.

In the vicinity of the proposed new harbour development only local and limited thicknesses of made ground was encountered beneath the south western corner of the site. A significant and variable thickness of superficial deposits were encountered beneath the site typically comprising medium dense or dense marine granular deposits overlying typically very stiff and hard glacial till strata and very dense glacial granular strata with thicknesses of superficial deposits between not encountered and 38.00m recorded in the exploratory holes. The superficial deposits appear to infill an east west trending valley feature incised into the underlying weak, medium strong and strong Dalradian rock strata.

The ground conditions encountered beneath the site appear to be generally favourable for the development. The exploratory holes indicate that the areas where breakwaters are to be constructed are underlain by medium dense, dense and very dense marine granular materials, very stiff and hard glacial till and granitic gneiss rock strata. In the area of the new quay, a similar sequence of superficial strata was encountered with variable thicknesses and type of superficial deposits and rockhead levels encountered. Based on the current borehole information dredging of the new harbour basin and approach channel will excavate marine granular deposits and the underlying glacial till and granular glacial deposits.

The concrete design classification for the site is calculated as DS-1 with an ACEC class AC-1.



#### 1.0 INTRODUCTION

In June 2013 Soil Engineering Geoservices Limited were instructed by Arch Henderson LLP (The Engineer) acting for and on behalf of Aberdeen Harbour Board (The Employer), to carry out a ground investigation for the Bay of Nigg Harbour Development. The investigation comprised the formation of cable percussive boreholes selectively extended by rotary drilling together with trial pitting, grab sampling, in situ testing and a geophysical magnetometer survey. Most of the work was to be undertaken overwater or within the intertidal area of the bay.

This ground investigation report (GIR) comprises the results of the fieldwork and laboratory testing together with an interpretation of the geoenvironmental conditions at the site. The fieldwork was carried out between 5<sup>th</sup> June and 2<sup>nd</sup> November 2013.

#### 2.0 PURPOSE, SCOPE AND REPORT FORMAT

#### 2.1 Purpose

The purpose of this investigation was to determine the subsurface ground, and groundwater conditions at the site. An interpretative geoenvironmental (GIR) report was also required in order that appropriate material parameters for the design of the proposed structures could be ascertained.

# 2.2 Scope of Work

The brief for this Ground Investigation Report comprised the following items:

- 1. To form exploratory holes on site.
- 2. To install gas and ground water monitoring instruments.
- 3. To monitor on site installations.
- 4. To undertake laboratory tests scheduled by the Engineer on samples recovered from exploratory holes
- 5. Review and provide a written appraisal of readily available published geotechnical information and geotechnical and historical information provided by the Engineer
- 6. Provide a written appraisal of the ground and water conditions
- 7. Provide analysis and interpretation of factual data for the classification and derivation of design parameters for each stratum encountered
- 8. Provide geotechnical engineering assessment

The sources of information used in the compilation of this report are detailed in the list of references on page 39.

# 2.3 Limitations

This report has been prepared using the site investigation data and / or desk study / historical information referenced in the report text. Soil Engineering has prepared the report in accordance with the specification and scope of works for this project, which was designed by Arch Henderson LLP together with the relevant European and British Standards.

It should be noted that the investigation data on which this report is based is only indicative of the actual ground, groundwater and ground gas conditions that exist at the locations of the exploratory holes and may not be representative of the conditions that exist on the site as a whole.

Soil Engineering accept no liability for any adverse geotechnical or environmental impacts on the proposed



development, that result from ground not investigated as part of this project. Similarly, Soil Engineering is not liable for any adverse effects that arise as a result of conditions that exist on land adjacent to the subject site.

#### 2.4 Report Format

This report is presented in the following format:

- Description of fieldwork
- Summary of Desk Study Information
- Geotechnical Appraisal, Interpretation and Engineering Assessment
- Exploratory hole logs
- Laboratory test results
- Data Plots and Sections
- Maps and plans

# 2.5 Key Sources of Information

- Arch Henderson, Drawing No 121106-01
- BGS 1:50,000 scale geological map for the area, Sheet 77-Scotland, Solid (1982) and Drift (1980) editions for Aberdeen.
- BGS Memoir for the 1:50 000 Sheet 77-Scotland (1986) entitled Geology of the country around Aberdeen.
- British Geological Survey Borehole Data Pack, Ref BH\_119433\_1, dated 28 October 2013

#### 3.0 DESK STUDY INFORMATION

# 3.1 Scope of Study

A formal comprehensive desk study was not requested or supplied by the Engineer for this investigation. Information from the British Geological Survey on the site geology and historical borehole records for the area was provided by the Engineer and is appended to this report.

The following sections provide general details of site location, site description and site geology as ascertained from published maps and memoirs.

# 3.2 Site Location and Description

The site is located at the eastern end of St Fittick's Road, some 6km to the south-east of Aberdeen city centre (centred on approximate National Grid reference NJ 970 046). The site is irregular in shape and comprises the over water and inter tidal area of Nigg Bay between the headlands occupied by Balnagask Golf Course to the north and Loirston country park to the south. The site is bounded by the two aforementioned headlands/golf courses to the north and south, by rough ground, pasture land and the Nigg Bay Waste Water treatment plant to the west and by the North Sea to the east. A road (Coast Road and Greyhope Road) approximately bounds the northern, western and south-eastern edges of the site. The site is currently unoccupied and comprises Nigg Bay, an area of tidal open seawater, as well as the bounding intertidal areas comprising open sand, roughly vegetated areas as well as exposed rock headland.

The site is located in a predominantly semi-rural coastal area to the south east of Aberdeen with the mouth of the River Dee and Aberdeen harbour located approximately 1km to the north of the site to the north of the bounding northern headland.



The site has a complex relief with elevated headland areas to the north and south, a lower lying area to the east and the bay topography generally sloping towards the centre of the bay and out to sea.

The location of the site is indicated on Figure 1 in Section C of this report.

# 3.3 Site History

No information on the history of the site was provided by the Engineer.

# 3.4 Geology

The 1:50,000 scale Geological Survey map for the area, sheet 77-(Scotland) for Aberdeen, Solid (1982) and Drift (1980) editions, shows the land adjacent to the site to be underlain by Pleistocene deposits comprising glacial meltwater deposits (sand and gravels with lenses of silt and clay) and glacial till (clay, sandy clay or sand with a significant gravel, cobble and boulder content). The map also records a glacial melt water channel as entering the bay from the south. At greater depth, the adjacent land is shown to be underlain by metasedimentary rocks (psammites, semipelites and subsidiary pelites) of the Aberdeen Formation of the Dalradian supergroup of Precambrian age. Subsidiary discordant sheets of amphibolite and hornblende schist are also recorded. The map records outcrops of Dalradian rock strata underlying the Pleistocene deposits on the headlands to the north and south of the site. The map also records foliation and banding within the Dalradian strata as dipping to the north-west and north-east with dips between 45° and 90° recorded. The nearest faulting is recorded as the north-east south-west trending Dee Fault which is recorded approximately 1.5km to the north west of the centre of the site.

Further information on the superficial deposits is contained within the geological maps and information in the British Geological Survey Borehole Data Pack, Ref BH\_119433\_1, dated 28 October 2013 (presented in the appendix to this report). This records a variable sequence of glacial sand and gravel deposits overlying glacial till on both headlands to the north and south of Nigg Bay. Alluvium is recorded infilling the shallow valley behind the bay and a sequence of marine beach deposits is recorded lining the shore of the bay.

Information from the BGS geological memoir for the area (BGS Memoir for the 1:50 000 Sheet 77-Scotland (1986) entitled Geology of the country around Aberdeen) indicates that the bay area is underlain by silts, sands and gravels classified by the BGS as marine beach deposits of Quaternary age. The memoir also records raised beach deposits in the Aberdeen area sometimes with associated deposits of peat. Nigg Bay is recorded by the memoir as being underlain by an infilled former glacial melt out channel and possible former course of the River Dee. The memoir records that boreholes drilled within the bay indicate anomalous drift depths associated with a buried channel and glacial deposits underlying more recent marine beach deposits. The buried channel is recorded as being infilled with glacial (largely till) deposits with a thickness of 30m noted from boreholes. Geophysical surveys mentioned in the memoir indicate that the channel may extend at least 1km out to sea and the publication speculates that the channel may be a subglacial or pre Devensian feature. The glacial tills in the Aberdeen area are noted by the memoir to be variable with at least three till units noted. The memoir suggests lodgement, melt-out and flow till origins for individual till units with the melt-out and flow till units typically being more granular in nature and with all types of till containing coarse granular materials.

The memoirs record significant weathering of rock to depths of up to 20m in the Aberdeen area with the psammites being less prone to weathering than other types of rock however the weathering is noted to be variable and difficult to predict. This deep weathering is thought to be associated with relatively warm interglacial periods that occurred during the last glaciation and preceding this, during the Tertiary period. The Dalradian rocks are interpreted as sedimentary rocks altered by low grade metamorphism and the amphibolite and hornblende schist is thought to represent metamorphosed basic igneous intrusions.



# 3.5 Hydrology and Hydrogeology

No information on the Hydrology and Hydrogeology of the site was provided by the Engineer.

#### 3.6 Previous Investigations

The Engineer has supplied details of a geophysical and bathymetric survey carried out on the site in 2012 by Caledonian Geotech Ltd. This investigation comprised sub-bottom profile, bathymetry and side scan sonar surveys. For further information, reference should be made to the full report, which is listed on page 39 of this report. This investigation produced an isopach map of rockhead depths in Nigg Bay area and opposite the adjacent headlands based on the results of the sonar survey. Although quite variable, the general pattern indicated is for rockhead depths to gradually increase out to sea opposite the headland areas (depths between 14.0m and 26.0m below chart datum are indicated approximately 500m out from the headlands). In the central part of the bay, a roughly east-west trending channel with a width of approximately 200m to 300m is indicated. In the area of Nigg Bay rockhead depths are indicated to increase away from the headlands towards the centre of the channel however, the channel appears to have relatively steep sides in some areas and local plateau areas indicated to either side of this. Although the base of the channel is indicated to be relatively level, an uneven and undulating local topography is indicated. The channel is also indicated to gradually increase in depth out to sea (with rock head depths increasing from 14.0m to in excess of 40.0m below chart datum indicated).

The Engineer supplied a British Geological Survey (BGS) Borehole Data Pack, Ref BH\_119433\_1, dated 28 October 2013 containing a description of the geology of the area and also database records for twelve exploratory holes undertaken within Nigg Bay and the surrounding vicinity principally for the Aberdeen Sea Outfall. The boreholes were mainly drilled in the bay area, along the southern headland (Greg Ness) and out to sea from this. A summary of the strata and ground water encountered in these records together with key in situ testing results are summarised in the following tables. For further detailed information, reference should be made to Section 7.2 and to the full report, which is listed on page 39 of this report.

TABLE 1: SUMMARY OF STRATA TYPES RECORDED IN THE BRITISH GEOLOGICAL SURVEY BOREHOLE DATA PACK REF. BH\_119433\_1

| Borehole No     | Made<br>Ground<br>(mbgl) | Sand and<br>Sand and<br>Gravel,<br>Local<br>Cobbles<br>(mbgl) | Glacial Till<br>(Variably<br>Sandy<br>Variably<br>Gravelly<br>Clay)<br>(mbgl) | Glacial<br>Silt<br>(mbgl) | Sand,<br>Gravel<br>Cobbles<br>and<br>Boulders<br>(mbgl) | Weathered<br>Granite and<br>Gneiss<br>(mbgl) | Less<br>Weathered<br>Granite and<br>Gneiss<br>(mbgl) |
|-----------------|--------------------------|---|---|---------------------------|---|--|--|
| NJ90SESE7119 1A | NE                       | GL-15.20P   | NE  | NE                        | 15.20-20.0+   | -  | -  |
| NJ90SESE7807 8  | NE                       | GL-3.43   | NE  | 3.43-4.42                 | 35.97-40.54   | 40.54-54.56                                  | 54.56-66.29+   |
|                 |                          | 4.42-5.33   | 5.33-35.97  | NE                        |   |  |  |
| NJ90SESE7807 21 | GL – 5.50                | 5.50 - 6.50   | 6.50 - 11.00+   | -                         | -   | -  | -  |
| NJ90SESE7119 1  | NE                       | NE  | NE  | NE                        | GL-6.50+  | -  | -  |
| NJ90SESE7807 22 | GL-3.63                  | NE  | NE  | NE                        | NE  | 3.62-5.70+                                   | -  |
| NJ90SESE7807 7  | NE                       | GL-2.44   | NE  | 2.44-25.25                | 25.25-29.26+  | -  | -  |
| NJ90SESE7807 26 | NE                       | NE  | NE  | NE                        | GL-20.50  | NE   | 20.50-29.50+   |
| NJ90SESE7807 27 |                          | GL-0.60   | 0.60-18.50  | NE                        | NE  | 18.50-19.00                                  | 19.00-29.50+   |
| NJ90SESE7807 10 | NE                       | NE  | NE  | NE                        | NE  | GL-1.22                                      | 1.22-64.24+  |
| NJ90SESE7807 11 | NE                       | GL-3.05   | NE  | NE                        | 3.05-4.12   | 4.12-8.48+                                   | -  |
| NJ90SESE7113 16 | NE                       | GL-6.50   | 6.50-9.50   | NE                        | 9.5 -11.00  | NE   | 11.00-33.50+   |
| NJ90SESE7113 17 | NE                       | GL-6.30   | NE  | NE                        | NE  | 6.30-9.50                                    | 9.50-34.50+  |

Notes: + Denotes base of strata not encountered

NE Not encountered

P Strata contains peat bands



Table 1 indicates that seven main material types were identified during the various investigations. The table also indicates the variability of the superficial materials encountered around the edge of Nigg Bay and especially along the northern edge of the Greg Ness headland where they principally comprise variable granular and cohesive glacial deposits. On the tip of the headland itself, rock was encountered at shallow depth with superficial deposits thickening to the east of this towards Nigg Bay. Two boreholes within these investigations proved granite and gneiss bedrock to depths in excess of 60.00m.

Limited ground water data was obtained during the various investigations contained in the BGS report. These are summarised in Table 2.

TABLE 2: SUMMARY OF GROUNDWATER OBSERVATIONS FROM THE BRITISH GEOLOGICAL SURVEY BOREHOLE DATA PACK REF. BH\_119433\_1

| Borehole No     | Strike Depth<br>(m) | Standing Level (m) | Strata        | Notes        |
|-----------------|---------------------|--------------------|---------------|--------------|
| NJ90SESE7119 1A | 5.00                | 4.00               | Sand & Gravel |              |
| NJ90SESE7807 8  | -                   | -                  | -             | Not Recorded |
| NJ90SESE7807 21 | Dry                 | -                  | -             | Borehole Dry |
| NJ90SESE7119 1  | Dry                 | -                  | -             | Borehole Dry |
| NJ90SESE7807 22 | Dry                 | -                  |               | Borehole Dry |
| NJ90SESE7807 7  | -                   | -                  | -             | Not Recorded |
| NJ90SESE7807 26 | Dry                 | -                  | -             | Borehole Dry |
| NJ90SESE7807 27 | Dry                 | -                  | -             | Borehole Dry |
| NJ90SESE7807 10 | -                   | -                  | -             | Not Recorded |
| NJ90SESE7807 11 | -                   | -                  | -             | Not Recorded |
| NJ90SESE7113 16 | -                   | -                  | -             | Not Recorded |
| NJ90SESE7113 17 | _                   | -                  | -             | Not Recorded |

TABLE 3: SUMMARY OF IN SITU TEST RESULTS FROM THE BRITISH GEOLOGICAL SURVEY BOREHOLE DATA PACK REF. BH\_119433\_1

| DATA : ACK KET : DIT_110 100_1 |        |   |   |         |                                      |                       |                                    |  |  |
|--------------------------------|--------|---|---|---------|--------------------------------------|-----------------------|------------------------------------|--|--|
| In situ test                   | Made   | Sand and                                | Glacial Till  | Glacial | Sand,                                | Weathered             | Less                               |  |  |
| type                           | Ground | Sand and<br>Gravel,<br>Local<br>Cobbles | (Variably<br>Sandy<br>Variably<br>Gravelly<br>Clay) | Silt    | Gravel<br>Cobbles<br>and<br>Boulders | Granite<br>and Gneiss | Weathered<br>Granite and<br>Gneiss |  |  |
| SPT 'N' value<br>(blows)       | -      | 8 - 97                                  | 54 - 89   | -       | 46 - 79                              | -                     | -                                  |  |  |

Note: SPT trip hammer efficiency unknown

Limited in situ testing was undertaken during the various investigations contained in the BGS report. This is summarised in Table 3 and comprised standard penetration testing.

#### 4.0 FIELDWORK

# 4.1 Scope of Fieldwork

The scope of the fieldwork was specified by the Engineer and was undertaken in general accordance with Eurocode 7 Part 2 (BS EN 1997-2: 2007) and where there is no conflict also with BS 5930: 1999 + A2: 2010. Soil and rock logging has been undertaken in accordance with the relevant European Standards, listed in the references for this report. Soil Engineering had responsibility for setting out and surveying all exploratory holes while the Engineer had responsibility for determining the in situ testing and sampling regime. Cable percussion boreholes selectively extended by rotary drilling were formed together with mechanically excavated trial pits, seabed and magnetometer surveys and grab sampling. The exploratory hole locations are shown on the site plan presented in Section C of this report.



# 4.2 Magnetometer Survey

A detailed marine magnetometer survey was undertaken by Coastline Surveys Limited in June 2013. The results of the survey show thirty-three targets with magnetic signature significantly above background levels

For further information, reference should be made to the full survey report, included as an appendix to this report.

# 4.3 Inspection Pits

In order to reduce the risk of damaging buried services, the location of exploratory hole L01 was scanned using a cable avoidance tool (CAT). As a further precaution, an inspection pit was hand excavated to a depth of 1.20m, followed by a further scan of the base of the pit with the CAT. Inspection pits were not excavated for the remaining boreholes, as they were formed overwater from a jack-up platform.

#### 4.4 Cable Percussion Boreholes

A total of forty-nine over-water boreholes and a single land based borehole were formed to depths between 0.10m and 10.40m using conventional light cable percussion techniques together with 200mm and 150mm diameter temporary steel casings. The boreholes were all formed in order to obtain samples for laboratory testing and to provide geotechnical information for foundation design.

In granular materials, cohesive materials and rock Standard Penetration Tests were carried out using either a split spoon sampler or a solid 60° cone. The results of these tests are given as a Standard Penetration "N" value or as a blow count for a given penetration at the appropriate position on the borehole logs, where the use of either the sampler or cone is also recorded.

Representative disturbed samples of all materials encountered were obtained and these were placed in sealed containers for transport to the laboratory.

Where appropriate / required, environmental samples were obtained for chemical testing.

The samples recovered from the boreholes were described by an Engineering Geologist, in accordance with the terminology presented in Appendix 1 of this report. A detailed description of all strata encountered, groundwater conditions and the position and type of samples taken are included on the borehole logs presented in Section A of this report.

# 4.5 Rotary Drilling

In order to obtain information on the solid geology beneath the site and/or where the stiffness of the cohesive material and presence of coarse granular material prevented the progression of the cable percussion drilling, boreholes were extended using rotary drilling techniques. These boreholes were extended to depths between 4.00m and 40.00m, using a combination of SWF, Geobore S or T6116 core barrels together with a protective semi rigid plastic liner and a Polycrystalline Diamond (PCD) or Diamond Impregnated (Impreg) core bit with water flush to produce cores of 107, 102 or 89mm nominal diameter respectively.

Details of the strata encountered are given on the borehole logs along with the Engineering Geologist's assessment of Total Core Recovery (TCR), Solid Core Recovery (SCR), and Rock Quality Designation (RQD) each expressed as a percentage of the individual core runs. Where applicable a fracture spacing ( $I_f$ ) has also



been determined and this information is given on the logs.

The symbols and abbreviations used on the rotary borehole logs are explained on the exploratory hole log legend and notation sheet presented in Section A of this report.

The core samples recovered were photographed and described by an Engineering Geologist in accordance with the terminology presented in Appendix 1 of this report. Where suitable, sub-samples of the cored superficial deposits were taken. These sub-samples were sealed in wax to prevent moisture loss and transported to the Leeds laboratory of Soil Engineering for geotechnical testing. The borehole logs are presented in Section A of this report and photographic records are presented in Section D of this report.

#### 4.6 Grab Sampling

In order to establish contamination levels for proposed dredged material, twenty-six grab samples were undertaken using a Van Veen grab sampler.

The recovered samples were described by an Engineering Geologist and the descriptions of the samples recovered are shown on the relevant logs presented in Section A of this report.

#### 4.7 Trial Pits

Eighteen trial pits designated TP01 to TP18 inclusive were excavated using a 20 tonne tracked excavator to depths between 1.70m and 4.40m. The pits were located around the inter-tidal foreshore of the site to provide a reasonable indication of the presence of any made ground and in particular to assess the mass soil fabric of the near surface natural deposits.

The trial pits were not shored and were logged from the surface by an Engineering Geologist. The Engineering Geologist provided a detailed description of the ground conditions encountered in each pit and also obtained disturbed soil samples at regular intervals for geotechnical analysis. The strata encountered in the trial pits are described on the trial pit logs presented in Section A of this report and the location of each of the trial pits is indicated on the site plan presented in Section C of this report. Trial pit photographs are included in Section D of this report.

## 5.0 LABORATORY TESTING

# 5.1 Scope of Testing

All geotechnical (soils) and chemical (contamination) testing was scheduled by the Engineer. The scope of the testing was required to enable comments regarding the dredgability of overburden and rock and the suitability of soil and rock for construction of quay walls and breakwaters to be made and for potential site contamination levels to be established.

#### 5.2 Geotechnical Soils Testing

The programme of laboratory testing was carried out in accordance with BS 1377. The testing was carried out at the Leeds laboratory of Soil Engineering, a UKAS accredited testing laboratory No 1265.

Results are given on the summary sheets with individual test plots presented in Section B of this report.

In addition, chemical (sulfate and pH) testing was undertaken by SAL, a UKAS accredited testing laboratory No. 1549. Testing was undertaken in order to assess concrete requirements from BRE Special Digest No 1. Samples were prepared in general accordance with BS 1377, although final analysis of total sulfate was



performed using ICP and aqueous extract using Ion Chromatography.

# 5.3 Geotechnical Rock Testing

In order to provide an indication of the strength of the rock encountered, point load testing and unconfined compressive strength testing was undertaken on selected core samples. These tests were performed in accordance with the specifications indicated on the individual test plots.

Results are presented in Section B of this report.

# 5.4 Environmental Testing

A programme of environmental testing was scheduled on the samples recovered utilising the Van Veen grab sampler. Testing was carried out by SAL, a UKAS accredited testing laboratory No. 1549.

Testing was carried out in accordance with the methods identified in the test reports.

The results of the environmental testing are presented in Section B of this report.

#### 6.0 SUMMARY OF RESULTS OF THE INVESTIGATION

# 6.1 Scope of Commentary

The results of this investigation appear to conflict to some extent with the published geology summarised in Section 3.3 of this report but generally agreed with the findings of the previous investigations carried out on this site and referenced in Section 3.4 of this report. Although the superficial deposits were as predicted by the published geological information, the solid geology differed to some extent for the published records. The following sections are only intended to provide a summary of the ground conditions encountered during this investigation whilst the logs presented in Section A of this report give detailed descriptions of all the strata observed.

#### 6.2 Made Ground

Made ground typically between 0.60m and 3.70m in thickness was only encountered in trial pits TP08 and TP10 to TP15 inclusive in the south western corner of the bay. The made ground was generally seen to comprise a granular mix of coarse and very coarse materials comprising a variable mix of sand and gravel, cobble and boulder sized fragments of metamorphic rock, igneous rock, concrete, tarmac, brick, plastic pipe, packaging and metal. Other materials were also identified including wood fragments, cast iron pipe pieces and polystyrene.

# 6.3 Superficial Deposits

Underlying any made ground, topsoil or at ground/seabed level, a variable sequence of sand, sand and gravel, cobbles, boulders, and variably sandy variably gravelly clay with cobbles and boulders was encountered. The sequence typically comprised an upper principally granular formation of marine deposits comprising a variable mix of sand, gravel, cobbles and boulders underlain by glacial deposits comprising variably sandy variably gravelly clay with cobbles and boulders with interbedded granular materials comprising sand, gravel, cobbles and boulders.

Two distinct units were noted within the upper marine granular formation with both being discontinuous and not encountered in all exploratory holes. Typically, the uppermost unit comprised a fine to coarse sand with varying fine gravel, silt and cobble content. This unit was encountered in the majority of the boreholes to depths between 0.20m and 10.10m below bed level and typically increased in thickness towards the mouth of Nigg Bay. This unit was locally underlain by a unit of very coarse material typically comprising cobbles and boulders of mixed igneous and metamorphic lithologies with a sand and gravel matrix. It was noted that the coarse granular deposit was more prevalent in the intertidal and foreshore areas especially in the north western quadrant of the bay to the south of the Girdle Ness headland while towards the centre of the bay the unit thins and in this area sometimes comprises isolated cobbles and boulders.

Underlying the upper marine granular formation glacial deposits comprising till with subsidiary granular materials and/or bedrock was encountered. The glacial deposits, where present, were seen to principally comprise units of glacial till generally consisting of brown or greyish brown, stiff, very stiff and hard clay with varying sand, gravel, cobble and boulder content. Localised variation in the clay included a reddish brown clay layer within this stratum. The glacial till strata also contained variable granular units comprising sand and gravel often with a significant cobble and boulder content. The glacial deposits were noted to be very variable in thickness with thicknesses in excess of 25.00m noted along a roughly east-west trending axis running through the centre of the bay.

# 6.4 Dalradian Rock Strata

The depth to rockhead was very variable across the site. Rock was encountered at ground/bed level or at



shallow depth adjacent to the headlands but depths to rockhead in excess of 30.00m were recorded in exploratory holes drilled along a roughly east-west trending axis running through the centre of the bay. The topography of the buried valley as illustrated by varying rockhead levels in boreholes appears to be quite complex with plateau areas and areas of steeply sloping ground indicated (e.g. between boreholes A31 and A34).

Twenty-eight boreholes were extended into rock in order to assess the solid geology. These boreholes encountered a banded granitic gneiss, comprising of interbanded units of micaceous schist, gneiss and coarse grained granitic materials frequently in thin to thickly banded units. The granitic gneiss was proved to a maximum depth of 40.00m in borehole A05. The rock appeared to be variably weathered and typically appeared to be slightly or moderately weathered but also contained weaker moderately and highly weathered strata. The distribution of the weathered material between boreholes appeared to follow no set pattern and was very variable.

A summary of the ground conditions encountered during this investigation is presented as Tables 4, 5, 6 and 7.

Additional information on the ground conditions is available from the British Geological Survey Borehole Data Pack and a summary of this information is given in Table 1.

TABLE 4: SUMMARY OF STRATA TYPES ENCOUNTERED IN BOREHOLES FROM THE SOIL ENGINEERING 2013 INVESTIGATION - C AND D SERIES BOREHOLES

| Borehole<br>No | Made<br>Ground<br>(mbgl) | Marine<br>Deposits<br>(Sand and<br>Sand and<br>Gravel)<br>(mbgl) | Marine Deposits (Sand, Gravel, Cobbles and Boulders) (mbgl) | Glacial Till (Variably Sandy Variably Gravelly Clay with Cobbles and Boulders) | Glacial<br>Sand,<br>Gravel<br>Cobbles<br>and<br>Boulders<br>(mbgl) | Weathered<br>Gneiss<br>(Granite,<br>Gneiss and<br>Schist)<br>(mbgl) | Less Weathered Gneiss (Granite, Gneiss and Schist) (mbgl) |
|----------------|--------------------------|--|---|--|--|---|---|
| C79            | NE                       | GL-0.90  | NE  | NE   | NE   | 6.13-8.00+  | 0.90-6.13   |
| C81            | NE                       | GL – 2.50  | 2.50-4.40   | 4.40-8.00+   | -  | -   | -   |
| C83            | NE                       | GL-2.30  | 2.30-2.50   | 2.50-10.10+  | -  | -   | -   |
| C84            | NE                       | GL-1.00  | 1.00-1.40   | 1.40-7.40+   | -  | -   | -   |
| C87            | NE                       | GL-1.10  | 1.10-1.20   | 1.20-8.50+   | -  | -   | -   |
| C88            | NE                       | GL-1.00  | 1.00-1.20   | 1.20-8.25+   | -  | -   | -   |
| C96            | NE                       | GL-4.50  | NE  | NE   | NE   | 4.50-7.30+  | -   |
| D98            | NE                       | GL-2.00  | NE  | NE   | NE   | NE  | 2.00-4.10+  |
| D99            | NE                       | GL-4.10  | NE  | 4.10-7.10+   | -  | -   | -   |
| D100           | NE                       | GL-3.10  | NE  | NE   | NE   | NE  | 3.10-4.00+  |
| D101           | NE                       | GL-4.80  | NE  | 4.80-8.80+   | -  | -   | -   |
| D102           | NE                       | GL-3.00+   | -   | -  | -  | -   | -   |
| D104           | NE                       | GL-7.95  | 7.95-8.25   | 8.25-11.60+  | -  | -   | -   |

Notes: + Denotes base of stratum not encountered
NF Not encountered



TABLE 5: SUMMARY OF STRATA TYPES ENCOUNTERED IN BOREHOLES FROM THE SOIL ENGINEERING 2013 INVESTIGATION - A, B, GS AND L SERIES BOREHOLES

|                |                          | Marine   | Marine<br>Deposits<br>(Sand,                     | Glacial Till<br>(Variably<br>Sandy                       | Glacial   | Weathered<br>Gneiss                          | Less  |
|----------------|--------------------------|--|--|--|---|--|---|
| Borehole<br>No | Made<br>Ground<br>(mbgl) | Deposits<br>(Sand and<br>Sand and<br>Gravel)<br>(mbgl) | Gravel,<br>Cobbles<br>and<br>Boulders)<br>(mbgl) | Variably Gravelly Clay with Cobbles and Boulders) (mbgl) | Sand,<br>Gravel<br>Cobbles<br>and<br>Boulders<br>(mbgl) | (Granite,<br>Gneiss and<br>Schist)<br>(mbgl) | Weathered<br>Gneiss<br>(Granite,<br>Gneiss and<br>Schist)<br>(mbgl) |
| A05            | NE                       | GL-1.80  | NE   | 1.80-14.50   | 14.50-19.40   | 38.00-40.00+                                 | -   |
|                |                          |  |  | 19.40 - 38.00  |   |  |   |
| A08            | NE                       | GL – 1.60  | NE   | 1.60-32.40   | 32.40 - 35.60   | -  | -   |
|                |                          |  |  | 35.60-36.00+   |   |  |   |
| A11            | NE                       | GL-1.20  | NE   | 1.20-14.60   | 14.60-17.10   | NE   | 28.20-32.80+  |
|                |                          |  |  | 17.10-27.50  | 27.50-28.20   |  |   |
| A19            | NE                       | NE   | NE   | GL-1.40  | 1.40-4.50   | NE   | 4.50-9.80+  |
| A26            | NE                       | NE   | GL-2.80?   | 2.80-3.20  | NE  | 3.20-6.34                                    | 6.34-8.10+  |
| A29            | NE                       | GL-2.30  | 2.30-2.65?                                       | 2.65-22.50   | NE  | NE   | 22.50-28.00+  |
| A31            | NE                       | GL-1.35  | 1.35-1.80  | 1.80-26.00   | NE  | NE   | 26.00-34.00+  |
| A34            | NE                       | GL-2.30  | NE   | 2.30-10.35   | NE  | NE   | 10.35-15.30+  |
| A36            | NE                       | NE   | GL-4.65  | NE   | NE  | NE   | 4.65-9.70+  |
| A39            | NE                       | NE   | GL-1.50  | NE   | NE  | 2.83-12.60+                                  | 1.50-2.83   |
| A42            | NE                       | NE   | GL-2.20  | 2.20-2.50?   | NE  | NE   | 2.50-12.50+   |
| A47            | NE                       | NE   | NE   | NE   | NE  | NE   | GL-10.10+   |
| A51            | NE                       | GL-2.10  | 2.10-5.20  | NE   | NE  | NE   | 5.20-10.20+   |
| A54            | NE                       | GL-4.65  | NE   | 4.65-11.25   | 11.25-11.65   | NE   | 11.65-16.50   |
| A57            | NE                       | GL-5.60  | NE   | 5.60-27.00   | NE  | 27.00-28.50                                  | 28.50-32.00+  |
| A59            | NE                       | GL-4.10  | 4.10-4.60  | 4.60-29.50   | 29.50-31.00+  | -  | -   |
| A63            | NE                       | GL-6.00  | NE   | 6.00-18.80   | 18.80-25.00   | -  | -   |
|                |                          |  |  | 25.00-25.50+   |   |  |   |
| B61            | NE                       | GL-4.50  | 4.50-5.00  | 5.00-31.30   | NE  | NE   | 31.30-36.80+  |
| GS011          | NE                       | NE   | GL-2.40  | 2.40-19.00+  | -   | -  | -   |
| L01            | NE                       | GL-3.50  | 3.50-6.80  | 13.00-20.30  | 6.80-13.00  | NE   | 20.30-25.55+  |

Notes: + Denotes base of stratum not encountered NE Not encountered



TABLE 6: SUMMARY OF STRATA TYPES ENCOUNTERED IN BOREHOLES FROM THE SOIL ENGINEERING 2013 INVESTIGATION - E SERIES BOREHOLES

| Borehole<br>No | Made<br>Ground<br>(mbgl) | Marine<br>Deposits<br>(Sand and<br>Sand and<br>Gravel)<br>(mbgl) | Marine Deposits (Sand, Gravel, Cobbles and Boulders) (mbgl) | Glacial Till (Variably Sandy Variably Gravelly Clay with Cobbles and Boulders) (mbgl) | Glacial<br>Sand,<br>Gravel<br>Cobbles<br>and<br>Boulders<br>(mbgl) | Weathered<br>Gneiss<br>(Granite,<br>Gneiss and<br>Schist)<br>(mbgl) | Less Weathered Gneiss (Granite, Gneiss and Schist) (mbgl) |
|----------------|--------------------------|--|---|---|--|---|---|
| Northern       | Breakwater               |  |   |   |  |   |   |
| E65            | NE                       | GL-7.50  | NE  | 7.50-10.60+   | -  | -   | -   |
| E66            | NE                       | GL - 10.10   | 10.10-10.70   | 10.70-14.25+  | -  | -   | -   |
| E69            | NE                       | GL-6.90  | 6.90-7.30   | 7.30-10.60+   | -  | -   | -   |
| E71            | NE                       | GL-9.50  | NE  | 9.50-13.30+   | -  | -   | -   |
| E72            | NE                       | GL-6.15  | 6.15-6.66   | 6.66-6.90?  | NE   | 6.90-9.60+  | -   |
| E74            | NE                       | NE   | GL-3.50   | NE  | NE   | NE  | 3.50-6.10+  |
| E75            | NE                       | GL-3.60  | NE  | NE  | NE   | 3.60-6.90+  | NE  |
| Southern       | Breakwater               |  |   |   |  |   |   |
| E105           | NE                       | GL-6.00+   | -   | -   | -  | -   | -   |
| E106           | NE                       | GL-6.00+   | -   | -   | -  | -   | -   |
| E107           | NE                       | GL-2.95  | 2.95-4.50   | -   | -  | -   | -   |
|                |                          | 4.95-6.00+   |   |   |  |   |   |
| E108           | NE                       | GL-3.65  | NE  | NE  | NE   | NE  | 3.65-6.65+  |
| E109           | NE                       | GL-5.80  | -   | -   | -  | 5.80-5.90?+   | -   |
| E110           | NE                       | GL-2.15  | NE  | NE  | NE   | NE  | 2.15-5.85+  |
| E111           | NE                       | GL-3.30  | NE  | NE  | NE   | 3.30-4.00   | 4.00-6.00+  |
| E112           | NE                       | GL-2.70  | NE  | NE  | NE   | NE  | 2.70-6.05+  |
| E115           | NE                       | GL-1.50  | NE  | NE  | NE   | 1.70-4.35+  | 4.35-5.70+  |
| E116           | NE                       | GL-1.00  | NE  | NE  | NE   | NE  | 1.00-4.50+  |

Notes: + Denotes base of stratum not encountered

NE Not encountered

TABLE 7: SUMMARY OF STRATA TYPES ENCOUNTERED IN BOREHOLES FROM THE SOIL ENGINEERING 2013 INVESTIGATION - TRIAL PITS

| Borehole<br>No | Made<br>Ground<br>(mbgl) | Marine Deposits (Sand and Sand and Gravel with Clay Interbeds) (mbgl) | Marine Deposits (Sand, Gravel, Cobbles and Boulders) (mbgl) | Glacial Till (Variably Sandy Variably Gravelly Clay with Cobbles and Boulders) (mbgl) | Glacial<br>Sand,<br>Gravel<br>Cobbles<br>and<br>Boulders<br>(mbgl) | Weathered<br>Gneiss<br>(Granite,<br>Gneiss and<br>Schist)<br>(mbgl) | Less Weathered Gneiss (Granite, Gneiss and Schist) (mbgl) |
|----------------|--------------------------|---|---|---|--|---|---|
| TP01           | NE                       | GL-0.85   | NE  | NE  | NE   | 0.85-1.70+  | -   |
| TP02           | NE                       | GL-0.40   | NE  | 0.40-1.00   | NE   | 1.00-2.10+  | -   |
| TP03           | NE                       | GL-0.55   | NE  | 0.55-2.40   | NE   | 2.40-2.70+  | -   |
| TP04           | NE                       | GL-0.50   | NE  | 0.50-3.30+  | -  | -   | -   |
| TP05           | NE                       | GL-1.30   | NE  | 1.30-3.20+  | -  | -   | -   |
| TP06           | NE                       | GL-3.00+  | -   | -   | -  | -   | -   |
| TP07           | NE                       | GL-2.00+  | -   | -   | -  | -   | -   |
| TP08           | GL-2.50                  | 2.50-3.80+  | -   | -   | -  | -   | -   |
| TP09           | NE                       | NE  | GL-2.40   | 2.40-3.80+  | -  | -   | -   |
| TP10           | GL-2.40                  | 2.40-3.20   | NE  | 3.20-4.40+  | -  | -   | -   |
| TP11           | GL-2.30                  | NE  | NE  | 2.30-3.10+  | -  | -   | -   |
| TP12           | GL-3.70+                 | -   | -   | -   | -  | -   | -   |
| TP13           | GL-2.50                  | NE  | NE  | 2.50-3.50+  | -  | -   | -   |
| TP14           | GL-3.50+                 | -   | -   | -   | -  | -   | -   |
| TP15           | GL-0.60                  | 0.60-2.90+  | -   | -   | -  | -   | -   |
| TP16           | NE                       | GL-2.50   | NE  | NE  | NE   | NE  | 2.50-2.80+  |
| TP17           | NE                       | GL-4.40+  | -   | -   | -  | -   | -   |
| TP18           | NE                       | GL-2.00+  |   | -   | -  |   | -   |

Notes: + Denotes base of stratum not encountered

NE Not encountered

The information obtained from all the investigations undertaken on the site has been summarised in a simplified form in Table 8. This table provides the main stratum types together with their depth ranges and a general description of the material composition.

#### 6.5 Groundwater

During the investigation, minor ground water inflows were recorded in most of the exploratory holes formed on land at depths in the range 0.00m to 3.10m below ground level. The majority of the inflows were recorded within the made ground and granular superficial deposits but inflows were also recorded within the clay and rock strata. The majority of these inflows were recorded as seepages or minor inflows.

TABLE 8: SUMMARY OF GROUND CONDITIONS FROM SOIL ENGINEERING 2013 INVESTIGATION

| Stratum  | Depth to top<br>(mbgl) | Depth to base<br>(mbgl) | Typical Description  |
|--|------------------------|-------------------------|--|
| Made ground (generally<br>absent)                              | GL                     | 0.60 - >3.70            | A granular mix of coarse and very coarse materials comprising a mix of sand and gravel, cobble and boulder sized fragments of metamorphic rock, igneous rock, concrete, tarmac, brick, plastic pipe, packaging and metal |
| Marine Sands and Sand &<br>Gravel Deposits (locally<br>absent) | GL - 2.50              | 0.40 - 10.10            | Typically medium dense and dense fine to coarse sand with varying fine gravel, silt and cobble content   |
| Marine Very Coarse Deposits (locally absent)                   | GL - 10.10             | 1.80 - 10.70            | Cobbles and boulders of mixed igneous and metamorphic lithologies with a sand and gravel matrix  |
| Glacial Till (locally absent)                                  | 0.40 - 13.00           | 1.00 - 38.00            | Firm and stiff brown or greyish brown clay with varying sand, gravel, cobble and boulder content   |
| Glacial Granular Deposits<br>(locally absent)                  | 1.40 - 32.40           | 4.50 – 35.60            | Dense and very dense sand and gravel often with a significant cobble and boulder content   |
| Weathered Gneiss (locally absent)                              | 0.85 - 38.00           | 1.70 - >40.00           | Extremely weak, very weak and weak often fractured banded granitic gneiss, comprising of interbanded units of micaceous schist, gneiss and coarse grained granitic materials   |
| Less Weathered Gneiss  | GL - 31.30             | >40.00                  | Weak medium strong and strong banded granitic<br>gneiss, comprising of interbanded units of<br>micaceous schist, gneiss and coarse grained granitic<br>materials   |

# 6.6 Summary

The strata encountered in the various exploratory holes formed on or adjacent to this site are summarised in tables 1, 4, 5, 6 and 7. Table 8 describes the general sequence of strata encountered on the site. These tables illustrate the variability of the sequence across the site.

An inspection of the exploratory holes and the strata they encountered in relation to their location on the site generally confirms the findings of the geophysics bathometric survey and previous geological information in relation to the location of the infilled buried valley beneath Nigg Bay. The investigation confirmed the geological information that the buried valley is, to the depths investigated, infilled principally with glaciogenic materials (glacial till and granular deposits). These are overlain by a predominantly granular sequence of marine deposits that generally appear to thicken towards the mouth of the bay.

#### 7.0 GEOTECHNCIAL PARAMETRIC ASSESSMENT

#### 7.1 General Comment

The data obtained during both the current investigation has been used in the parametric assessment and material geotechnical parameters are given in the following sections.

It should be noted that the geotechnical parameters detailed in Section 7 are based on a general assessment of the data. The values stated should be reviewed by the designer and specific characteristic values determined in order to make them applicable to the individual design requirements.

#### 7.2 Soil Classification

# 7.2.1 Moisture Content and Atterberg Limits

Moisture content testing and Atterberg Limits testing was undertaken on the glacial till deposits.

The natural moisture content test results obtained from these deposits are summarised in Table 9 below.

TABLE 9: SUMMARY OF MOSITURE CONTENT TEST RESULTS FROM SOIL ENGINEERING 2013 INVESTIGATION

| Strata          | No of Tests | Minimum<br>Moisture<br>Content % | Maximum<br>Moisture<br>Content % | Average Moisture<br>Content % |
|-----------------|-------------|----------------------------------|----------------------------------|-------------------------------|
| Marine Deposits | 3           | 9.4                              | 25                               | 19.5                          |
| Glacial Till    | 70          | 3.6                              | 32                               | 9.7                           |

A plot of moisture content against depth is presented in Figure 1 in Section E of this report. The plot illustrates the relatively low and consistent moisture content of the glacial till which shows little variation with depth apart from slightly elevated values near its top.

Three Atterberg Limits tests were performed on potentially cohesive samples taken from the marine deposits. Both of the test results indicate that the material tested is non-plastic.

The results of the Atterberg Limits testing on marine deposits are shown in Table 10.

TABLE 10: SUMMARY OF MOISTURE CONTENT AND ATTERBERG LIMIT TEST RESULTS FOR MARINE DEPOSITS FROM SOIL ENGINEERING 2013 INVESTIGATION

| Parameter            | No of Tests | Minimum | Maximum | Average |
|----------------------|-------------|---------|---------|---------|
| Natural mc %         | 3           | 9.4     | 25      | 19.5    |
| Plastic Limit %      | 3           | NP      | 21      | NP      |
| Liquid Limit %       | 3           | 22      | 36      | 28      |
| Plasticity Index %   | 3           | NP      | 15      | NP      |
| Note: NP Non Plastic |             |         |         |         |

Twenty-nine Atterberg Limits tests were performed on samples taken from the glacial till. The majority of the test results indicate that the material tested is clay, with only one sample classifying as non-plastic. The plasticity of the samples is relatively consistent with the classification on the A line plot which is shown as Figure 2 in Section E, indicating that the material is of low plasticity (86% of the till samples tested) but with a few samples of intermediate and high plasticity also determined and with most of the test results



plotting close to the T Line. The relative consistency of the material is also illustrated by a plot of Plasticity Index against depth detailed in Figure 3 in Section E of this report.

The results of the Atterberg Limits testing on Marine Alluvium are shown in Table 11.

TABLE 11: SUMMARY OF MOISTURE CONTENT AND ATTERBERG LIMIT TEST RESULTS FOR GLACIAL TILL FROM SOIL ENGINEERING 2013 INVESTIGATION

| No of Tests | Minimum        | Maximum                  | Average                           |
|-------------|----------------|--------------------------|-----------------------------------|
| 70          | 3.6            | 32                       | 9.7                               |
| 29          | 13             | 21                       | 17                                |
| 29          | 22             | 52                       | 31                                |
| 29          | 7              | 31                       | 14                                |
|             | 70<br>29<br>29 | 70 3.6<br>29 13<br>29 22 | 70 3.6 32<br>29 13 21<br>29 22 52 |

Based on these results a moderately conservative value of 15% has been adopted for the Plasticity Index in glacial till.

#### 7.2.2 Particle size Distribution

Eighty seven particle size distribution tests were carried out on selected samples from the marine deposits, thirty eight tests were undertaken on the glacial till and six tests were undertaken on made ground and the results are presented in Figures 4, 5, and 6 in Section E of this report. The samples from the glacial till deposits generally classify as being slightly gravelly sandy clays with a variable content of very coarse material with seven samples classifying as slightly sandy slightly gravelly clays, three samples classifying as slightly sandy gravely clays and one sample classifying as slightly sandy clay all with a variable content of very coarse material. The fines content of this material indicates that it is on the borderline of cohesive and granular.

The earthworks classification of the glacial till has been assessed in accordance with the Highway Agency Specification Series 600. The particle size distribution curves for the tests undertaken on the glacial till are plotted in Figure 6 in Section E of this report, with the material class envelopes for Class 2C - Stony Cohesive Fill shown as a black solid line. Results indicate that the samples of the glacial till generally fall within the Class 2C envelope.

Eighty-seven particle size distribution tests were carried out on selected samples from the marine deposits and the results are presented in Figure 5 in Section E of this report. The majority of samples classify as a slightly silty or silty variably gravelly sand with only four samples classifying as very clayey variably gravelly sand and eight samples classifying as variably clayey variably sandy gravel or sand and gravel. It is noted that some of these strata had a significant content of very coarse material and the very coarse marine deposits noted in Section 6 were generally not tested because of the difficulty of sampling this stratum.

The earthworks classification of the marine deposits has been assessed in accordance with the Highway Agency Specification Series 600. The particle size distribution curves for the tests undertaken on the marine deposits are plotted in Figure 5 in Section E of this report, with the material class envelopes for Class 1 - General Granular Fill shown as a black solid line. Results indicate that the samples of the sand marine deposits tested generally fall within the Class 1 envelope and may also be suitable as Class 6 for fill to structures.

Six particle size distribution tests were carried out on selected samples from the made ground deposits and the results are presented in Figure 4 in Section E of this report. The plot demonstrates the generally granular nature of this material with the majority of samples classify as a slightly silty or silty sandy or very sandy gravel with a low to medium content of very coarse material.



#### 7.3 Earthworks Classification

Laboratory determinations of California bearing Ratio (CBR) tests were carried out on two samples of remoulded material from beds of clay encountered within the marine sand deposits. The tests were performed on samples from depths between 1.00m and 1.50m below existing ground level obtained on land while trial pitting. Results of these tests are shown in Table 12.

TABLE 12: SUMMARY OF LABORATORY DETERMINED CBR TEST RESULTS FOR CLAY UNITS WITHIN THE MARINE SAND DEPOSITS FROM SOIL ENGINEERING 2013 INVESTIGATION

| Strata                                   | Number of<br>Tests | Average Natural MC% | CBR %<br>Min value | CBR%<br>Max Value | CBR %<br>Average |
|--|--------------------|---------------------|--------------------|-------------------|------------------|
| Clay beds within Marine Sand<br>Deposits | 4                  | 15                  | 0.31               | 0.65              | 0.48             |

These results indicate that based on the results of laboratory testing a conservative value of 1% is recommended for the marine sand deposits encountered on land. Although a higher California Bearing Ratio value could reasonably be anticipated for the granular materials within this unit, the lower bound 1% value is proposed because of the weak clay units within this stratum.

### 7.4 Shear Strength Parameters

#### 7.4.1 Triaxial Tests

A total of thirty-eight total stress undrained triaxial tests were performed on the glacial till encountered within the exploratory holes. Single stage tests were performed and these yielded value of undrained shear strength (Cu). A summary of the test results obtained for the three material types is given in Table 13.

TABLE 13: SUMMARY OF UNDRAINED SHEAR STRENGTH VALUES FROM SOIL ENGINEERING 2013 INVESTIGATION

| Material Type | No of Tests | Minimum Shear<br>Strength Cu kPa | Maximum Shear<br>Strength Cu kPa | Average Shear<br>Strength Cu kPa |
|---------------|-------------|----------------------------------|----------------------------------|----------------------------------|
| Glacial Till  | 38          | 58                               | 488                              | 291                              |

All of the test results are shown on Figure 7 in Section E of this report in which they are plotted against depth. The trend within the glacial till shows little variation with depth and the results show considerable variability. From the triaxial test data, a moderately conservative undrained shear strength of 260kPa is considered appropriate to the glacial till. In terms of Eurocode EC7, the parameters detailed above are for moderately conservative large volume assessments of strength. Other strength assessments for instance for local failure conditions are also detailed on Figure 7.

#### 7.4.2 Standard Penetration Test

Standard Penetration Tests (SPT) were carried out in all of the boreholes and window sampler holes. The undrained shear strength of the cohesive materials tested has been estimated using the relationship developed by Stroud, where:

Cu = f1 x SPT N60 value

The value of f1 is dependent on the Plasticity Index (Ip). By using the moderately conservative Plasticity Index of 15% for the glacial till a moderately conservative value of f1 = 5.0 has been derived.



Results from one hundred and ninety eight SPT N60 values in the glacial till are plotted against depth in Figure 8 in Section E of this report and suggest that the majority of the material is typically in the very high and extremely high strength category with shear strengths varying from 175kPa to in excess of 750kPa. As with the triaxial testing the results show little trend with depth and a considerable variation in values. Based on these results a moderately conservative assessment of undrained shear strength of 350kPa has been derived.

In terms of Eurocode EC7, the parameters detailed above are for moderately conservative large volume assessments of strength. Other strength assessments, for instance, for local failure are also detailed in Figure 8.

# 7.4.2 Effective Stress Shear Strength Parameters

A total of three consolidated undrained triaxial compression test with pore water pressure measurement was performed on the glacial till materials encountered within the exploratory holes. Multistage tests were performed and these yielded value of effective cohesion c' and effective angle of shearing resistance Ø'. A summary of the test results obtained for the glacial till deposits is given in table 14.

TABLE 14: SUMMARY OF EFFECTIVE STRESS SHEAR STRENGTH VALUES FOR CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION EFFECTIVE STRESS TESTS ON GLACIAL TILL SAMPLES FROM SOIL ENGINEERING 2013 INVESTIGATION

| Material Type and<br>Parameter  | No of Tests | Minimum    | Maximum    | Average *  |
|---|-------------|------------|------------|------------|
| Glacial Till  |             |            |            |            |
| Effective cohesion c' (kPa) Effective angle of shearing resistance Ø' (°) | 3 3         | 17<br>29.5 | 19<br>35.5 | 18<br>32.7 |

#### 7.5 Granular Strata Density Classification

# 7.5.1 Shear Box Tests

A total of six small shear box tests were performed on the granular materials encountered within the exploratory holes with all six tests performed on the marine sand deposits. Multistage small shear box tests were performed to record peak shear strength parameters and these yielded value of peak cohesion c' and peak angle of shearing resistance  $\mathcal{O}'$ . On three tests, residual values were also determined. A summary of the test results obtained for the creek deposits is given in table 15.

TABLE 15: SUMMARY OF SHEAR STRENGTH VALUES FOR SMALL SHEAR BOX TESTING ON SAMPLES OF MARINE SAND DEPOSITS FROM SOIL ENGINEERING 2013 INVESTIGATION

| Material Type and Parameter   | No of Tests | Minimum     | Maximum   | Average     |
|---|-------------|-------------|-----------|-------------|
| Marine Sand Deposits  |             |             |           |             |
| Peak cohesion $c_{p'}$ (kPa)  Peak angle of shearing resistance $\emptyset_{p'}$ (°)                      | 6<br>6      | 0.3<br>35.5 | 10<br>42  | 5.9<br>39.5 |
| Residual cohesion c <sub>r</sub> ' (kPa)<br>Residual angle of shearing<br>resistance Ø <sub>r</sub> ' (°) | 3<br>3      | 1.0<br>34   | 4.9<br>38 | 2.6<br>35.5 |

#### 7.5.2 Standard Penetration Testing

The results of one hundred and seventy two Standard Penetration Tests normalised to 60% trip hammer energy ratio (N60) undertaken within the marine deposits ranged from N60 = 3 to N60 = 129 (upper value extrapolated) with these values generally falling in the medium dense, dense and very dense categories. The results are plotted against depth in Figure 9 in Section E of this report and based on these results a moderately conservative design line of N60 = 24 at 0.50mdepth increasing to N60 = 90 at 9.50mdepth has been adopted for these data. The SPT N60 values for the marine deposits are plotted against vertical effective stress in Figure 10 in Section E of this report together with curves generated by Mitchell for angles of internal friction. The results detailed on this plot should be treated with caution because of the relatively low values of effective stress encountered however based on these results an effective angle of shearing resistance of  $42^{\circ}$  is assessed for the marine sand deposits from this testing.

The results of nine Standard Penetration Tests normalised to 60% trip hammer energy ratio (N60) undertaken within the granular glacial deposits ranged from N60 = 43 to N60 = 117 (upper value extrapolated) with these values falling in the dense and very dense categories. The results are plotted against depth in Figure 11 in Section E of this report and based on these results a conservative local design value of N60 = 50 has been adopted for these data because of the low number of test results. Based on these results an effective angle of shearing resistance of  $45^\circ$  is assessed for these deposits.

In terms of Eurocode EC7, the parameters detailed above are for moderately conservative large volume assessments of relative density. Other strength assessments, for instance, for local failure are also detailed on Figure 9.

#### 7.6 Consolidation Parameters

No odometer or Row cell (consolidation) tests were performed on samples because the coarse granular material encountered within the glacial till prevented compliant testing. Five consolidation test results obtained from effective stress testing during consolidation yielded an  $m_{vi}$  value in the range 0.04 m<sup>2</sup>/MN 0.09 m<sup>2</sup>/MN with an average of 0.07 m<sup>2</sup>/MN over an appropriate stress range.

The modulus of volume compressibility  $m_v$  of the cohesive materials tested has been estimated from SPT data using the relationship developed by Stroud, where:

 $m_v = 1 / f2 \times SPT N60 \text{ value}$ 

The value of f2 is dependent on the Plasticity Index (Ip). By using the moderately conservative Plasticity Index of 15% for the glacial till a moderately conservative value of f1 = 0.5 has been derived. The results of SPT testing detailed in Figure 8 in Section E of this report indicates that compressibility values do not vary



much with depth.

For the glacial till a moderately conservative design value of  $m_v = 0.04$  m<sup>2</sup>/ MN has been adopted for design. A summary of adopted design values is given in Table 16.

TABLE 16: ASSUMED VALUES OF VOLUME COMRESSIBILITY (mv) BASED ON IN SITU AND LABORATORY INDEX TESTING FOR THE SOIL ENGINEERING 2013 INVESTIGATION

| Material Type | mv (MN/m²) | Assumptions                                  |
|---------------|------------|--|
| Glacial Till  | 0.04       | mv calculated for load increment po + 100kPa |

# 7.7 Soil Unit Weight

# 7.7.1 Particle Density of Granular Materials

In order to confirm assessments of soil unit weight in granular materials particle density testing was undertaken on eleven samples of the granular marine deposits.

The particle density test results obtained from these deposits are summarised in Table 17 below.

TABLE 17: SUMMARY OF PARTICLE DENSITY TEST RESULTS FROM SOIL ENGINEERING 2013 INVESTIGATION

| Strata          | No of Tests | Minimum<br>Particle Density<br>(Sg) | Maximum<br>Particle Density<br>(Sg) | Average Particle<br>Density<br>(Sg) |
|-----------------|-------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Marine Deposits | 12          | 2.61                                | 2.68                                | 2.67                                |

The results are relatively consistent and show little variance indicating a relatively consistent mineralogy of the sand in the marine deposits.

#### 7.7.2 Bulk Density

Bulk density testing was undertaken on forty-three samples from the Glacial Till. In all cases the test values were derived as part of triaxial and odometer testing. Table 18 summarises the results of bulk density testing and values of laboratory determined bulk density are plotted against depth for all samples tested in Figure 12 in Section E of this report. Figure 12 demonstrates the high and relatively consistent bulk density of the glacial till which appears to vary little but shows a slight decrease in density over the depth interval assessed.

TABLE 18: SUMMARY OF LABORATORY DETERMINED BULK DENSITY VALUES FROM SOIL ENGINEERING 2013 INVESTIGATION

| Material Type | Number of<br>Tests | Minimum $\gamma$ (Mg/m³) | Maximum $\gamma$ (Mg/m³) | Average $\gamma$ (Mg/m $^{3}$ ) |
|---------------|--------------------|--------------------------|--------------------------|---------------------------------|
| Glacial Till  | 48                 | 1.96                     | 2.40                     | 2.28                            |

All of the laboratory results have also been correlated with published values in the literature and values of unit weight for design are summarised in Table 19.



**TABLE 19: SUMMARY OF DERIVED SOIL UNIT WEIGHT PARAMETERS** 

| Material Type                                      | $\gamma$ (kN/m³) | Assumptions                                  | Source                                  |
|--|------------------|--|---|
| Made Ground  | 16               | Unsaturated rock fill                        | CIRIA C580:2003                         |
| Marine Sand Deposits                               | 21.5             | Saturated medium dense and dense medium sand | CIRIA C580:2003 &<br>Laboratory Testing |
| Marine Sand, Gravel Cobble and<br>Boulder Deposits | 20               | Saturated loose gravel                       | CIRIA C580:2003                         |
| Glacial Till                                       | 22               | Very Stiff and Hard Clay                     | CIRIA C580:2003 &<br>Laboratory Testing |
| Granular Glacial Deposits                          | 21               | Saturated dense gravel                       | CIRIA C580:2003                         |

#### 7.8 Rock Classification

#### 7.8.1 Moisture Content

Moisture content testing was undertaken on the granitic gneiss strata.

The natural moisture content test results obtained from these strata are summarised in Table 20 below.

TABLE 20: SUMMARY OF ROCK MOSITURE CONTENT TEST RESULTS FROM SOIL ENGINEERING 2013 INVESTIGATION

| Strata          | No of Tests | Minimum<br>Moisture<br>Content % | Maximum<br>Moisture<br>Content % | Average Moisture<br>Content % |
|-----------------|-------------|----------------------------------|----------------------------------|-------------------------------|
| Granitic Gneiss | 48          | 0.1                              | 2.9                              | 0.48                          |

A plot of rock moisture content against depth is presented in Figure 13 in Section E of this report. The plot illustrates the relatively low and consistent moisture content of the granitic gneiss strata which shows little variation with depth but is quite variable.

#### 7.8.2 Point Load Tests

Point Load testing was performed on a number of rock core samples of both the weathered and less weathered granitic gneiss. One hundred and ninety four tests were performed on weathered granitic gneiss and seven hundred and thirty four on the less weathered granitic gneiss. The results of these tests are shown in Table 21. Plots of point load Is50 verses depth and elevation for the samples tested are presented in Figure 14 and Figure 15 respectively. Values in both plots show little variation with depth/elevation but a considerable variation in values indicating there is little topographic variation in rock strength but a large variation in the strength properties of the rock mass.



**TABLE 21: SUMMARY OF POINT LOAD IS50 TEST RESULTS** 

| Material Type                | No of Tests | Minimum<br>(MN/m2) | Maximum<br>(MN/m2) | Average<br>(MN/m2) |
|------------------------------|-------------|--------------------|--------------------|--------------------|
| Weathered Granitic<br>Gneiss | 194         | 0.0                | 16.6               | 2.1                |
| Less Weathered<br>Gneiss     | 734         | 0.0                | 22.4               | 3.9                |

### 7.8.3 Unconfined Compressive Strength Tests

Unconfined Compressive Strength (UCS) testing was undertaken on three samples of weathered granitic gneiss and twenty-two tests were performed on samples of less weathered granitic gneiss. These tests yielded results as presented in Table 22. Plots of UCS verses depth and elevation for the samples tested are presented in Figure 16 and Figure 17 respectively. As with point load test data UCS values in both plots show little variation with depth/elevation but a considerable variation in values indicating there is little topographic variation in rock strength but a large variation in the strength properties of the rock mass.

TABLE 22: SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH (UCS) TEST RESULTS

| (0.00) 1.00 1.100.100        |             |                 |                    |                    |  |  |  |
|------------------------------|-------------|-----------------|--------------------|--------------------|--|--|--|
| Material Type                | No of Tests | Minimum (MN/m2) | Maximum<br>(MN/m2) | Average<br>(MN/m2) |  |  |  |
| Weathered Granitic<br>Gneiss | 3           | 8.46            | 16.5               | 11.7               |  |  |  |
| Less Weathered Gneiss        | 22          | 35.1            | 111                | 68.6               |  |  |  |

#### 7.9 Sulfate and Related Test Results

TABLE 23: RESULTS OF CHEMICAL TESTS FOR CONCRETE DESIGN FROM SOIL ENGINEERING 2013 INVESTIGATION

| Material Type        | Water<br>Soluble<br>SO4<br>(mg/l) | рН  | Nitrate<br>(mg/kg) | CI<br>(mg/kg) | Mg<br>(mg/l) | BRE Design<br>Class | ACEC Class |
|----------------------|-----------------------------------|-----|--------------------|---------------|--------------|---------------------|------------|
| Made Ground          | 60                                | 8.5 | 10                 | 93            | 5300         | DS-1                | AC-1       |
| Marine Sand Deposits | 480                               | 8.3 | -                  | 4100          | 77000        | DS-1                | AC-1       |
| Glacial Till         | 255                               | 8.2 | 1                  | 2950          | 43500        | DS-1                | AC-1s      |

The tests outlined in BRE Special Digest 1 for determining appropriate concrete class for use on this site were performed on a total of seventeen soil samples. Water soluble Sulfate, pH, Nitrate, Chloride and Magnesium testing was undertaken on two samples from the made ground, six samples from the marine sand deposits and nine samples from the glacial till. The characteristic values for these tests for the three material types and groundwater are shown in Table 23. The table also details the aggressive chemical environment for concrete (ACEC) classification for undisturbed ground.



# 7.10 Summary of Geotechnical Parameters

A summary of the geotechnical parameters discussed in the preceding sections is given in Table 24 below. If any additional information on ground conditions is obtained before design is undertaken, these values should be reassessed.

TABLE 24: SUMMARY OF GEOTECHNICAL PARAMETERS FROM SOIL ENGINEERING 2013 INVESTIGATION

|   | Stratum type   |                            |  |                 |   |                     |                             |  |  |  |
|---|----------------|----------------------------|--|-----------------|---|---------------------|-----------------------------|--|--|--|
|   | Made<br>Ground | Marine<br>Sand<br>Deposits | Marine<br>Sand,<br>Gravel,<br>Cobble<br>and<br>Boulder<br>Deposits | Glacial<br>Till | Glacial<br>Sand,<br>Gravel,<br>Cobble<br>and<br>Boulder<br>Deposits | Weathered<br>Gneiss | Less<br>Weathered<br>Gneiss |  |  |  |
| SPT 'N60' Value   | -              | 2 - >65                    | >65  | 35 - >65        | 43 - >65  | >65                 | >65                         |  |  |  |
| Moisture Content<br>%   | -              | 24 - 25                    | -  | 3.6 - 32        | -   | 0.1                 | - 2.9                       |  |  |  |
| PI %  | -              | -                          | NP   | 15              | -   | -                   | -                           |  |  |  |
| PSD range   | Figure 4       | Figure 5                   | -  | Figure 6        | -   | -                   | -                           |  |  |  |
| Saturated Unit<br>Weight (kN/m³)  | 16             | 21.5                       | 20   | 22              | 21  | -                   | -                           |  |  |  |
| California Bearing<br>Ratio %   | -              | 1                          | -  | -               | -   | -                   | -                           |  |  |  |
| Undrained Shear<br>Strength (kPa)   | -              | -                          | -  | 300             | -   | -                   | -                           |  |  |  |
| Odometer mv<br>value (MN/m²)  | -              | -                          | -  | 0.04            | -   | -                   | -                           |  |  |  |
| Effective Angle of<br>Shearing<br>Resistance Ø'°  | -              | 40                         | 35   | 33              | 45  | -                   | -                           |  |  |  |
| Effective<br>Cohesion c' (kPa)  | -              | 0                          | -  | 0               | 0   | -                   | -                           |  |  |  |
| Critical State<br>Angle of Shearing<br>Resistance ${\mathscr O}'_{\operatorname{crit}}{}^\circ$ | -              | 32                         | -  | 30              | 36  | -                   | -                           |  |  |  |
| Point Load Is50<br>(MPa)  | -              | -                          | -  | -               | -   | 0 - 16.6            | 0 - 22.4                    |  |  |  |
| Unconfined<br>Compressive<br>Strength (MPa)   | -              | -                          | -  | -               | -   | 8.5 - 16.5          | 35.1 - 111                  |  |  |  |
| Concrete Class<br>(disturbed)   | DS - 1         | DS - 1                     | -  | DS - 1          | -   | -                   | -                           |  |  |  |

#### 8.0 GEOTECHNICAL ENGINEERING ASSESSMENT

#### 8.1 Proposals

It is understood that the site investigated is to be developed as a new port with a general layout as shown on Arch Henderson drawing No. 121106 - 01 Rev. D dated 31/01/1 and cross section drawings DKR4708/300/D002 and DKR4708/300/D003 dated 12/10/2012. The proposed development will include the construction of new breakwaters, quays and a navigation channel and harbour area. The construction of the navigation channel and harbour area will involve dredging of parts of Nigg Bay to reduce its level.

Two breakwaters constructed of quarried rock materials are to be constructed to enclose the bay. The northern breakwater is indicated to run roughly north - south and extend from the end of Girdle Ness headland with a crest level of 11.5m (chart datum) indicated. Breakwater heights from seabed of approximately 17.0m to 18.0m are indicated with the width of the crest indicated at 14.7m and the breakwater flanks indicated at an inclination id 1.33 horizontal to 1 vertical. The southern breakwater is indicated to run roughly south west - north east and extend from the end of the Greg Ness headland with a crest level of 12.3m (chart datum) indicated. For this breakwater, heights from seabed of approximately 21.8m to 24.8m are indicated with the width of the crest indicated at between 14.4m and 16.5m and the breakwater flanks indicated at an inclination id 1.33 horizontal to 1 vertical.

The approach channel running between the breakwaters is indicated to have a level of -10.5m chart datum and this links into the roughly circular main harbour basin behind the breakwaters with a base level of -9.0m indicated.

For the quay and harbour side a concrete deck supported by precast concrete beam units with a level of +6.5m chart datum is indicated. The drawing also indicates steel tubular piles are proposed to support the deck.

#### 8.2 Site Conditions

A description of the site location, its condition, and general environs has already been given in section 3.2 of this report. It is considered however that the following factors noted during the site works or taken from the desk study report prepared by the Engineer and in a site check type report prepared by and supplied by the Employer may be of engineering and environmental significance with regard to the proposed development.

A walkover survey carried out by the site engineering geologist noted that the site comprised a wide bay area between two rock headlands. Rock comprising fractured granitic gneiss was noted on both headlands and on the northern headland, some evidence of superficial deposits overlying this can also be seen in the cliff section. Rock was seen at the end of the southern headland and a distinct contact between granitic gneiss and glacial superficial deposits can be seen in the south western corner of the bay. To the west of this contact, a large section of glacial superficial deposits can be seen in the cliff face that appear to extend all the way to beach level. The western end of the bay comprised a sloping sand, gravel and cobble beach backed by the coastal road and open grassland. At the southern end of the beach, a level area backing onto the cliff behind is evident with some evidence of bituminous surfacing exposed at its top and blocks of concrete and brick and other man made materials noted in exposed and eroded materials.

Historical exploratory hole data noted in Section 3.6 of this report confirm the rapid thickening of superficial deposits behind the Greg Ness headland to the north west of the soil rock contact noted in the preceding paragraph in the south western corner of the bay. It is also noted that the borehole from the historical information drilled in Nigg Bay (borehole NJ90SESE7807 7) recorded a considerable thickness of glacial silt overlying bedrock and this information is at variance with all the data from this current



investigation.

### 8.3 Summary of Subsurface Conditions

The ground conditions encountered in the exploratory holes have been described in section 6.0 of this report. Within this section, however the general stratigraphy encountered during the investigation is reviewed, the engineering significance of individual strata is discussed and design information is summarised. Any particular problem areas are also highlighted.

A variable and in places thick sequence of superficial deposits infilling a buried valley and overlying metamorphic rock strata was encountered by the investigation. Cross sections of borehole data presented as Figures 18 to 26 inclusive in Section E of this report demonstrate the buried valley topography of the soil rock contact. A reasonably well defined sequence of predominantly granular marine deposits overlying typically cohesive glacial deposits that infill a buried valley incised into the underlying granitic gneiss bedrock is indicated by the current boreholes. The strata encountered in these exploratory holes are also summarised in Tables 4, 5, 6 and 7 in Section 6 of the report.

The made ground encountered was very limited in extent and was only encountered in trial pits dug in the south western corner of the bay with thicknesses between 2.60m and in excess of 3.70m recorded. The made ground appears to be largely inert comprising predominantly granular materials with a variable mix of sand and gravel, cobble and boulder sized fragments of metamorphic rock, igneous rock, concrete, tarmac, brick, plastic pipe, packaging and metal observed.

Two distinct units were noted within the upper marine granular formation with both being discontinuous and not encountered in all exploratory holes drilled around the bay. Typically, the uppermost unit comprised a fine to coarse sand with varying fine gravel, silt and cobble content and this locally overlies a variable sequence of very coarse material comprising a mix of sand, gravel, cobbles and boulders.

The marine sand deposits were encountered in most boreholes drilled in the bay but were variable in thickness. This stratum typically exceeded 4.00m in the mouth of the bay (beneath the ends of both breakwaters) and decreased in thickness towards the beach and headlands as illustrated by cross sections B-B, C-C and G-G. The strata comprised units of generally well sorted fine to coarse sand with varying fine gravel, silt and cobble content. In situ test and laboratory test data associated with the marine sand deposits are summarised and discussed in Section 7 while Figures 5, 9 and 10 presented in Section E of this report provide summary plots of in situ and laboratory test data for the stratum. Based on this information a moderately conservative design SPT "N60" value of N60 = 24 at 0.50m depth increasing to N60 = 90 at 9.50m is assessed for design where large volumes of this material are affected. Based on SPT results and the results of shear box testing an effective angle of shearing resistance of 40° and a critical state angle of shearing resistance of 32° is assessed with effective cohesion of 0kPa in both cases.

The very coarse marine deposits were mainly encountered in boreholes drilled in the northern and north western parts of the bay to the south of the Girdle Ness Headland. This stratum was very variable in thickness as illustrated by sections B-B, C-C, E-E and F-F. The stratum was principally granular typically comprising cobbles and boulders of mixed igneous and metamorphic lithologies with a sand and gravel matrix. In situ SPT testing in this stratum was largely ineffective as tests refused on cobble and boulder obstructions and similarly sampling of this material proved difficult. Consequently, a conservative effective angle of shearing resistance of 35 ° is proposed for this material.

In all of the boreholes and trial pits that fully penetrated the marine deposits these strata were underlain by glacial till, glacial granular deposits and/or rock. The glacial till and glacial granular strata varied considerably in thickness as illustrated by sections B-B, C-C, and D-D and these sections illustrate that the buried valley feature has been principally infilled with glacial deposits. The glacial till lithology comprised



the predominant material for these deposits with the granular materials generally interlensed with the glacial till. The top of the glacial deposits where present was recorded at depths between 0.40m and 13.00m below ground level and the strata was proved to depths of up to 38.00m below ground level in the exploratory holes and probes undertaken.

The glacial till material comprised very stiff and hard brown or greyish brown clay with varying sand, gravel, cobble and boulder content. Figure 6 illustrates the variable fines content of this material and in some cases the material analysed appears to be borderline cohesive/granular. This is also illustrated by Figure 2 which shows the till to be of generally low plasticity. In situ test and laboratory test data associated with the glacial till are summarised and discussed in Section 7 while Figures 3 to 3 inclusive, 6, to 8 inclusive and 12 presented in Section E of this report provide summary plots of in situ and laboratory test data for the stratum. Based on this information, a moderately conservative design undrained shear strength of 300 kPa is assessed with undrained shear strength appearing to vary little with depth. A preliminary design compressibility of mv = 0.04 MN/m² is also assessed for the glacial till with little variation with depth indicated from in situ testing. The above values are assessed for structural design and should not be applied to an assessment of the excavatability of this stratum. To evaluate this all of the data presented in Figures 6 to 8 inclusive should be assessed.

The granular glacial material comprised variable granular units of sand and gravel often with a significant cobble and boulder content. In situ test and laboratory test data associated with the glacial granular deposits are summarised and discussed in Section 7 while Figures 6 and 11 presented in Section E of this report provide summary plots of in situ and laboratory test data for the stratum. Based on this information a moderately conservative design value of N60 = 50 has been adopted for these data because of the low number of test results. Based on these results an effective angle of shearing resistance of 45° is assessed for these deposits is assessed for design where large volumes of this material are affected and a critical state angle of shearing resistance of 36° is assessed with effective cohesion of 0kPa in both cases.

In all boreholes that fully penetrated the made ground and superficial deposits rock comprising granitic gneiss was encountered. As previously noted rockhead depths were very variable and pick out an east - west trending valley running beneath Nigg Bay. This is illustrated by cross sections A-A to G-G inclusive presented in Section E of this report. The lithology if the banded granitic gneiss varied on a relatively small scale with this material comprising of interbanded units of micaceous schist, gneiss and coarse grained granitic materials frequently in thin to thickly banded units. The rock appeared to be variably weathered and typically appeared to be slightly or moderately weathered but also contained weaker moderately and highly weathered strata. The distribution of the weathered material between boreholes appeared to follow no set pattern and was very variable. In situ test and laboratory test data associated with the granitic gneiss are summarised and discussed in Section 7 while Figures 13 to 17 inclusive presented in Section E of this report provide summary plots of in situ and laboratory test data for the stratum. These plots indicate a considerable variation in unconfined compressive strength and point load test results with values showing little trend with depth or elevation indicating strength variations within the rock mass are on a local rather than a site wide scale.

During laboratory testing point load testing was undertaken on a few of the same samples selected for UCS testing in order to establish a site correlation between the two strength parameters and the results of this testing is detailed in Figure 18. Based on this testing a site correlation of UCS = 10.7 Is50 MPa was derived. Based on this correlation the results of point load testing were converted to equivalent unconfined compressive strength values and a composite plot of laboratory UCS and derived point load UCS against depth is presented in Figure 19. When analysing point load test data for this plot only sets of 10 tests have been included and the average value excluding the two highest and lowest Is50 values has been calculated. For the less weathered granitic gneiss strata based on this information a moderately conservative design rock strength value of UCS = 30 MPa has been assessed for structural design where large volumes of this material are affected and a local strength value of 6MPa has also been derived. The results detailed in



Tables 21 and 22 indicate that the weathered rock material has lower strength and moderately conservative design rock strength value of UCS = 6 MPa has been assessed for structural design where large volumes of the weathered gneiss material are affected and a local strength value of 1MPa is assessed for this material. The above values are assessed for structural design and should not be applied to an assessment of the excavatability of rock strata. To evaluate this all of the data presented in Figures 13 to 19 inclusive should be assessed.

With regard to groundwater most of the site was below sea level or within the intertidal zone. The limited exploratory holes undertaken on land indicate that in these parts of the site the groundwater table beneath the site appears to be encountered at shallow depth within the rock strata or superficial deposits with strikes recorded between 0.00m to 3.10m below ground level during the formation of the exploratory holes.

### 8.4 Development of Site

As noted in section 8.3 above, the boreholes show that there is only local and limited thicknesses of made ground present beneath the south western corner of the site. The remaining ground conditions encountered beneath the site are generally favourable for the development with typically medium dense or dense marine granular deposits encountered overlying typically very stiff and hard glacial till strata and very dense glacial granular strata and at greater depth typically weak, medium strong and strong Dalradian rock strata

The proposed development of the site will need to take into account the nature, thickness and variability of the superficial deposits and the variability of rockhead levels and rock strata beneath the site.

The main structures with significant associated loads are indicated to be:

- North and South Breakwaters
- Harbour access channel and harbour area
- Quay area comprising reinforced concrete deck supported by tubular steel piles

The remaining proposals which could include car parking areas, access roads and storage areas are unlikely to have significant loads associated with them.

For the purposes of assessing foundation levels, it has been assumed that the majority of the site will remain at existing levels.

#### 8.5 Foundations

#### 8.5.1 Summary

Piled foundations have been indicated to support part of the quay area in the northern side of the bay (cross section drawings DKR4708/300/D002 and DKR4708/300/D003). Any foundation solution will however have to take account of the site geology and the nature of the development and the site location adjacent to the North Sea.

Spread foundations are likely to be suitable for lightly loaded structures constructed on land on the site. For those more heavily loaded structures which require settlement to be maintained at minimal levels, and for structures constructed over water piled foundations would be suitable for use on the site.

#### 8.5.2 Spread Foundations

Shallow spread foundations could be used to support parts of the quay structure where this abuts the



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Girdle Ness headland and beach area.

Based on the results of the in situ and laboratory testing it is considered that a net allowable bearing pressure of 185kPa may be placed the marine sand strata at a depth of 1.00m by a conventional spread strip foundation of least width 0.6 to 1.0 metre at the location of borehole L01. For pad foundations, a net allowable bearing pressure of 175 kPa may be placed on the same material at the same depths by a conventional pad foundation of dimensions 2.0m by 2.0m. A minimum adequacy factor in excess of 3.0 was assessed for this foundation configuration and consequently the GEO limit state requirement is satisfied. The quoted net allowable bearing pressure is for settlement not exceeding 25mm. Shallow spread foundations should be founded on the marine sand strata and because of the low shrinkage potential of this strata a minimum founding depth of 0.80m should be adopted. Care should be exercised to confirm the density of the founding granular strata on the shore area as any windblown sand deposits are likely to be less compact and have lower bearing pressures.

Higher allowable bearing pressures would be available on the granitic gneiss rock strata. Based on the results of the in situ and laboratory testing it is considered that a net allowable bearing pressure of 2.5MPa may be placed the less weathered granitic gneiss strata with a fracture spacing greater than 100mm by a conventional spread strip foundation of least width 0.6 to 1.0 metre. For pad foundations, the same net allowable bearing pressure may be placed on the same material by a conventional pad foundation of dimensions 2.0m by 2.0m. For the weathered granitic gneiss strata, a lower net allowable bearing pressure of 0.5MPa is assessed for the same strip and pad foundation dimensions and rock fracture spacing detailed above. The quoted net allowable bearing pressure is for settlement not exceeding 25mm.

Prior to blinding, the base of foundation excavations should be carefully examined for pockets of organic, soft or loose material. If encountered, these should be removed and replaced with compacted lean mix concrete. Over excavation and compacted back filling must be avoided.

#### 8.5.3 Piled Foundations

If it is considered that some or all of the proposed structures need to be supported on foundations that will guarantee very limited settlement, or for foundations to be constructed over water, a piled foundation solution could be adopted. The suspended reinforced concrete deck for the quay could be supported on closed or open-ended steel tubular driven piles as proposed by the Engineer provided that ground vibration and noise can be tolerated during construction. The advice of specialist piling contractors should be sought on the suitability and load carrying capacity of their proprietary systems for use at the site. Cross sections C-C, D-DE-E, F-F, H-H and I-I indicate very variable rockhead depths over the area of the proposed quay. Whereas sections E-E and F-F indicate that rockhead is typically less than 5.00m along the northern edge of the bay, rockhead depths increase rapidly towards the centre of the bay and this will impact on the installation of piles in these areas. The presence of cobble and boulder obstructions within the very coarse granular marine deposits (for example as detailed on cross section F-F) and glacial till and granular deposits will present difficulties for driven piles in these materials and suitable protection or other measures may be required to ease passage through this material.

Piles will need to be extended to sufficient depth within the glacial till or less weathered granitic gneiss and based on the borehole information this could mean that piles between 6.0m to in excess of 30.0m length would be required to support a suspended concrete deck at the level indicated (+6.5m chart datum). The exploratory hole logs, the data presented in Tables 1 to 25 inclusive together with Figures 1 to 28 inclusive should be made available to piling contractors.

It is recommended that limited pile load tests should be carried out to verify design loads although it is acknowledged that this testing may be restricted by the cost of these tests. When reviewing the pile load test programme the design economies associated with the Eurocode UK National Annex should be



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considered. It is also recommended that if piles are considered to be necessary for this scheme, piling contractors are consulted about the most suitable type of pile for use on the site.

#### 8.6 Access Channel and Harbour Excavations

As part of the harbour development parts of the bay are to be dredged and the ground level lowered to construct a harbour basin and approach channel. The approach channel running between the breakwaters is indicated to have a level of -10.5m chart datum and this links into the roughly circular main harbour basin behind the breakwaters with a base level of -9.0m indicated.

The dredge levels detailed on drawing 121106-AB-01 are indicated on cross sections B-B, C-C, G-G and H-H. These sections indicate that excavations will principally be undertaken within the marine sand deposits, the coarse granular marine deposits and the underlying glacial till. Although the levels detailed on the drawing are limited excavation levels do not appear to intersect the extrapolated rockhead levels drawn on the cross sections. It is noted however that rockhead levels in this type of buried valley feature are often very variable and this is to some extent confirmed by the geophysical survey and consequently excavations intersecting the underlying rock strata cannot be discounted based on the current distribution of exploratory holes.

Dredging excavations within the marine sand deposits and coarse granular marine deposits should be readily achievable with marine dredging plant although the dredging plant should be capable of handling the very coarse (cobble and boulder) materials noted in the very coarse marine strata. The underlying glacial till materials will prove more difficult to excavate because of the high undrained shear strength of this material. A review of the data for the glacial till presented in Figures 7 and 8 indicates an inferior local undrained shear strength value of 175kPa and a superior local strength value of around 750kPa and the dredging plant employed on this project should be capable of readily excavating till materials within this strength range. It is also noted that the glacial till stratum contains very coarse (cobble and boulder) materials that could also cause excavation difficulties.

# 8.7 Breakwater Construction

Cross sections A-A, B-B and I-I indicate that both breakwaters will be constructed on ground that is variable both in terms of thickness and lithology. Depth to rockhead varies considerably beneath both breakwaters with this being especially so beneath the northern breakwater. The thickness of the individual strata beneath the breakwaters also varies considerably as indicated by the above cross sections. The above cross sections all indicate that the base of both breakwaters will mainly be founded on the marine sand deposits but locally (e.g. cross section B-B) the breakwater bases may found on the very coarse granular marine deposits.

For the northern breakwater, the topographic survey information indicates that for much of its length the base will be founded at approximately -8.00m chart datum with the height of the crest indicated at 11.5m chart datum. Based on these values and assuming a saturated bulk density of 20 kN/m³ for the rock fill forming the bund and a sea level of 0.00m chart datum total settlements in the centre of the breakwater at its northern end (at the location of BHE74) are assessed to be in the range 25mm to 70mm while at the southern end of the northern breakwater (at the location of BHB61) total settlements are assessed to be in the range 160mm to 400mm.

For the southern breakwater, assessments of settlement at its north eastern end are difficult because the depth of rockhead has not been determined. The breakwater will stress the ground to a considerable depth because of its width (the depth at which the stress increase due to loading is equal to 20% effective stress is estimated to be approximately 70m) and consequentially information in ground conditions to rockhead would be required in this area for a full assessment. The topographic survey information indicates that for



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much of its length the base of the southern breakwater will be founded at approximately -13.00m chart datum with the height of the crest indicated at 12.3m chart datum. Based on these values and assuming a saturated bulk density of  $20 \text{ kN/m}^3$  for the rock fill forming the bund and a sea level of 0.00m chart datum total settlements in the centre of the breakwater at its southern end (at the location of BHE112) are assessed to be in the range 35mm to 100mm while at the northern end of the southern breakwater (at the location of BHE106) total settlements are assessed to be in the range 65mm to in excess of 150mm.

In the above assessment, it is estimated that between 50% and 90% of settlement will occur during construction depending on its location along the breakwater.

## 8.8 Sulfate and pH Aggressivity

A total of seventeen soil samples were analysed for water soluble sulfate content, chloride content, water soluble magnesium content and pH levels. Selected soil samples were also analysed for nitrate content. The results of the analyses are given on the summary sheets in Section C. The results of the soil analysis indicate that a characteristic value for water soluble sulfate levels of 420 mg/l exist in the ground and that pH levels lie in the range pH = 7.9 to pH = 9.0. Chloride content values are in the range 81 to 3000 mg/kg and nitrate content values are in the range 5 to 10mg/kg.

Referring to Table C1 in BRE Special Digest 1 the recorded sulfate, pH and other test results would require the use of Design Sulfate Class DS-1 concrete and an ACEC class of AC-1 on this site. This is in agreement with the characteristic values and material classification for the various individual strata as detailed in Table 23. All other recommendations given in the Digest should be followed when designing concrete mixes for use on this site.

#### 8.9 Mining

This report has been prepared on the basis that the site is stable with regard to mining activities. No evidence of economically viable minerals or mining was encountered within the depth zone penetrated by the exploratory holes formed as part of this investigation.



BAY OF NIGG HARBOUR DEVELOPMENT
ABERDEEN

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#### 9.0 CONCLUSIONS AND RECOMMENDATIONS

The information available for the site has been gathered from a historical ground investigation and from the current ground investigation. Together with the desk study information, these investigations have provided sufficient and suitable data from which design parameters have been derived.

Although sufficient information has been obtained to allow a preliminary assessment of the project additional exploratory hole information would be required for final design. This would include additional exploratory holes on land to facilitate the development of structures associated with the harbour and additional boreholes within the bay to fill in parts of the site where exploratory hole coverage is poor. In addition, an assessment of the stability of the high slope of superficial deposits observed in the south western corner of the site should be considered if its failure will impact on the new facility.

For and on behalf of **Soil Engineering Geoservices Ltd** 

**Principal Engineering Geologist** 

P. Rodgers Reports Manager

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Where any documents referenced above are subject to any amendment, then the latest version incorporating such amendment shall be deemed to apply, unless specifically stated otherwise.





# SUPPORTING FACTUAL DATA

# **SECTION A**

Exploratory Hole Records and Field Data

EXPLORATORY HOLE LOG LEGEND AND NOTATION SHEET

# **SECTION A: EXPLORATORY HOLE LOG LEGENDS**

| CODE | DESCRIPTION | LEGEND           | CODE         | DESCRIPTION  | LEGEND                                 |
|------|-------------|------------------|--------------|--|--|
| 101  | Topsoil     |                  | 806          | Coal   |  |
| 102  | Made Ground |                  | 807          | Breccia  |  |
| 104  | Concrete    |                  | 808          | Conglomerate   | 00000                                  |
| 201  | Clay        |                  | 809          | Fine Grained Igneous   | \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ |
| 301  | Silt        | ×××××            | 810          | Medium Grained Igneous   | ++++                                   |
| 401  | Sand        |                  | 811          | Coarse Grained Igneous   | ****                                   |
| 501  | Gravel      |                  | 812          | Fine Grained Metamorphic   |  |
| 601  | Peat        | alle alle alle   | 813          | Coarse / Medium Grained<br>Metamorphic   |  |
| 701  | Cobbles     | 0 2 0 0          | EVT          | Evaporite  | 0000000                                |
| 730  | Boulders    |                  | MWS          | Mine Workings  |  |
| 801  | Mudstone    |                  | 904          | Grout  |  |
| 802  | Siltstone   | ******<br>****** | 905          | Arisings   |  |
| 803  | Sandstone   |                  | BLK          | Zone of No Recovery  |  |
| 804  | Limestone   |                  | WTR          | Water  | ~~                                     |
| 805  | Chalk       | T T T            | types are re | soils types comprise a mixture of particle<br>presented graphically on the exploratory<br>the legends shown on this sheet. |  |



# **SECTION A: EXPLORATORY HOLE LOG LEGENDS**

| SAMPLIN | IG NOTATION   |
|---------|---|
| u       | Undisturbed U100 or U38 sample (size given on log)    |
| ит      | Thin wall open drive tube sampler (size given on log) |
| Р       | Piston Sample   |
| BLK     | Block Sample  |
| М       | Mazier Sample   |
| TW      | Thin Walled Sample                                    |
| L       | Liner Sample obtained from windowless sampler         |
| D       | Small Disturbed Sample                                |
| В       | Bulk Disturbed Sample                                 |
| LB      | Large Bulk Disturbed Sample                           |
| С       | Core Sample   |
| ES      | Environmental Soil Sample                             |
| EW      | Environmental Water Sample                            |
| W       | Water Sample  |
| UF      | No Recovery in U Sample                               |
| UTF     | No Recovery in UT Sample                              |
| PF      | No Recovery in P Sample                               |
| TWF     | No Recovery in TW Sample                              |
|         |   |

| IN SITU 1 | TEST NOTATION                                       |
|-----------|---|
| SPT       | Standard Penetration Test with a Split Spoon        |
| SPT(C)    | Standard Penetration Test with a Cone               |
| С         | Cone Penetration Test                               |
| NP        | No Penetration for SPT or SPT(C)                    |
| V         | Vane Test   |
| HV        | Hand Vane   |
| НР        | Hand Penetrometer                                   |
| CBR       | California Bearing Ratio Test                       |
| K         | Permeability Test<br>(test type not differentiated) |
|           | (test type not unierentiated)                       |
| Pr        | Pressuremeter Test                                  |
|           |   |

| OTHER N | IOTATION                 |
|---------|--------------------------|
| TCR     | Total Core Recovery      |
| SCR     | Solid Core Recovery      |
| RQD     | Rock Quality Designation |
| FI      | Fracture Index           |
| lf      | Fracture Spacing         |
| NI      | Non Intact               |
| NA      | Data Not Applicable      |
| NR      | Data Not Recorded        |
|         |                          |

# **GRAPHICS USED**



Standing water level Joining bar indicates level risen Waterstrike level



# SUPPORTING FACTUAL DATA

# **SECTION A**

Exploratory Hole Records and Field Data

CABLE PERCUSSION AND ROTARY DRILLING RECORDS

| Project Name Bay of Nigg Harbour Development Ground Investigation   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         | Hole II                 |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
|---|----------------------|-----------------------|-------------------------|---------------------|--|-------------------|------------------------------------|----------------------------|---------------|---------------|------------------|-------------------------|-------------------------|------------------------------|---|--------------------|-------------------------|-----------------|-------------------------|-------------------------|--|--|--|--|
| Project   |                      | ,                     | '01 Nig<br>'148         | y i iai             | Dour De  | /610 <sub>F</sub> | )IIIEII                            | Groun                      | U IIIve.      | stiya         | LIUII            |                         |                         | Explo                        | ratory  | Hole L             | og                      | н               | ole ID.                 |                         |  |  |  |  |
| Engine  |                      |                       | 140<br>h Hend           | oreor               | . II D   |                   |                                    |                            |               |               |                  |                         |                         | -                            | -   |                    |                         | A               | ۸05                     |                         |  |  |  |  |
| Employ  |                      |                       |                         |                     | our Board  | ı                 |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         | н               | eader                   |                         |  |  |  |  |
| Ground I  |                      |                       | 3m CD                   | 141 ~ .             | Jui Dea  |                   |                                    | Coc                        | rdinate       | s             | 3966             | 88.10 E,                | 80463                   | 36.30 N Na                   | ntional Gric                                  | <u> </u>           |                         |                 |                         |                         |  |  |  |  |
| Date Sta  | rted                 | 23/0                  | 09/2013                 |                     |  |                   |                                    | Dat                        | e Comp        | leted         | 29/09            | 9/2013                  |                         |                              |   | Inclina            | tion Vert               | cal             |                         |                         |  |  |  |  |
| Тор   | Base                 | Туре                  | Date Sta                | arted               | Date Ende  | d (               | Crew                               | Section<br>Logged E        | n Co<br>By Ba | re<br>rrel    | Core<br>Bit      |                         | Equip                   | ment                         | Sł<br>Si                                      | oring /<br>upport  | Remarks                 |                 |                         |                         |  |  |  |  |
| 0.00<br>1.40  | 1.40<br>1.80         | CP<br>RO              | 23/09/2                 |                     | 23/09/201<br>23/09/201   |                   | IC<br>WW                           | DT<br>DT                   |               | -             |                  |                         | Dando<br>Deltaba        | 3000<br>se 520               |   | Tr.                |                         |                 |                         |                         |  |  |  |  |
| 1.80<br>8.50  | 8.50<br>14.00        | RC                    | 23/09/2                 | 013                 | 24/09/201<br>24/09/201   | .3                | WW<br>TT                           | DT<br>DT                   | T6:           | 116<br>VF     | Impreg<br>Impreg |                         | )eltaba                 | se 520<br>se 520             |   |                    |                         |                 |                         |                         |  |  |  |  |
| 14.00<br>14.50  | 14.50                | RO                    | 24/09/2                 | 013                 | 24/09/201<br>26/09/201   | .3                | TT                                 | DT<br>WW                   |               | 116           | Impreg           |                         | )eltaba                 | se 520<br>se 520             |   |                    |                         |                 |                         |                         |  |  |  |  |
| 19.40     30.10     RC     26/09/2013     27/09/2013     WW/MM     DT     SWF     Impreg     Deltabase 520       30.10     38.00     RO     28/09/2013     28/09/2013     WW     WW     WW     DT     T6116     Impreg     Deltabase 520       38.00     40.00     RC     28/09/2013     29/09/2013     WW/MM     DT     T6116     Impreg     Deltabase 520 |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
| 30.00   | 40.00                | ic                    | 20/03/2                 |                     | 29/09/2013         WW/MM         DT         T6116         Impreg         Deltabase 520         WATER STRIKES |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
| Date  | -                    | Гime                  | Hole<br>depth           | Cas<br>dep          |  |                   |                                    | Rema                       | arks          |               |                  | Dat                     | е                       | Time                         | Strike at depth                               | Rise to depth      | Time<br>taken           | Ca<br>at stril  | sing dep                | th<br>seal              |  |  |  |  |
| 23/09/20  |                      | 2300                  | 1.40                    | 1.2                 | 0 -1.10  | ) En              | d of CP/                           | Start of R                 | otary         |               |                  | -                       | чериі чериі             |                              |   | to rise            | time                    | 1               | low                     |                         |  |  |  |  |
| 24/09/20<br>24/09/20  | 13                   | 0700<br>1900          | 8.50<br>14.50           | 1.8<br>9.1          | 0 -3.80<br>0 -3.60   | En En             | d of Shi<br>d of Shi               | ft/Start of<br>ft          | Shift         |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
| 26/09/20<br>26/09/20<br>27/09/20  | 13                   | 0700<br>1800<br>0700  | 14.50<br>20.10<br>20.10 | 9.1<br>19.3<br>19.3 | -5.70  | ) En              | art of Sh<br>d of Shi<br>art of Sh | ft                         |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
| 27/09/20<br>28/09/20  | 13                   | 1900<br>0700          | 25.60<br>30.10          | 19.3<br>19.4        | 30 -3.40   | ) En              | d of Shi                           | ft/Start of<br>ft/Start of |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
| 28/09/20<br>29/09/20  | 13                   | 1900<br>0700          | 39.00<br>40.00          | 19.4<br>19.4        | -3.70  | ) En              |                                    | ft/Start of                |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
|   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
|   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
|   |                      |                       | C                       | ABLE F              | PERCUSSIO  | N DE              | TAILS                              |                            |               |               |                  |                         |                         |                              | <u> </u>                                      | SPT DETA           | ILS                     |                 |                         |                         |  |  |  |  |
| Hard<br>from  |                      | Depth<br>to           | Start                   |                     | elling<br>Duration   |                   | narks                              |                            |               |               |                  | Depth                   | Туре                    |                              | nental blov<br>etration in                    |                    | Hammer<br>No.           | Energy<br>ratio | Casing depth            | Water<br>depth          |  |  |  |  |
| 0.80  |                      | 1.40                  | hhm<br>210              | nm                  | hhmm<br>0200   |                   | elling                             |                            | _             |               |                  | 0.50                    | SPT(C                   |                              |   |                    | AR362                   | %               | N/A                     | -2.00                   |  |  |  |  |
|   |                      |                       |                         |                     |  |                   | 3                                  |                            |               |               |                  | 1.40<br>2.80            | SPT(C<br>SPT(C          | []] 50/80mm                  | n (25/75,50/<br>(25/0,50/0)<br>n (6,11,25,25  | /5)                | AR362<br>AR362          | 75<br>75<br>75  | 1.20<br>1.80            | -1.10<br>-1.10          |  |  |  |  |
|   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  | 4.30<br>5.80<br>7.30    | SPT(C<br>SPT(C<br>SPT(C | C) 50/125m                   | n (9,17,25,25<br>m (6,12,18,3<br>n (25/25,50/ | 2/50)              | AR362<br>AR362<br>AR362 | 75<br>75<br>75  | 1.80<br>1.80<br>1.80    | -2.10<br>-3.00<br>-3.80 |  |  |  |  |
|   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  | 8.50<br>10.00           | SPT(C                   | 50/160m<br>N=70 (7,1         | m (10,14,21<br>.3,13,17,19,2                  | 21,8/10)<br>21)    | AR362<br>AR362          | 75<br>75<br>75  | 1.80<br>9.10            | -2.30<br>-1.40          |  |  |  |  |
|   |                      |                       |                         | ROTAI               | RY FLUSH [   | DETAI             | _S                                 |                            |               |               |                  | 11.50<br>13.00<br>14.50 | SPT(C<br>SPT(C<br>SPT(C | 50/5mm<br>50/10mm<br>50/75mm | (25/10,50/5<br>n (25/0,50/1<br>n (18,25,38,1  | )<br>0)<br>2/0)    | AR362<br>AR362<br>AR362 | 75<br>75<br>75  | 9.10<br>9.10<br>9.10    | -2.30<br>-2.70<br>-3.10 |  |  |  |  |
| From<br>deptl   |                      | To<br>depth           |                         |                     | Flush<br>type  |                   | ret                                | ush<br>urn                 |               | lush<br>olour |                  | 20.10<br>22.00          | SPT(C                   | 50/80mm                      | ı (9,11,25,25<br>(25/0 50/0)                  | /5)                | AR362<br>AR362          | 75              | 19.30<br>19.30          | -3.00<br>NR             |  |  |  |  |
| 1.80<br>8.50  | 1                    | 8.50<br>9.00          |                         |                     | Water<br>Water   |                   | 1                                  | %<br>00<br>0               | N             | Лilky         |                  | 24.00<br>26.20          | SPT(C                   | 50/160m<br>50/175m           | m (6,8,17,23<br>m (5,9,11,18                  | ,10/10)<br>,21/25) | AR362<br>AR362          | 75<br>75<br>75  | 19.30<br>19.40          | NR<br>-3.40             |  |  |  |  |
| 9.00<br>39.00   |                      | 39.00<br>40.00        |                         |                     | Water<br>Water   |                   | 1                                  | 00                         |               | rown<br>rown  |                  | 27.70<br>29.20<br>32.00 | SPT(C<br>SPT(C          | 50/95mm<br>50/180m<br>50/0mm | n (7,18/70,41<br>m (4,10,18,1<br>(25/0,50/0)  | 9,13/30)           | AR362<br>AR362<br>AR362 | 75<br>75<br>75  | 19.40<br>19.40<br>19.40 | -2.10<br>-2.00<br>NR    |  |  |  |  |
|   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              | ì (11,14,21,2                                 | 9/10)              | AR362                   | 75              | 19.40                   | NR                      |  |  |  |  |
|   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
|   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
| HO<br>Hole  |                      | METER<br>h of Ca      | / CASINO                | oth of              | Тор  | DY                |                                    | SAMPL                      | ING<br>Time   | Pac           | overy            |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
| diameter<br>200   | ho<br>1.4            | le dian               | neter ca                | sing<br>20          | ТОР  | Dase              | Die                                |                            | hhmms         |               | %                |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
| 150<br>145  | 19.4<br>19.4<br>38.0 | 0 1                   |                         | 9.40                |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
| 116   | 40.0                 |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
|   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
|   | 1                    | NSTALL                | ATION DE                | TAILS               |  |                   | PI                                 | PE CON                     | STRUCT        | ION           |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
| Distance<br>from G.L.   | ID                   | Т                     | уре                     |                     | onse zone  | ID                |                                    | Pipe                       | Dia.          |               | e of             |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
| Irom G.L.   |                      |                       |                         | То                  | p Base   |                   | Тор                                | Base                       | of pipe       | ; F           | oipe             |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
|   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
|   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              | * Seating b                                   | lows only.         |                         |                 |                         |                         |  |  |  |  |
| T4  | : 1                  | Df                    |                         |                     | CKFILL DE  | TAILS             |                                    | D =                        |               |               |                  |                         |                         |                              | (   | GENERAL N          | OTES                    |                 |                         |                         |  |  |  |  |
| Top of<br>section<br>0.00   |                      | Base of section 38.00 |                         | Mater               |  |                   |                                    | Rem                        | arks          |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
| 38.00   |                      | 40.00                 |                         | Grou                |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
|   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
|   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
|   |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
| NOTES:  |                      |                       |                         |                     | neters in n  |                   |                                    | in hhmn                    | n             |               |                  |                         |                         |                              |   |                    |                         | 4               |                         |                         |  |  |  |  |
| Water strike rise time in minutes, hard strata time in hhmm<br>For details of abbreviations, see key  |                      |                       |                         |                     |  |                   |                                    |                            |               |               |                  |                         |                         |                              |   |                    |                         |                 |                         |                         |  |  |  |  |
|   |                      |                       |                         |                     | .og Print Da   | ate Ar            | d Time                             | : 23/12                    | /2013 1       | L0:23:        | 06               |                         |                         |                              |   |                    | SOI                     | L eng           | inee                    | RING                    |  |  |  |  |

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Issue Date 22/10/2012

Part of the Bachy Soletanche Group

Issue.Revision No. 1.05

Form No. SIEXPHOLEHDR

# Project Name Bay of Nigg Harbour Development Ground Investigation Project No. TA7148 Engineer Arch Henderson LLP Hole ID. Exploratory Hole Log A05

Employer Aberdeen Harbour Board

Ground Level -0.53 m CD Coordinates 396688.10 E, 804636.30 N National Grid

| Description of Strata  | Legend | Depth | Datum | Sampl        | ling  |      |     |     | ount A |    | In Situ Test  | Ins |
|--|--------|-------|-------|--------------|-------|------|-----|-----|--------|----|---|-----|
| p  | 3      | -1    | Level | Details      |       | Dia. | TCR | SCR | RQD    | IF | Details   | ati |
| nense brown silty gravelly fine to coarse SAND. Gravel is ngular to rounded fine to coarse of mixed igneous and netamorphic lithologies including granite, gneiss and schist. It is notes large cobbles and boulders.  from 0.80m to 1.80m driller notes boulders  |        |       |       |              |       |      |     | •   |        |    | SPT(C)50/15mm - 0.50 0.59 -                                       |     |
|  |        | 1.80  | -2.33 | B001 1.40-1. | 80    |      |     |     |        |    | SPT(C)50/0mm -<br>1.40 1.40 -                                     |     |
| iff very high strength brown slightly gravelly sandy CLAY ith medium cobble content. Sand is fine to coarse. Gravel is ngular to rounded fine to coarse of mixed igneous and letamorphic lithologies including granite, gneiss, schist and ranite. Cobbles are angular to subrounded of granite and neiss. |        |       | -2.33 | 1.80         | 2.80  | 89   | 100 | NA  | NA     |    |   |     |
|  |        |       |       | 2.80         | 4.30  | 89   | 100 | NA  | NA     |    | SPT(C)50/80mm -<br>2.80 3.03 -<br>-<br>-<br>-<br>-<br>-<br>-<br>- |     |
|  |        |       |       | 4.30         | 5.80  | 89   | 100 | NA  | NA NA  |    | SPT(C)50/85mm - 4.30 4.54   |     |
|  |        |       |       |              |       |      |     |     |        |    | SPT(C)50/125mm -<br>5.80 6.08 -                                   |     |
|  |        |       |       | 5.80         | 7.30  | 89   | 93  | NA  | NA     |    | -   |     |
| from 7.20m to 7.30m assumed zone of no recovery  |        |       |       | 7.30         | 8.50  | 89   | 100 | NA  | NA     |    | SPT(C)50/10mm - 7.30 7.34   |     |
|  |        |       |       | 8.50         | 9.00  | 107  | 80  | NA  | NA     |    | SPT(C)50/160mm -<br>8.50 8.81 -                                   |     |
| from 8.90m to 9.00m assumed zone of no recovery  |        |       |       | 9.00         | 10.00 | 107  | 85  | NA  | NA     |    | -   |     |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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ue.Revision No. 1.05

Issue Date 22/10/2012



Sheet 1 of 4

# Project Name Bay of Nigg Harbour Development Ground Investigation Project No. TA7148 Engineer Arch Henderson LLP Hole ID. Exploratory Hole Log A05

Employer Aberdeen Harbour Board

Ground Level -0.53 m CD Coordinates 396688.10 E, 804636.30 N National Grid
Hole Type CP+RC Inclination Vertical

| Description of Strata  | Legend                                  | Depth                         | Datum<br>Level | Sam   | pling |      |     |     | ount A<br>Recov |    | In Situ Test<br>Details      | Inst |
|--|---|-------------------------------|----------------|-------|-------|------|-----|-----|-----------------|----|------------------------------|------|
|  |   |                               | Level          | Detai | ils   | Dia. | TCR | SCR | RQD             | IF | Details                      | atio |
| Remaining Detail : 9.85m - 10.00m : from 9.85m to 10.00m ssumed zone of no recovery  | 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - |                               |                |       |       |      |     |     |                 |    | SPT(C)70<br>10.00 10.45      |      |
| from 10.40m to 10.53m strong grey boulder of granite   | P                                       | 10.70                         | -11.23         | 10.00 | 11 50 | 107  | 47  | NA  |                 |    |                              |      |
| ussumed zone of no recovery. Stiff greyish brown boulder CLAY with large cobbles and granite boulders. (Driller's lescription)   |   |                               |                | 10.00 | 11.50 | 107  | 47  | INA | NA              |    | <u>-</u>                     |      |
| rm to stiff brown slightly gravelly sandy CLAY with medium<br>obble content. Sand is fine to coarse. Gravel is angular to  | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0   | 11.50 -<br>-<br>-             | -12.03         |       |       |      |     |     |                 |    | SPT(C)50/5mm - 11.50 11.52   |      |
| ounded fine to coarse of mixed igneous and metamorphic ithologies including granite, gneiss, schist and quartz. Cobbles are angular to subrounded of granite and gneiss.  from 11.95m to 12.10m angular coarse gravel sized fragments of granite and schist  |   | 12.10 -                       | -12.63         | 11.50 | 13.00 | 107  | 40  | NA  | NA              |    | <u>-</u><br>-<br>-<br>-      |      |
| Assumed zone of no recovery. Stiff brown boulder CLAY with small bands of large gravels and granite boulders. (Driller's lescription)  | 9 6 9                                   | 13.00                         | -13.53         |       |       |      |     |     |                 |    | SPT(C)50/10mm<br>13.00 13.01 |      |
| irm to stiff brown slightly gravelly sandy CLAY with medium obble content. Sand is fine to coarse. Gravel is angular to ounded fine to coarse of mixed igneous and metamorphic ithologies including granite, gneiss and schist. Cobbles are ingular to subrounded of granite and gneiss.   |   | 13.40                         | -13.93         | 13.00 | 14.00 | 107  | 40  | NA  | NA              |    |                              |      |
| Assumed zone of no recovery. Stiff brown boulder CLAY with mall bands of large gravels and granite boulders. (Driller's lescription)   | P - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - | 14.00                         | -14.53         | 14.00 | 14.50 | 89   | 40  | NA  | NA              |    |                              |      |
| stiff brown slightly gravelly sandy CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded ine to coarse of mixed igneous and metamorphic lithologies nocluding granite, gneiss and schist. Cobbles are angular to substrounded of granite and gneiss.  from 14.20m to 14.50m assumed zone of no recovery |   | 14.50<br><br><br><br><br><br> | -15.03         |       |       |      |     |     |                 | ļ  | SPT(C)50/75mm - 14.50 14.73  |      |
| lo recovery. SAND. (Driller's description)<br>from 14.50m to 14.90m driller notes boulders of granite  |   |                               |                |       |       |      |     |     |                 |    | -                            |      |
|  |   |                               |                |       |       |      |     |     |                 |    | -<br>-<br>-<br>-<br>-<br>-   |      |
|  |   |                               |                |       |       |      |     |     |                 |    |                              |      |
| tiff brown slightly gravelly sandy CLAY with medium cobble ontent. Sand is fine to coarse. Gravel is angular to rounded  | 6                                       | 19.40 -<br>-<br>-<br>-        | -19.93         | 19.40 | 20.10 | 107  | 100 | NA  | NA              | NA |                              |      |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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sue.Revision No. 1.05

Issue Date 22/10/2012



Sheet 2 of 4

Project No. TA7148

Engineer

Arch Henderson LLP

# **Exploratory Hole Log**

Hole ID.

A05

Sheet 3 of 4

Employer Aberdeen Harbour Board Ground Level

-0.53m CD Coordinates

396688.10 E, 804636.30 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend                                  | Depth                                 | Datum  | Samp    | ling     |      |     | low Count And<br>mple Recovery |          |          | In Situ Test  | Install |
|---|---|---------------------------------------|--------|---------|----------|------|-----|--------------------------------|----------|----------|---|---------|
|   |   | ·                                     | Level  | Details | 5        | Dia. | TCR | SCR                            | RQD      | IF       | Details   | ation   |
| fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to subrounded of granite and gneiss.  |   |                                       |        | 20.10   | 20.80    | 107  | 100 | NA                             | NA       |          | SPT(C)50/80mm -<br>20.10 20.33 -<br>-<br>-<br>-           |         |
| from 21.80m to 22.00m assumed zone of core loss   |   |                                       |        | 20.80   | 22.00    | 107  | 83  | NA                             | NA       |          | -   |         |
|   |   |                                       | -      | 22.00   | 23.00 10 | 107  | 100 | NA                             | NA       |          | SPT(C)50/0mm  |         |
| Assumed zone of no recovery. Firm greyish brown very sandy boulder CLAY and large cobbles. (Driller's description)  |   | 23.65                                 | -24.18 | 23.00   | 24.00    | 107  | 65  | NA                             | NA       |          | -   |         |
| Stiff brown slightly gravelly sandy CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to  |   | 24.00                                 | -24.53 | 24.00   | 24.70    | 107  | 86  | NA                             | NA       | _        | SPT(C)50/160mm—<br>24.00 24.31 -<br>-<br>-<br>-           |         |
| subrounded of granite, gneiss and schist. from 24.46m to 24.60m medium strong grey boulder of gneiss from 24.60m to 24.709m assumed zone of no recovery   |   |                                       |        | 24.70   | 25.40    | 107  | 57  | NA                             | NA       | 1        | <u>-</u>  |         |
| from 25.10m to 25.40m assumed zone of no recovery   | P. 0. 10                                | =                                     |        |         |          |      |     |                                |          | ļ        |   |         |
| from 25.50m to 25.60m assumed zone of no recovery from 25.60m to 25.80m subangular to rounded coarse gravel and subangular cobbles of granite and gneiss  |   |                                       |        | 25.40   | 25.60    | 107  | 67  | NA<br>NA                       | NA<br>NA | <u>.</u> | -<br>-<br>-   |         |
| from 26.00m to 26.20m assumed zone of no recovery   | P 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |                                       |        |         |          |      |     |                                |          | _        | SPT(C)50/175mm -<br>26.20 26.53 -                         |         |
| from 26.46m to 26.55m medium strong grey boulder of granite from 26.70m to 26.95m assumed zone of no recovery   | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0   |                                       |        | 26.20   | 26.95    | 107  | 67  | NA                             | NA       |          |   |         |
| Assumed zone of no recovery. Very stiff very sandy boulder CLAY with cobbles, boulders and small sand bands. (Driller's description)  |   | 27.20 -                               | -27.73 | 26.95   | 27.70    | 107  | 33  | NA                             | NA       |          | -   |         |
| Stiff brown slightly gravelly sandy CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to subrounded of granite, gneiss and schist. from 28.30m to 28.70m and 29.00m to 29.20m assumed zone of |   | 27.70                                 | -28.23 | 27.70   | 28.70    | 107  | 60  | NA                             | NA       |          | SPT(C)50/95mm -<br>27.70 27.94 -<br>-<br>-<br>-<br>-<br>- |         |
| no recovery   |   | =                                     |        | 28.70   | 29.20    | 107  | 60  | NA                             | NA       |          |   |         |
| No recovery. Stiff greyish brown very sandy boulder CLAY with large cobbles and boulders. (Driller's description)   |   | 29.40 -<br>-<br>-<br>-<br>-<br>-<br>- | -29.93 | 29.20   | 30.10    | 107  | 22  | NA                             | NA       |          | 5PI(C)50/180mm -<br>29.20 29.53 -<br>-<br>-<br>-          |         |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:23:18

Form No. SIEXPHOLELOG



| Project Name | Bay of Nigg Harbour Development Ground Investigation |                      | Hole ID.     |
|--------------|--|----------------------|--------------|
| Project No.  | TA7148   | Exploratory Hole Log | ۸٥۶          |
| Engineer     | Arch Henderson LLP                                   |                      | A05          |
| Employer     | Aberdeen Harbour Board                               |                      | Sheet 4 of 4 |

396688.10 E, 804636.30 N National Grid Ground Level -0.53m CD Coordinates

Hole Type CP+RC Inclination Vertical

| Description of Strata   | Legend | Depth | Datum  | Sam   | pling |      | Blo<br>San | ow Co<br>nple I | ount A<br>Recov | And<br>ery | In Situ Test               | msta  |
|---|--------|-------|--------|-------|-------|------|------------|-----------------|-----------------|------------|----------------------------|-------|
|   |        |       | Level  | Detai | ils   | Dia. | TCR        | SCR             |                 | IF         | Details                    | ation |
| No recovery. Stiff greyish brown very sandy boulder CLAY with arge cobbles and boulders. (Driller's description)  |        |       | Level  | Detai | 35.60 | B9   |            |                 |                 |            | SPT(C)50/0mm = 32.00 32.00 | ation |
| Extremely weak dark grey locally stained dark reddish brown<br>GNEISS. Recovered as non intact core (angular fine to coarse<br>gravel sized fragments). |        | 38.00 | -38.53 | 38.00 | 39.00 |      | 100        | 0               | 0               | · NI       |                            |       |

Form No. SIEXPHOLELOG

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

Issue,Revision No. 1.05

Log Print Date And Time: 23/12/2013 10:23:23

Issue Date 22/10/2012

SOIL ENGINEERING

| Project  | ject Name Bay of Nigg Harbour Development Ground Investigation |  |  |  |  |  |   |  |  |   |                            |                                  | Exploratory Hole Log  Hole ID. |   |   |  |   |  |                                  |   |  |  |  |
|--|--|--|--|--|--|--|---|--|--|---|----------------------------|----------------------------------|--------------------------------|---|---|--|---|--|----------------------------------|---|--|--|--|
| Project  |  | TA7  |  |  |  |  |   |  |  |   |                            |                                  |                                | Explo   | Tau   | ory r  | tole Lo   | og   | 1                                | 804                                       |  |  |  |
| Engine   | er   | Arch   | n Hend   | dersor   | 1 LLP  |  |   |  |  |   |                            |                                  |                                |   |   |  |   |  | ,                                | 100                                       |  |  |  |
| Employ   |  |  |  | Harbo  | our Board  | <u> </u>                               |   |  |  |   |                            |                                  | 22/2                           |   |   |  |   |  | Н                                | eader                                     |  |  |  |
| Ground<br>Date Sta   |  | 0.18i<br>19/0  | m CD<br>9/2013   | 3  |  |  |   |  | ordinat<br>te Com  | ites<br>npleted   |                            |                                  | 80474                          | 40.90 N N   | lationa   | al Grid  | Inclinat  | ion Vert   | ical                             |   |  |  |  |
| Тор  | Base   | _  | Date S   |  | Date Ende  | d C                                    | rew   | Section  | n  | Core  | Core                       |                                  | Equip                          | ment  |   | Shc  |   | Remarks  |                                  |   |  |  |  |
| 0.00   | 1.20   | СР   | 19/09/   |  | 19/09/201  |  | IC  | Logged I<br>DT   | By E   | Barrel  | Bit                        |                                  | Dando                          |   |   | Sup  | oring /<br>oport  |  |                                  |   | -                                      |  |  |
| 1.20<br>1.60<br>2.60<br>9.60   | 1.60<br>2.60<br>9.60<br>36.00                                  | RO<br>RC<br>RC<br>RC   | 19/09/<br>19/09/<br>19/09/<br>20/09/                             | /2013<br>/2013<br>/2013                                | 19/09/201<br>19/09/201<br>20/09/201<br>21/09/201   | .3 N<br>.3 N                           | WW<br>MM<br>MM<br>r/WW  | WW<br>DT<br>DT<br>DT   | T  | SWF<br>T6116<br>T6116   | Impreg<br>Impreg<br>Impreg |                                  | Deltaba<br>Deltaba<br>Deltaba  | use 520<br>use 520<br>use 520<br>use 520<br>use 520                           |   |  |   |  |                                  |   |  |  |  |
|  |  | PROGRESS WATER ST  |  |  |  |  |   |  |  |   | 44TED 0TD                  |                                  |                                |   |   |  |   |  |                                  |   |  |  |  |
| Date   | Ті   | me   | Hole   |  |  | er                                     |   | Rem  | narks  |   |                            | Dat                              | e                              | Time  | Sti   | rike at  | ATER STRI   | Time   | Ca                               | sing dep                                  | oth                                    |  |  |
|  |  |  | depth  | dep  | oth dept   | :h                                     |   |  |  |   |                            |                                  |                                |   | ď   | lepth  | depth   | taken<br>to rise                                   | at stril<br>time                 | κe ĭ to                                   | o seal<br>flow                         |  |  |
| 19/09/20<br>19/09/20<br>19/09/20<br>20/09/20<br>20/09/20<br>21/09/20<br>21/09/20<br>22/09/20 | )13   1<br>)13   1<br>)13   0<br>)13   1<br>)13   0<br>)13   1 | 755<br>800<br>900<br>7700<br>9900<br>7700<br>900<br>7700                     | 1.20<br>1.60<br>2.60<br>9.60<br>14.50<br>22.80<br>30.70<br>36.00 | 1.2<br>-<br>2.3<br>5.5<br>10.1<br>17.4<br>24.9<br>34.0 | NR<br>-1.75<br>0 -2.00<br>15 -4.00<br>40 -1.80<br>90 -2.30                               | End<br>End<br>End<br>End<br>End<br>End | End of CP/Start of RO End of RO/Start of RC End of Shift/Start of Shift End of Hole |  |  |   |                            |                                  |                                |   |   |  |   |  |                                  |   |  |  |  |
|  |  |  | (  | CABLE F  | PERCUSSIO  | N DET                                  | AILS  |  |  |   |                            |                                  |                                |   |   |  | SPT DETAI   | LS   |                                  |   |  |  |  |
| Hard<br>from   | Strata   | Depth<br>to  | Star   | Chis<br>t time   | elling<br>Duration   | Rem                                    | arks  |  |  |   |                            | Depth                            | Туре                           |   |   | al blow<br>ion in n  |   | Hammer<br>No.                                      | Energy ratio                     | Casing depth                              |  |  |  |
| 0.80   | •  | 1.20   |  | <u>mm</u><br>600                                       | 0200   | Chise                                  | elling  |  | —  |   | $\overline{}$              | 0.50                             | SPT(C                          | C) 50/50mi  |   |  |   | AR362  | %<br>75                          | N/A                                       | -3.00<br>-2.60                         |  |  |
|  |  |  |  |  |  |  |   | 3.60<br>5.80<br>7.30<br>8.80<br>10.30<br>11.50<br>13.00<br>14.50 | SPT(C<br>SPT(C<br>SPT(C<br>SPT(C<br>SPT(C<br>SPT(C<br>SPT(C<br>SPT(C | 5) 50/95mi<br>5) 50/220n<br>5) N=48 (3,<br>6) N=47 (4,<br>6) N=59 (7,<br>7) 50/20mi<br>6) N=68 (1 | (/ 7                       | 0 /2 /201                        |                                | AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362 | 75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>7 | 2.30<br>2.30<br>2.30<br>2.30<br>2.30<br>9.60<br>9.60<br>9.60<br>9.60 | -2.60<br>-2.20<br>-2.50<br>-3.00<br>-2.70<br>-3.60<br>-3.80<br>-4.40<br>-4.10 |  |                                  |   |  |  |  |
| Fron   |  | To   |  | KOTAI  | Flush  | /LIAIL                                 | F   | lush<br>eturn  |  | Flush   |                            | 16.10<br>17.95                   | SPT(C<br>SPT(C                 | 50/225n<br>50/75m   |   |  | (5)   | AR362<br>AR362                                     | 75<br>75                         | 10.15<br>17.40                            | -3.20                                  |  |  |
| 1.60   | "  | depth<br>4.30  |  |  | type<br>Water  | $\dashv$                               |   | %<br>100   |  | Brown   |                            | 19.75<br>21.25<br>22.80          | SPT(C<br>SPT(C<br>SPT(C        | 50/0mm<br>N=42 (4,<br>50/0mm  | 1 (25/0,<br>,6,11,9,<br>1 (25/0   | ,50/0)<br>,10,12)<br>.50/0)  |   | AR362<br>AR362<br>AR362                            | 75<br>75<br>75                   | 17.40<br>17.40<br>17.40                   | NR<br>-2.40<br>-1.80                   |  |  |
| 4.30<br>9.60<br>10.30<br>14.70<br>17.40<br>17.95<br>21.25<br>22.00<br>22.80                  |  | 9.60<br>10.30<br>14.50<br>17.40<br>17.95<br>21.25<br>22.00<br>22.80<br>30.70 |  | V<br>V<br>V  | Water<br>Water<br>Water<br>Vater/Air<br>Vater/Air<br>Vater/Air<br>Vater/Air<br>Vater/Air |  | :   | 0<br>100<br>50<br>100<br>80<br>100<br>80<br>0<br>100             |  | Brown<br>Brown<br>Brown<br>Brown<br>Brown<br>Brown<br>Brown                                       |                            | 24.30<br>25.80<br>27.30<br>28.60 | SPT(C<br>SPT(C<br>SPT(C        | 50/10m<br>50/0mm  | m (25/1<br>n (25/1<br>n (25/1<br>m (25/1  | 5,50/10)<br>0,50/0)<br>0,50/0)<br>20,50/10                           | 0)  | AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362 | 75<br>75<br>75<br>75<br>75<br>75 | 24.30<br>24.90<br>24.90<br>24.90<br>24.90 | -1.80<br>-2.90<br>-3.60<br>-2.50<br>NR |  |  |
|  | ·  | METER /  |  |  |  |  |   | IC SAMPL   |  |   |                            |                                  |                                |   |   |  |   |  |                                  |   |  |  |  |
| Hole<br>diameter<br>150<br>120<br>116  |  | ) 15   | neter c  | epth of<br>casing<br>24.90<br>36.00                    | Тор  | Base                                   | ase Diameter Time hhmmss %  |  |  |   |                            |                                  |                                |   |   |  |   |  |                                  |   |  |  |  |
|  | II   | ISTALLA  | TION D   | ETAILS   |  |  | F   | PIPE CON   | ISTRUC   | CTION   |                            | ]                                |                                |   |   |  |   |  |                                  |   |  |  |  |
| Distance<br>from G.L   |  | Ту   | /pe  | Resp   | onse zone<br>p   Base  | ID                                     | Тор   | Pipe<br>  Base   | Dia<br>of pi   |   | pe of<br>pipe              |                                  |                                |   |   |  |   |  |                                  |   |  |  |  |
|  |  |  |  |  |  |  |   |  |  |   |                            |                                  |                                |   |   |  |   |  |                                  |   |  |  |  |
|  |  |  |  | B/   | ACKFILL DE   | TAILS                                  |   |  |  |   | $\overline{}$              |                                  |                                |   | * Se  | eating blo   | ows only.<br>ENERAL NO  | OTES   |                                  |   |  |  |  |
| Top o  |  | ase of   |  | Mater  |  | T                                      |   | Ren  | narks  |   |                            |                                  |                                |   |   |  |   |  |                                  |   |  |  |  |
| sectio<br>0.00   |  | ection<br>36.00  |  | Arising  | gs   |  |   |  |  |   |                            |                                  |                                |   |   |  |   |  |                                  |   |  |  |  |
| NOTES  | Water  | strike r   | ise tim  | e in mii<br>iations,                                   | meters in m<br>nutes, hard<br>, see key<br>Log Print Da                                  | d strata                               | a time  |  |  | 3 10:23:  | :38                        | I                                |                                |   |   |  |   | SOI  | L eng                            | inee                                      | RING                                   |  |  |

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Project No. TA7148

Arch Henderson LLP

**Exploratory Hole Log** 

Hole ID.

80A

Sheet 1 of 4

Employer Aberdeen Harbour Board Ground Level 0.18m CD

Engineer

Coordinates

396673.80 E, 804740.90 N National Grid

Hole Type CP+RC Inclination

| Stiff brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss, schist and quartz. Cobbles are angular to subrounded of granite, gneiss and schist.  Assumed zone of no recovery. Firm brown boulder CLAY and some cobbles. (Oriller's description)  Light gray gravelly COBBLES and BOULDERS with medium to coarse gravel sized pockets of sandy gravelly clay. (Driller notes boulder clay).  In the gravelly cobbles and BOULDERS with medium to coarse gravel sized pockets of sandy gravelly clay. (Driller notes boulder clay).  Assumed zone of no recovery. Stiff brown boulder CLAY with cobbles and frequent boulders of granite. (Driller's description)  Assumed zone of no recovery. Stiff brown boulder CLAY with cobbles and frequent boulders of granite. (Driller's description)  Stiff very high strength brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is analysia to rounded fine to coarse drixed ignous and metamorphic lithologies including granite, gneiss, schist and quartz. Cobbles are analysial to subrounded of granite, gneiss and schist.  From 5.20m to 5.30m assumed zone of no recovery  from 6.10m to 6.20m angular to subrounded coarse gravel of granite, gneiss and schist.   | Description of Strata  | Legend                                  | Depth                           | Datum | Sampli        | ng       | _   |     | ount An<br>Recover | v                    | !      |
|--|--|---|---------------------------------|-------|---------------|----------|-----|-----|--------------------|----------------------|--------|
| from 0.20m to 1.60m driller notes cluster of large cobbles and boulders  Stiff brown slightly sandy gravelly CLAY with medium cobble content. Sand is fire to coarse. Gravel is angular to rounded fine to coarse of make dispease and metamorphic lithologies including granite, gness, solist and quartz. Cobbles are angular to subrounded of granite, gness and schist.  Assumed zone of no recovery. Firm brown boulder CLAY and some cobbles of comiler's description)  1,50  2,60  2,60  2,60  2,60  2,60  2,60  2,60  2,60  2,60  2,60  2,60  2,60  3,60   |  |   |                                 | Level | Details       | Dia      | TCR | SCR | RQD                | IF Detail            | is     |
| Stiff brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse of mixed igneous and metamorphic lithologies necluding granite, geniess, schist and quartz. Cobbles are angular to subrounded of granite, genies and schist.    2.18   | from 0.20m to 1.60m driller notes cluster of large cobbles   | * | -                               |       | B001 0.50-0.8 | 0        |     |     |                    |                      | 0.55 - |
| ight grey gravely COBBLES and BOULDERS with medium to coarse gravel sized pockets of sandy gravely clay. (Driller notes outled clay).  from 2.80m to 3.00m granite boulder  sasumed zone of no recovery. Stiff brown boulder CLAY with cobbles and boulders of granite. (Driller's description)  assumed zone of no recovery. Stiff brown boulder CLAY with cobbles and frequent boulders of granite. (Driller's description)  3.60  3.75  3.57  3.60  4.30  107  40  NA  NA  SPTICISO-25mm 3.60  3.77  3.57  3.60  4.30  107  7  NA  NA  Assumed zone of no recovery. Stiff brown boulder CLAY with cobbles and frequent boulders of granite. (Driller's description)  3.60  3.75  3.60  4.30  4.30  5.30  88  89  90  NA  NA  SPTICISO-25mm 3.60  SP | content. Sand is fine to coarse. Gravel is angular to rounded<br>fine to coarse of mixed igneous and metamorphic lithologies<br>ncluding granite, gneiss, schist and quartz. Cobbles are<br>angular to subrounded of granite, gneiss and schist. |   | =                               |       | 1.60          | 2.60 89  | 58  | NA  | NA                 |                      |        |
| cobbles and boulders of granite. (Driller's description)  3.75 3.60 3.70 3.70 3.70 3.70 3.70 3.70 3.70 3.7   | cobbles. (Driller's description)  Light grey gravelly COBBLES and BOULDERS with medium to coarse gravel sized pockets of sandy gravelly clay. (Driller notes boulder clay).  |   | 1                               |       | 2.60          | 3.60 107 | 40  | NA  | NA                 |                      |        |
| Assumed zone of no recovery. Stiff brown boulder CLAY with cobbles and frequent boulders of granite. (Driller's description)  4.30 5.30 89 90 NA NA STICOSO STIFF very high strength brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss, schist and quartz. Cobbles are angular to subrounded of granite, gneiss and schist.  from 5.20m to 5.30m assumed zone of no recovery  from 6.10m to 6.20m angular to subrounded coarse gravel of granite, gneiss and schist  from 7.10m to 7.30m assumed zone of no recovery  Assumed zone of no recovery. Stiff brown boulder CLAY with cobbles and frequent boulders of granite. (Driller's description)  7.90 - 7.72  7.30 8.80 89 40 NA  | cobbles and boulders of granite. (Driller's description)  Light grey gravelly COBBLES and BOULDERS with medium to coarse gravel sized pockets of sandy gravelly clay. (Driller notes   |   | 3.75 <u>-</u><br>               | -3.57 | 3.60          | 4.30 107 | 27  | NA  | NA                 |                      | nm -   |
| angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss, schist and quartz. Cobbles are angular to subrounded of granite, gneiss and schist.  from 5.20m to 5.30m assumed zone of no recovery  from 6.10m to 6.20m angular to subrounded coarse gravel of granite, gneiss and schist  from 7.10m to 7.30m assumed zone of no recovery  Assumed zone of no recovery. Stiff brown boulder CLAY with cobbles and frequent boulders of granite. (Driller's  | cobbles and frequent boulders of granite. (Driller's description) Stiff very high strength brown slightly sandy gravelly CLAY  |   | 4.30 -<br>-<br>-<br>-<br>-<br>- | -4.12 | 4.30          | 5.30 89  | 90  | NA  | NA                 |                      |        |
| from 6.10m to 6.20m angular to subrounded coarse gravel of granite, gneiss and schist  5.80 7.30 89 87 NA NA  SPT(C)48 7.30 7.30 8.80 89 40 NA NA  Assumed zone of no recovery. Stiff brown boulder CLAY with cobbles and frequent boulders of granite. (Driller's   | angular to rounded fine to coarse of mixed igneous and<br>metamorphic lithologies including granite, gneiss, schist and<br>quartz. Cobbles are angular to subrounded of granite, gneiss<br>and schist.   |   |                                 |       | 5.30          | 5.80 89  | 100 | NA  | NA                 | 5.30<br>SPT(C)50/220 | 5.55 - |
| Assumed zone of no recovery. Stiff brown boulder CLAY with cobbles and frequent boulders of granite. (Driller's  | from 6.10m to 6.20m angular to subrounded coarse gravel of granite, gneiss and schist  |   |                                 |       | 5.80          | 7.30 89  | 87  | NA  | NA                 |                      | 6.17 - |
| cobbles and frequent boulders of granite. (Driller's   | Assumed zone of no recovery. Stiff brown boulder CLAY with   |   | 7.90                            | -7.72 | 7.30          | 8.80 89  | 40  | NA  | NA NA              |                      | 7.75 - |
| Stiff brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies  8.80  -8.62  SPT(C)47  8.80  9  8.80  9  8.80  9  8.80  9  8.80  9  8.80  9   | description) Stiff brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded   |   | 8.80 -                          | -8.62 |               |          |     |     |                    |                      | 9.25   |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:23:43

SOIL engineering

Part of the Bachy Soletanche Group

Project No. TA7148

Engineer

Ground Level

Arch Henderson LLP

# **Exploratory Hole Log**

Hole ID.

80A

Sheet 2 of 4

Employer Aberdeen Harbour Board

0.18m CD Coordinates

396673.80 E, 804740.90 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend     | Depth       | Datum  | San   | npling |      |  |     | ount A<br>Recov |    | In Situ Test                      | Insta |
|---|------------|-------------|--------|-------|--------|------|--|-----|-----------------|----|-----------------------------------|-------|
| ·   |            |             | Level  | Deta  | ils    | Dia. | TCR  | SCR | RQD             | IF | Details                           | ation |
| Stiff brown slightly sandy gravelly CLAY with medium cobble   | 0-0-0-     | 9 -         |        |       |        |      |  |     |                 |    | 12                                |       |
| content. Sand is fine to coarse. Gravel is angular to rounded   | 0 0 0      | P =         |        |       |        |      |  |     |                 |    | CDT/C\EO                          |       |
| fine to coarse of mixed igneous and metamorphic lithologies   | 2000       | ; =         |        |       |        |      |  |     |                 |    | SPT(C)59 -<br>10.30 10.75 -       |       |
| including granite, gneiss and schist. Cobbles are angular to  | -0-0-      | -           |        |       |        |      |  |     |                 |    | 2                                 |       |
| subrounded of granite, gneiss and schist.   | 20 20 0    | -           |        |       |        |      |  |     |                 |    | 9                                 |       |
| from 10.00m to 10.30m assumed zone of no recovery   | 9          | _           |        | 10.30 | 11.50  | 89   | 64   | NA  | NA              |    |                                   |       |
|   | P - D - 7  | 11.07       | -10.89 | 10.00 | 11.00  | - 00 | ••   |     |                 |    | H                                 |       |
| Assumed zone of no recovery. Stiff to firm brown boulder CLAY   | 0 0        | -           | -10.65 |       |        |      |  |     |                 |    | 3                                 |       |
| with large granite boulders and small sand and gravel bands.  | 0 0 0      |             |        |       |        |      |  |     |                 |    | 5                                 |       |
| (Driller's description)   | -0-10-1    | 11.50 -     | -11.32 |       |        |      |  |     |                 |    | SPT(C)50/20mm -                   |       |
| Stiff to firm brown slightly sandy gravelly CLAY with medium  | 2          |             |        |       |        |      |  |     |                 |    | 11.50 11.54                       |       |
| cobble content. Sand is fine to coarse. Gravel is angular to  | P 9 7      | S -         |        |       |        |      |  |     |                 |    | -                                 |       |
| ounded fine to coarse of mixed igneous and metamorphic  | 0 0 0      | _           |        |       |        |      |  |     |                 |    |                                   |       |
| ithologies including granite, gneiss and schist. Cobbles are  | 0 - 0 - 0  | -           |        |       |        |      |  |     |                 |    | 1                                 |       |
| angular to subrounded of granite, gneiss and schist.  | 0000       | 1 -         |        | 11.50 | 13.00  | 89   | 43   | NA  | NA              |    | 3                                 |       |
|   | 00000      | 5           |        |       |        |      |  |     |                 |    | 1                                 |       |
|   | 10 -05     | h -         |        |       |        |      |  |     |                 |    | 1                                 |       |
|   | 30 + 05    | -           |        |       |        |      |  |     |                 |    | 1                                 |       |
|   | 9          | -           |        |       |        |      |  |     |                 |    |                                   |       |
| from 12.90m to 13.00m assumed zone of no recovery   | 0 0 0      |             |        |       |        |      |  |     |                 | İ  | SPT(C)68 —<br>13.00 13.45 —       |       |
| 6 4000 - 4040 - 1 - 1   | 0.00       | -           |        |       |        |      |  |     |                 |    | 15.50                             |       |
| from 13.20m to 13.40m angular to subrounded coarse gravel   | 00-10-     | 13.40 -     | -13.22 |       |        |      |  |     |                 |    | 3                                 |       |
| and angular cobbles of granite, gneiss and schist   | 9 0110     |             | 15.22  |       |        |      |  |     |                 |    | 1                                 |       |
| Assumed zone of no recovery. Stiff to firm brown boulder CLAY   | P - u - 5  |             |        | 40.00 | 4/50   |      |  |     | l               |    | 1                                 |       |
| with large granite boulders and small sand and gravel bands.  | 0 0 0      | -           |        | 13.00 | 14.50  | 89   | 27   | NA  | NA              |    | 1 3                               |       |
| (Driller's description)   | 0-40-      | ) I         |        |       |        |      |  |     |                 |    |                                   |       |
|   | 20200      | -           |        |       |        |      |  |     |                 |    |                                   |       |
|   | - 0 P      | 9 -         |        |       |        |      |  |     |                 |    | 19                                |       |
|   | P-9-0      | 14.50 -     | -14.32 |       |        |      |  |     |                 |    | SPT(C)69                          |       |
| Rotary openhole drilling. BOULDERS. (Driller's description)   | 0,00       | _           |        |       |        |      |  |     |                 |    | 14.50 14.95 -                     |       |
| Ctiff brown aliabety and a gravally CLAV with madium ashble   | 9 - 10 - 7 | 14.70 -     | -14.52 |       |        |      |  |     |                 |    | 12                                |       |
| Stiff brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded | 2000       | -           |        |       |        |      |  |     |                 |    | 1 3                               |       |
| fine to coarse of mixed igneous and metamorphic lithologies   | 0 0 0      |             |        |       |        |      |  |     |                 |    | -                                 |       |
| including granite, gneiss and schist. Cobbles are angular to  | 10 +0 6    |             |        | 14.50 | 16.10  | 89   | 100  | NA  | NA              |    | 3                                 |       |
| subrounded of granite, gneiss and schist.   | 23 + 10    | ļ. <u>-</u> |        | 14.30 | 10.10  | 03   | 100  | IVA | INA             |    | 2                                 |       |
|   | 8-6-6      |             |        |       |        |      |  |     |                 |    |                                   |       |
|   | 0 0 0      | <u> </u>    |        |       |        |      |  |     |                 |    | -                                 |       |
|   | 0 0 0      |             |        |       |        |      |  |     |                 |    | 12                                |       |
|   | 0-2-5      | 1010 -      | -15.92 |       |        |      |  |     |                 |    | CDT/C)F0 /22F                     |       |
| Assumed zone of no recovery. Firm to stiff greyish brown  | 0 0 0      | 16.10 -     | -15.92 |       |        |      |  |     |                 |    | SPT(C)50/225mm =<br>16.10 16.48 = |       |
| boulder CLAY and some cobbles. (Driller's description)  | 0 0 0      | _           |        |       |        |      |  |     |                 |    | =                                 |       |
|   | 0 000      | -           |        |       |        |      |  |     |                 |    | 3                                 |       |
|   | 0000       | -           |        |       |        |      |  |     |                 |    |                                   |       |
|   | 200        | -           |        | 16.10 | 17.40  | 89   | 0  | NA  | NA              |    | 9                                 |       |
|   | 0 0 0      |             |        |       |        |      |  |     |                 |    | Lī                                |       |
|   | 0 0 0      | ( -         |        |       |        |      |  |     |                 |    | 1                                 |       |
|   | P 0 0 0    | 5 -         |        |       |        |      |  |     |                 |    | 1                                 |       |
| Stiff very high strength greyish brown slightly sandy   | 20.20      | 17.40       | -17.22 |       |        |      |  |     |                 | İ  |                                   |       |
| gravelly CLAY with medium cobble content. Sand is fine to   | 2000       | ja I        |        | 47 10 | 47.00  |      | 100  |     |                 |    |                                   |       |
| coarse. Gravel is angular to rounded fine to coarse of mixed  | 2000       |             |        | 17.40 | 17.95  | 89   | 100  | NA  | NA              |    |                                   |       |
| igneous and metamorphic lithologies including granite, gneiss   | 0 0        | , -         |        |       |        |      |  |     |                 |    | SPT(C)50/75mm                     |       |
| and schist. Cobbles are angular to subrounded of granite,   | 9 + 1p     | h =         |        |       |        |      |  |     |                 |    | 17.95 18.18                       |       |
| gneiss and schist.  | P 1 0 0    | -           |        |       |        |      |  |     |                 |    | 18                                |       |
|   | 0 0 0      |             |        |       |        |      |  |     |                 |    |                                   |       |
|   | 0 00       | 0           |        |       |        |      |  |     |                 |    | 1                                 |       |
|   | 0          | ji -        |        |       |        |      |  |     |                 |    | 1                                 |       |
|   | -0-0       |             |        | 17.95 | 19.75  | 89   | 100  | NA  | NA              | NA | 1 2                               |       |
|   | 0.00       | }   =       |        |       |        |      |  |     |                 |    | =                                 |       |
|   | 0.00       | 1 - 1       |        |       |        |      |  |     |                 |    |                                   |       |
|   | 0          | -           |        |       |        |      |  |     |                 |    | -                                 |       |
|   | 0 0 0      | -           |        |       |        |      |  |     |                 |    | ] 3                               |       |
|   | 0 100      | -           |        |       |        |      |  |     |                 |    | 14                                |       |
|   | 33202      | _           |        |       |        |      | <del>                                     </del> | -   |                 | 1  | SPT(C)50/0mm                      |       |
|   | 10 10      |             | 1 1    | l     |        |      | l  | 1   | I               | I  | 19.75 19.75                       | 11/2  |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG Issue Date 22/10/2012



Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

**Exploratory Hole Log** 

Hole ID.

80A

Sheet 3 of 4

Ground Level 0.18m CD Coordinates

396673.80 E, 804740.90 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend                                  | Depth                            | Datum  | Samı   | pling |      |     | ow Co<br>nple I |     |    | In Situ Test                | Instal |
|---|---|----------------------------------|--------|--------|-------|------|-----|-----------------|-----|----|-----------------------------|--------|
| ·   |   |                                  | Level  | Detail | s     | Dia. | TCR | SCR             | RQD | IF | Details                     | ation  |
| Stiff very high strength greyish brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to subrounded of granite, gneiss and schist.   |   |                                  |        | 19.75  | 21.25 | 89   | 100 | NA              | NA  |    | -                           |        |
|   |   | 22.10 -                          | -21.92 | 21.25  | 22.10 | 89   | 100 | NA              | NA  |    | SPT(C)42<br>21.25 21.70     |        |
| Assumed zone of no recovery. Stiff greyish brown boulder CLAY and some cobbles. (Driller's description)   |   |                                  |        | 22.10  | 22.80 | 89   | 0   | NA              | NA  |    | SPT(C)50/0mm                |        |
|   |   | -<br>-<br>-<br>-<br>23.40 -      | -23.22 | 22.80  | 23.40 | 89   | 0   | NA              | NA  |    | 22.80 22.80 -               |        |
| Light grey and brown gravelly COBBLES and BOULDERS with cobbkle sized pockets of sandy gravelly clay. (Driller notes boulder clay).  Assumed zone of no recovery. Boulder CLAY with large granite   |   | 23.80                            | -23.62 | 23.40  | 24.30 | 89   | 44  | NA              | NA  |    | -<br>-<br>-<br>-            |        |
| Stiff brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite, schist and gneiss.  |   | 24.30 -<br>-<br>-<br>-<br>-<br>- | -24.12 |        |       |      |     |                 |     |    | SPT(C)50/10mm - 24.30 24.32 |        |
| Cobbles are subangular to subrounded of granite and gneiss. from 24.30m to 24.36m strong grey boulder of granite  |   |                                  |        | 24.30  | 25.80 | 89   | 93  | NA              | NA  |    |                             |        |
| from 25.70m to 25.80m assumed zone of no recovery   |   | -<br>-<br>-<br>26.20 -           | -26.02 | 25.80  | 26.60 | 89   | 50  | NA              | NA  |    | SPT(C)50/0mm 25.80 25.81    |        |
| Assumed zone of no recovery. Boulder CLAY with large granite boulders. (Driller's description)  |   |                                  |        |        |       |      |     |                 |     |    | -                           |        |
|   | P 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |                                  | -27.12 | 26.60  | 27.30 | 89   | 0   | NA              | NA  |    | SPT(C)50/0mm                |        |
| Stiff brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse.Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to subrounded of granite, gneiss and schist.   |   | 27.90 -<br>27.90 -               | -27.72 | 27.30  | 28.60 | 89   | 46  | NA              | NA  |    | 27.30 27.31 -               |        |
| Assumed zone of no recovery. Boulder CLAY and large granite boulders. (Driller's description)   | 0 0 0                                   | 28.60 -                          | -28.42 |        |       |      |     |                 |     |    | SPT(C)50/10mm -             |        |
| Stiff brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to subrounded of granite, gneiss and schist. from 28.70m to 28.89m medium strong grey boulder of granite from 29.36m to 29.50m strong grey boulder of granite |   | 28.60 -                          | -28.42 | 28.60  | 30.10 | 89   | 80  | NA              | NA  |    | 28.60 28.63 ·               |        |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Part of the Bachy Soletanche Group



# Project Name Bay of Nigg Harbour Development Ground Investigation Project No. TA7148 Engineer Arch Henderson LLP Employer Aberdeen Harbour Board Exploratory Hole Log A08 Sheet 4 of 4

Ground Level 0.18m CD Coordinates 396673.80 E, 804740.90 N National Grid

Hole Type CP+RC Inclination Vertica

| Description of Strata   | Legend                                | Depth              | Datum            | s     | ampling     |      |     |     | ount A<br>Recov |    | In Situ Test                 | Instal |
|---|---------------------------------------|--------------------|------------------|-------|-------------|------|-----|-----|-----------------|----|------------------------------|--------|
|   |                                       |                    | Level            | De    | etails      | Dia. |     | SCR |                 | IF | Details                      | ation  |
| Assumed zone of no recovery. Boulder CLAY with large granite boulders. (Driller's description)  | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 30.10 -<br>30.30 - | -29.92<br>-30.12 | 30.10 | 30.70       | 89   | 0   | NA  | NA              |    |                              |        |
| Stiff brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to subrounded of granite and gneiss.  |                                       | 30.70 -            | -30.52           |       |             |      |     |     |                 | •  | SPT(C)50/15mm<br>30.70 30.72 |        |
| Assumed zone of no recovery. Boulder CLAY with large granite boulders. (Driller's description)  |                                       | =                  |                  | 30.70 | 32.35       | 89   | 100 | NA  | NA NA           |    |                              |        |
| Stiff brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse grained igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to subrounded of granite and gneiss.  from 30.70m to 30.80m and 32.35m to 32.45m angular to subrounded cobbles of granite, schist and gneiss | 0 0 0                                 | 32.35 _<br>32.40 _ | -32.17<br>-32.22 | B002  | 32.50-33.50 |      |     |     |                 |    | -                            |        |
| Rotary openhole drilling: Firm brown sandy boulder clay with some cobbles (drillers description)  |                                       |                    |                  |       |             |      |     |     |                 |    |                              |        |
| Rotary openhole drilling: Brown slightly gravelly coarse SAND. Gravel is angular to rounded fine to medium of mixed igneous and metamorphic lithologies including granite, gneiss and schist. (driller notes sand and gravel).  |                                       | -                  |                  | B003  | 33.50-34.00 |      |     |     |                 |    |                              |        |
|   |                                       |                    |                  | B004  | 35.00-35.50 |      |     |     |                 |    |                              |        |
| Rotary openhole drilling: boulder clay (drillers description)   |                                       | 35.60              | -35.42           |       |             |      |     |     |                 |    |                              |        |
| Exploratory hole complete at 36.00 m.   |                                       | 36.00              | -35.82           |       |             |      |     |     |                 |    |                              |        |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG

sue.Revision No. 1.05



| Project  | t Nam  | е Вау  | of Nigo   | g Har  | rbour Dev   | elopm   | nent (   | Groun  | d Inv                   | estiga                  | tion                         |  |  | Evn   | loro  | ton, l   | ا مام ا              |   | Нс  | ole ID.   |   |
|--|--|--|---|--|---|---|--|--|-------------------------|-------------------------|------------------------------|--|--|---|---|--|----------------------|---|---|---|---|
| Project  |  | TA7  |   |  |   |   |  |  |                         |                         |                              |  |  | Exh   | lOra  | itory r  | Hole Lo              | og  | 1   | 11  |   |
| Engine   |  | Arch   | n Hende   | erson  | ı LLP   |   |  |  |                         |                         |                              |  |  |   |   |  |                      |   | ,   | ,11   |   |
| Employ   |  |  |   | Harbo  | our Board   |   |  |  |                         |                         |                              |  | 22/2   |   |   |  |                      |   | Н   | eader   |   |
| Ground<br>Date Sta   |  |  | 7m CD<br>9/2013   |  |   |   |  |  | ordinat<br>te Com       |                         | 18/09                        |  | 8047   | 98.70 N   | Natio   | onal Grid  | Inclinat             | ion Vert  | ical  |   |   |
| Тор  | Base   | _  | Date Sta  | arted  | Date Ende   | d Cr  | ew   | Section  |                         | Core                    | Core                         |  | Equip  | ment  |   | Sho  |                      |   | Remarks   |   |   |
| 0.00   | 0.70   | СР   | 14/09/2   |  | 14/09/201   |   | CL LC  | ogged B.<br>DT   | 3y E                    | Barrel                  | Bit                          |  | Dando  |   |   | Su   | oring /<br>oport     |   |   |   | -   |
| 0.70<br>6.20<br>6.50   | 6.20<br>6.50<br>32.80                                  | RC<br>RO<br>RC   | 14/09/2<br>16/09/2<br>16/09/2                                     | 2013<br>2013   | 14/09/201<br>16/09/201<br>18/09/201                               | 3 M<br>3 W                                    | 1M<br>/W<br>/W   | DT<br>DT<br>DT   |                         | SWF<br>F6116            | Impreg<br>4 3/4 RF<br>Impreg |  | Deltaba<br>Deltaba   | ise 520<br>ise 520<br>ise 520                       |   |  |                      |   |   |   |   |
|  |  |  | <u> </u>  |  |   | 丄   |  |  |                         |                         |                              |  |  |   |   |  |                      |   |   |   |   |
|  | - 1 -  |  |   |  | OGRESS  |   |  |  |                         |                         |                              |  |  | -   |   |  | ATER STRI            |   |   |   | .1  |
| Date   | '  | ime  | Hole<br>depth   | Casi<br>dep  | ing Wate<br>oth dept  |   |  | Rema   | arks                    |                         |                              | Dat  | e  | Tim   | e   | Strike at<br>depth   | Rise to<br>depth     | Time<br>taken<br>to rise  | at strik  | sing dep<br>ke to<br>f  | oth<br>o seal<br>flow   |
| 14/09/20<br>15/09/20<br>16/09/20<br>16/09/20<br>17/09/20<br>17/09/20<br>18/09/20 | 013 (0<br>013 (0<br>013 1<br>013 (0<br>013 1<br>013 (0 | 2240<br>3600<br>3700<br>1900<br>1700<br>1900<br>1900<br>1900<br>1900 | 0.70<br>6.20<br>6.20<br>13.40<br>17.10<br>28.10<br>29.80<br>32.80 | 0.7(<br>4.7(<br>4.7(<br>4.7(<br>11.4<br>17.0<br>28.6<br>28.6 | 0 -3.20<br>0 -1.90<br>0 -2.80<br>45 -1.30<br>00 -1.10<br>52 -2.00 | End of<br>Start<br>End of<br>End of<br>End of | of Shift<br>t of Shift<br>of Shift<br>of Shift<br>of Shift | ft<br>t/Start of<br>t/Start of<br>t/Start of<br>t/Start of | Shift<br>Shift<br>Shift |                         |                              |  |  |   |   |  |                      | to rise   |   |   | iow   |
|  |  |  | C.F   | ABLE P   | PERCUSSIO   | N DETA  | AILS   |  |                         |                         |                              |  |  |   |   |  | SPT DETAI            | LS  |   |   |   |
|  | Strata   | •  | Start t   |  | elling<br>Duration  | Rema  | rks  |  |                         |                         |                              | Depth  | Туре   |   |   | ntal blow<br>ration in r   |                      | Hammer<br>No.   | Energy ratio  | Casing depth  |   |
| from<br>0.60   | 1  | 0.70   | hhm<br>204  | nm   | hhmm<br>0200  | Chisell                                       | lina   |  |                         |                         |                              | 0.50   | SPT  |   |   | ,21,50/15)   |                      | AR362   | %   | N/A   |   |
|  |  |  |   | DOTAL  | RY FLUSH D  |   |  |  |                         |                         |                              | 0.70<br>2.00<br>3.50<br>5.00<br>6.50<br>8.20<br>9.60<br>11.10<br>12.70 | SPT(C<br>SPT(C<br>SPT(C<br>SPT(C<br>SPT(C<br>SPT(C<br>SPT(C<br>SPT(C | 50/0i<br>50/30<br>50/8!<br>50/20                    | mm (2 <sup>°</sup> 5<br>0mm (2<br>5mm (7<br>0mm (2<br>5       | 5/0,50/0)<br>15/30,50/3<br>1,10,42,8/1<br>15/40,50/2<br>5/0,50/0)<br>10,11,11<br>8,8,10)<br>6,8,9)<br>7,7,9)<br>(4,9,12,13,2 |                      | AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362 | 75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>7 | N/A<br>2.00<br>2.00<br>2.00<br>4.70<br>4.70<br>4.70<br>4.70<br>4.70 | -3.20<br>-3.30<br>-3.50<br>-3.20<br>-3.10<br>-1.90<br>-2.90<br>-4.20<br>-3.70<br>-3.00<br>-3.10 |
| Fron   |  | To   |   | RUTAR  | Flush   | ETAILS  | Flu  |  |                         | Flush                   |                              | 14.10<br>15.60   | ISPIR  | 711 DO/T  | / UIIIIII I   | 110.12.13.2  | .5,10/20)<br>3,8/20) | AR362<br>AR362  | 75<br>75  | 5.70<br>14.10   | -3.20   |
| 0.70   | ın   | depth<br>6.20  | +   |  | type<br>Water   | $\dashv$                                      | retu<br>%<br>0   | 6  |                         | colour<br>-             |                              | 17.10<br>18.60<br>19.60  | SPT(C<br>SPT(C   | N=30<br>N=37<br>N=37                                | (4,6,7,<br>(5,5,8,  | 7,7,9)<br>9,9,11)<br>5/0,50/0)   |                      | AR362<br>AR362<br>AR362   | 75<br>75<br>75  | 17.00<br>17.00<br>17.00   | -1.30<br>-2.30<br>-2.80   |
| 6.20<br>11.10<br>17.10<br>27.40<br>29.80   |  | 11.10<br>17.10<br>27.40<br>29.80<br>32.80                            |   |  | Water<br>Water<br>Water<br>Water<br>Water<br>Water                |   | 10<br>0<br>10<br>0<br>10                                   | 00<br>00<br>0  |                         | Brown<br>Brown<br>White |                              | 20.10<br>22.40   | SPT(C<br>SPT(C<br>SPT(C<br>SPT(C                                     | C) N=33<br>C) N=41<br>C) N=33<br>C) N=32<br>C) N=34 | 3 (4,4,6,<br>1 (5,5,7,<br>3 (4,6,6,<br>2 (4,4,6,<br>4 (5.6.6. | 8,9,10)<br>9,11,14)<br>7,9,11)<br>8,8,10)  |                      | AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362                            | 75<br>75<br>75<br>75<br>75<br>75<br>75  | 17.00<br>17.00<br>17.00<br>17.00<br>17.00<br>17.00<br>17.00         | -3.40<br>-4.40<br>-3.20<br>-2.00<br>-1.70<br>-1.40  |
| HC   | LE DIA   | METER  | / CASING  | à  |   | DYN.  | AMIC   | SAMPLI   | ING                     |                         |                              |  |  |   |   |  |                      |   |   |   |   |
| Hole<br>diameter<br>200<br>155<br>125<br>116                                     |  | 20<br>1 15<br>2 12   | neter ca<br>00 0<br>50 5  | pth of<br>asing<br>0.70<br>5.70<br>8.62                      | Тор   | Base  | Diar   | meter I  | Time<br>hhmm            |                         | covery<br>%                  |  |  |   |   |  |                      |   |   |   |   |
|  |  |  |   |  |   |   |  |  |                         |                         |                              |  |  |   |   |  |                      |   |   |   |   |
|  | -  |  | TION DE   |  |   |   |  | PE CONS  |                         |                         |                              |  |  |   |   |  |                      |   |   |   |   |
| Distance<br>from G.L   |  | 13   | /pe   | Respo  | onse zone<br>p   Base   | ID 1  | Top Pi   | ipe<br>  Base  | Dia<br>of pi            |                         | pe of<br>pipe                |  |  |   |   |  |                      |   |   |   |   |
|  |  |  |   |  |   |   |  |  |                         |                         |                              |  |  |   |   |  |                      |   |   |   |   |
|  |  |  |   | DΛ   | ACKFILL DET   | TAILS   |  |  |                         |                         |                              |  |  |   | *   | * Seating blo  | ows only.            | )TES  |   |   |   |
| Top of   | f E  | Base of  |   | Mater  |   | AILS  |  | Rema   | narks                   |                         |                              |  |  |   |   | G  | ENERAL INC           | JIE2  |   |   |   |
| sectio<br>0.00<br>28.20  | n s  | ection<br>28.20<br>32.80   |   | Arising<br>Grout   | gs  |   |  |  |                         |                         |                              |  |  |   |   |  |                      |   |   |   |   |
| NOTES:   | Wate   | r strike r   |   | in mir   | meters in m<br>nutes, hard<br>see key<br>.og Print Da             | l strata                                      | time i   |  |                         | 10:24:                  | :11                          |  |  |   |   |  |                      | SOI   | L eng   | inee  | RING  |

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Project No. TA7148

Arch Henderson LLP

**Exploratory Hole Log** 

Hole ID.

A11

Sheet 1 of 4

Employer Ground Level

Engineer

Aberdeen Harbour Board

-0.17m CD Coordinates

396693.40 E, 804798.70 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend                                  | Depth                                | Datum<br>Level |                      | Sampling                  |      |     |     | ount A<br>Recov |    | In Situ<br>Deta             |                    | Instal |
|--|---|--------------------------------------|----------------|----------------------|---------------------------|------|-----|-----|-----------------|----|-----------------------------|--------------------|--------|
|  | 100                                     |                                      | Level          | [                    | Details                   | Dia. | TCR | SCR | RQD             | IF | Deta                        | IIIS               | ation  |
| Grey slightly silty slightly gravelly fine to coarse SAND.<br>Gravel is fine.  | × × ×                                   | =                                    |                | D001<br>B002<br>D003 | 0.00<br>0.00-0.50<br>0.50 |      |     | •   |                 |    | SPT50/15m                   |                    |        |
| No recovery. Large boulder obstruction. (Driller's description)  | 0000                                    | 0.60 -<br>0.70 -                     | -0.77<br>-0.87 |                      |                           |      |     |     |                 |    | 0.50<br>SPT(C)50/0r<br>0.70 | 0.60<br>mm<br>0.70 |        |
| Medium dense to dense grey and brown gravelly subangular to rounded COBBLES and BOULDERS of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Recovered as angular to rounded coarse gravel and cobble sized fragments. (Driller notes boulder clay).  from 0.80m to 1.20m with clay pockets   |   | 1.20 -                               | -1.37          | 0.7                  | 0 2.00                    | 107  | 38  | NA  | NA              |    |                             |                    |        |
| Assumed zone of no recovery. Stiff boulder CLAY with cobbles and boulders. (Driller's description)   | 0000                                    | 2.00                                 | -2.17          |                      |                           |      |     |     |                 |    | SPT(C)50/30<br>2.00         | 2.06 –             |        |
| Medium dense to dense grey and brown gravelly subangular to rounded COBBLES and BOULDERS of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Recovered as angular to rounded coarse gravel and cobble sized fragments. (Driller notes boulder clay).  |   | 2.35                                 | -2.52          | 2.0                  | 0 3.50                    | 107  | 20  | NA  | NA              |    |                             |                    |        |
| Assumed zone of no recovery. Stiff boulder CLAY with cobbles and boulders. (Driller's description)   | 8 8 8 0                                 | 3.50                                 | -3.67          |                      |                           |      |     |     |                 |    | SPT(C)50/85                 |                    |        |
| Medium dense to dense grey and brown gravelly subangular to rounded COBBLES and BOULDERS of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Recovered as angular to rounded coarse gravel and cobble sized fragments. (Driller notes boulder clay).  Assumed zone of no recovery. Stiff boulder CLAY with cobbles and boulders. (Driller's description)  |   | 3.70 -                               | -3.87          | 3.5                  | 0 5.00                    | 107  | 13  | NA  | NA              |    | 3.50                        | 3.74               |        |
| Medium dense to dense grey and pink gravelly subangular to   |   | 5.00 —                               | -5.17          |                      |                           |      |     |     |                 |    | SPT(C)50/20<br>5.00         | 0mm —              |        |
| rounded COBBLES and BOULDERS of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Recovered as angular to rounded coarse gravel, cobble and boulder sized fragments. (Driller noted boulder clay).  from 5.00m to 5.20m and 5.45m to 5.60m with medium to coarse gravel sized pockets of clay.  from 5.10m to 5.33m strong grey boulder of granite from 5.47m to 5.60m strong grey boulder of gneiss |   | 5.60 -                               | -5.77<br>-6.37 | 5.0                  | 0 6.20                    | 107  | 50  | NA  | NA              |    |                             |                    |        |
| Assumed zone of no recovery. Stiff boulder CLAY with cobbles and boulders. (Driller's description)   | 000                                     | 6.50                                 | -6.67          |                      |                           |      |     |     |                 |    | SPT(C)50/0r<br>6.50         | mm<br>6.50         |        |
| Rotary openhole drilling: BOULDERS. (Driller's description)  | 4 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - |                                      |                | 6.5                  | 0 7.10                    | 107  | 100 | NA  | NA              |    |                             | 1                  |        |
| Dense grey, brown and pink clayey angular to rounded coarse GRAVEL with medium cobble content. Cobbles are subangular to rounded of granite and gneiss. Gravel is of mixed igneous and metamorphic lithologies including granite, gneiss and schist.  Stiff extremely high strength reddish brown slightly sandy   |   | 7.10 -<br>-<br>-<br>-<br>-<br>-<br>- | -7.27          | 7.1                  | 0 8.20                    | 89   | 95  | NA  | NA              |    |                             | 1                  |        |
| slightly gravelly CLAY with low cobble content. Sand is fine<br>to coarse. Gravel is angular to subrounded fine to coarse of<br>mixed igneous and metamorphic lithologies including granite,   | 0 0 0                                   |                                      |                |                      |                           |      |     |     |                 |    | SPT(C)41<br>8.20            | 8.65 -             |        |
| gneiss and schist. Cobbles are angular to subrounded of<br>granite and gneiss.<br>from 8.15m to 8.20m assumed zone of no recovery  |   | -                                    |                | 8.2                  | 0 9.60                    | 89   | 100 | NA  | NA              |    | 5.EV                        | -                  |        |
|  | P                                       |                                      |                |                      |                           |      |     |     |                 |    | SPT(C)32<br>9.60            | 10.05              |        |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:24:15

Part of the Bachy Soletanche Group

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

**Exploratory Hole Log** 

Hole ID.

A11

Sheet 2 of 4

Ground Level -0.17m CD

Coordinates

396693.40 E, 804798.70 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend | Depth                                   | Datum                      | Sampli  | ng     |       |      |      | t And<br>overy | In Situ Test                  | Insta |
|--|--------|---|----------------------------|---------|--------|-------|------|------|----------------|-------------------------------|-------|
| ·  |        | ·                                       | Level                      | Details | Di     | a. TO | R SC | R RC | D IF           | Details                       | ation |
| Stiff extremely high strength reddish brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to subrounded of granite and gneiss.  |        | 10.50                                   | -10.67                     | 9.60 1  | 1.10 8 | 9 10  | 10 N | A r  | IA.            |                               |       |
| Stiff extremely high strength greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist.  |        | 12.40                                   | -12.57                     | 11.10 1 | 2.70 8 | 9 10  | 00 N | A N  | JA             | SPT(C)28<br>11.10 11.55       |       |
| Stiff brown slightly gravelly CLAY. Gravel is angular to rounded fine to medium of granite and gneiss.  from 13.10m to 13.20m cobble of quartz from 13.20m to 13.40m assumed zone of no recovery   |        | -                                       |                            | 12.70 1 | 3.40 8 | 9 7   | 1 N  | 1 A  | JA             | SPT(C)29<br>12.70 13.15       |       |
| from 13.60m to 13.70m cobble of granite  Assumed zone of no recovery. Stiff to firm greyish brown boulder CLAY. (Driller's description)  |        | 13.70 -                                 | -13.87<br>-14.27           | 13.40 1 | i.10 8 | 9 5   | 7 N  | A N  | JA             | SPT(C)50/245mm ·              |       |
| Firm brown slightly gravelly CLAY. Gravel is angular to rounded fine to coarse of granite and schist. from 14.40m to 14.60m recovered as angular coarse gravel sized fragments  Assumed zone of no recovery. Dense clay bound GRAVEL with cobbles and boulders. (Driller's description)  |        | 14.60                                   | -14.77                     | 14.10 1 | 5.60 8 | 9 3   | 3 N  | 1 A  | N/A            | 14.10 14.50                   |       |
| Dense clayey angular to subrounded fine to coarse GRAVEL of mixed igneous and metamorphic lithologies including granite, gneiss and schist with low cobble content. Cobbles are subangular of granite and gneiss.  Stiff brown slightly sandy gravelly CLAY with medium cobble content. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to rounded of granite and gneiss. |        | 15.60 -<br>-<br>-<br>16.20 -<br>16.50 - | -15.77<br>-16.37<br>-16.67 | 15.60 1 | 7.10 8 | 9 6   | 0 N  | 1 A  | JIA            | SPT(C)50/170mm<br>15.60 15.92 |       |
| Assumed zone of no recovery. Clay bound GRAVEL with cobbles and boulders. (Driller's description)  Stiff brown slightly sandy gravelly CLAY with medium cobble content. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to subrounded of granite and gneiss.  Assumed zone of no recovery. Firm greyish brown boulder CLAY  |        | 17.10 -                                 | -17.27<br>-17.87           | 17.10 1 | 8.60 8 | 9 4   | 0 N  | 1 A  | JA             | SPT(C)30                      |       |
| with sandy bands. (Driller's description)  Stiff brown slightly sandy gravelly CLAY with medium cobble content. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to subrounded of granite, gneiss and schist.  |        | 18.60                                   | -18.77                     | 18.60 1 | 9.60 8 | 9 8   | 0 N  | 1 A  | JA             | SPT(C)37<br>18.60 19.05       |       |
| from 19.40m to 19.60m assumed zone of no recovery  | 0000   | -                                       |                            |         |        |       |      |      |                | SPT(C)50/0mm -                |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:24:20

SOIL ENGINEERING

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

# **Exploratory Hole Log**

Hole ID.

A11

Sheet 3 of 4

Ground Level -0.17m CD Coordinates 396693.40 E, 804798.70 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend                                  | Depth             | Datum            | Sam   | npling |      |     |          | ount A   |                  |                               | u Test                      | Ins  |
|---|---|-------------------|------------------|-------|--------|------|-----|----------|----------|------------------|-------------------------------|-----------------------------|------|
| ·   |   |                   | Level            | Deta  | ils    | Dia. | TCR | SCR      | RQD      | İF               | Det                           | ails                        | atio |
| Stiff brown slightly sandy gravelly CLAY with medium cobble content. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to subrounded of granite, gneiss and schist.  from 20.15m to 20.20m angular medium to coarse gravel of schist and granite   |   | 20.20 -           | -20.37<br>-21.27 | 19.85 | 21.10  | 89   | 28  | NA       | NA       |                  | SPT(C)33<br>20.10             | 20.55                       |      |
| Assumed zone of no recovery. Firm greyish brown boulder CLAY with sandy bands. (Driller's description)  Stiff extremely high strength brown slightly sandy gravelly CLAY with medium cobble content. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are angular to subrounded of granite, gneiss and schist.  from 22.40m to 22.60m assumed zone of no recovery |   | 21.10             | -21.21           | 21.10 | 22.60  | 89   | 87  | NA       | NA       |                  | SPT(C)41<br>22.40             | 22.85                       |      |
| from 23.35m to 23.60m assumed zone of no recovery   |   |                   |                  | 22.60 | 23.60  | 89   | 75  | NA<br>NA | NA<br>NA |                  | SPT(C)33<br>23.60             | 24.05                       |      |
| from 24.10m to 24.20m assumed zone of no recovery   |   |                   |                  | 24.20 | 25.60  | 89   | 96  | NA       | NA       |                  |                               |                             |      |
| from 25.55m to 25.60m assumed zone of no recovery   | 0 0 0                                   | -                 |                  | 25.60 | 26.00  | 89   | 88  | NA       | NA       |                  | SPT(C)32<br>25.60<br>SPT(C)34 | 26.05 -<br>-<br>-<br>-      |      |
| Assumed zone of no recovery. Firm greyish brown boulder CLAY with sand bands and cobbles. (Driller's description)   |   | 26.40             | -26.57           | 26.00 | 27.50  | 89   | 27  | NA       | NA       |                  | 26.00                         | 26.45                       |      |
| Dense grey, pink and brown gravelly angular to subrounded COBBLES and BOULDERS of mixed igneous and metamorphic lithologies including granite, gneiss, schist and quartz.  Recovered as angular to subrounded coarse gravel and cobble  | 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 27.50<br><br><br> | -27.67           | 27.50 | 28.10  | 89   | 50  | NA       | NA       |                  | SPT(C)50/0<br>27.50           | 0mm<br>27.50<br>-<br>-<br>- |      |
| sized fragments. from 27.50m to 27.70m strong grey boulder of granite from 27.70m to 27.80m with medium to coarse gravel sized pockets of slightly gravelly sandy clay. from 27.80m to 28.00m assumed zone of no recovery   |   | 28.20             | -28.37           | 28.10 | 28.70  | 89   | 100 | 83       | 48       | 50<br>140<br>290 |                               |                             |      |
| Strong grey granitic GNEISS. Discontinuities: 1) 10-20 degrees closely and medium spaced planar rough stained brown on surfaces. 2) 40-50 degrees medium spaced planar rough stained brown on surfaces.  from 28.95m to 29.05m recovered as non intact core (angular coarse gravel sized fragments)   |   | -<br>-<br>-<br>-  |                  | 28.70 | 29.80  | 89   | 100 | 91       | 24       |                  |                               | -                           |      |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:24:24

SOIL ENGINEERING Part of the Bachy Soletanche Group

#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 A11 Engineer Arch Henderson LLP Employer Aberdeen Harbour Board Sheet 4 of 4

Ground Level -0.17m CD Coordinates 396693.40 E, 804798.70 N National Grid

Hole Type CP+RC Inclination

| Description of Strate  | locand | Depth | Datum  | Sampling    |      | Blo | ow Co | ount A<br>Recov | nd         | In Situ Test | IIIsta |
|--|--------|-------|--------|-------------|------|-----|-------|-----------------|------------|--------------|--------|
| Description of Strata  | Legend | Depth | Level  | Details     | Dia. |     |       | RQD             | ery<br>IF  | Details      | ation  |
| Remaining Detail : 29.80m - 29.84m : from 29.80m to 29.84m, 30.36m to 30.46m, 30.70m to 30.74m and 31.29m to 31.33m recovered as non intact core |        |       | -32.97 | 29.80 32.80 |      |     | 93    | 66              | NI 100 220 |              |        |
| Exploratory hole complete at 32.80 m.  |        |       |        |             |      |     |       |                 |            |              |        |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

Form No. SIEXPHOLELOG

Log Print Date And Time: 23/12/2013 10:24:29



| 1                                |                 | •                    | -                                     | ј Har                | bour Dev               | elop       | ment                                 | Ground               | Invest          | tigatior       | 1         |                      |                         | Fxnlo                      | orat                        | orv F                              | Hole Lo          | 00                      | Нс                         | ole ID.             |                         |
|----------------------------------|-----------------|----------------------|---------------------------------------|----------------------|------------------------|------------|--------------------------------------|----------------------|-----------------|----------------|-----------|----------------------|-------------------------|----------------------------|-----------------------------|------------------------------------|------------------|-------------------------|----------------------------|---------------------|-------------------------|
| Project                          |                 | TA7                  |                                       |                      |                        |            |                                      |                      |                 |                |           |                      |                         | LAPIC                      | Jia                         | .Ory i                             | TOTO LC          | <b>'</b> 9              | ļ                          | 119                 |                         |
| Engine                           |                 |                      | n Hende                               |                      |                        |            |                                      |                      |                 |                |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
| Employ<br>Ground                 |                 |                      | raeen F<br>8m CD                      | larbo                | our Board              |            |                                      | Coor                 | rdinates        | 39             | 680       | 05.70 E,             | <u> </u><br>80491       | .7.80 N I                  | Vation                      | nal Grid                           |                  |                         | Гп                         | eader               |                         |
| Date Sta                         |                 |                      | 8/2013                                |                      |                        |            |                                      |                      |                 | eted 02        |           | ,                    | -                       |                            |                             | -                                  | Inclinat         | ion Verti               | cal                        |                     |                         |
| Тор                              | Base            | Туре                 | Date Sta                              | ırted                | Date Ende              | d C        | Crew                                 | Section<br>Logged By | Core<br>y Barr  | re Co<br>rel B | re<br>it  | I                    | Equipr                  | nent                       |                             | Sho<br>Sur                         | oring /<br>oport | F                       | Remarks                    |                     |                         |
| 0.00<br>0.10                     | 0.10<br>9.80    | CP<br>RC             | 31/08/2<br>31/08/2                    | 013<br>013           | 31/08/201<br>02/09/201 |            | KL<br>MM                             | DT<br>DT             | SWI             |                |           |                      | Dando<br>Deltabas       |                            |                             |                                    |                  |                         |                            |                     |                         |
| 0.23                             | •               |                      | 01                                    |                      | <b>52</b> ,            | Ĭ          |                                      |                      |                 |                | 123       |                      | ,0                      | JC 0                       |                             |                                    |                  |                         |                            |                     |                         |
|                                  |                 |                      |                                       |                      |                        |            |                                      |                      |                 |                |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
|                                  |                 |                      |                                       |                      |                        |            |                                      |                      |                 |                |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
|                                  |                 |                      |                                       | PR                   | OGRESS                 |            |                                      |                      |                 |                | $\rfloor$ |                      |                         |                            |                             | V                                  | /ATER STRI       | KES                     |                            |                     |                         |
| Date                             | Т               | ime                  | Hole<br>depth                         | Casi<br>dep          | ing Wate               | r<br>h     |                                      | Remar                | ks              |                |           | Date                 | е                       | Time                       | S                           | trike at<br>depth                  | Rise to<br>depth | Time<br>taken           | at strik                   | sing dep            | o seal                  |
| 31/08/20<br>31/08/20             | 113             | 1330<br>1345         | 0.10<br>0.10                          | 0.10                 |                        |            | d of CP<br>art of Rot                | tarv                 |                 |                | $\exists$ |                      |                         |                            | +                           |                                    |                  | to rise                 | time                       | +                   | flow                    |
| 31/08/20<br>01/09/20             | 013   1         | 1900<br>0900         | 2.70<br>2.70                          | 2.70<br>2.70         | 0 -3.10<br>0 -4.50     | End<br>Sta | d of Shif<br>art of Shi              | ft ´<br>ift          |                 |                |           |                      |                         |                            |                             |                                    | ı                |                         |                            |                     |                         |
| 01/09/20<br>02/09/20<br>02/09/20 | )13 (           | 1500<br>0800<br>1715 | 4.50<br>4.50<br>9.80                  | 3.70<br>3.70<br>5.00 | 0 -4.50                | Sta        | d of Shif<br>art of Shi<br>d of Hole | ift                  |                 |                |           |                      |                         |                            |                             |                                    | ı                |                         |                            |                     |                         |
| 02/03/23                         | 15              | 1/13                 | 5.00                                  | 3.0                  | J1.55                  | Liis       | 101110                               | ž.                   |                 |                |           |                      |                         |                            |                             |                                    | ı                |                         |                            |                     |                         |
|                                  |                 |                      |                                       |                      |                        |            |                                      |                      |                 |                |           |                      |                         |                            |                             |                                    | ı                |                         |                            |                     |                         |
|                                  |                 |                      |                                       |                      |                        |            |                                      |                      |                 |                |           |                      |                         |                            |                             |                                    | ı                |                         |                            |                     |                         |
|                                  | $\perp$         |                      |                                       | DIE D                | 2500100101             | DEI        | -AUC                                 |                      |                 |                | $\dashv$  |                      |                         |                            |                             |                                    | SPT DETAII       |                         |                            |                     |                         |
| Hard                             | Strata          | Depth                | \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ |                      | PERCUSSIOI<br>elling   |            | narks                                |                      |                 |                | $\dashv$  | Depth                | Туре                    | Incre                      | ement                       | tal blow                           |                  | Hammer                  | Energy                     | Casing              | Water                   |
| from                             |                 | to                   | Start t                               | time<br>nm           | Duration<br>hhmm       |            |                                      |                      |                 |                |           | ·                    |                         | pe                         | enetra                      | tion in m                          |                  | No.                     | ratio<br>%                 | depth               | depth                   |
| 0.00                             |                 | 0.10                 | 113                                   | 0                    | 0200                   | Chise      | elling                               |                      |                 |                |           | 0.10<br>1.40<br>2.70 | SPT(C                   | 50/0mr<br>50/81n<br>50/4mr | nm (20                      | ,5/0,32,18                         | 3/6)             | AR362<br>AR362<br>AR362 | 75<br>75<br>75<br>75<br>75 | N/A<br>1.40<br>1.40 | -6.10<br>-3.50<br>-3.00 |
|                                  |                 |                      |                                       |                      |                        |            |                                      |                      |                 |                |           | 2.70<br>3.70<br>4.50 | SPT(C<br>SPT(C<br>SPT(C | 50/4mr<br>50/95n<br>50/10n | m (23/1<br>nm (12<br>nm (25 | 0,50/4)<br>,13,41,9/2<br>/15,50/10 | 20)<br>))        | AR362<br>AR362<br>AR362 | 75<br>75                   | 3.70<br>3.70        | -3.00<br>-4.10<br>-4.00 |
|                                  |                 |                      |                                       |                      |                        |            |                                      |                      |                 |                |           |                      |                         |                            | •                           |                                    | ,                |                         |                            |                     |                         |
|                                  |                 |                      | F                                     | POTAF                | <br>Ry flush d         | FTAIL      | ς                                    |                      |                 |                | $\dashv$  |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
| Fron<br>dept                     |                 | To<br>depth          |                                       |                      | Flush<br>type          | LIME       | Flu                                  | ush<br>turn          |                 | ush<br>lour    | $\dashv$  |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
| 0.10                             | $\ddot{+}$      | 5.00                 | -+                                    |                      | Water                  | $\dashv$   | 9                                    | 0                    |                 | -              | $\dashv$  |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
| 5.00                             |                 | 9.80                 |                                       | ,                    | Water                  |            | 10                                   | .00                  | Cle             | lear           |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
|                                  |                 |                      |                                       |                      |                        |            | ĺ                                    |                      |                 |                |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
|                                  |                 |                      |                                       |                      |                        |            | 1                                    |                      |                 |                |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
|                                  | $\perp$         |                      |                                       |                      |                        |            |                                      |                      |                 |                | 4         |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
| HO<br>Hole                       | LE DIA<br>Depti |                      | / CASING                              | i<br>oth of          | Тор                    | DYI        |                                      | SAMPLIN<br>meter -   | NG<br>Time      | Recove         | rv.       |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
| diameter<br>200                  | hol<br>0.10     | e diam               | neter ca                              | sing                 | ТОР                    | Базе       |                                      |                      | hmmss           | %              | у<br>     |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
| 150<br>145                       | 3.70<br>9.80    | ) 15                 |                                       | .70                  |                        |            |                                      |                      |                 |                |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
|                                  |                 |                      |                                       |                      |                        |            |                                      |                      |                 |                |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
|                                  |                 |                      |                                       |                      |                        |            |                                      |                      |                 |                |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
|                                  | - II            | NSTALLA              | TION DE                               | TAILS                |                        |            | PI                                   | IPE CONST            | FRUCTIO         | ON.            | ٦         |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
| Distance<br>from G.L.            |                 | Ту                   | /ре                                   | Respo                | onse zone<br>p   Base  | ID         | Top                                  | Pipe<br>  Base       | Dia.<br>of pipe | Type of pipe   |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
|                                  |                 |                      |                                       |                      |                        |            | <u>-</u> -                           |                      |                 |                | ٦         |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
|                                  |                 |                      |                                       |                      |                        |            | 1                                    |                      |                 |                |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
|                                  |                 |                      |                                       | RΛ                   | CKFILL DET             | TAILS      |                                      |                      |                 |                | 4         |                      |                         |                            | * 5                         | Seating blo                        | ows only.        | )TES                    |                            |                     |                         |
| Top of                           |                 | Base of              | ı                                     | Materi               |                        | AILS       |                                      | Remai                | rks             |                | $\dashv$  |                      |                         |                            |                             |                                    | - INLINAL INC    | 71123                   |                            |                     |                         |
| 9.00<br>4.50                     | <u>1 s</u>      | 4.50<br>9.80         |                                       | Arising<br>Grout     |                        |            |                                      |                      |                 |                | $\dashv$  |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
| 4.50                             |                 | 3.80                 |                                       | Grout                | L                      |            |                                      |                      |                 |                |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
|                                  |                 |                      |                                       |                      |                        |            |                                      |                      |                 |                |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
|                                  |                 |                      |                                       |                      |                        |            |                                      |                      |                 |                |           |                      |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
| NOTES:                           | All de          | nthe in              | metres a                              | ll diar              | meters in m            | illima     |                                      |                      |                 |                | _         | <u> </u>             |                         |                            |                             |                                    |                  |                         |                            |                     |                         |
| NOTES.                           | Wate            | r strike ı           |                                       | in min               | nutes, hard            |            |                                      | in hhmm              |                 |                |           |                      |                         |                            |                             |                                    |                  |                         | 4                          |                     |                         |
| Unched                           |                 |                      |                                       |                      | og Print Da            | te An      | d Time                               | : 23/12/7            | 2013 10         | 0:24:40        |           |                      |                         |                            |                             |                                    |                  | SOI                     | L eng                      | inee                | RING                    |

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

# **Exploratory Hole Log**

Hole ID.

A19

Sheet 1 of 1

Ground Level -2.58m CD Coordinates 396805.70 E, 804917.80 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend | Depth | Datum  | Sam   | pling |      |     |     | unt A<br>Recov |                  | In Situ Test                   | Install |
|---|--------|-------|--------|-------|-------|------|-----|-----|----------------|------------------|--------------------------------|---------|
|   |        |       | Level  | Detai | ls    | Dia. | TCR | SCR | RQD            | IF               | Details                        | ation   |
| No recovery. Large BOULDER obstruction. (Driller's description)   | 0000   | 0.10  | -2.68  | 0.10  | 0.40  | 113  | 83  | NA  | NA             |                  | SPT(C)50/0mm<br>0.10 0.10      |         |
| Strong grey BOULDERS of granite.<br>from 0.35m to 0.40m assumed zone of no recovery   | 000    | 0.58  | -3.16  |       |       |      |     |     |                |                  | -                              |         |
| Very stiff reddish brown slightly sandy slightly gravelly CLAY with high cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed igneous and metamorphic lithologies including granite and gneiss. Cobbles are angular of granite and gneiss. |        | 1.40  | -3.98  | 0.40  | 1.40  | 113  | 100 | NA  | NA             |                  | SPT(C)50/81mm - 1.40 1.56 -    |         |
| from 0.87m to 1.10m strong grey boulder of gneiss  Very dense pink, grey and dark grey COBBLES and BOULDERS of mixed igneous and metamorphic lithologies including granite and gneiss.  |        | 1.80  | -4.38  | 1.40  | 2.70  | 113  | 31  | NA  | NA             |                  | -                              |         |
| Assumed zone of no recovery. Slightly claybound GRAVEL with frequent large granite boulders. (Driller's description)  | 0.000  | 2.70  | -5.28  |       |       |      |     |     |                | NA               | 007(0)50 (4                    |         |
| Very dense pink, grey and dark grey COBBLES and BOULDERS of mixed igneous and metamorphic lithologies including granite and gneiss.   |        | 3.00  | -5.58  | 2.70  | 3.70  | 113  | 30  | NA  | NA             |                  | SPT(C)50/4mm = 2.70 = 2.70 = - |         |
| Assumed zone of no recovery. Slightly claybound GRAVEL with frequent large granite boulders. (Driller's description)  | 0000   | 3.70  | -6.28  |       |       |      |     |     |                |                  | SPT(C)50/95mm -                |         |
| Very dense pink, grey and dark grey COBBLES and BOULDERS of mixed igneous and metamorphic lithologies including granite and gneiss.   | 50000  | 4.20  | -6.78  | 3.70  | 4.50  | 113  | 63  | NA  | NA             |                  | 3.70 3.95 -<br>-<br>-          |         |
| Assumed zone of no recovery. Slightly claybound GRAVEL with frequent large granite boulders. (Driller's description)  | 0.00   | 4.50  | -7.08  |       |       |      |     |     |                |                  | SPT(C)50/10mm -<br>4.50 4.53 - |         |
| Strong locally medium strong pink and grey coarse crystalline GRANITE. Discontinuities: 1) 10-20 degrees closely locally very closely spaced planar and undulose rough with patchy brown staining on surface. 2) 50-60 degrees medium spaced  |        |       |        | 4.50  | 5.00  | 113  | 100 | 60  | 22             |                  | -<br>-<br>-<br>-               |         |
| undulose rough with brown staining on surfaces. from 4.80m to 5.00m recovered as non intact core (angular coarse gravel sized fragments)  |        |       |        | 5.00  | 5.50  | 93   | 100 | 100 | 0              | NI<br>60<br>140  | -<br>-<br>-<br>-               |         |
| from 5.75m to 6.09m weak stained reddish brown on surfaces and recovered as non intact core (angular coarse gravel sized fragments) from 6.09m to 6.14m assumed zone of no recovery   | *****  |       |        | 5.50  | 6.50  | 93   | 95  | 61  | 14             |                  | -                              |         |
| from 6.50m to 7.50m 10-20 degrees discontinuities medium locally closely spaced from 6.76m to 6.80m recovered as non intact core (angular coarse gravel sized fragments)  | *****  |       |        | 6.50  | 7.50  | 93   | 100 | 96  | 62             | NI<br>150<br>220 | -                              |         |
| from 7.90m to 8.00m recovered as non intact core (angular coarse gravel sized fragments of schist) from 7.90m to 8.10m 1 No thin band of medium strong thinly (<3mm) foliated grey schist from 8.10m to 9.40m 10-20 degrees discontinuities closely locally medium spaced             | ****   |       |        | 7.50  | 9.00  | 93   | 100 | 93  | 42             | NI<br>120<br>500 |                                |         |
| Medium strong closely (<3mm) foliated grey SCHIST. Discontinuities: 1) 40-50 degrees closely spaced planar rough  | *****  | 9.40  | -11.98 | 9.00  | 9.80  | 93   | 100 | 100 | 64             |                  | -<br>-<br>-<br>-<br>-          |         |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG



Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 A19 Engineer Arch Henderson LLP Employer Aberdeen Harbour Board Sheet 1+ of 1

Ground Level -2.58m CD Coordinates 396805.70 E, 804917.80 N National Grid

Hole Type CP+RC Inclination

|                             | Description of Strata |   | Legend | Depth | Datum | Sampling |      | Bl | ow Co<br>mple I | ount A | And | In Situ Test | Insta |
|-----------------------------|-----------------------|---|--------|-------|-------|----------|------|----|-----------------|--------|-----|--------------|-------|
|                             | Description of Strata |   | Legend | Depth | Level | Details  | Dia. |    | SCR             | RQD    | IF  | Details      | ation |
| lean.                       |                       | i |        | -     |       |          |      |    |                 |        |     | -            |       |
| xploratory hole complete at | 9.80 m.               |   |        | -     |       |          |      |    |                 |        |     | -<br>-<br>-  |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -            |       |
|                             |                       |   |        | _     |       |          |      |    |                 |        |     |              |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -<br>-       |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -<br>-<br>-  |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -            |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     |              |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -            |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | =            |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -            |       |
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|                             |                       |   |        |       |       |          |      |    |                 |        |     | -<br>-<br>-  |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -<br>-<br>-  |       |
|                             |                       |   |        | _     |       |          |      |    |                 |        |     |              |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -            |       |
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|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -<br>-<br>-  |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -            |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     |              |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -<br>-       |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -<br>-       |       |
|                             |                       |   |        |       |       |          |      |    |                 |        |     | =            |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -<br>-<br>-  |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -<br>-<br>-  |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -            |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     |              |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -            |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -<br>-       |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -<br>-       |       |
|                             |                       |   |        |       |       |          |      |    |                 |        |     | -<br>-<br>-  |       |
|                             |                       |   |        | -     |       |          |      |    |                 |        |     | -            |       |
|                             |                       |   |        |       |       |          |      |    |                 |        |     | ] =          | 1     |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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|                      |              | e Bay         | of Nigg              | ) Harl       | bour Dev               | elopment Ground Investigation |          |                 |            |         |                |              | Evnlo  | ratory             | Hole ID.                       |                |                  |                      |              |                |  |  |  |
|----------------------|--------------|---------------|----------------------|--------------|------------------------|-------------------------------|----------|-----------------|------------|---------|----------------|--------------|--------|--------------------|--------------------------------|----------------|------------------|----------------------|--------------|----------------|--|--|--|
| Project              |              | TA7           |                      |              |                        |                               |          |                 |            |         |                |              |        | LXPIO              | iatory                         | I IOIC L       | <b>J</b> 9       | 9 A26                |              |                |  |  |  |
| Engine               |              |               | n Hende              |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| Employ<br>Ground     |              |               | rdeen F<br>Im CD     | larbo        | ur Board               |                               |          | Coor            | dinates    |         | 20690          | 06 20 E      | 90493  | 06 10 N N          | ational Gric                   | 1              |                  | Н                    | eader        |                |  |  |  |
| Date Sta             |              |               | 8/2013               |              |                        |                               |          |                 | Comple     |         |                |              | 00432  | .0.10 14 14        | ational Gric                   | Inclina        | tion Verti       | cal                  |              |                |  |  |  |
| Тор                  | Base         |               | Date Sta             | rted         | Date Ende              | d C                           | rew      | Section         | Coi        | re (    | Core           |              | Equipr | ment               | Sh                             | oring /        | Remarks          |                      |              |                |  |  |  |
| 0.00                 | 0.20         | СР            | 30/08/20             | 013          | 30/08/201              | 3                             | KL       | Logged By<br>DT | y Barı     | rel     | Bit            |              | Dando  | 3000               | Sı                             | upport         |                  |                      |              |                |  |  |  |
| 0.20<br>4.10         | 4.10<br>8.10 | RC<br>RC      | 30/08/20<br>30/08/20 |              | 30/08/201<br>30/08/201 | 3   I                         | MM<br>MM | DT<br>DT        | SW<br>T61  |         | npreg<br>npreg |              |        | se 520<br>se 520   |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| Date                 | Ti           | me            | Hole                 | Casii        | OGRESS<br>ng Wate      | r                             |          | Remai           | rks        |         | -              | Date         | e      | Time               | Strike at                      | WATER STR      | Time             | Ca                   | sing dep     | th             |  |  |  |
|                      |              |               | depth                | dept         | th dept                | h                             |          | Kerria          | i no       |         |                | Dut          |        | 111110             | depth                          | depth          | taken<br>to rise | at stril             | κe i tα      | seal<br>low    |  |  |  |
| 30/08/20<br>30/08/20 | 13 1         | 000<br>015    | 0.20<br>0.20         | 0.20<br>0.20 | -6.50                  | Sta                           | of CP    |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| 30/08/20             | 13   1       | 900           | 8.10                 | 3.10         | -6.10                  | End                           | d of Hol | e               |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      | Charte       | D             | CA                   |              | ERCUSSIO               |                               |          |                 |            |         |                | D .1         | T      | I                  |                                | SPT DETA       |                  | F                    |              | 10/            |  |  |  |
| from                 | Strata       | to            | Start t              |              | Duration<br>hhmm       | Ken                           | arks     |                 |            |         |                | Depth        | Туре   |                    | nental blov<br>etration in     |                | Hammer<br>No.    | Energy<br>ratio<br>% | Casing depth | Water<br>depth |  |  |  |
| 0.00                 |              | 0.20          | 080                  |              | 0200                   | Chise                         | elling   |                 |            |         |                | 0.20<br>1.00 | SPT(C  | 50/0mm<br>50/152m  | (25/0,50/0)<br>im (18,7/0,22   | 21 7/2)        | AR362<br>AR362   | 75<br>75             | N/A<br>1.00  | -4.80<br>-6.45 |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                | 2.00         | SPT(C  | 50/83mn<br>50/55mn | n (25/10,37,1<br>n (8,17/35,50 | 13/8)<br>0/55) | AR362<br>AR362   | 75<br>75             | 2.00<br>3.00 | -6.35<br>-6.20 |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              | ,      |                    | ,, ,                           | ,              |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| Fron                 | 2            | То            | F                    |              | Y FLUSH D<br>Flush     | ETAIL                         |          | ush             | El         | ush     |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| dept                 |              | depth         |                      |              | type                   |                               | ret      | urn<br>%        |            | lour    |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| 0.20                 |              | 8.10 Water    |                      |              | Nater                  | 0 -                           |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      | . 1          |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| Hole                 | Depth        |               | / CASING             | th of        | Тор                    | Base                          |          | SAMPLII         | NG<br>Time | Reco    | verv           |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| diameter<br>200      | hole<br>0.20 | diam          | neter cas            | sing<br>.20  |                        |                               |          |                 | hmmss      |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| 150<br>146           | 3.10<br>4.10 | 15            |                      | .10          |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| 116                  | 8.10         |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      | IN           | ISTALLA       | TION DE              | TAILS        |                        |                               | PI       | PE CONS         | TRUCTIO    | DN C    |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| Distance             |              | Ту            | /pe                  |              | nse zone               | ID                            |          | ipe             | Dia.       | Туре    |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| from G.L.            |              |               |                      | Top          | Base                   |                               | Тор      | Base            | of pipe    | pip     | oe             |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    | * Seating b                    | lows only.     |                  |                      |              |                |  |  |  |
|                      | . 1          |               |                      |              | CKFILL DET             | AILS                          |          |                 |            |         |                |              |        |                    | (                              | GENERAL N      | OTES             |                      |              |                |  |  |  |
| Top of section       | n se         | ase of ection |                      | Materi       |                        |                               |          | Rema            | rks        |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| 0.00                 |              | 8.10          |                      | Arising      | S                      |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      |              |               |                      |              |                        |                               |          |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| NOTES:               | All de       | oths in       | metres. a            | II diam      | neters in m            | illime                        | tres.    |                 |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
|                      | Water        | strike i      |                      | in min       | utes, hard             |                               |          | in hhmm         |            |         |                |              |        |                    |                                |                |                  |                      |              |                |  |  |  |
| Unched               |              |               |                      |              | og Print Da            | te An                         | d Time   | : 23/12/        | 2013 1     | 0:24:55 | 5              |              |        |                    |                                |                | SOI              | L end                | inee         | RING           |  |  |  |

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Ground Level

Arch Henderson LLP

**Exploratory Hole Log** 

Hole ID.

A26

Sheet 1 of 1

Engineer Employer Aberdeen Harbour Board

-4.11m CD

Coordinates 396896.20 E, 804926.10 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend | Depth                      | Datum<br>Level | Sampling |      |      |     | ow Co<br>nple I  |     |                   | In Situ Test                    | Insta |
|--|--------|----------------------------|----------------|----------|------|------|-----|--|-----|-------------------|---------------------------------|-------|
| ·  |        |                            |                | Detail   | s    | Dia. | TCR | SCR  | RQD | IF                | Details                         | ation |
| No recovery. Large BOULDER obstruction. (Driller's description)  | 0,00   | 0.20                       | -4.31          |          |      |      |     |  |     |                   | SPT(C)50/0mm - 0.20 0.20 - 0.20 |       |
| Grey angular to subangular fine to coarse GRAVEL and angular to subrounded COBBLES of granite, schist and gneiss.  | 000    | 0.47                       | -4.58          | 0.20     | 1.00 | 113  | 34  | NA   | NA  |                   | 5.25 5.25<br>-                  |       |
| Assumed zone of no recovery. Granite and quartz BOULDERS with sand lenses. (Driller's description)   | 000    | 1.00                       | -5.11          |          |      |      |     |  |     |                   | SPT(C)50/152mm-<br>1.00 1.23    |       |
| Grey angular to rounded fine to coarse GRAVEL and subangular to rounded COBBLES of granite, gneiss and schist.   | 0000   | 1.20                       | -5.31          | 1.00     | 2.00 | 113  | 20  | NA NA  | NA  |                   | 1.00                            |       |
| Assumed zone of no recovery. Granite and quartz BOULDERS with sand lenses. (Driller's description)   |        | -                          |                | 1.00     | 2.00 | 110  | 20  |  |     | NA.               | :                               |       |
| Grey subangular to rounded fine to coarse GRAVEL of subangular to rounded COBBLES of granite, gneiss and schist.   | 0000   | 2.00 —                     | -6.11<br>-6.16 |          |      |      |     |  |     |                   | SPT(C)50/83mm —<br>2.00 2.09 -  |       |
| Assumed zone of no recovery. Granite and quartz BOULDERS with sand lenses. (Driller's description)   | 0000   | =                          |                | 2.00     | 3.00 | 113  | 25  | NA   | NA  |                   |                                 |       |
| Stiff brown slightly sandy slightly gravelly CLAY. Sand is<br>fine to coarse. Gravel is angular to subrounded fine to coarse<br>of mixed igneous and metamorphic lithologies including   |        | 2.80 -<br>-<br>-<br>3.20 - | -6.91<br>-7.31 |          |      |      |     |  |     |                   | SPT(C)50/55mm —<br>3.00 3.17 -  |       |
| granite, schist and gneiss.  Strong pink and grey coarse crystalline GRANITE.  Discontinuities: 1) 60-70 degrees medium locally closely spaced planar rough with yellow staining on surfaces. from 3.20m to 3.35m very weak and stained brown and yellow   |        |                            |                | 3.00     | 4.10 | 113  | 100 | 50   | 40  | 110<br>250<br>400 | _                               |       |
| with staining penetrating through whole diameter of core from 3.20m to 3.55m recovered as non intact core (angular coarse gravel sized fragments)  | *****  | 4.10                       | -8.21          | 4.10     | 5.10 | 93   | 80  | 0  | 0   |                   |                                 |       |
| Weak locally very weak pink and grey stained yellow coarse<br>crystalline GRANITE. Recovered as non intact core (angular<br>gravel sized fragments and angular cobble sized fragments).  | *****  |                            | -10.45         |          | 0.10 |      |     | , and the second |     |                   |                                 |       |
|  |        |                            |                | 5.10 6.2 | 6.20 | 93   | 100 | 62   | 12  | NI<br>90<br>- 360 | :<br>:<br>:                     |       |
| Medium strong to strong pink and grey coarse crystalline GRANITE. Discontinuities: 1) 10-20 degrees closely spaced blanar rough with yellow and brown staining on fracture surfaces. 2) 60-70 degrees closely spaced planar rough with yellow and brown staining on surfaces. from 6.62m to 6.80m, 6.95m to 7.05m and 7.66m to 8.00m |        | 6.34                       |                | ]        |      | 93   | 100 |  |     |                   | :<br>:<br>:                     |       |
| recovered as non intact core (angular coarse gravel sized fragments) from 7.40m to 8.10m discontinuities 2) medium spaced  | *****  |                            |                | 7.30     |      | 93   | 100 | 58   | 45  |                   | -                               |       |
| Exploratory hole complete at 8.10 m.   |        | 8.10 -                     | -12.21         |          |      |      |     |  |     |                   |                                 |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Unchecked Log Print Date And Time: 23/12/2013 10:24:58

Form No. SIEXPHOLELOG

Issue.Revision No. 1.05



Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 A29 Engineer Arch Henderson LLP Employer Aberdeen Harbour Board Header Coordinates 396899.04 E, 804841.79 N National Grid Ground Level -2.70m CD 22/07/2013 Date Started Date Completed 25/07/2013 Inclination Vertical Section Logged By Date Started Date Ended Crew Equipment Shoring / Support Remarks Top Base Tvpe 22/07/2013 22/07/2013 23/07/2013 22/07/2013 23/07/2013 23/07/2013 Dando 2000 Deltabase 520 Deltabase 520 0.00 2.30 DT DT DT MM MM 2.30 14.50 14.50 28.00 RC RC Impred T6116 **PROGRESS** WATER STRIKES Time taken to rise Casing depth at strike to seal time flow Date Hole depth Water depth Date Time Strike at depth Rise to depth Time Casing depth Remarks 22/07/2013 22/07/2013 23/07/2013 1130 2000 0700 2.30 8.50 8.50 End of CP/Start of Rotary End of Shift Start of Shift 5.50 5.50 -1.50 21.50 21.50 24.00 24.00 28.00 14.50 14.50 20.00 -4.10 -1.10 -5.00 -2.10 23/07/2013 1930 End of shift 24/07/2013 0700 Start of Shift 24/07/2013 1730 End of Shift 25/07/2013 0700 20.00 Start of Shift 25/07/2013 End of Hole CABLE PERCUSSION DETAILS SPT DETAILS Chiselling me | Duration Hard Strata Depth Remarks Depth Туре Incremental blow count / Hammer Energy ratio Casing depth Water Start time penetration in mm depth from hhmm hhmm N=13 (1,2,3,3,4) N=23 (2,3,4,4,5,10) 50/0mm (2,5/5,50/0) 50/5mm (7,18/10,50/5) 50/245mm (8,10,14,16,16,4/20) 50/270mm (7,810,13,15,12/35) 50/260mm (7,8,10,13,15,12/35) 50/250mm (8,12,15,21,14/50) 50/230mm (7,10,12,13,13,17/5) 50/200mm (7,10,12,13,13,17/5) 50/200mm (9,12,15,23,12/50) 50/5mm (20,5/5,50/5) 50/230mm (9,12,18,18,2/5) 0.50 1.50 2.30 3.00 4.00 -5.10 -5.20 -5.40 -4.10 -3.00 0200 Chiselling AR362 1.50 SPT(C) SPT SPT(C) 2.30 2.30 3.00 AR362 AR362 AR362 3.00 5.50 5.50 5.50 5.50 5.50 14.50 -4.00 -4.10 -1.00 -1.00 -1.20 -2.00 -5.00 5.50 7.00 AR362 AR362 AR362 8 50 10.00 11.50 13.00 14.50 SPT(C SPT(C SPT(C SPT(C **ROTARY FLUSH DETAILS** From Flush Flush Flush AR362 depth SPTIC | 50/5mm (20,5/5,50/5) SPTIC | 50/230mm (6,10,10,17,20,3/5) SPTIC | 50/230mm (6,10,10,17,20,3/5) SPTIC | 50/255mm (5,7,9,13,15,13/40) SPTIC | 50/265mm (5,7,9,13,15,13/40) SPTIC | 50/80mm (7,10,45,5/5) 14.50 14.50 14.50 14.50 14.50 -5.20 -6.00 -6.40 -6.80 -11.00 16.00 17.50 19.00 AR362 AR362 AR362 depth type return colour 2.30 6.50 6.50 7.00 Water Water 100 Brown 20.50 22.00 AR362 AR362 7.00 14.50 21.50 Water 100 100 28.00 Brown HOLE DIAMETER / CASING DYNAMIC SAMPLING Depth of Casing Depth of Top Base Diameter Time Recovery iametei hole diameter casing hhmmss 2.30 5.50 14.50 146 121 22.40 INSTALLATION DETAILS PIPE CONSTRUCTION Dia. Distance ID Type Response zone Pipe Type of Top | Base Base from G.L. Top of pipe pipe \* Seating blows only BACKFILL DETAILS GENERAL NOTES Top of section Base of Material Remarks section Arisings Grout 0.00 22.30 28.00 NOTES: All depths in metres, all diameters in millimetres. Water strike rise time in minutes, hard strata time in hhmm For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:25:06

Issue Date 22/10/2012

Issue, Revision No. 1.05

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orm No. SIEXPHOLEHDR

SOIL ENGINEERING

Part of the Bachy Soletanche Group

Project No. TA7148

Engineer

**Exploratory Hole Log** 

Hole ID.

A29

Sheet 1 of 3

Employer Ground Level -2.70m CD Coordinates 396899.04 E, 804841.79 N National Grid

Hole Type CP+RC Inclination

Arch Henderson LLP

Aberdeen Harbour Board

| Description of Strata   | Legend | Depth                      | Datum<br>Level          | :    |  | Blow Count And<br>Sample Recovery |     |     |     | In Situ Test Details |                    | Inst                 |  |
|---|--------|----------------------------|-------------------------|------|--|-----------------------------------|-----|-----|-----|----------------------|--------------------|----------------------|--|
|   | 100    |                            | Levei                   | D    | etails                                 | Dia.                              | TCR | SCR | RQD | IF                   | Det                | atio                 |  |
| Medium dense grey slightly silty slightly gravelly fine to coarse SAND. Gravel is angular to subrounded fine of granite, schist and quartzite.                                      |        |                            |                         |      | 0.50-0.95<br>0.50-1.00                 |                                   |     | ,   |     |                      | SPT13<br>0.50      | 0.95                 |  |
|   |        |                            |                         | B007 | 1.50-1.95<br>1.50-2.00<br>2.00<br>2.00 |                                   |     |     |     |                      | SPT23<br>1.50      | 1.95 -               |  |
| Strong grey BOULDER of schist and quartzite.  | 0000   | 2.30                       | -5.00                   | 2.20 | 200                                    | 107                               |     |     |     |                      | SPT(C)50/0<br>2.30 | 0mm -<br>2.31 -<br>- |  |
| Stiff brown slightly gravelly slightly sandy CLAY. Sand is<br>fine to coarse. Gravel is angular to subrounded fine to coarse<br>of granite, schist and quartzite.                   |        | 2.65 _<br>2.70 _<br>3.00 _ | -5.35<br>-5.40<br>-5.70 | 2.30 | 3.00                                   | 107                               | 57  | NA  | NA  |                      | SPT50/5m<br>3.00   | -<br>-<br>nm<br>3.09 |  |
| Assumed zone of no recovery. Stiff to very stiff brown gravelly sandy CLAY. (Driller's description)   |        |                            |                         | 3.00 | 4.00                                   | 107                               | 100 | NA  | NA  |                      |                    |                      |  |
| Stiff extremely high strength brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite. |        |                            |                         |      |  |                                   |     |     |     |                      | SPT(C)50/2<br>4.00 | 245mm<br><br>4.40    |  |
|   | 2 E C  |                            |                         | 4.00 | 4.50                                   | 107                               | 100 | NA  | NA  |                      |                    | -                    |  |
| from 5.10m to 5.15m assumed zone of no recovery from 5.30m to 5.45m angular coarse gravel of granite,   |        |                            |                         | 4.50 | 5.50                                   | 107                               | 60  | NA  | NA  |                      | CDT/C/FO           | 370                  |  |
| schist and quartzite  Assumed zone of no recovery. Stiff to very stiff brown gravelly sandy CLAY. (Driller's description)   |        | 5.60 -                     | -8.30<br>-9.20          | 5.50 | ) 6.50                                 | 107                               | 35  | NA  | NA  |                      | SPT(C)50/3<br>5.50 | 5.92 -<br>           |  |
| Stiff extremely high strength brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite. |        | 0.30                       | -5.20                   | 6.50 | 7.00                                   | 107                               | 80  | NA  | NA  |                      | SPT(C)50/2         | 260                  |  |
| from 6.90m to 7.00m assumed zone of no recovery   |        |                            |                         | 7.00 | 8.50                                   | 107                               | 90  | NA  | NA  |                      | 7.00               | 7.41                 |  |
| from 8.35m to 8.50m assumed zone of no recovery   |        |                            |                         | 8.5G | ) 10.00                                | 107                               | 100 | NA  | NA  |                      | SPT(C)50/:<br>8.50 | 25mm - 8.60          |  |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG Issue.Revision No. 1.05



Project No. TA7148

Engineer

Arch Henderson LLP

# **Exploratory Hole Log**

Hole ID.

A29

Sheet 2 of 3

Employer Aberdeen Harbour Board Ground Level -2.70m CD

Coordinates

396899.04 E, 804841.79 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend | Depth   | Datum      | Sampling |       |       | Blow Count And<br>Sample Recovery |     |        |       | In Situ Test                    | Insta        |                                  |    |  |
|---|--------|---|------------|----------|-------|-------|-----------------------------------|-----|--------|-------|---------------------------------|--------------|----------------------------------|----|--|
|   |        |   | Level      | Deta     | ils   | Dia.  | TCR                               | SCR | RQD IF |       | Details                         | ation        |                                  |    |  |
| Stiff extremely high strength brown slightly gravelly slightly<br>sandy CLAY. Sand is fine to coarse. Gravel is angular to<br>subrounded fine to coarse of granite, schist and quartzite.   |        |   |            | 10.00    | 11.50 | 107   | 90                                | NA  | NA     |       | SPT(C)50/20001938 -             |              |                                  |    |  |
| from 12.85m to 13.00m assumed zone of no recovery   |        |   |            | 11.50    | 13.00 | 107   | 90                                | NA  | NA     | NA    | SPT(C)50/230mm - 11.50 11.88    |              |                                  |    |  |
| Assumed zone of no recovery. Stiff to very stiff brown gravelly sandy CLAY. (Driller's description)   |        | 14.00   | -16.70     | 13.00    | 14.50 | 107   | 67                                | NA  | NA     |       | SPT(c)50/200mm— 13.00 13.35     |              |                                  |    |  |
| Stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite.  from 14.50m to 14.67m strong grey boulder of granite  at 15.25m gravelly |        | 14.50 -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | 14.5017.20 |          | 14.50 | 16.00 | 92                                | 90  | NA     | NA    |                                 | SPT(C)50/5mm |                                  |    |  |
|   |        |   |            |          |       | 16.00 | 17.50                             | 92  | 100    | NA    | NA                              |              | SPT(c)50/230mm—<br>16.00 16.38 - |    |  |
|   |        |   |            |          |       | -     |                                   |     | 17.50  | 19.00 | 92                              | 100          | NA                               | NA |  |
|   |        |   |            | 19.00    | 20.50 | 92    | 83                                | NA  | NA     |       | SPT(C)50/100mm<br>19.00 19.25 - |              |                                  |    |  |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Unchecked Log Print Date And Time: 23/12/2013 10:25:14 Issue Date 22/10/2012

Form No. SIEXPHOLELOG



Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

**Exploratory Hole Log** 

Hole ID.

A29

Sheet 3 of 3

Ground Level -2.70m CD Coordinates 396899.04 E, 804841.79 N National Grid

Hole Type CP+RC Inclination

| Blow Count And<br>Sample Recovery |      | npling   | Sam   | Datum  | Depth   | Legend   | Description of Strata  |
|-----------------------------------|------|----------|-------|--------|---------|--|--|
| TCR SCR RQD IF                    | Dia. | ails Dia | Detai | Level  |         |  | ·  |
|                                   |      |          |       |        | -       |  | Stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite.  from 20.25m to 20.50m assumed zone of no recovery |
| 53 NA NA                          | 92   | 21.50 92 | 20.50 | -23.73 | 21.03   |  | Assumed zone of no recovery. Stiff to very stiff brown sandy   |
| 400 NA NA                         | 02   | 22.00    | 24.50 | -24.20 | 21.50 - | 00.5   | gravelly CLAY with occasional granite boulders. (Driller's description)  Stiff high strength brown slightly gravelly slightly sandy  |
| 100 NA NA                         |      |          | 21.50 |        | =       |  | ELAY. Sand is fine to coarse. Gravel is angular to subrounded ine to coarse of granite, schist and quartzite.  |
| 100 NA NA                         | 92   | 22.50 92 | 22.00 | -25.20 | 22.50 - | *****  | Medium strong pink and grey coarse crystalline GRANITE.<br>Recovered as non intact core (angular medium to coarse gravel   |
| 100 0 0                           | 92   | 23.50 92 | 22.50 |        |         | ****   | sized fragments stained yellow and brown).   |
| 80 0 0                            | 92   | 24.00 92 | 23.50 |        |         | * * * * * * * * * * * * * * * * * * *                |  |
| 100 16 8                          | 92   | 25.50 92 | 24.00 |        |         | *****  | from 24.00m to 24.25m intact core. Discontinuities: 1) 20-30 degrees closely spaced planar rough stained yellow and brown  |
| NI<br>NI<br>120                   |      |          |       |        |         | ****<br>****<br>****<br>****<br>****                 | from 25.30m to 25.50m intact core. Discontinuities: 1) 20-30 degrees closely spaced planar rough stained yellow and brown  |
| 100 8 0                           | 92   | 27.00 92 | 25.50 |        |         | ++++<br>++++<br>++++<br>++++<br>++++<br>++++<br>++++ | from 26.10m to 26.23m intact core. Discontinuities: 1) 20-30 degrees closely spaced planar rough stained yellow and brown  |
| 100 6 0                           | 92   | 28.00 92 | 27.00 |        |         | *****<br>****<br>****<br>****<br>****<br>****        | from 27.10m to 27.15m intact core. Discontinuities: 1) 20-30 degrees closely spaced planar rough stained yellow and brown  |
|                                   |      |          |       | -30.70 | 28.00   | ****   | Exploratory hole complete at 28.00 m.  |
|                                   |      |          |       |        |         |  |  |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Unchecked Log Print Date And Time: 23/12/2013 10:25:18

Form No. SIEXPHOLELOG Issue.Revision No. 1.05



Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 A31 Engineer Arch Henderson LLP Employer Aberdeen Harbour Board Header 396948.24 E, 804804.54 N National Grid Ground Level -4.11m CD Coordinates Date Started 19/07/2013 Date Completed 21/07/2013 Inclination Vertical Section Logged By Date Started Date Ended Crew Equipment Shoring / Support Remarks Top Base Tvpe 17/07/2013 18/07/2013 20/07/2013 18/07/2013 20/07/2013 21/07/2013 Dando 2000 Deltabase 520 Deltabase 520 0.00 1.80 DT DT DT MM MM 1.80 23.50 23.50 31.40 Impred RC RC T6116 **PROGRESS** WATER STRIKES Casing depth at strike to seal time flow Date Hole depth Water depth Date Strike at depth Rise to depth Time taken to rise Time Casing depth Remarks Time 18/07/2013 18/07/2013 18/07/2013 1.80 1.80 1.80 End of CP End of shift Start of Rotary 1 80 1015 1030 -7.50 -7.50 -7.00 1.80 8.50 8.50 22.00 22.00 28.50 28.50 18/07/2013 2030 7.30 -6.00 End of Shift 19/07/2013 0700 7.30 -6.20 Start of Shift End of Shift 19/07/2013 2030 7.30 7.30 -6.00 -1.20 -1.00 -8.00 20/07/2013 0700 Start of Shift 20/07/2013 21/07/2013 1900 0800 23.50 23.50 End of Shift Start of Shift 21/07/2013 23.50 End of Hole CABLE PERCUSSION DETAILS SPT DETAILS Chiselling me | Duration Hard Strata Depth Remarks Depth Туре Incremental blow count / Hammer Energy ratio Casing depth Water Start time penetration in mm depth from hhmm hhmm N=17 (2,3,3,3,5,6) S0/Smm (25/5,50/5) S0/200mm (10,15,14,18,18/50) S0/200mm (10,15,50/5) S0/210mm (9,12,13,15,22/60) S0/220mm (10,14,15,16,19/70) S0/20mm (7,18/50,50/20) S0/295mm (7,910,10,16,14/70) S2/245mm (9,12,12,14,16,10/20) S0/295mm (8,8,11,14,21,4) S0/5mm (25/10,50/5) S2/255mm (8,10,12,13,15,12/30) 0.50 1.50 3.30 4.80 6.30 1.55 1.80 1.80 1.80 -6.10 -7.00 1730 0815 Chiselling Chiselling 1.50 3.00 0100 AR362 -8.00 NR -6.00 AR362 AR362 AR362 AR362 AR362 NR 3.00 -4.00 -7.00 -7.30 7.30 8.50 3.00 7.30 7.30 7.30 7.30 7.30 7.30 10.00 13.00 14.50 16.00 17.50 AR362 AR362 AR362 AR362 -6.00 9.30 10.80 **ROTARY FLUSH DETAILS** From Flush Flush Flush AR362 8.00 50/5mm (25/10,50/5) 52/255mm (8,10,12,13,15,12/30) 50/85mm (10,15/30,40,10/10) 50/70mm (25/15,50/70) 50/220mm (9,12,15,16,19/70) 50/215mm (8,10,10,15,25/65) depth 7.30 7.30 7.30 7.30 23.50 23.50 23.50 depth 19.00 20.50 22.00 AR362 AR362 AR362 7.40 8.10 10.80 type return colour 3.30 8.50 Water Water Brown 100 3.30 23.50 24.50 SPT SPT AR362 AR362 -5.00 -4.00 8.50 16.00 22.00 26.00 100 100 100 Water Brown 16.00 22.00 Water Water Green Brown 50/40mm (13,12/40,50/40) AR362 -1.00 26.00 28.50 31.40 Water 100 White HOLE DIAMETER / CASING DYNAMIC SAMPLING Depth of Casing Depth of Top Base Diameter Time Recovery iametei hole diameter casing hhmmss 139 145 23.50 23.50 116 INSTALLATION DETAILS PIPE CONSTRUCTION Dia. Distance ID Type Response zone Pipe Type of Top | Base Base from G.L. Top of pipe pipe \* Seating blows only BACKFILL DETAILS GENERAL NOTES Top of section Base of Material Remarks section Arisings Grout 0.00 26.00 NOTES: All depths in metres, all diameters in millimetres. Water strike rise time in minutes, hard strata time in hhmm For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:25:30

Issue Date 22/10/2012

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orm No. SIEXPHOLEHDR

SOIL ENGINEERING

Part of the Bachy Soletanche Group

Project No. TA7148

Ground Level

Arch Henderson LLP

**Exploratory Hole Log** 

Hole ID.

A31

Sheet 1 of 4

Engineer

Employer Aberdeen Harbour Board -4.11m CD

Coordinates 396948.24 E, 804804.54 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend                                  | Depth  | Datum<br>Level   | Sampling |                                |      | Blow Count And<br>Sample Recovery |                |    |  | In Situ Test<br>Details   | Insta |
|---|---|--|------------------|----------|--------------------------------|------|-----------------------------------|----------------|----|--|---------------------------|-------|
|   |   |  | Levei            | De       | tails                          | Dia. | TCR                               | TCR SCR RQD IF |    |  | Details                   | ation |
| Medium dense grey slightly silty slightly gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse of granite and schist.   |   |  |                  | B002 0   | 0.50-0.95<br>0.50-1.00<br>0.00 |      |                                   |                |    |  | SPT17<br>0.50 0.95        |       |
| Strong grey BOULDER of granite.   | % * .*<br>0 0 0                         | 1.55   | -5.66            |          |                                |      |                                   |                |    |  | SPT(C)50/5mm<br>1.50 1.51 |       |
| Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite.  |   | 1.80 -   | -5.91            | 1.80     | 3.30                           | 107  | 60                                | NA             | NA |  |                           |       |
| Assumed zone of no recovery. Boulder CLAY with cobbles and boulders. (Driller's description)  |   | 2.70 -<br>-<br>-<br>-<br>-   | -6.81            |          |                                |      |                                   |                |    |  | _                         |       |
| Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite.  |   | 3.30 -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | -7.41<br>-8.11   |          |                                |      |                                   |                |    |  | SPT50/200mm<br>3.30 3.65  |       |
| Assumed zone of no recovery. Boulder CLAY with cobbles and boulders. (Driller's description)  |   | 4.00 —<br>—<br>—<br>—<br>—   | -6.11            | 3.30     | 4.80                           | 107  | 46                                | NA             | NA |  |                           |       |
| Stiff brown slightly gravelly sandy CLAY. Sand is fine to<br>coarse. Gravel is angular to subrounded fine to coarse of<br>granite, schist and quartzite.  |   | 4.80 -<br>-<br>-<br>5.15 _   | -8.91<br>-9.26   |          |                                |      |                                   |                |    |  | SPT50/5mm<br>4.80 4.96    |       |
| Assumed zone of no recovery. Boulder CLAY with cobbles and boulders.  |   |  |                  | 4.80     | 6.30                           | 107  | 23                                | NA             | NA |  |                           |       |
| Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite.  from 6.30m to 6.60m clayey subangular cobbles of schist and granite |   | 6.30 -<br>-<br>-<br>-<br>6.70 -  | -10.41<br>-10.81 | 6.30     | 7.30                           | 107  | 40                                | NA             | NA |  | SPT50/210mm<br>6.30 6.66  |       |
| Assumed zone of no recovery. Boulder CLAY with cobbles and boulders. (Driller's description)  | P 0 0                                   | 7.30   | -11.41           |          |                                |      |                                   |                |    |  | SPT50/220mm<br>7.30 7.67  |       |
| Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite. from 7.30m to 7.40m clayey gravel                                    | 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 7.60 -   | -11.71           | 7.30     | 8.50                           | 107  | 25                                | NA             | NA |  | _                         |       |
| Assumed zone of no recovery. Boulder CLAY with cobbles and boulders. (Driller's description)  | 0 0 0                                   | -<br>-<br>8.50 -   | -12.61           |          |                                |      |                                   |                |    |  | SPT50/10mm                |       |
| Stiff extremely high strength brown slightly gravelly sandy<br>CLAY. Sand is fine to coarse. Gravel is angular to subrounded<br>fine to coarse of granite, schist and quartzite.  |   |  |                  | 8.50     | 9.70                           | 107  | 100                               | NA             | NA |  | 8.50 8.61                 |       |
|   |   | =  |                  | 9.70     | 10.00                          | 107  | 100                               | NA             | NA |  |                           |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG Issue.Revision No. 1.05



Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

# **Exploratory Hole Log**

Hole ID.

A31

Sheet 2 of 4

Ground Level -4.11m CD Coordinates 396948.24 E, 804804.54 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend                                | Depth        | Datum<br>Level | Sam   | npling |      |     |     | unt A<br>Recov |     | In Situ Test<br>Details      | In<br>at |
|--|---------------------------------------|--------------|----------------|-------|--------|------|-----|-----|----------------|-----|------------------------------|----------|
|  |                                       |              | Level          | Deta  | ils    | Dia. | TCR | SCR | RQD            | IF  | Details                      | a        |
| Stiff extremely high strength brown slightly gravelly sandy  |                                       | <u> </u>     |                |       |        |      |     |     |                |     | SPT50/20mm<br>10.15          | 33       |
| CLAY. Sand is fine to coarse. Gravel is angular to subrounded  |                                       | _            |                |       |        |      |     |     |                |     | 10.00                        |          |
| ne to coarse of granite, schist and quartzite.   | The same                              | -            |                |       |        |      |     |     |                |     |                              | 8        |
|  |                                       | -            |                |       |        |      |     |     |                |     |                              | 8        |
|  | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 7 -          |                | 10.00 | 11.50  | 107  | 40  | NA  | NA             |     |                              |          |
|  | 1000                                  | _            |                |       |        |      |     |     |                |     | _                            | ĕ        |
| D. H. CLAY SI, LILL  |                                       | 11.10 -      | -15.21         |       |        |      |     |     |                |     | -                            | ĕ        |
| Assumed zone of no recovery. Boulder CLAY with cobbles and poulders. (Driller's description)   | 2000                                  | 1 -          |                |       |        |      |     |     |                |     |                              | 8        |
| Journal & description)   | 10.70                                 | 11.50 -      | -15.61         |       |        |      |     |     |                |     |                              | B        |
| Zone of no recovery. Boulder CLAY with cobbles. (Driller's   | 0 0 0                                 |              |                |       |        |      |     |     |                |     |                              | ø        |
| lescription)   | P 9 70                                | );           |                |       |        |      |     |     |                |     |                              | 8        |
|  | 0 0 0                                 | [ _          |                |       |        |      |     |     |                |     | _                            |          |
|  | 0 0 0 0                               | -            |                |       |        |      |     |     |                |     |                              |          |
|  | 0 0 0                                 | -            |                | 11.50 | 13.00  | 107  | 0   | NA  | NA             |     | -                            |          |
|  | 00000                                 | =            |                |       |        |      |     |     |                |     | -                            |          |
|  | 0 0000                                |              |                |       |        |      |     |     |                |     |                              |          |
|  | 9. 0. 0                               | -            |                |       |        |      |     |     |                |     |                              |          |
| number of the state of the stat | 40.00                                 | 13.00        | -17.11         |       |        |      | -   |     |                |     | SPT50/295mm —                |          |
| Stiff brown slightly gravelly sandy CLAY. Sand is fine to  |                                       | ) <u> </u>   |                |       |        |      |     |     |                |     | 13.00 13.45                  |          |
| coarse. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite.   | 100                                   | 13.40 -      | -17.51         |       |        |      |     |     |                |     |                              |          |
|  | 0 0 0 0                               | 13.40 -      | -17.51         |       |        |      |     |     |                |     |                              | 3        |
| Assumed zone of no recovery. Boulder CLAY with cobbles and   | P 0 0 0                               |              |                | 13.00 | 14.35  | 107  | 29  | NA  | NA             |     |                              |          |
| poulders. (Driller's description)  | 0 000                                 | _            |                |       |        |      |     |     |                | NA  |                              |          |
|  | 0 -0 -0                               | _            |                |       |        |      |     |     |                | INA | _                            |          |
|  | 2000                                  | 1 -          |                |       |        |      |     |     |                |     |                              |          |
|  | 40.00                                 | 14.35        | -18.46         |       |        |      |     |     |                |     |                              |          |
| Stiff brown slightly gravelly sandy CLAY. Sand is fine to  |                                       | -            |                | 14.35 | 14.50  | 107  | 100 | NA  | NA             |     | SPT52/245mm -                |          |
| coarse. Gravel is angular to subrounded fine to coarse of<br>granite, schist and quartzite.  | 3 4 3 3                               | -            |                |       |        |      |     |     |                |     | 14.50 14.90                  |          |
| granite, scriist and quartzite.  |                                       | =            |                |       |        |      |     |     |                |     |                              |          |
|  | 1                                     | _            |                |       |        |      |     |     |                |     | -                            |          |
|  |                                       | ) I          |                | 14.50 | 16.00  | 107  | 53  | NA  | NA             |     |                              |          |
| Assumed zone of no recovery. Boulder CLAY with cobbles and   |                                       | 15.30 -      | -19.41         | 14.30 | 10.00  | 107  | 33  | INA | INA            |     |                              |          |
| boulders. (Driller's description)  | F.F.F.                                | _            |                |       |        |      |     |     |                |     |                              |          |
|  |                                       | -            |                |       |        |      |     |     |                |     | -                            |          |
|  | ===                                   |              |                |       |        |      |     |     |                |     |                              |          |
| Stiff brown slightly gravelly sandy CLAY. Sand is fine to  | The Care                              | 16.00        | -20.11         |       |        |      |     |     |                |     | SPT50/225mm —<br>16.00 16.38 |          |
| coarse. Gravel is angular to subrounded fine to coarse of  |                                       | 9 -          |                |       |        |      |     |     |                |     | 10.00                        |          |
| granite, schist and quartzite.   |                                       | 10 /7        | 20.50          |       |        |      |     |     |                |     | -                            |          |
| Assumed zone of no recovery. Boulder CLAY with cobbles and   | 7777                                  | 16.47        | -20.58         |       |        |      |     |     |                |     | 1.                           |          |
| boulders. (Driller's description)  | 5-3-5                                 | -            |                | 16.00 | 17.50  | 107  | 31  | NA  | NA             |     | 1                            |          |
| · · · · · · · · · · · · · · · · · · ·  | 2-2-3                                 | -            |                |       |        |      |     |     |                |     |                              |          |
|  |                                       | -            |                |       |        |      |     |     |                |     |                              |          |
|  | ===                                   | -            |                |       |        |      |     |     |                |     |                              |          |
|  | -5-                                   | 47.50        | 24.54          |       |        |      |     |     |                |     | CDTEO/E                      |          |
| Stiff brown slightly gravelly sandy CLAY. Sand is fine to  | - 1 m                                 | 17.50 -      | -21.61         |       |        |      |     |     |                |     | SPT50/5mm - 17.50 17.52 -    |          |
| coarse. Gravel is angular to subrounded fine to coarse of  | 100                                   | j - <u>-</u> |                |       |        |      |     |     |                |     |                              |          |
| granite, schist and quartzite.   | - 4                                   | 7 -          |                |       |        |      |     |     |                |     |                              |          |
|  |                                       | -            |                |       |        |      |     |     |                |     |                              | 8        |
|  | 2年(                                   | 3            |                | 17.50 | 19.00  | 107  | 100 | NA  | NA             |     | ]                            |          |
|  | [三五三]                                 | -            |                |       |        |      |     |     |                |     | -                            |          |
|  | 125                                   | <b>—</b> I   |                |       |        |      |     |     |                |     | l li                         | 1        |
|  | 155                                   |              |                |       |        |      |     |     |                |     | 1                            | ı        |
|  |                                       | - 10.00      | 22.55          |       |        |      |     |     |                |     | CDTE2/255                    |          |
| Firm medium strength brown slightly sandy CLAY. Sand is fine.  | 4747                                  | 19.00        | -23.11         |       |        |      |     |     |                |     | SPT52/255mm —<br>19.00 19.41 |          |
|  |                                       | -            |                |       |        |      |     |     |                |     |                              |          |
|  |                                       | -            |                |       |        |      |     |     |                |     | -                            |          |
|  |                                       | ) [          |                |       |        |      |     |     |                |     |                              |          |
|  |                                       |              |                | 19.00 | 20.40  | 107  | 71  | NA  | NA             |     |                              |          |
|  |                                       | _            |                |       |        | 1    | l   | 1   |                |     |                              | 3        |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG Issue.Revision No. 1.05



Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

# **Exploratory Hole Log**

Hole ID.

A31

Sheet 3 of 4

Ground Level -4.11m CD Coordinates 396948.24 E, 804804.54 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend  | Depth   | Datum<br>Level   | Samplii  | ng      |     |     | ount A<br>Recov |                 | In Situ Test<br>Details       | Inst |
|---|---|---------|------------------|----------|---------|-----|-----|-----------------|-----------------|-------------------------------|------|
|   |   |         | Level            | Details  | Dia     | TCR | SCR | RQD             | IF              | Details                       | atio |
| Assumed zone of no recovery. Boulder CLAY with cobbles and coulders. (Driller's description)  | 0 0 0 P   | 20.00 _ | -24.11           |          |         |     |     |                 |                 | 1                             |      |
| tiff brown slightly gravelly sandy CLAY. Sand is fine to oarse. Gravel is angular to subrounded fine to coarse of   |   | 20.40 - | -24.51           | 20.40 20 | .50 107 | 100 | NA  | NA              |                 | SPT50/85mm -<br>20.50 20.69 - |      |
| ranite, schist and quartzite.   | 20 A 0.21   | 20.90 - | -25.01           |          |         |     |     |                 |                 |                               |      |
| Assumed zone of no recovery. Boulder CLAY with cobbles and poulders. (Driller's description)  |   |         |                  | 20.50 22 | .00 107 | 26  | NA  | NA              |                 | :                             |      |
| oft to firm brown sandy CLAY.   |   | 22.00   | -26.11           |          |         |     |     |                 |                 | SPT50/70mm —<br>22.00 22.09 - |      |
| from 22.45m to 22.60m strong grey dolerite boulder of granite   | 0 - 1 | 22.60 - | -26.71           | 22.00 23 | .50 107 | 40  | NA  | NA              |                 | :                             |      |
| Assumed zone of no recovery. Boulder CLAY with cobbles and boulders. (Driller's description)  |   | =       |                  |          |         |     |     |                 |                 | -                             |      |
| stiff greyish brown slightly gravelly sandy CLAY. Sand is fine<br>o coarse. Gravel is angular to subrounded fine to coarse of<br>granite, schist and quartzite.   |   | 23.50   | -27.61<br>-28.01 | 23.50 24 | .50 92  | 40  | NA  | NA.             |                 | SPT50/220mm 23.50 23.87 -     |      |
| Assumed zone of no recovery. Boulder CLAY with cobbles and boulders. (Driller's description)  | 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0   | 24.50 - | -28.61           | 23.30 24 | .50 92  | 40  | INA | INA             |                 | SPT50/215mm                   |      |
| Stiff greyish brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite.  |   | 26.00   | -30.11           | 24.50 26 | .00 92  | 100 | NA  | NA              |                 | 24.50 24.87 -                 |      |
| Wedium strong greenish grey coarsely crystalline GRANITE. Recovered as non intact core (angular coarse gravel sized ragments and angular cobble sized fragments stained yellow and brown).  from 26.40m to 26.47m recovered as intact core.  Discontinuities: 1) 20-30 degrees closely spaced planar rough stained yellow and brown. 2) 60-70 degrees closely to  | *****   |         | 30.11            | 26.00 27 | .00 92  | 100 | 20  | 0               |                 | 26.00 26.16 ·                 |      |
| medium spaced planar rough stained dark brown and grey from 26.72m to 26.85m recovered as intact core.  Discontinuities: 1) 20-30 degrees closely spaced planar rough stained yellow and brown. 2) 60-70 degrees closely to medium spaced planar rough stained dark brown and grey from 27.23m to 27.35m recovered as intact core.  Discontinuities: 1) 20-30 degrees closely spaced planar rough stained yellow and brown. 2) 60-70 degrees closely to medium spaced planar rough stained dark brown and grey from 27.53m to 27.70m recovered as intact core.  Discontinuities: 1) 20-30 degrees closely spaced planar | *****<br>*****<br>*****<br>*****<br>*****<br>*****<br>*****   |         |                  | 27.00 28 | .50 92  | 100 | 19  | 0               |                 |                               |      |
| rough stained yellow and brown. 2) 60-70 degrees closely to<br>medium spaced planar rough stained dark brown and grey   | *****   |         |                  | 28.50 29 | .50 92  | 100 | 10  | 0               | NI<br>NI<br>165 | -<br>-<br>-<br>-<br>:         |      |
| from 29.40m to 29.55m recovered as intact core.  Discontinuities: 1) 20-30 degrees closely spaced planar  | *****   |         |                  | 29.50 30 | .00 92  | 100 | 10  | 0               |                 | -                             |      |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG



Project No. TA7148

Ground Level

**Exploratory Hole Log** 

Hole ID.

A31

Sheet 4 of 4

Engineer Arch Henderson LLP Employer Aberdeen Harbour Board

-4.11m CD

Coordinates 396948.24 E, 804804.54 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend | Depth  | Datum  | Samp    | oling |      | Blo<br>San | ow Co<br>nple | ount A<br>Recov | And<br>erv | In Situ Test | IIIsta |
|---|--------|--------|--------|---------|-------|------|------------|---------------|-----------------|------------|--------------|--------|
| 2000, page 10. Catala   | Logona | Jopan. | Level  | Details | s     | Dia. |            |               | RQD             | IF         | Details      | ation  |
| Remaining Detail: 29.40m - 29.55m: rough stained yellow and brown. 2) 60-70 degrees closely to medium spaced planar rough stained dark brown and grey  from 30.50m to 31.00m recovered as intact core.  Discontinuities: 1) 20-30 degrees closely spaced planar rough stained yellow and brown. 2) 60-70 degrees closely to medium spaced planar rough stained dark brown and grey  Exploratory hole complete at 31.40 m. | ****   | 31.40  | -35.51 | 30.00   | 31.40 | 92   | 100        | 35            | 0               |            |              |        |
|   |        |        |        |         |       |      |            |               |                 |            |              |        |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Part of the Bachy Soletanche Group

|                      |                    | •              |                    | ) Harl           | bour Dev                   | elop       | ment                 | Ground          | Inves         | tigat       | ion              |                      |                                  | Fxnlo                               | orat                            | orv F                 | Hole Lo                    | 00                      | Но                   | le ID.               |                         |
|----------------------|--------------------|----------------|--------------------|------------------|----------------------------|------------|----------------------|-----------------|---------------|-------------|------------------|----------------------|----------------------------------|-------------------------------------|---------------------------------|-----------------------|----------------------------|-------------------------|----------------------|----------------------|-------------------------|
| Project              |                    | TA7            |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  | LAPIC                               | Jiac                            | Ory i                 | TOIC L                     | 9                       | ļ                    | 34                   |                         |
| Engine               |                    |                | h Hende            |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
| Employ<br>Ground     |                    |                | rdeen F<br>5m CD   | larbo            | ur Board                   |            |                      | Coor            | dinates       |             | 20600            | 0E 60 E              | 907.90                           | 30.50 N N                           | Vation                          | al Grid               |                            |                         | Н                    | eader                |                         |
| Date Sta             |                    |                | 8/2013             |                  |                            |            |                      |                 | Comple        |             |                  |                      | 00400                            | 50.50 IN I                          | vation                          | ai Gilu               | Inclinat                   | ion Verti               | cal                  |                      |                         |
| Тор                  | Base               |                | Date Sta           | rted             | Date Ende                  | d C        | rew                  | Section         | Coi           | re          | Core             |                      | Equip                            | ment                                |                                 | Sho                   | oring /                    |                         | Remarks              |                      |                         |
| 0.00                 | 2.30               | СР             | 28/08/2            | 013              | 28/08/201                  | 3          | KL                   | Logged By<br>TE | Barı          | rel         | Bit              |                      | Dando                            | 3000                                |                                 | Su                    | oport                      |                         |                      |                      |                         |
| 2.30<br>11.10        | 11.10<br>15.30     | RC<br>RC       | 28/08/2<br>29/08/2 | 013              | 29/08/201<br>29/08/201     | 3   1      | MM<br>MM             | DT<br>DT        | SW<br>T61     |             | Impreg<br>Impreg | D                    | eltaba)                          | se 520<br>se 520                    |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
| Date                 | Т:                 | me             | Hole               |                  | ogress<br>ng Wate          |            |                      | Remai           | ılın          |             |                  | Date                 |                                  | Time                                |                                 |                       | /ATER STRI                 | KES<br>Time             | Co.                  | sing dep             | th.                     |
| Date                 | ''                 | ille           | depth              | Casii            | th dept                    | h          |                      | Remai           | KS            |             |                  | Dati                 | e                                | Time                                | 31                              | rike at<br>lepth      | Rise to<br>depth           | taken<br>to rise        | at strik             | e i to               | seal<br>low             |
| 28/08/20<br>28/08/20 | )13   1            | 430<br>440     | 2.30<br>2.30       | 2.30             | 7.00                       | Sta        | d of CP<br>rt of Ro  | tary            |               |             |                  | -                    |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
| 28/08/20<br>29/08/20 | 013   1<br>013   0 | 900<br>700     | 11.10<br>11.10     | 2.30             | 9.00<br>-9.50              | End<br>Sta | l of Shi<br>rt of Sh | ft<br>ift       |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
| 29/08/20             | 013   1            | 330            | 15.30              | 2.30             | 9.50                       | Enc        | d of Hol             | e               |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                | CA                 |                  | ERCUSSIO                   |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       | SPT DETAI                  |                         |                      |                      |                         |
| Hard<br>from         | Strata             | Depth<br>to    | Start t            |                  | Duration                   | Rem        | arks                 |                 |               |             |                  | Depth                | Туре                             |                                     |                                 | al blow<br>ion in n   | count /<br>nm              | Hammer<br>No.           | Energy<br>ratio      | Casing depth         | Water<br>depth          |
| 2.20                 |                    | 2.30           | hhm<br>123         |                  | 0200                       | Chise      | elling               |                 |               |             |                  | 0.50                 | SPT                              | N=13 (2<br>N=20 (1                  | 2,2,3,3,4                       | 4,3)                  |                            | AR362                   | 75<br>75             | N/A                  | -5.00                   |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  | 1.50<br>2.20<br>2.30 | SPT<br>SPT(C                     | N=20 (1<br>50/5mr<br>50/0mr         | 1,2,4,5,3<br>n (25/5<br>n (25/5 | ,50/5)<br>,50/0)      |                            | AR362<br>AR362<br>AR362 | 75<br>75<br>75<br>75 | 1.50<br>2.20<br>2.30 | -7.80<br>-7.60<br>-7.00 |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  | 3.60<br>5.10         | SPT(C<br>SPT(C<br>SPT(C<br>SPT(C | 50/15m<br>50/245                    | nm (25/<br>mm (6,               | ,50,50/1!<br>12,12,17 | 5)<br>,16,5/40)<br>/20/60) | AR362<br>AR362          | 75<br>75<br>75<br>75 | 2.30<br>2.30<br>2.30 | -7.10<br>-8.10          |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  | 6.60<br>8.10         | SPT(C                            | () 45/210<br>() 50/85m<br>() 50/160 | mm (4,<br>1m (5,2               | 10,10,15<br>0,40,10/  | /20/60)<br>10)             | AR362<br>AR362          | 75<br>75<br>75       | 2.30<br>2.30         | -8.30<br>-9.80          |
|                      |                    |                | F                  |                  | Y FLUSH D                  | ETAIL      |                      |                 |               |             |                  | 9.60                 | 371(0                            | .)  50/160                          | mm (5,                          | 8,10,12,2             | .8/10)                     | AR362                   | 15                   | 2.30                 | -9.70                   |
| Fror<br>dept         |                    | To<br>depth    |                    |                  | Flush<br>type              |            | ret                  | ush<br>urn      |               | ush<br>Iour |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
| 2.30<br>3.60         |                    | 3.60<br>15.30  |                    |                  | Water<br>Water             |            | -                    | %<br>70<br>0    | Br            | own         |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
| 3.00                 |                    | 13.30          |                    | ,                | vvater                     |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                | / CASING           |                  |                            |            |                      | SAMPLI          |               | 1-          |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
| Hole<br>diameter     | Depth<br>hole      | dian           | neter ca           | oth of<br>sing   | Тор                        | Base       | Dia                  |                 | Time<br>hmmss |             | overy<br>6       |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
| 200<br>146           | 2.30<br>11.10      | )              | 00 2               | .30              |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
| 116                  | 15.30              | '              |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
| Distance             |                    |                | ype DE             |                  | onse zone                  | ID         |                      | PE CONST        | Dia.          | Тур         | e of             |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
| from G.L             |                    |                | ,,,                | Top              |                            | 10         | Тор                  |                 | of pipe       |             | ipe              |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     | * C                             | eating blo            | ows only                   |                         |                      |                      |                         |
|                      |                    |                |                    | BA               | CKFILL DET                 | AILS       |                      | 1               |               |             |                  |                      |                                  | 1                                   |                                 |                       | ENERAL NO                  | OTES                    |                      |                      |                         |
| Top o<br>sectio      |                    | ase of         | 1                  | Materi           | ial                        |            |                      | Rema            | rks           |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
| 0.00<br>11.10        |                    | 11.10<br>15.30 |                    | Arising<br>Grout | js                         |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
| 11.10                |                    | 13.50          |                    | arout            | •                          |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         |                      |                      |                         |
|                      |                    |                |                    |                  |                            |            |                      |                 |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         | 1                    |                      |                         |
| NOTES                | Water              | strike         | rise time          | in min           | neters in m<br>nutes, hard |            |                      | in hhmm         |               |             |                  |                      |                                  |                                     |                                 |                       |                            |                         | đ                    |                      |                         |
| Unched               |                    | calls of       | abbrevia           |                  | see key<br>og Print Da     | te An      | d Time               | · 22/12/        | 2012 1        | 0.25.5      | 6                |                      |                                  |                                     |                                 |                       |                            | SOII                    | L eng                | inee                 | RING                    |

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Issue Date 22/10/2012

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

# **Exploratory Hole Log**

Hole ID.

A34

Sheet 1 of 2

Ground Level -5.45m CD Coordinates 396995.60 E, 804880.50 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend                       | Depth    | Datum | Sa                        | mpling   |      |     |    | ount A   |    | In Situ                          | ı Test                                    | Ins  |
|--|------------------------------|----------|-------|---------------------------|----------|------|-----|----|----------|----|----------------------------------|---|------|
| Description of strata  | Legena                       | Берин    | Level | Det                       | tails    | Dia. | TCR | _  | RQD      | IF | Deta                             | ails                                      | atio |
| Medium dense brown slightly silty slightly gravelly fine to oarse SAND. Gravel is subangular to rounded fine to medium ocally coarse of mixed igneous and metamorphic lithologies.  from 0.00m to 1.50m gravel absent  |                              | 11111111 |       | D001 0.  D002 0.  B003 0. | 50<br>50 |      |     |    | <b>!</b> |    | SPT13<br>0.50                    | 0.95                                      |      |
|  |                              |          |       | D005 1. B006 1.           | 50<br>50 |      |     |    |          |    | SPT20<br>1.50                    | 1.95                                      |      |
| from 2.20m to 2.30m driller notes boulder  |                              | 2.30     | -7.75 |                           |          |      |     |    |          |    | SPT(C)50/5<br>2.20<br>SPT(C)50/0 | 2.21 -                                    |      |
| ery stiff brown slightly sandy gravelly CLAY with medium obble content. Sand is fine to coarse. Gravel is subangular of subrounded fine to coarse of mixed igneous and metamorphic thologies including granite and gneiss. Cobbles are ubangular to subrounded of granite and gneiss. from 2.30m to 2.40m strong pink and grey boulder of granite. (Recovered as angular cobble sized fragments) from 3.21m to 3.30m subangular cobble of schist |                              | 3.30     | -8.75 | 2.30                      | 3.60     | 107  | 77  | NA | NA       |    | 2.30                             | 1   |      |
| ssumed zone of no recovery. Stiff to very stiff brown ravelly sandy CLAY with granite boulders. (Driller's escription)   | 2000<br>2000<br>2000<br>2000 | 4.10     | -9.55 |                           |          |      |     |    |          |    | SPT(C)50/1<br>3.60               | 3.67                                      |      |
| ery stiff extremely high strength brown slightly sandy cavelly CLAY with medium cobble content. Sand is fine to parse. Gravel is angular to subrounded fine to coarse of ixed igneous and metamorphic lithologies including granite, neiss, schist and quartz. Cobbles are angular to subrounded granite, schist and gneiss.   |                              |          |       | 3.60                      | 5.10     | 107  | 67  | NA | NA       |    | SPT(C)50/2                       | 45mm =                                    |      |
| from 4.10m to 4.30m recovered as angular to subrounded fine to coarse gravel of mixed igneous and metamorphic lithologies  |                              |          |       | 5.10                      | 6.60     | 107  | 100 | NA | NA       |    | 5.10                             | 5.50                                      |      |
| from 6.20m to 6.30m subrounded cobble of granite   | 0 0 0                        |          |       |                           |          |      |     |    |          | NA | SPT(C)45/2                       | <br><br><br>10mm                          |      |
| from 6.75m to 6.85m subangular cobble of gneiss  |                              |          |       | 6.60                      | 8.10     | 107  | 93  | NA | NA       |    | 6.60                             | 6.96 -                                    |      |
| from 8.00m to 8.10m assumed zone no recovery   |                              | Immuniti |       | 8.10                      | 9.60     | 107  | 90  | NA | NA       |    | SPT(C)50/8<br>8.10               | 8.34 -<br>8.34 -<br>-<br>-<br>-<br>-<br>- |      |
| from 9.45m to 9.60m assumed zone of no recovery  |                              |          |       |                           |          |      |     |    |          |    | SPT(C)50/1<br>9.60               |   |      |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Unchecked Log Print Date And Time: 23/12/2013 10:26:00 Issue Date 22/10/2012

Form No. SIEXPHOLELOG Issue.Revision No. 1.05



Project No. TA7148

Engineer

Ground Level

Arch Henderson LLP

**Exploratory Hole Log** 

Hole ID.

**A34** 

Sheet 2 of 2

**Employer** Aberdeen Harbour Board

-5.45m CD

Hole Type CP+RC Coordinates Inclination

| Description of Strata | Legend | Depth | Datum | Sampling | Blow Count And<br>Sample Recovery |
|-----------------------|--------|-------|-------|----------|-----------------------------------|
|                       |        |       |       |          |                                   |

Very stiff extremely high strength brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss, schist and quartz. Cobbles are angular to subrounded of granite, schist and gneiss.

Medium strong locally weak pink and grey coarse crystalline GRANITE. Discontinuities: 1) 10-20 degrees closely and very closely spaced planar to undulating rough with localised irregular orange staining on surfaces. 2) 70-80 degrees medium spaced planar rough stained orange on surfaces.

from 10.80m to 10.95m recovered as non intact core (angular coarse gravel sized fragments)

Assumed zone of no recovery. Medium strong GRANITE. (Driller's

from 11.00m to 11.10m assumed zone of no recovery from 11.35m to 11.50m, 11.70m to 11.85m, 12.00m to 12.10m, 12.20m to 12.25m, 13.10m to 13.20m and 14.10m to 14.30m recovered as non intact core (angular coarse gravel sized fragments)

396995.60 E, 804880.50 N National Grid

10.35

-15.80

In Situ Test Install Details ation Dia. TCR SCR RQD IF Details

> 40 16

11.10 107

9.60

12.60

11.10 12.60 93 90 70 0

> 14.10 93 100 93 16

14.80 -20.25

15.30 -20.75

Exploratory hole complete at 15.30 m.

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water.

For details of abbreviations, see key

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orm No. SIEXPHOLELOG Issue, Revision No. 1.05



| Project                          | : Nam        | e Bay                | of Nig               | g Hai             | rbour Dev                | elop <sup>e</sup> | men                              | t Groun        | d Inves               | tiga         | tion             |              |                      | Ev.              | nlor     | oton, l                     | ا ماما           | 20               | F         | lole    | ID.  |                |
|----------------------------------|--------------|----------------------|----------------------|-------------------|--------------------------|-------------------|----------------------------------|----------------|-----------------------|--------------|------------------|--------------|----------------------|------------------|----------|-----------------------------|------------------|------------------|-----------|---------|------|----------------|
| Project                          |              | TA7                  | 148                  |                   |                          |                   |                                  |                |                       |              |                  |              |                      | ĽΧĮ              | piora    | atory r                     | Hole Lo          | og               |           | A36     | S    |                |
| Engine                           |              |                      | n Hend               |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           | 730     | ,    |                |
| Employ                           |              |                      |                      | Harbo             | our Board                | I                 |                                  |                |                       |              | 2000             | 00.50.5      | 20105                | - / 00           |          |                             |                  |                  |           | Head    | er   |                |
| Ground<br>Date Sta               |              |                      | 2m CD<br>8/2013      |                   |                          |                   |                                  |                | ordinates<br>e Comple |              |                  |              | 80495                | 54.90            | N Natı   | ional Grid                  | Inclinat         | tion Ve          | rtical    |         |      |                |
| Тор                              | Base         | 1                    | Date St              | arted             | Date Ende                | d C               | rew                              | Section        | n Coi                 | re           | Core<br>Bit      |              | Equipr               | ment             |          | Sho                         |                  |                  | Remark    | s       | —    |                |
| 0.00                             | 0.40         | CP                   | 20/08/2              |                   | 20/08/201                | .3                | DS                               | Logged B<br>TW | By Barı               | rel          | Bit              |              | Dando                |                  |          | Sup                         | oring /<br>pport |                  |           |         |      |                |
| 0.40<br>1.00                     | 1.00<br>2.10 | RC<br>RO             | 20/08/2              | 2013<br>2013      | 20/08/201<br>20/08/201   | .3 I              | MM<br>MM                         | TW<br>MM       | T61<br>5 3/4 [        | DHM          | Impreg           |              | Deltaba:<br>Deltaba: | se 520<br>se 520 | .0<br>.0 |                             |                  |                  |           |         |      |                |
| 2.10<br>4.70                     | 4.70<br>9.70 | RC<br>RC             | 20/08/2<br>22/08/2   | 2013<br>2013      | 22/08/201<br>22/08/201   |                   | MM<br>MM                         | TW<br>TW       | SF<br>T61             | 16           | Impreg<br>Impreg |              | Deltaba<br>Deltaba   |                  |          |                             |                  |                  |           |         |      |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
| Date                             | Т            | me                   | Hole                 | Cas               | ROGRESS<br>sing Wate     | er                |                                  | Rema           | arks                  |              |                  | Dat          | e l                  | Tir              | me       | Strike at                   | VATER STR        | Time             |           | asino   | dept | th             |
|                                  |              |                      | depth                | dep               | oth dept                 | h                 |                                  |                |                       |              |                  | L            | .0                   |                  |          | depth                       | depth            | taker<br>to rise | n at sti  | rike j  | i to | seal<br>ow     |
| 20/08/20                         | 13 1         | 530<br>845           | 0.40<br>3.00         | 0.4<br>3.0        | 0 -8.12                  | ! Enc             | d of Sh                          |                | otary                 |              |                  |              |                      |                  |          |                             |                  |                  |           |         | 1    |                |
| 21/08/20<br>21/08/20<br>22/08/20 | 13 1         | 700<br>930<br>700    | 3.00<br>3.50<br>3.50 | 3.0<br>3.5<br>3.5 | -6.70                    | ) Enc             | rt of SI<br>d of Sh<br>irt of SI | nift           |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         | 1    |                |
| 22/08/20                         |              | 930                  | 9.70                 | 4.5               |                          |                   | d of Ho                          |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         | 1    |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         | 1    |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         | 1    |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         | 1    |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         | Щ.   |                |
| Hard                             | Strata       | Donth                | C                    |                   | PERCUSSIO<br>selling     |                   | narks                            |                |                       |              |                  | Donth        | Typo                 | .1 1             | nerome   | ental blow                  | SPT DETAI        | ILS<br>Hamme     | er Energy | , Co    | sing | Water          |
| from                             |              | to                   | Start<br>hhr         | time              | Duration<br>hhmm         |                   | ains                             |                |                       |              |                  | Depth        | Туре                 | "                |          | tration in n                |                  | No.              | ratio     |         |      | depth          |
| 0.00                             |              | 0.40                 | 130                  |                   | 0200                     | Chise             | elling                           |                |                       |              |                  | 3.00<br>3.50 | SPT<br>SPT(C         | 50/              |          | 2,3/0,50/5)<br>21,4/0,27,23 | 3/15)            | AR362<br>AR362   | 75        |         | 00   | -8.12<br>-7.40 |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          | ,,,                         | /                |                  |           |         |      |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
| Fron                             | <u> </u>     | То                   |                      | ROTAI             | RY FLUSH [<br>Flush      | ETAIL             |                                  | lush           | <u></u>               | lush         |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
| dept                             |              | depth                |                      |                   | type                     |                   |                                  | eturn<br>%     |                       | lour         |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
| 0.00<br>1.00                     |              | 1.00<br>2.10         |                      | ,                 | Water<br>Air/Mist        |                   |                                  | 0<br>100       |                       | reen         |                  | ]            |                      |                  |          |                             |                  |                  |           |         |      |                |
| 2.10<br>3.00<br>4.70             |              | 3.00<br>4.70<br>5.70 |                      |                   | Water<br>Water<br>Water  |                   |                                  | 30<br>0<br>100 |                       | reen<br>reen |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
| 5.70<br>6.70                     |              | 6.70<br>9.70         |                      |                   | Water<br>Water           |                   |                                  | 90             |                       | reen         |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
| нс                               | I E DIAI     | METED                | / CASING             | <u> </u>          |                          |                   | NAM                              | IC SAMPLI      | ING                   |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
| Hole                             | Depth        | of Cas               | ing De               | pth of            | Тор                      | Base              |                                  | iameter        | Time                  |              | covery           |              |                      |                  |          |                             |                  |                  |           |         |      |                |
| diameter<br>200                  | 0.40         |                      | 00 (                 | asing<br>0.40     |                          |                   | +                                |                | hhmmss                | - 9          | %                |              |                      |                  |          |                             |                  |                  |           |         |      |                |
| 150<br>145                       | 3.00<br>4.70 | 15                   | 50                   | 3.00              |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
| 116                              | 9.70         |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
|                                  | IN           | ISTALLA              | TION DE              | ETAILS            | ;                        |                   | F                                | PIPE CONS      | STRUCTION             | ON           |                  | 1            |                      |                  |          |                             |                  |                  |           |         |      |                |
| Distance<br>from G.L             |              | Ty                   | уре                  | Resp<br>To        | onse zone<br>p   Base    | ID                | Тор                              | Pipe<br>I Base | Dia.<br>of pipe       |              | pe of pipe       | 1            |                      |                  |          |                             |                  |                  |           |         |      |                |
| HOIH G.E                         |              |                      |                      | 10                | p Buse                   |                   | 100                              | Buse           | or pipe               |              | , pc             |              |                      |                  |          |                             |                  |                  |           |         |      |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                | <u> </u>              | $oxed{oxed}$ |                  |              |                      |                  |          | * Seating blo               | ows only.        | <u> </u>         |           | $\perp$ |      |                |
| T                                | <u>د ا ہ</u> | ase of               | I                    |                   | ACKFILL DE               | TAILS             |                                  |                |                       |              |                  |              |                      |                  |          | G                           | ENERAL NO        | OTES             |           |         |      |                |
| Top of section                   |              | ection<br>4.70       |                      | Mater             |                          | <u> </u>          |                                  | Rem            | arks                  |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
| 4.70                             |              | 9.70                 |                      | Grou              |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
|                                  |              |                      |                      |                   |                          |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
| NOTES:                           |              |                      |                      |                   | meters in m              |                   |                                  |                |                       |              |                  |              |                      |                  |          |                             |                  |                  |           |         |      |                |
|                                  |              |                      |                      |                   | nutes, hard<br>, see key | l strata          | a time                           | e in hhmn      | n                     |              |                  |              |                      |                  |          |                             |                  |                  |           |         | /    |                |
|                                  |              |                      |                      | L                 | Log Print Da             | ite An            | d Tim                            | e: 23/12/      | /2013 1               | 0:26:        | 17               |              |                      |                  |          |                             |                  | SO               | IL en     | GIN     | eer  | RING           |

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Issue Date 22/10/2012

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

# **Exploratory Hole Log**

Hole ID.

A36

Sheet 1 of 1

Ground Level -5.22m CD Coordinates 396992.50 E, 804954.90 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend                                 | Depth                      | Datum<br>Level          | Sam   | pling |      |     | ow Co<br>nple I | ount A<br>Recov |                  | In Situ Test Details                | Ir<br>at   |
|--|--|----------------------------|-------------------------|-------|-------|------|-----|-----------------|-----------------|------------------|-------------------------------------|--|
|  |  |                            | Level                   | Detai | ls    | Dia. | TCR | SCR             | RQD             | IF               | Details                             | a  |
| No recovery. Obstruction. (Driller's description)  |  | -                          |                         |       |       |      |     |                 |                 |                  | -                                   |  |
| Very strong pink and grey BOULDER of granite.  | 0000                                   | 0.40 -                     | -5.62<br>-5.75          |       |       |      |     |                 |                 |                  | -                                   |  |
| Brown and grey slightly clayey subangular to subrounded fine to medium GRAVEL of schist and granite.   | 0000                                   | 0.56 _                     | -5.78                   | 0.40  | 1.00  | 92   | 26  | NA              | NA              |                  | -                                   |  |
| Assumed zone of no recovery. Granite and quartz BOULDERS with sand lenses and cobbles. (Driller's description)   | 0000                                   | 1.00                       | -6.22                   |       |       |      |     |                 |                 |                  | -                                   |  |
| Rotary openhole drilling. Granite and quartz BOULDERS with sand lenses and cobbles. (Driller's description)  | 0000                                   |                            |                         |       |       |      |     |                 |                 |                  | -                                   |  |
| Grey subangular to well rounded fine to coarse GRAVEL of granite, schist and quartz with low cobble content. Cobbles are subrounded of granite.  | 000                                    | 2.10 -<br>2.29 -<br>2.50 - | -7.32<br>-7.51<br>-7.72 | 2.10  | 2.50  | 107  | 48  | NA              | NA              | NA               | -<br>-<br>-<br>-                    |  |
| Assumed zone of no recovery. Granite and quartz BOULDERS with some lenses and cobbles. (Driller's description)   | 0000                                   | =                          |                         | 2.50  | 3.00  | 107  | 0   | NA              | NA              |                  | -                                   |  |
| Zone of no recovery. Granite and quartz BOULDERS with sand enses and cobbles. (Driller's description)  | 0000                                   |                            |                         | 3.00  | 3.50  | 107  | 0   | NA              | NA              |                  | SPT50/5mm                           |  |
| Grey angular to subrounded fine to coarse GRAVEL of granite, schist and quartz.  | \0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0 | 3.50 -<br>3.70 -           | -8.72<br>-8.92          | 3.50  | 4.00  | 107  | 40  | NA              | NA              |                  | SPT(C)50/90mm -<br>3.50 3.67 -<br>- |  |
| Assumed zone of no recovery. Granite and quartz COBBLES and GOULDERS. (Driller's description)  |  |                            |                         |       |       |      |     |                 |                 |                  |                                     |  |
| from 4.37m to 5.60m recovered as non intact core (angular fine to coarse gravel sized fragments)   | 5000                                   | 4.65                       | -9.87                   | 4.00  | 4.70  | 107  | 7   | 7               | 0               |                  | -<br>-<br>-<br>-                    |  |
| Medium strong to strong grey GNEISS with closely to medium spaced intrusions of pink and grey granite. Discontinuities:  1) 10-20 degrees closely very closely spaced undulating rough clean. 2) 50-70 degrees medium spaced planar rough stained prown. 3) 80-90 degrees widely spaced planar rough stained prown. The form 4.86m to 4.97m 1. No discontinuity 50 degrees |  |                            |                         | 4.70  | 5.70  | 92   | 90  | 67              | 40              |                  | -                                   |  |
| undulating rough clean from 5.00m to 5.10m 2 No incipient fractures 60-70 degrees very closely spaced planar from 5.60m to 5.70m assumed zone of no recovery from 5.70m to 5.73m recovered as non intact core (angular fine gravel sized fragments) from 5.87m to 6.08m 1 No incipient fracture 60-70 degrees  |  |                            |                         | 5.70  | 6.70  | 92   | 100 | 76              | 56              |                  | -                                   |  |
| planar at 6.20m 1 No discontinuity 0-10 degrees undulating smooth clean at 6.32m 1 No discontinuity 0-10 deg undulating rough clean from 6.50m to 6.80m recovered as non intact core (angular fine to medium gravel sized fragments) from 6.94m to 9.97m and 7.04m to 7.13m 1 No incipient   |  |                            |                         | 6.70  | 7.70  | 92   | 71  | 43              | 0               | NI<br>100<br>230 |                                     |  |
| fracture 90 degrees planar from 7.20m to 7.43m recovered as non intact core (angular fine to coarse gravel sized fragments) from 7.43m to 7.70m assumed zone of no recovery from 7.70m to 7.85m recovered as non intact core (angular fine to medium gravel sized fragments)   |  |                            |                         | 7.70  | 8.70  | 92   | 90  | 67              | 30              |                  |                                     | 015<br>015<br>015<br>015<br>015<br>015<br>015<br>015<br>015<br>015 |
| from 7.97m to 8.00m 2 No discontinuities 0-10 degrees very closely spaced planar rough clean from 8.15m to 8.20m 1 No incipient fracture 60-70 degrees planar from 8.17m to 8.23m discontinuities: 2) very closely spaced from 8.60m to 8.70m assumed zone of no recovery from 9.15m to 9.23m recovered as non intact core (angular  |  |                            |                         | 8.70  | 9.70  | 92   | 100 | 88              | 42              |                  | -<br>-<br>-<br>-<br>-<br>-          |  |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:26:20

Form No. SIEXPHOLELOG Issue Date 22/10/2012



Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 A36 Engineer Arch Henderson LLP Employer Aberdeen Harbour Board Sheet 1+ of 1

Ground Level -5.22m CD Coordinates 396992.50 E, 804954.90 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend | Depth | Datum | Sampling | ı    | Blo<br>San | ow Co<br>nple F | unt A<br>Recov | nd<br>ery | In Situ Test | Inst |
|--|--------|-------|-------|----------|------|------------|-----------------|----------------|-----------|--------------|------|
| ·  |        |       | Level | Details  | Dia. |            | SCR             |                | IF        | Details      | atio |
| maining Detail : 9.34m - 9.43m : from 9.34m to 9.43m many cipient fractures 60-90 degrees extremely closely spaced |        | -     |       |          |      |            |                 |                |           | -            |      |
| cipient fractures 60-90 degrees extremely closely spaced   |        | -     |       |          |      |            |                 |                |           | -            | 1    |
| anar;;; 9.64m - 9.70m : from 9.64m to 9.70m 1 No incipient<br>cture 60-70 degrees planar                           |        | -     |       |          |      |            |                 |                |           | -            | 1    |
| cture 60-70 degrees planar<br>ploratory hole complete at 9.70 m.   |        | -     |       |          |      |            |                 |                |           | -            | 1    |
| protatory note complete account in   |        | -     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | _     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | -     |       |          |      |            |                 |                |           | -            |      |
|  |        | -     |       |          |      |            |                 |                |           | -<br>-       | 1    |
|  |        | -     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | _     |       |          |      |            |                 |                |           | -            | }    |
|  |        | _     |       |          |      |            |                 |                |           | _            | 1    |
|  |        | _     |       |          |      |            |                 |                |           | =            | 1    |
|  |        | -     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | _     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | -     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | _     |       |          |      |            |                 |                |           | _            | 1    |
|  |        | _     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | _     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | -     |       |          |      |            |                 |                |           | -            |      |
|  |        | -     |       |          |      |            |                 |                |           | -            |      |
|  |        | -     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | _     |       |          |      |            |                 |                |           | -            | -    |
|  |        | -     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | -     |       |          |      |            |                 |                |           | -            |      |
|  |        | -     |       |          |      |            |                 |                |           | -            |      |
|  |        | -     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | _     |       |          |      |            |                 |                |           | -            |      |
|  |        | -     |       |          |      |            |                 |                |           | -            |      |
|  |        | -     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | -     |       |          |      |            |                 |                |           | -            |      |
|  |        | -     |       |          |      |            |                 |                |           | -            | -    |
|  |        | _     |       |          |      |            |                 |                |           | _            | }    |
|  |        | _     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | -     |       |          |      |            |                 |                |           | -            |      |
|  |        | -     |       |          |      |            |                 |                |           | -            |      |
|  |        | -     |       |          |      |            |                 |                |           | -            | 1    |
|  |        |       |       |          |      |            |                 |                |           |              | 1    |
|  |        | -     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | -     |       |          |      |            |                 |                |           | -            |      |
|  |        | -     |       |          |      |            |                 |                |           | -            |      |
|  |        | -     |       |          |      |            |                 |                |           | -            |      |
|  |        | _     |       |          |      |            |                 |                |           | _            | 1    |
|  |        | _     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | _     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | -     |       |          |      |            |                 |                |           | -            | -    |
|  |        | _     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | _     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | _     |       |          |      |            |                 |                |           |              | 1    |
|  |        | -     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | -     |       |          |      |            |                 |                |           | -            | 1    |
|  |        | _     |       |          |      |            |                 |                |           | -            | -    |
|  | - 1    | _     | 1     |          | 1    | 1          |                 |                |           | -            | 1    |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Form No. SIEXPHOLELOG

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Issue Date 22/10/2012

SOIL engineering Part of the Bachy Soletanche Group

| Project              | t Nam           | e Bay              | of Ni              | gg Ha                 | rbour De                 | elop   | men        | t Groun                       | ıd Inve             | stiga      | tion             |         |                    | Evn     | loro    | ton, L                   | ا مام ا          | 20                       | Н               | ole ID.           |                 |
|----------------------|-----------------|--------------------|--------------------|-----------------------|--------------------------|--------|------------|-------------------------------|---------------------|------------|------------------|---------|--------------------|---------|---------|--------------------------|------------------|--------------------------|-----------------|-------------------|-----------------|
| Project              | t No.           |                    | 148                |                       |                          |        |            |                               |                     |            |                  |         |                    | ⊏xþ     | iora    | itory r                  | Hole Lo          | og                       |                 | 439               |                 |
| Engine               |                 |                    |                    | derso                 |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          | ,               | 733               |                 |
| Employ               |                 |                    |                    |                       | our Board                |        |            |                               |                     |            | 2070             | 22.00.5 | 20500              |         |         | 10:1                     |                  |                          | H               | leader            |                 |
| Ground<br>Date Sta   |                 |                    | 9m CD<br>)9/201    |                       |                          |        |            |                               | ordinate<br>te Comp |            |                  |         | 80502              | 24.80 N | N Natio | onal Grid                | Inclinat         | ion Vert                 | ical            |                   |                 |
| Тор                  | Base            |                    |                    | Started               | Date Ende                | d C    | rew        | Section<br>Logged I           |                     | ore        | Core<br>Bit      |         | Equipr             | nent    |         | Sho                      | oring /          |                          | Remarks         |                   |                 |
| 0.00                 | 0.80            | СР                 |                    | 9/2013                | 13/09/201                | 3      | IC         | Logged I<br>DT                | By Ba               | arrel      | Bit              |         | Dando              |         |         | Sup                      | ppořt            |                          |                 |                   |                 |
| 0.80<br>3.65         | 3.65<br>12.60   | RC<br>RC           | 13/09              | 9/2013<br>9/2013      | 13/09/201<br>14/09/201   | 3   GS | S/MM<br>MM | DT<br>DT                      |                     | WF<br>5116 | Impreg<br>Impreg |         | Deltaba<br>Deltaba |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| Date                 | Ιπ              | me                 | Uolo               |                       | ROGRESS<br>sing Wate     |        |            | Rema                          | orko                |            |                  | Dat     |                    | Tim     |         | V<br>Strike at           | VATER STR        |                          |                 | sina da           | nth             |
| Date                 | ''              | ine                | Hole<br>deptl      | h de                  | pth dept                 | ĥ      |            | Kem                           | arks                |            |                  | Dat     | .e                 | 11111   | ie      | depth                    | Rise to<br>depth | Time<br>taken<br>to rise | at stri         | sing de<br>ke   1 | to seal<br>flow |
| 13/09/20<br>13/09/20 | 013   1         | .430<br>.900       | 0.80<br>3.35       | 0.7<br>1.5            | -3.60                    | End    | d of Sh    | P/Start of R<br>hift/Start of | otary<br>Shift      |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| 14/09/20             |                 | 008                | 12.60              |                       |                          |        | d of Ho    |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    | CABLE I               | PERCUSSIO                | N DET  | AILS       |                               |                     |            |                  |         |                    |         |         |                          | SPT DETAI        | LS                       |                 |                   |                 |
| Hard<br>from         | Strata          | Depth<br>to        | Stai               | Chis                  | selling<br>Duration      |        | arks       |                               |                     |            |                  | Depth   | Туре               |         |         | ntal blow<br>ration in n |                  | Hamme<br>No.             | Energy<br>ratio | Casing            |                 |
| 0.20                 |                 | 0.80               | hł                 | nmm<br>.230           | hhmm<br>0200             | Chise  | elling     |                               |                     |            |                  | 0.50    | SPT(C              |         | •       | /0,50/0)<br>/0,50/0)     |                  | AR362                    | %<br>75<br>75   | N/A               | -4.10<br>-4.30  |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  | 0.80    | SPT(C              | 50/0    | mm (25  | /0,50/0)                 |                  | AR362                    | 75              | N/A               | -4.30           |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      | <u> </u>        |                    | <u> </u>           | ROTA                  | RY FLUSH D               | ETAIL  | S          |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| Fron<br>dept         |                 | To<br>depth        |                    |                       | Flush<br>type            |        |            | lush<br>eturn                 |                     | Flush      |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| 0.80                 |                 | 1.50               |                    |                       | Water                    |        |            | 20                            |                     | Brown      |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| 1.50<br>3.35         |                 | 3.35<br>3.65       |                    |                       | Water<br>Water           |        |            | 100<br>0                      | ı                   | Brown      |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| 3.65                 |                 | 12.60              |                    |                       | Water                    |        |            | 100                           |                     | Pink       |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| l                    |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| НС                   | LE DIAI         | METER              | / CASII            | NG                    |                          | DYI    | NAMI       | IC SAMPL                      | ING                 |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| Hole<br>diameter     |                 | of Cas             |                    | epth of casing        | Тор                      | Base   | Di         | iameter                       | Time<br>hhmms       |            | covery<br>%      |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| 150<br>145           | 2.50<br>3.65    | 1                  | 50                 | 2.50                  |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| 116                  | 12.60           |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 | ISTALLA            | ATION I            | DETAILS               |                          |        |            | PIPE CON                      |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| Distance<br>from G.L |                 | T                  | ype                | Resp<br>To            | onse zone<br>p   Base    | ID     | Тор        | Pipe<br>  Base                | Dia.<br>of pip      |            | pe of<br>pipe    |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    | Щ.                    |                          |        |            |                               |                     |            |                  |         |                    |         | *       | * Seating blo            | -                |                          |                 |                   |                 |
| Top o                | f R             | ase of             |                    | Mate                  | ACKFILL DE               | TAILS  |            | Pen                           | narks               |            |                  |         |                    |         |         | G                        | ENERAL NO        | OTES                     |                 |                   |                 |
| sectio<br>0.00       |                 | ection<br>3.65     |                    | Arisin                |                          |        |            |                               | iai Ko              |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| 3.65                 |                 | 12.60              |                    | Grou                  |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| l                    |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      |                 |                    |                    |                       |                          |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| NOTES                |                 |                    |                    |                       | meters in m              |        |            |                               |                     |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
|                      | Water<br>For de | strike<br>tails of | rise tin<br>abbrev | ne in mi<br>viations, | nutes, hard<br>, see key | strat  | a time     | in hhmr                       | n                   |            |                  |         |                    |         |         |                          |                  |                          |                 |                   |                 |
| <b>-</b>             |                 |                    |                    |                       | Log Print Da             | ite An | d Tim      | e: 23/12                      | /2013               | 10:26      | :31              |         |                    |         |         |                          |                  | so                       | L end           | inee              | RING            |

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Issue Date 22/10/2012

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

# **Exploratory Hole Log**

Hole ID.

A39

Sheet 1 of 2

Ground Level -2.69m CD Coordinates 397003.80 E, 805024.80 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend                                | Depth                      | Datum<br>Level | Sampl   | ing   |      |     | ow Co<br>nple I |     |                 | In Situ Test<br>Details           | Insta |
|---|---------------------------------------|----------------------------|----------------|---------|-------|------|-----|-----------------|-----|-----------------|-----------------------------------|-------|
|   | -                                     |                            | Level          | Details |       | Dia. | TCR | SCR             | RQD | IF              | Details                           | ation |
| No recovery. BOULDERS and SAND. (Driller's description)   |                                       |                            |                |         |       |      |     |                 |     |                 | SPT(C)50/0mm -<br>0.50 0.50       |       |
| Rotary openhole drilling. BOULDERS of granite and schist. (Driller's description)   |                                       | 0.80 -<br>-<br>-<br>-<br>- | -3.49          |         |       |      |     |                 |     |                 | SPT(C)50/0mm<br>0.80 0.80<br><br> |       |
| Medium strong pink and grey coarse crystalline GRANITE. Discontinuities: 1) 30-40 degrees closely spaced undulating rough stained yellow on surfaces. 2) 70-80 degrees closely spaced planar rough stained yellow and brown on surfaces. from 1.80m to 2.10m 1 No medium band of very weak dark grey coarse crystalline granite. Recovered as non intact core (angular fine to coarse gravel sized fragments) | *****                                 | 1.50 -                     | -4.19          | 1.50    | 2.45  | 107  | 100 | 63              | 34  | NI<br>60<br>170 |                                   |       |
| Weak locally very weak dark grey coarse crystalline GRANITE.<br>Recovered as non intact core (angular fine to coarse gravel<br>and angular cobble sized fragments).   | *****                                 | 2.83                       | -5.52          | 2.45    | 3.35  | 107  | 100 | 42              | 0   | NI              | -<br>-<br>-<br>-                  |       |
| Strong pink and grey coarse crystalline GRANITE. Discontinuities: 1) 30-40 degrees closely spaced planar rough  | ****                                  | 3.35                       | -6.04          | 3.35    | 3.65  | 107  | 100 | 66              | 0   | NI<br>40        | -                                 |       |
| stained yellow on surfaces. from 3.35m to 3.55m recovered as non intact core (angular coarse gravel and cobble sized fragments)   |                                       | 4.00                       | -6.69          |         |       |      |     |                 |     | 60              |                                   |       |
| Medium strong and weak locally very weak pink and grey coarse crystalline GRANITE. Recovered as non intact core (angular fine to coarse gravel sized fragments).  | *****                                 |                            |                | 3.65    | 5.15  | 89   | 100 | 23              | 7   | NI              | -<br>-<br>-<br>-<br>-<br>-        |       |
| Strong pink and grey coarse crystalline GRANITE. Discontinuities: 1) 30-40 degrees closely spaced planar rough stained yellow on surfaces. from 5.50m to 5.65m recovered as non intact core (angular coarse gravel sized fragments)   | *****                                 | 5.30                       | -7.99<br>-8.34 | 5.15    | 6.50  | 89   | 74  | 15              | 15  | 40<br>80<br>180 | -                                 |       |
| Weak grey very thinly and thinly bedded GNEISS. Discontinuities: 1) 20-30 degrees closely spaced undulose rough clean. from 5.65m to 5.95m recovered as non intact core (angular  |                                       |                            |                |         |       |      |     |                 |     | . NI<br>30      | ]<br>-<br>-                       |       |
| coarse gravel sized fragments) from 6.15m to 6.50m assumed zone of no recovery from 6.50m to 6.53m, 6.80m to 6.90m and 7.00m to 7.27m recovered as non intact core (angular coarse gravel sized fragments) from 7.27m to 7.60m assumed zone of no recovery  |                                       |                            | -10.29         | 6.50    | 7.60  | 89   | 73  | 36              | 18  | 160             | -                                 |       |
| Weak to medium strong pink, grey and dark grey coarse crystalline GRANITE GNEISS. Discontinuities: 1) 20-30 degrees closely to medium spaced planar to undulating rough clean. 2) 70-80 degrees medium spaced undulose rough clean.   | ****                                  |                            | 10.23          | 7.60    | 9.10  | 89   | 100 | 100             | 77  |                 | -                                 |       |
|   | * * * * * * * * * * * * * * * * * * * |                            |                | 9.10    | .0.60 | 89   | 100 | 95              | 69  |                 | -<br>-<br>-<br>-<br>-             |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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SOIL ENGINEERING Part of the Bachy Soletanche Group

Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 A39 Engineer Arch Henderson LLP

Ground Level -2.69m CD Coordinates 397003.80 E, 805024.80 N National Grid

Hole Type CP+RC Inclination

Aberdeen Harbour Board

Employer

| Description of Strata  | Legend                                | Depth                      | Datum  | Sar   | npling |      | Blo<br>San | ow Co<br>nple I | ount A<br>Recov | nd<br>erv             | In Situ Test               | Insta |
|--|---------------------------------------|----------------------------|--------|-------|--------|------|------------|-----------------|-----------------|-----------------------|----------------------------|-------|
|  | -374                                  | · F '                      | Level  | Deta  | ails   | Dia. |            |                 | RQD             | IF                    | Details                    | ation |
| Remaining Detail: 9.67m - 9.76m: from 9.67m to 9.76m and 12.20m to 12.20m recovered as non intact core (angular coarse gravel sized fragments) | * * * * * * * * * * * * * * * * * * * |                            |        |       |        |      |            |                 |                 | NI<br><del>7</del> 90 | -                          |       |
|  |                                       | -                          |        | 10.60 | 11.60  | 89   | 100        | 100             | 90              |                       | -                          |       |
|  | *****                                 | -                          |        | 11.60 | 12.60  | 89   | 100        | 80              | 80              |                       | -<br>-<br>-<br>-<br>-<br>- |       |
| ploratory hole complete at 12.60 m.  |                                       | 12.60 -                    | -15.29 |       |        |      |            |                 |                 |                       | -<br>-<br>-<br>-           |       |
|  |                                       | -<br>-<br>-<br>-<br>-      |        |       |        |      |            |                 |                 |                       | :<br>:<br>:                |       |
|  |                                       | -<br>-<br>-<br>-<br>-      |        |       |        |      |            |                 |                 |                       | :<br>:<br>:                |       |
|  |                                       | -<br>-<br>-<br>-<br>-      |        |       |        |      |            |                 |                 |                       | -<br>-<br>-<br>-<br>-      |       |
|  |                                       | -<br>-<br>-<br>-<br>-<br>- |        |       |        |      |            |                 |                 |                       | -                          |       |
|  |                                       | -<br>-<br>-<br>-<br>-      |        |       |        |      |            |                 |                 |                       | -<br>-<br>-<br>-           |       |
|  |                                       | -<br>-<br>-<br>-<br>-      |        |       |        |      |            |                 |                 |                       | -<br>-<br>-<br>-<br>-      |       |
|  |                                       | -<br>-<br>-<br>-<br>-      |        |       |        |      |            |                 |                 |                       | -<br>-<br>-<br>-<br>-      |       |
|  |                                       | -<br>-<br>-<br>-<br>-      |        |       |        |      |            |                 |                 |                       | -<br>-<br>-<br>-<br>-      |       |
|  |                                       | -<br>-<br>-<br>-<br>-      |        |       |        |      |            |                 |                 |                       | -<br>-<br>-<br>-           |       |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Sheet 2 of 2

| Project                                      | t Nam                         | e Bay                             | of Nigg                                      | Har                  | rbour Dev   | elopn     | nent                       | t Groun              | ıd Inve       | estiga                | ition            |          |  | Evr              | olor.  | aton, l       | ا ماما               | 00             |         | Но                     | le ID.       |                |
|--|-------------------------------|-----------------------------------|--|----------------------|---|-----------|----------------------------|----------------------|---------------|-----------------------|------------------|----------|--|------------------|--------|---------------|----------------------|----------------|---------|------------------------|--------------|----------------|
| Project                                      |                               |                                   | '148   |                      |   |           |                            |                      |               |                       |                  |          |  | 드자               | HOIG   | atory F       | 1016 L               | og             |         | £                      | 42           |                |
| Engine                                       |                               |                                   | h Hende                                      |                      |   |           |                            |                      |               |                       |                  |          |  |                  |        |               |                      |                |         |                        |              |                |
| Employ<br>Ground                             |                               |                                   | erdeen H                                     | arbo                 | our Board   |           |                            | Cor                  | ordinate      | es                    | 39709            | 91.30 E, | 80503                                  | 37.20            | N Nat  | ional Grid    |                      |                |         | He                     | eader        |                |
| Date Sta                                     |                               |                                   | 09/2013                                      |                      |   |           |                            |                      |               |                       | 13/09            | •        |  |                  |        |               | Inclinat             | tion Ve        | ertica  | al                     |              |                |
| Тор  | Base                          | Туре                              | Date Star                                    | ted                  | Date Ende   | d Cr      | rew                        | Section<br>Logged I  | n C<br>By B   | Core<br>Barrel        | Core<br>Bit      |          | Equip                                  | ment             |        | Sho           | oring /<br>oport     |                | Re      | emarks                 |              |                |
| 0.00<br>0.50<br>2.60<br>5.00                 | 0.50<br>2.60<br>5.00<br>12.50 | CP<br>RO<br>RC<br>RC              | 12/09/20<br>12/09/20<br>12/09/20<br>12/09/20 | 13<br>13<br>13<br>13 | 12/09/201<br>12/09/201<br>12/09/201<br>13/09/201      | 3   T     | TT<br>TT<br>TT<br>MM       | DT<br>DT<br>DT<br>DT | 5 3           | 3/4 RR<br>SWF<br>6116 | Impreg<br>Impreg |          | Dando<br>Deltaba<br>Deltaba<br>Deltaba | se 520<br>se 520 | )      |               |                      |                |         |                        |              |                |
|  |                               |                                   |  |                      |   |           |                            |                      |               |                       |                  |          |  |                  |        |               |                      |                |         |                        |              |                |
|  |                               |                                   |  |                      | OCDESS.   | Щ         |                            |                      |               |                       |                  |          |  |                  |        |               | MTED CTD             | LLCEC          |         |                        |              |                |
| Date   | Ti                            | me                                | Hole   | Casi                 | OGRESS<br>ing Wate                                    | r         |                            | Rem                  | arks          |                       |                  | Dat      | te                                     | Tin              | ne     | Strike at     | VATER STR<br>Rise to | Tim            |         | Cas                    | sing dep     | oth .          |
| 12/09/20                                     | 013 1                         | 300                               | depth<br>0.50                                | 0.50                 |   |           | of CP                      | /Start of R          | otary         |                       |                  |          |  |                  |        | depth         | depth                | take<br>to ris | n<br>se | at strik<br>time       | e to         | o seal<br>flow |
| 12/09/20<br>12/09/20<br>12/09/20<br>13/09/20 | 013   1<br>013   1            | 530<br>900<br>700                 | 5.00<br>5.00<br>12.50                        | 2.5(<br>2.5)<br>2.5( | 0 -3.75<br>0 -5.10                                    | End Start | of Shi<br>t of Sh<br>of Ho | ift<br>hift          | Otaly         |                       |                  |          |  |                  |        |               |                      |                |         |                        |              |                |
|  |                               |                                   |  |                      |   |           |                            |                      |               |                       |                  |          |  |                  |        |               |                      |                |         | 1                      |              |                |
|  |                               |                                   | CAI  | RIFF                 | PERCUSSIO   | N DETA    | AII S                      |                      |               |                       |                  |          |  |                  |        |               | SPT DETA             | II S           |         |                        |              |                |
|  | Strata                        |                                   |  | Chis                 | elling  | Rema      |                            |                      |               |                       |                  | Depth    | Туре                                   | e In             |        | ental blow    | count /              | Hamm           |         | Energy                 | Casing       |                |
| 0.30   | 1                             | 0.50                              | Start ti<br>hhmr<br>1100                     | n                    | Duration<br>hhmm<br>0200                              | Chisel    | llina                      |                      |               |                       |                  | 0.50     | SPT                                    | 50/0             | •      | tration in n  | ım<br>               | No.            |         | ratio<br>%<br>75<br>75 | depth<br>N/A | depth          |
|  |                               |                                   |  |                      |   |           |                            |                      |               |                       |                  | 2.00     | SPT                                    | 50/1             | l0mm ( | (25/0,50/10)  |                      | AR36           | 2       | 75                     | 2.00         | -3.75<br>-3.75 |
|  |                               | т.                                | R  | OTAF                 | RY FLUSH D  | ETAILS    |                            | lusk                 |               | Flush                 |                  |          |  |                  |        |               |                      |                |         |                        |              |                |
| Fron<br>dept                                 |                               | To<br>depth                       |  |                      | Flush<br>type   |           | re                         | lush<br>eturn<br>%   |               | Flush<br>colour       |                  |          |  |                  |        |               |                      |                |         |                        |              |                |
| 0.50<br>5.00                                 |                               | 5.00<br>12.50                     |  |                      | Water<br>Water  |           |                            | 100<br>100           |               | Brown<br>Pink         |                  |          |  |                  |        |               |                      |                |         |                        |              |                |
|  |                               | AFTED                             | / 6461116                                    |                      | <u> </u>  |           |                            |                      |               |                       |                  |          |  |                  |        |               |                      |                |         |                        |              |                |
| Hole   | Depth                         | of Cas                            |  | h of                 | Тор   | Base      |                            | C SAMPL<br>iameter   | Time          |                       | covery           |          |  |                  |        |               |                      |                |         |                        |              |                |
| diameter<br>150<br>145<br>116                | 2.50<br>4.50<br>12.50         | 1                                 | neter cas<br>50 2.5                          |                      |   |           |                            |                      | hhmm          | SS                    | %                |          |  |                  |        |               |                      |                |         |                        |              |                |
|  |                               |                                   |  |                      |   |           |                            |                      |               |                       |                  |          |  |                  |        |               |                      |                |         |                        |              |                |
| Distance                                     | _                             |                                   | ATION DET                                    |                      |   |           |                            | PIPE CON             |               |                       |                  |          |  |                  |        |               |                      |                |         |                        |              |                |
| Distance<br>from G.L                         |                               |                                   | ype F  | Top                  | onse zone<br>p Base                                   | ID .      | Тор                        | Pipe<br>Base         | Dia<br>of pip |                       | pe of<br>pipe    |          |  |                  |        |               |                      |                |         |                        |              |                |
|  |                               |                                   |  |                      |   |           |                            |                      |               |                       |                  |          |  |                  |        |               |                      |                |         |                        |              |                |
|  |                               |                                   |  |                      |   |           |                            |                      |               |                       |                  |          |  |                  |        | * Seating blo | ows only.            |                |         |                        |              |                |
|  |                               |                                   |  |                      | ACKFILL DET   | AILS      |                            |                      |               |                       |                  |          |  |                  |        | GI            | ENERAL N             | OTES           |         |                        |              |                |
| Top o<br>sectio<br>0.00<br>2.50              | n s                           | ase of<br>ection<br>2.50<br>12.50 | A  | Arising<br>Grou      | gs  |           |                            | Rem                  | narks         |                       |                  |          |  |                  |        |               |                      |                |         |                        |              |                |
| NOTES  | Water                         | strike                            |  | n mir<br>ions,       | meters in m<br>nutes, hard<br>see key<br>.og Print Da | strata    | time                       |                      |               | 10:26                 | :46              |          |  |                  |        |               |                      | S              | OIL     | eng                    | inee         | RING           |

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Issue Date 22/10/2012

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

**Exploratory Hole Log** 

Hole ID.

A42

Sheet 1 of 2

Ground Level -3.29m CD Coordinates 397091.30 E, 805037.20 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend  | Depth  | Datum          | Sampling  |       |     |     | ount A<br>Recov |                  | In Situ Test                    | Insta |
|---|---|--------|----------------|-----------|-------|-----|-----|-----------------|------------------|---------------------------------|-------|
|   | 3   |        | Level          | Details   | Dia.  | +   | SCR | RQD             | IF               | Details                         | ation |
| No recovery. BOULDERS of granite. (Driller's description)  Rotary openhole drilling. Large BOULDERS of granite. (Driller's description)   |   | 0.50   | -3.79          |           |       |     |     |                 |                  | SPT50/0mm -<br>0.50 0.50 -<br>- |       |
| Rotary openhole drilling. Boulder CLAY. (Driller's<br>description)  |   | 2.20 - | -5.49<br>-5.79 |           |       |     |     |                 |                  | SPT50/10mm                      |       |
| Medium strong pink and grey coarse crystalline GRANITE. Discontinuities: 1) 10-20 degrees closely spaced planar rough clean and locally stained yellow on surfaces. from 2.50m to 2.70m weak and recovered as non intact core (angular coarse gravel and cobble sized fragments)  | *****   | 2.97 — | -6.26          | 2.50 3.50 | 107   | 100 | 27  | 26              | NI<br>NI<br>270  |                                 | # 1   |
| Medium strong locally weak pink and grey coarse crystalline GRANITE. Recovered as non intact core (angular coarse gravel and cobble sized fragments).  Strong pink and grey coarse crystalline GRANITE.  Discontinuities: 1) 10-20 degrees closely locally very closely spaced planar and undulose rough clean and locally stained yellow on surfaces. 2) 70-80 degrees closely spaced planar ough stained yellow and dark brown on surfaces. | *****<br>****<br>****<br>****<br>****<br>**** | 3.85   | -7.14<br>-7.79 | 3.50 5.00 | ) 107 | 67  | 37  | 25              | NI<br>150<br>200 | -                               |       |
| from 4.40m to 4.50m recovered as non intact core (angular coarse gravel sized fragments)  Assumed zone of no recovery. Highly weathered GRANITE.  Driller's description)  |   | 5.00   | -8.29          |           |       |     |     |                 | NA               | -                               |       |
| Veak dark grey and pink coarse crystalline GRANITE.  Discontinuities: 1) 10-20 degrees closely and very closely paced undulating rough stained yellow on surfaces. 2) 40-50 legrees closely spaced planar rough stained yellow and dark prown on surfaces.  from 5.00m to 5.30m recovered as non intact core (angular   | *****<br>****<br>****<br>****<br>****         | 6.20   | -9.49          | 5.00 6.20 | 89    | 83  | 58  | 11              | NI<br>60<br>130  | -                               |       |
| coarse gravel sized fragments) from 5.65m to 6.00m discontinuities 1) and 2) locally clay and sand infilled (<5mm) from 6.00m to 6.25m assumed zone of no recovery  | *****   |        |                | 6.20 7.00 | 89    | 100 | 51  | 0               |                  | -<br>-<br>-<br>-                |       |
| Medium strong locally weak dark grey coarse crystalline GRANITE. Discontinuities: 1) 10-20 degrees closely and very closely spaced planar and undulating rough stained yellow on surfaces. 2) 40-50 degrees closely spaced planar rough stained yellow on surfaces. from 6.36m to 6.49m, 6.64m to 6.80m, 6.90m to 7.00m, 7.20m to 7.50m and 7.65m to 7.90m recovered as non intact core (angular fine to coarse gravel sized fragments)       | * * * * * * * * * * * * * * * * * * *         | 8.00   | -11.29         | 7.00 8.00 | 89    | 90  | 35  | 0               | NI<br>40<br>60   | -                               |       |
| from 7.90m to 8.00m assumed zone of no recovery  Medium strong grey and pink coarse crystalline GRANITE.  Recovered as non intact core (angular fine to coarse gravel sized fragments).  Strong grey and pink coarse crystalline GRANITE.   |   | 8.60   | -11.89         | 8.00 9.50 | 89    | 97  | 35  | 0               | NI               | -<br>-<br>-<br>-<br>-           |       |
| Discontinuities: 1) 10-20 degrees closely locally very closely spaced planar rough clean. 2) 70-80 degrees closely spaced planar rough stained yellow and brown on surfaces. from 8.68m to 8.89m, 9.06m to 9.26m, 9.50m to 9.60m and 10.46m to 10.60m recovered as non intact core (angular coarse gravel sized fragments)  | *****<br>*****<br>*****<br>****<br>****       |        |                |           |       |     |     |                 | NI<br>680<br>170 | -                               |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Project No. TA7148

Engineer

Employer

Arch Henderson LLP Aberdeen Harbour Board

# **Exploratory Hole Log**

Hole ID.

A42

Sheet 2 of 2

Ground Level -3.29m CD Coordinates 397091.30 E, 805037.20 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend | Depth | Datum  | San   | npling |      | Blo<br>San | ow Co | ount A<br>Recov | And<br>very | In Situ Test | Insta |
|---|--------|-------|--------|-------|--------|------|------------|-------|-----------------|-------------|--------------|-------|
| bescription of strata   | Legena | Берин | Level  | Deta  | nils   | Dia. |            | SCR   |                 | IF          | Details      | ation |
| Strong grey and pink coarse crystalline GRANITE. Discontinuities: 1) 10-20 degrees closely locally very closely spaced planar rough clean. 2) 70-80 degrees closely spaced planar rough stained yellow and brown on surfaces. |        | 10.60 | -13.89 | 9.50  | 11.00  | 89   | 93         | 57    | 20              |             | :            |       |
| Medium strong locally weak dark grey coarse crystalline<br>BRANITE. Recovered as non intact core (slightly sandy angular<br>ne to coarse gravel sized fragments).   |        |       |        | 11.00 | 12.50  | 89   | 67         | 0     | 0               | NI          |              |       |
| ssumed zone of no recovery. Highly fractures weathered RANITE. (Driller's description)  |        | 12.00 | -15.29 |       |        |      |            |       |                 | NA          | -<br>-<br>-  |       |
| Exploratory hole complete at 12.50 m.   |        | 12.50 | -15.79 |       |        |      |            |       |                 |             |              |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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SOIL ENGINEERING Part of the Bachy Soletanche Group

| Project              | t Nam          | ne Bay          | of Ni           | gg Ha             | rbour Dev                  | elop   | ment                | Groun               | d Inves             | stigat           | tion             |          |                    | Evolo      | ratanı l                     | ا مام ا                | 00               | Н                | ole ID.      |                |
|----------------------|----------------|-----------------|-----------------|-------------------|----------------------------|--------|---------------------|---------------------|---------------------|------------------|------------------|----------|--------------------|------------|------------------------------|------------------------|------------------|------------------|--------------|----------------|
| Project              | t No.          |                 | 7148            |                   |                            |        |                     |                     |                     |                  |                  |          |                    | Exploi     | ratory l                     | noie L                 | og               | 1                | 47           |                |
| Engine               |                |                 |                 | derso             |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  | ,                | \ <i>¬ 1</i> |                |
| Employ               |                |                 |                 | Harb              | our Board                  |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  | Н                | eader        |                |
| Ground<br>Date Sta   |                |                 | 6m CD<br>09/201 | 3                 |                            |        |                     |                     | ordinate:<br>e Comp |                  |                  |          | 80502              | 28.50 N Na | itional Grid                 | Inclina                | tion Verti       | ical             |              |                |
| Тор                  | Base           | Туре            | Date 9          | Started           | Date Ende                  | d C    | rew                 | Sectior<br>Logged E | _                   | ore              | Core             |          | Equipr             | ment       | Sh                           | oring /<br>pport       | F                | Remarks          |              |                |
| 0.00                 | 0.10           | СР              |                 | /2013             | 03/09/201                  | 3      | TT                  | DT                  |                     |                  | Bit              |          | Dando              |            | Su                           | pport                  |                  |                  |              |                |
| 0.10<br>3.10         | 3.10<br>10.10  | RC<br>RC        | 03/09           | )/2013<br>)/2013  | 03/09/201<br>04/09/201     |        | MM<br>MM            | DT<br>DT            | T61                 | VF<br>116        | Impreg<br>Inpreg |          | Deltaba<br>Deltaba |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 | PE                | ROGRESS                    |        |                     |                     |                     |                  |                  |          |                    |            |                              | VATER STR              | IKES             |                  |              |                |
| Date                 | Т              | ïme             | Hole            |                   | sina Wate                  | er     |                     | Rema                | arks                |                  |                  | Dat      | e                  | Time       | Strike at                    | Rise to                | Time             | Ca               | sing dep     | oth            |
| 03/09/20             | 013            | 1830            | 0.10            | n de <sub>l</sub> |                            |        | d of CP             |                     |                     |                  |                  | <u> </u> |                    |            | depth                        | depth                  | taken<br>to rise | at strii<br>time | ie to        | o seal<br>flow |
| 04/09/20<br>04/09/20 | 013 (<br>013 ( | 0200<br>0700    | 0.10<br>7.20    | 0.1<br>0.1        | -8.60                      | Sta    | rt of Ro            | tary<br>ft          |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
| 05/09/20<br>05/09/20 | 013 (          | 0100<br>0515    | 7.20<br>10.10   | 0.1               | LO -9.20                   | Sta    | rt of Sh<br>d of Ho | ift                 |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 | CABLE             | PERCUSSIO                  | N DET  | AILS                |                     |                     |                  |                  |          |                    |            |                              | SPT DETA               | ILS              |                  |              |                |
|                      |                | Depth           | Sta             | Chis              | selling<br>  Duration      |        | narks               |                     |                     |                  |                  | Depth    | Туре               |            | nental blow<br>etration in i |                        | Hammer<br>No.    | Energy<br>ratio  | Casing depth | Water<br>depth |
| from<br>0.00         |                | 0.10            | hl              | 1400              | hhmm<br>0200               | Chise  | ellina              |                     | _                   |                  |                  | 0.00     | SPT                | _          | n (25/0,50/10                |                        | AR362            | %<br>75          | N/A          | -8.20          |
|                      |                |                 |                 |                   |                            |        | 3                   |                     |                     |                  |                  |          |                    |            | , ,                          | ,                      |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 | ROTA              | RY FLUSH [                 | ETAIL  |                     |                     |                     |                  |                  | ]        |                    |            |                              |                        |                  |                  |              |                |
| Fror<br>dept         |                | To<br>depth     | 1               |                   | Flush<br>type              |        |                     | ush<br>turn<br>%    |                     | lush<br>olour    |                  |          |                    |            |                              |                        |                  |                  |              |                |
| 0.10                 |                | 10.10           |                 |                   | Water                      |        |                     | 0                   |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
| шс                   | DIE DIA        | METER           | / CASII         | NG.               |                            | DV     | NIANAIA             | C SAMPL             | ING                 |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
| Hole                 | Depti          | n of Ca         | sing [          | epth of           | Тор                        | Base   |                     | ameter              | Time                |                  | overy            |          |                    |            |                              |                        |                  |                  |              |                |
| diameter<br>150      | 0.10           | ) 1             | neter<br>.50    | 0.10              |                            |        |                     |                     | hhmmss              | S S              | %                |          |                    |            |                              |                        |                  |                  |              |                |
| 145<br>116           | 3.10<br>10.1   |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      | ll .           | NSTALL          | ATION           | DETAILS           | 5                          |        | Р                   | IPE CONS            | STRUCT              | ION              |                  |          |                    |            |                              |                        |                  |                  |              |                |
| Distance<br>from G.L |                | Т               | уре             | Resp<br>To        | onse zone<br>p   Base      | ID     | Top                 | Pipe<br>  Base      | Dia.<br>of pipe     |                  | e of<br>oipe     |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 | B.                | ACKFILL DE                 | LVII & |                     |                     |                     |                  |                  |          |                    |            | * Seating bl                 | ows only.<br>iENERAL N | OTES             |                  |              |                |
| Top o                |                | Base of         |                 | Mate              |                            | T      |                     | Rem                 | arks                |                  |                  |          |                    |            |                              |                        | 0120             |                  | -            | -              |
| sectio<br>0.00       |                | ection<br>10.10 |                 | Grou              | ut                         |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  |          |                    |            |                              |                        |                  |                  |              |                |
|                      |                |                 |                 |                   |                            |        |                     |                     |                     |                  |                  | ļ        |                    |            |                              |                        |                  |                  |              |                |
| NOTES                | Wate           | r strike        | rise tin        | ne in mi          | meters in n<br>nutes, hard |        |                     | in hhmn             | n                   |                  |                  |          |                    |            |                              |                        |                  | 1                |              |                |
|                      | ⊦or d          | etails of       | abbre           |                   | , see key                  | to As  | d Time              | v. 22/12            | /2012 1             | I (1 · 2 · 7 · 1 | n/ <sub>4</sub>  |          |                    |            |                              |                        | SOL              | L eng            | inee         | BIDG           |

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Issue Date 22/10/2012

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

# **Exploratory Hole Log**

Hole ID.

A47

Sheet 1 of 2

Ground Level -5.56m CD Coordinates 397218.30 E, 805028.50 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend    | Depth  | Datum<br>Level | San  | npling |      |     |     | ount A<br>Recov |            | In Situ Test<br>Details           | Insta    |
|--|-----------|--------|----------------|------|--------|------|-----|-----|-----------------|------------|-----------------------------------|----------|
|  |           |        | Level          | Deta | ils    | Dia. | TCR | SCR | RQD             | IF         | Details                           | atioi    |
| No recovery. Possible GRANITE. (Driller's description)   | ++++      | 0.10   | -5.66          |      |        |      |     |     |                 | NI         | SPT50/10mm <sub>0.01</sub> = 0.00 |          |
| Strong pink and grey coarse crystalline GRANITE.   | ++++      | 0.30 - | -5.86          |      |        |      |     |     |                 | NI         | =                                 | V.4340   |
| Discontinuities: 1) 10-20 degrees closely spaced planar rough  |           | =      |                |      |        |      |     |     |                 |            | =                                 | 2100000  |
| clean.   |           | =      |                |      |        |      |     |     |                 |            | =                                 | 200000   |
| from 0.10m to 0.22m recovered as non intact core (angular cobble sized fragments)  |           |        |                | 0.10 | 1.60   | 107  | 100 | 85  | 60              |            | 1                                 |          |
| Strong dayly avoy CNEICS with alongly appead your thin hands of  |           | _      |                |      |        |      |     |     |                 |            | _                                 |          |
| Strong dark grey GNEISS with closely spaced very thin bands of light grey granitic inclusions. Discontinuities: 1) 20-30 | 222       | _      |                |      |        |      |     |     |                 |            | _                                 |          |
| degrees closely and medium spaced planar and undulating rough  |           | _      |                |      |        |      |     |     |                 |            | ĺ                                 |          |
| clean. 2) 80-90 degrees widely spaced planar rough clean.  |           | _      |                |      |        |      |     |     |                 | NI         | 3                                 |          |
| from 1.00m to 1.10m recovered as non intact core (angular coarse gravel sized fragments)                                 |           | -      |                |      |        |      |     |     |                 | 280        | ]                                 |          |
| coulou giutoi oizou muginemoj  | ****      | _      |                |      |        |      |     |     |                 | 400        |                                   |          |
| from 2.10m to 2.15m recovered as non intact core (angular  |           | 9 -    |                |      |        |      |     |     |                 |            | _                                 |          |
| coarse gravel sized fragments)   |           | _      |                | 1.60 | 3.10   | 107  | 100 | 97  | 85              |            | 12                                | 1120-113 |
|  |           | 1 -    |                |      |        |      |     |     |                 |            |                                   |          |
|  |           | -      |                |      |        |      |     |     |                 |            | =                                 | ATRA     |
|  |           | _      |                |      |        |      |     |     |                 |            |                                   | 2007     |
|  |           | -      |                |      |        |      |     |     |                 |            | i <del>-</del>                    |          |
| Strong light grey and pink coarse crystalline GRANITE.   | ****      | 3.28 - | -8.84          |      |        |      |     |     |                 |            | =                                 | 3037/2   |
| Discontinuities: 1) 20-30 degrees closely and medium spaced  | *****     | _      |                |      |        |      |     |     |                 |            | ]                                 |          |
| planar and undulose rough. 2) 80-90 degrees medium spaced.   | *****     |        |                |      |        |      |     |     |                 |            |                                   | 200100   |
|  | ****      | _      |                | 3.10 | 4.70   | 89   | 100 | 76  | 43              | NI         | _                                 | 222      |
| from 4.00m to 4.20m recovered as non intact core (angular  | *****     | -      |                |      |        |      |     |     |                 | 180<br>500 |                                   |          |
| coarse gravel and cobble sized fragments)  | *****     |        |                |      |        |      |     |     |                 | 555        | 1                                 |          |
| , , , , , , , , , , , , , , , , , , ,  | *****     | j -    |                |      |        |      |     |     |                 |            |                                   |          |
| from 4.50m to 4.68m recovered as non intact core (angular  | *****     | -      |                |      |        |      |     |     |                 |            | ]                                 |          |
| coarse gravel sized fragments)   |           | 4.70 - | -10.26         |      |        |      |     |     |                 |            | =                                 |          |
| Strong grey GNEISS with closely spaced very thin bands of  |           | _      |                |      |        |      |     |     |                 |            |                                   |          |
| light grey granitic inclusions. Discontinuities: 1) 20-30  |           | -      |                |      |        |      |     |     |                 | 400        | _                                 |          |
| degrees medium spaced undulose rough clean.  |           | -      |                |      |        |      |     |     |                 | 100<br>250 |                                   |          |
|  |           | _      |                | 4.70 | 6.20   | 89   | 100 | 100 | 71              | 540        | -                                 |          |
|  |           | -      |                |      |        |      |     |     |                 |            | _                                 |          |
|  |           |        | 11.50          |      |        |      |     |     |                 |            | -                                 | 2000     |
| Medium strong to strong light grey coarse crystalline GRANITE.   | *****     | 6.00 - | -11.56         |      |        |      |     |     |                 |            |                                   |          |
| Discontinuities: 1) 30-40 degrees closely to medium spaced   | *****     | _      |                |      |        |      |     |     |                 |            | =                                 |          |
| planar rough clean. 2) 70-80 degrees medium spaced planar rough clean.   | * * * * * | _      |                |      |        |      |     |     |                 |            | =                                 | 1,,,,,,, |
| from 6.00m to 6.30m weak   | ****      | _      |                | 6.20 | 7.20   | 89   | 100 | 100 | 80              |            | 1                                 |          |
|  | *****     | -      |                |      |        |      |     |     |                 |            | _                                 |          |
|  | *****     | _      |                |      |        |      |     |     |                 |            |                                   |          |
| from 7.20m to 7.44m recovered as non-intact care (angular  | *****     |        |                |      |        |      |     |     |                 |            | 1                                 |          |
| from 7.20m to 7.44m recovered as non intact core (angular coarse gravel sized fragments)                                 | *****     | =      |                |      |        |      |     |     |                 |            | =                                 |          |
| 3  |           | _      |                |      |        |      |     |     |                 |            | ]                                 |          |
|  | *****     | _      |                |      |        |      |     |     |                 |            | 13                                | 719771   |
|  | ****      | _      |                | 7.20 | 8.60   | 89   | 100 | 83  | 76              | NI         |                                   | 3107     |
|  | ****      | _      |                |      |        |      |     |     |                 | 200<br>520 | 1                                 |          |
|  |           | -      |                |      |        |      |     |     |                 |            | <u>-</u>                          |          |
|  | * * * * * |        |                |      |        |      |     |     |                 |            | -                                 |          |
| from 8.60m to 8.74m recovered as non intact core (angular  | *****     | _      |                |      |        |      |     |     |                 |            | -                                 | ******   |
| coarse gravel sized fragments)   | *****     | _      |                |      |        |      |     |     |                 |            |                                   |          |
|  | * * * * * |        |                | 8.60 | 9.60   | 89   | 100 | 86  | 50              |            |                                   |          |
|  | * * * * * | -      |                |      |        |      |     |     |                 |            |                                   |          |
|  | *****     | -      |                |      |        |      |     |     |                 |            | =                                 | 217714   |
|  | *****     | -      |                |      |        |      |     |     |                 |            | =                                 |          |
|  | *****     | _      | -              | 9.60 | 10.10  | 89   | 80  | 100 | 68              |            | ]                                 |          |
|  | ++++      | _      |                | 00   |        |      |     |     |                 |            |                                   | 2001     |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:27:08

SOIL ENGINEERING Part of the Bachy Soletanche Group

| Project Name | Bay of Nigg Harbour Development Ground Investigation |                      | Hole ID.     |
|--------------|--|----------------------|--------------|
| Project No.  | TA7148   | Exploratory Hole Log | ۸./7         |
| Engineer     | Arch Henderson LLP                                   |                      | A47          |
| Employer     | Aberdeen Harbour Board                               |                      | Sheet 2 of 2 |

397218.30 E, 805028.50 N National Grid Ground Level -5.56m CD Coordinates

CP+RC Hole Type Inclination

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

Issue,Revision No. 1.05

Form No. SIEXPHOLELOG

Log Print Date And Time: 23/12/2013 10:27:12

Issue Date 22/10/2012



| Project                                      | . Nam                 | e Bay                    | of Nig                        | g Ha                            | rbour De  | /elop   | men  | t Groun                     | d Inve          | stiga             | tion                    |              |                             | Evolo              | rati     | anı L               | Hole L           | 20       |           | Но           | ole ID.                        |                |
|--|-----------------------|--------------------------|-------------------------------|---------------------------------|---|---------|--|-----------------------------|-----------------|-------------------|-------------------------|--------------|-----------------------------|--------------------|----------|---------------------|------------------|----------|-----------|--------------|--------------------------------|----------------|
| Project                                      |                       |                          | 148                           |                                 |   |         |  |                             |                 |                   |                         |              |                             | Expic              | Jiau     | лу г                | TOIR L           | Jy       |           | L            | \51                            |                |
| Engine                                       |                       |                          | h Hend                        |                                 |   |         |  |                             |                 |                   |                         |              |                             |                    |          |                     |                  |          |           |              |                                |                |
| Employ<br>Ground                             |                       |                          | rdeen<br>5m CD                | Harb                            | our Board   |         |  | Cor                         | ordinate        |                   | 3972                    | 1/ 99 F      | 80//0                       | 52.60 N N          | lations  | d Grid              |                  |          |           | H            | eader                          |                |
| Date Sta                                     |                       |                          | 8/2013                        |                                 |   |         |  |                             | te Comp         |                   |                         |              | 00430                       | J2.00 N N          | vacioni  | ai Gilu             | Inclina          | tion '   | Vertio    | cal          |                                |                |
| Тор  | Base                  | Туре                     | Date St                       | arted                           | Date Ende   | d C     | rew  | Section                     | n Co            | ore               | Core                    |              | Equip                       | ment               |          | Sho                 | oring /          |          | R         | emarks       |                                |                |
| 0.00<br>2.10<br>7.80                         | 2.10<br>7.80<br>10.20 | CP<br>RC<br>RC           | 12/08/<br>12/08/<br>13/08/    | 2013                            | 12/08/201<br>13/08/201<br>13/08/201                     | 3       | DS<br>MM<br>MM                             | Logged DT<br>DT<br>DT<br>DT | S               | rrel<br>SF<br>116 | Bit<br>Impreg<br>Impreg | [            | Dando<br>Deltaba<br>Deltaba | se 520             |          | Suj                 | oport            |          |           |              |                                |                |
|  |                       |                          |                               |                                 |   |         |  |                             |                 |                   |                         |              |                             |                    |          |                     |                  |          |           |              |                                |                |
|  |                       |                          |                               | PF                              | ROGRESS   |         |  |                             |                 |                   |                         |              |                             |                    |          | ٧                   | VATER STR        | IKES     |           |              |                                |                |
| Date   | Ti                    | me                       | Hole<br>depth                 | Cas<br>de <sub>l</sub>          | sing Wate<br>pth dept                                   | er<br>h |  | Rem                         | arks            |                   |                         | Dat          | e                           | Time               | Str<br>d | rike at<br>epth     | Rise to<br>depth | tak      | me<br>ken | Ca:          | sing de <sub>l</sub><br>ke   t | pth<br>to seal |
| 12/08/20<br>12/08/20<br>13/08/20<br>13/08/20 | 013   1<br>013   0    | 330<br>900<br>700<br>200 | 2.10<br>5.40<br>5.40<br>10.20 | 2.1<br>5.4<br>5.4<br>5.4        | 60 -10.40<br>60 -9.90                                   | ) En    | d of CP<br>d of Sh<br>irt of SI<br>d of Ho | hift                        | otary           |                   |                         |              |                             |                    |          |                     |                  | 101      | rise_     | time         |                                | flow           |
|  |                       |                          |                               |                                 |   |         |  |                             |                 |                   |                         |              |                             |                    |          |                     |                  |          |           |              |                                |                |
|  |                       |                          | С                             | ABLE I                          | PERCUSSIO   | N DET   | TAILS                                      |                             |                 |                   |                         |              |                             |                    |          |                     | SPT DETA         | ILS      |           |              |                                |                |
| Hard<br>from                                 | Strata                | Depth<br>to              |                               | time                            | selling<br>  Duration                                   |         | narks                                      |                             |                 |                   |                         | Depth        | Туре                        |                    |          | al blow<br>ion in n | count /<br>nm    | Ham<br>N |           | Energy ratio | Casing depth                   | Water<br>depth |
| 1.80   |                       | 2.10                     | hhr<br>11                     |                                 | 0200  | Chis    | elling                                     |                             | _               |                   |                         | 0.50<br>1.50 | SPT<br>SPT                  | N=13 (2<br>N=34 (2 | ,2,3,3,3 | ,4)                 |                  | AR3      |           | 75<br>75     | N/A<br>1.50                    | -8.10<br>-8.30 |
|  |                       |                          |                               |                                 |   |         |  |                             |                 |                   |                         |              |                             |                    |          | ,                   |                  |          |           |              |                                |                |
| Fror   |                       | То                       |                               | ROTA                            | RY FLUSH [<br>Flush                                     | EIAIL   | F  | lush                        |                 | lush              |                         |              |                             |                    |          |                     |                  |          |           |              | 1                              |                |
| 2.10   | h                     | depth<br>5.20            |                               |                                 | type<br>Water   |         | re   | eturn<br>%<br>0             | C               | olour             |                         |              |                             |                    |          |                     |                  |          |           |              | 1                              |                |
| 5.20<br>5.40                                 |                       | 5.40<br>10.20            |                               |                                 | Water<br>Water  |         |  | 50<br>0                     | (               | Clear             |                         |              |                             |                    |          |                     |                  |          |           |              |                                |                |
| НС   | LE DIAI               | ИETER                    | / CASIN                       | G                               |   | DY      | NAMI                                       | C SAMPL                     | ING             |                   |                         | 1            |                             |                    |          |                     |                  |          |           |              | Ī                              |                |
| Hole<br>diameter<br>200<br>150<br>145<br>116 |                       | 2                        | neter c                       | pth of<br>asing<br>2.10<br>5.40 | Тор   | Base    | Di   | ameter                      | Time<br>hhmms   |                   | covery<br>%             |              |                             |                    |          |                     |                  |          |           |              |                                |                |
|  |                       |                          |                               |                                 |   |         |  |                             |                 |                   |                         |              |                             |                    |          |                     |                  |          |           |              | 1                              |                |
|  | IN                    | ISTALLA                  | ATION D                       | ETAILS                          | 5   |         | F  | IPE CON                     | STRUCT          | ION               |                         | ]            |                             |                    |          |                     |                  |          |           |              | 1                              |                |
| Distance<br>from G.L                         |                       | Ty                       | ype                           | Resp<br>To                      | onse zone<br>p   Base                                   | ID      | Тор  | Pipe<br>  Base              | Dia.<br>of pipe |                   | pe of<br>pipe           |              |                             |                    |          |                     |                  |          |           |              | 1                              |                |
|  |                       |                          |                               |                                 |   |         |  |                             |                 |                   |                         |              |                             |                    |          |                     |                  |          |           |              |                                |                |
|  |                       |                          |                               | R/                              | ACKFILL DE  | LVII &  |  |                             |                 |                   |                         |              |                             |                    | * Se     |                     | ows only.        | OTES     |           |              |                                |                |
| Торо   | f B                   | ase of                   |                               | Mate                            |   | IAILS   |  | Rem                         | arks            |                   |                         |              |                             |                    |          | u                   | EINEKAL IN       | OTES     |           |              |                                |                |
| sectio<br>0.00<br>5.20                       |                       | ection<br>5.20<br>10.20  |                               | Arisin<br>Grou                  |   |         |  |                             |                 |                   |                         |              |                             |                    |          |                     |                  |          |           |              |                                |                |
| NOTES  | Water                 | strike                   | rise time                     | in mi<br>ations,                | meters in m<br>nutes, hard<br>, see key<br>Log Print Da | l strat | a time                                     |                             |                 | 10:27             | :18                     | <u> </u>     |                             |                    |          |                     |                  | S        | SOIL      | . eng        | inec                           | ering          |

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Issue Date 22/10/2012

Arch Henderson LLP

Project No. TA7148

CP+RC

Engineer

Hole Type

**Exploratory Hole Log** 

Vertical

Hole ID.

A51

Sheet 1 of 2

Employer Aberdeen Harbour Board Ground Level -6.95m CD Coordinates

Inclination

| 397214.99 E, 804952.60 N National Grid |
|--|

| Description of Strata   | Legend                       | Depth            | Datum            | :                             | Sampling   |      |     |     | unt A<br>Recov |                 |                                | u Test | Instal |
|---|------------------------------|------------------|------------------|-------------------------------|--|------|-----|-----|----------------|-----------------|--------------------------------|--------|--------|
| ·   |                              | ·                | Level            | D                             | etails   | Dia. |     | SCR | RQD            | IF              | Det                            | ails   | ation  |
| Medium dense dark grey slightly silty slightly gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss, schist and quartz.  from 1.80m to 2.10m driller notes large boulders  |                              |                  |                  | D002<br>B003<br>ES004<br>D005 | 0.00<br>0.50-0.95<br>0.50-1.00<br>1.00<br>1.20<br>1.50-1.95<br>1.50-2.00<br>1.80 |      |     |     |                |                 | SPT13<br>0.50<br>SPT34<br>1.50 | 0.95   |        |
| Strong dark grey and pink COBBLES and BOULDERS of granite and   | \$ * \$ * \$<br>\$ * \$ * \$ | 2.10 -<br>2.25 - | -9.05<br>-9.20   |                               |  |      |     |     |                |                 |                                | -      |        |
| gneiss.  Assumed zone of no recovery. Large BOULDERS. (Driller's description)   |                              |                  |                  | 2.10                          | 3.20   | 107  | 14  | NA  | NA             |                 |                                | -      |        |
| Strong pink speckled grey BOULDER of granite.   | 000                          | 3.20 -<br>3.35 _ | -10.15<br>-10.30 | 3.20                          | 3.50   | 107  | 50  | NA  | NA             |                 |                                | -      |        |
| Assumed zone of no recovery. Large BOULDERS. (Driller's description)  | 0.000                        | 3.50 -<br>3.70 - | -10.45<br>-10.65 |                               |  |      |     |     |                |                 |                                | -      |        |
| Strong light and dark grey COBBLES and BOULDERS of granite.   | 0000                         | =                |                  | 3.50                          | 4.20   | 107  | 28  | NA  | NA             |                 |                                | _      |        |
| Assumed zone of no recovery. Large BOULDERS. (Driller's description)  | 0.00                         | 4.20 -           | -11.15           |                               |  |      |     |     |                |                 |                                | -      |        |
| No recovery. Large BOULDERS. (Driller's description)  | 0000                         |                  |                  | 4.20                          | 5.20   | 107  | 0   | NA  | NA             |                 |                                | -      |        |
| Strong to very strong grey and pink coarse crystalline  |                              | 5.20 -           | -12.15           | 5.20                          | 5.40   | 107  | 100 | 100 | 100            |                 |                                | -      |        |
| GRANITE. Discontinuities: 1) 20-30 degrees closely spaced planar rough clean. 2) 50-60 degrees medium spaced planar rough clean locally stained yellow on surface.  from 5.60m to 6.25m 1 No discontinuity 80-90 degrees undulating rough with yellow staining on surface | *****                        |                  |                  | 5.40                          | ) 6.30   | 107  | 100 | 100 | 74             | NI<br>75<br>360 |                                | -      |        |
| from 6.47m to 6.55m, 6.70m to 6.75m, 7.03m to 7.13m and 7.40m to 7.47m recovered as non intact core (angular coarse gravel sized fragments)   |                              |                  |                  | 6.30                          | 7.80   | 92   | 100 | 80  | 53             |                 |                                | -      |        |
| from 8.15m to 8.50m stained yellow. Recovered as non intact core (angular coarse gravel sized fragments)  from 8.69m to 8.80m stained yellow. Recovered as non intact core (angular coarse gravel sized fragments) from 8.90m to 9.10m assumed zone of no recovery.       | *****                        |                  |                  | 7.80                          | 9.10   | 92   | 83  | 46  | 19             |                 |                                | -      |        |
| from 9.10m to 9.20m recovered as non intact core (angular coarse gravel sized fragments) with yellow staining from 9.20m to 9.45m 2 No discontinuities 80-90 degrees planar rough with yellow staining on surface   | *****                        |                  |                  | 9.10                          | 0 10.20  | 92   | 100 | 91  | 59             |                 |                                | -      |        |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:27:22

SOIL ENGINEERING Part of the Bachy Soletanche Group

| Project Name | Bay of Nigg Harbour Development Ground Investigation |                      | Hole ID.     |
|--------------|--|----------------------|--------------|
| Project No.  | TA7148   | Exploratory Hole Log | ۸ ت 1        |
| Engineer     | Arch Henderson LLP                                   |                      | A51          |
| Employer     | Aberdeen Harbour Board                               |                      | Sheet 2 of 2 |

397214.99 E, 804952.60 N National Grid Ground Level -6.95m CD Coordinates

Hole Type CP+RC Inclination

| Description of Strata   | Legend  | Depth | Datum  | Sampling |      | Blo<br>San | ow Co<br>nple I | ount A<br>Recov | nd<br>erv | In Situ Test | Insta |
|---|---------|-------|--------|----------|------|------------|-----------------|-----------------|-----------|--------------|-------|
| Josephon of Strate  | Logona  | Dopt  | Level  | Details  | Dia. |            |                 | RQD             | IF        | Details      | ation |
| Remaining Detail: 9.20m - 10.20m: from 9.20m to 10.20m Discontinuities: 1) and 2) stained yellow on fracture surfaces Detail 9.45m - 10.20m: from 9.45m to 10.20m 1 No discontinuity 80-90 degrees planar rough stained yellow on surface Exploratory hole complete at 10.20 m. | + + + + | 10.20 | -17.15 |          |      |            |                 |                 |           | -            |       |
|   |         |       |        |          |      |            |                 |                 |           |              |       |
|   |         |       |        |          |      |            |                 |                 |           |              |       |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:27:26

Part of the Bachy Soletanche Group

| -                     |               | e Bay           | of Nig             | g Har         | rbour De               | velor            | omeni                   | t Ground           | l Inves         | tigatic          | on             |                      |                   | Evnlo                             | ratory  | Hole Lo           | 00                      | Hc                         | ole ID.              |                         |
|-----------------------|---------------|-----------------|--------------------|---------------|------------------------|------------------|-------------------------|--------------------|-----------------|------------------|----------------|----------------------|-------------------|-----------------------------------|---|-------------------|-------------------------|----------------------------|----------------------|-------------------------|
| Project               |               |                 | 7148               |               |                        |                  |                         |                    |                 |                  |                |                      |                   | Lybici                            | atory   | IUIC L            | Jy                      | 1                          | 454                  |                         |
| Engine                |               |                 | h Hende            |               |                        |                  |                         |                    |                 |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| Employ<br>Ground I    |               |                 | erdeen F<br>64m CD | Harbo         | our Board              | <u>t</u>         | —                       | Coo                | rdinates        |                  | 9721           | 12 14 F ;            | 20488             | 22 50 N Na                        | ational Grid  |                   |                         | H                          | leader               |                         |
| Date Sta              |               |                 | 08/2013            |               |                        |                  |                         |                    | e Comple        |                  |                |                      | 50 10.            | J2.30 11                          | Itional C   | Inclinat          | ation Verti             | cal                        |                      |                         |
| Тор                   | Base          | Туре            | Date Sta           | arted         | Date Ende              | ed               | Crew                    | Section            | Cor<br>y Barr   | re C             | Core<br>Bit    | E                    | Equip             | ment                              | Sh  | oring /<br>upport | F                       | Remarks                    |                      |                         |
| 0.00                  | 4.50          | СР              | 14/08/2            | 2013          | 14/08/203              |                  | DS                      | Logged By          |                 |                  |                |                      | Dando             | 3000                              | - 34  | pport             |                         |                            |                      |                         |
| 4.50<br>8.50          | 8.50<br>16.50 | RC<br>RC        | 14/08/2<br>16/08/2 |               | 16/08/201<br>16/08/201 |                  | MM<br>MM                | TW<br>TW           | SW<br>T611      |                  | npreg<br>npreg |                      |                   | ase 520<br>ase 520                |   | ļ                 |                         |                            |                      |                         |
|                       |               |                 |                    |               |                        |                  |                         | I                  |                 |                  |                |                      |                   |                                   |   | ļ                 |                         |                            |                      |                         |
|                       |               |                 |                    |               |                        |                  |                         | I                  |                 |                  |                |                      |                   |                                   |   | ļ                 |                         |                            |                      |                         |
|                       |               |                 |                    | PF            | ROGRESS                |                  | —                       |                    |                 |                  | $\dashv$       |                      |                   |                                   |   | WATER STR         | L<br>≀IKES              |                            |                      |                         |
| Date                  | Ti            | ime             | Hole<br>depth      | Casi          | sing Wat               | er               |                         | Remar              | rks             |                  | $\dashv$       | Date                 | е                 | Time                              | Strike at depth   |                   | Time<br>taken           | Cas<br>at strik            | sing dep             | oth<br>o seal           |
| 14/08/20              |               | .330            | 4.50               | 4.50          | 50 -7.60               | 0 En             |                         | Start of Rot       | tary            |                  | $\dashv$       | -                    | $\rightarrow$     |                                   | иерин   | uepin             | to rise                 | time                       | ie i                 | flow                    |
| 14/08/20<br>16/08/20  | 013   19      | 1900<br>1700    | 7.00<br>7.00       | 5.8<br>5.8    | 35 -9.00<br>35 -9.80   | 0 En             | nd of Shi<br>tart of Sh | ift<br>hift        | ,               |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| 16/08/20              | 13   2        | 2100            | 16.50              | 5.8!          | 35 -10.0               | ı0 En            | nd of Ho                | le                 |                 |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
|                       |               |                 | l                  |               |                        |                  |                         |                    |                 |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
|                       |               |                 | l                  |               |                        |                  |                         |                    |                 |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
|                       |               |                 | l                  |               |                        |                  |                         |                    |                 |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
|                       |               |                 | I                  |               |                        |                  |                         |                    |                 |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
|                       |               |                 | C                  | ABLE F        | PERCUSSIC              | ON DE            | TAILS                   |                    |                 |                  | $\neg$         |                      |                   |                                   |   | SPT DETA          | dLS                     |                            |                      |                         |
| Hard<br>from          | Strata I      | Depth<br>to     | Start 1            |               | selling<br>Duration    |                  | marks                   | -                  |                 |                  |                | Depth                | Туре              |                                   | nental blow<br>etration in  |                   | Hammer<br>No.           | Energy<br>ratio            | Casing depth         |                         |
| 4.30                  | +             | 4.50            | hhm<br>113         | mm            | hhmm<br>0200           |                  | iselling                |                    |                 |                  | $\dashv$       | 0.50                 | SPT               |                                   |   |                   | AR362                   | 75<br>75                   | N/A                  | -9.30                   |
|                       |               |                 |                    | I             |                        |                  |                         |                    |                 |                  |                | 1.50<br>2.50         | SPT<br>SPT        | N=17 (2,3<br>N=20 (3,3            | 2,2,3,3,3)<br>3,4,4,4,5)<br>3,4,5,5,6)<br>4,6,6,7,8)<br>9,10,12,13,16 |                   | AR362<br>AR362          | 75<br>75                   | 1.50<br>2.50         | -9.10<br>-8.60          |
|                       |               |                 |                    | I             |                        |                  |                         |                    |                 |                  |                | 3.50<br>5.20<br>7.00 | SPT<br>SPT<br>SPT | N=21 (3,4<br>N=51 (6,9<br>50/85mm | ,6,6,7,8)<br>),10,12,13,16<br>n (21,4/0,39,1                          | .)<br>11/10)      | AR362<br>AR362<br>AR362 | 75<br>75<br>75<br>75<br>75 | 3.50<br>5.20<br>5.85 | -8.10<br>-8.50<br>-8.90 |
|                       |               |                 |                    | I             |                        |                  |                         |                    |                 |                  |                | 8.50<br>10.00        | SPT<br>SPT        | 50/220m<br>50/80mm                | n (21,4/0,39,1<br>ım (9,14,15,1<br>n (17,8/5,37,1                     | 7,18/70)<br>13/5) | AR362<br>AR362          | 75<br>75                   | 5.85<br>8.40         | -9.60<br>-9.00          |
|                       |               |                 |                    | ROTAI         | RY FLUSH I             | DETAI            |                         |                    |                 |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| From<br>dept          |               | To<br>depth     | _                  |               | Flush<br>type          |                  | re                      | lush<br>eturn<br>% |                 | lush<br>olour    |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| 4.50<br>8.00          | $\top$        | 8.00<br>9.00    |                    |               | Water<br>Water         |                  | 1                       | %<br>100<br>50     |                 | rown             | $\exists$      |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| 9.00<br>11.00         |               | 11.00<br>13.50  |                    |               | Water<br>Water         |                  | 1                       | 90<br>100          | Bro<br>Cl       | rown<br>Ilear    |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| 13.50<br>15.00        |               | 15.00<br>16.50  |                    |               | Water<br>Water         |                  |                         | 80<br>100          |                 | t brown<br>Ilear |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
|                       |               |                 |                    |               |                        |                  |                         |                    |                 |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| ПС                    | T DIM         | ACTED           | / CASING           |               |                        |                  | VALABAI.                | CCAMADIL           | NC.             |                  | $\dashv$       |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| Hole                  | Depth         |                 |                    | g<br>pth of   | Тор                    | Base             |                         | C SAMPLII          | Time            | Recov            | ery            |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| diameter<br>150       | hole<br>5.85  | dian            | neter ca           | asing<br>8.40 | <u> </u>               |                  | +                       |                    | nhmmss          |                  | $\dashv$       |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| 145<br>116            | 8.50<br>16.50 |                 |                    |               |                        |                  |                         |                    | İ               |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
|                       |               |                 |                    | l             |                        |                  |                         |                    | İ               |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
|                       |               |                 |                    | l             |                        |                  |                         |                    | İ               |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
|                       | IN            | ISTALL/         | ATION DE           | ETAILS        | ;                      |                  | P                       | PIPE CONS          | TRUCTIO         | ON               |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| Distance<br>from G.L. |               | T               | уре                | Respo         | onse zone              | ID               | Top                     | Pipe<br>  Base     | Dia.<br>of pipe | Type o           |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
|                       | 1             |                 |                    | <u> </u>      | -                      | <u> </u>         |                         |                    |                 | <u> </u>         | Ì              |                      |                   |                                   |   |                   |                         |                            |                      |                         |
|                       |               | l               |                    |               |                        |                  |                         |                    |                 |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| <u> </u>              | Ш             |                 |                    |               | : 5::EU   DI           |                  | <u></u>                 |                    |                 | <u></u>          | _              |                      | <u> </u>          |                                   | * Seating bl  |                   |                         |                            |                      |                         |
| Top of                | f B           | ase of          | T                  | BA<br>Mater   | ACKFILL DE             | TAILS            |                         | Rema               |                 |                  | $\dashv$       |                      |                   |                                   |   | GENERAL N         | OTES                    |                            |                      |                         |
| section<br>0.00       | n se          | ection<br>11.50 |                    | Arising       | ıgs                    | +                |                         |                    |                 |                  | $\dashv$       |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| 11.50                 | 1             | 16.50           |                    | Grou          | .t                     |                  |                         |                    |                 |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
|                       |               |                 |                    |               |                        |                  |                         |                    |                 |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
|                       |               |                 |                    |               |                        |                  |                         |                    |                 |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| <u> </u>              | $\perp$       |                 |                    |               |                        | 丄                |                         |                    |                 |                  |                |                      |                   |                                   |   |                   |                         |                            |                      |                         |
| NOTES:                | Water         | r strike ı      | rise time          | in mir        | meters in r            | nillim<br>d stra | etres.<br>Ita time      | e in hhmm          | 1               |                  |                |                      |                   |                                   |   |                   |                         | 4                          |                      |                         |
| <u> </u>              | For de        | tails of        | f abbrevia         | ations,       | , see key              |                  |                         |                    |                 | 3 3 7 9 1        |                |                      |                   |                                   |   |                   | SOU                     | L eng                      | IDAA                 | יטוחפ                   |
| 1                     |               |                 |                    | - 1           | ∟oa Print D            | ate A            | .∩d I im′               | e: 23/12/2         | 2013 10         | 0:27:31          |                |                      |                   |                                   |   |                   | 3011                    | _ CIIG                     | lilee                | KIIIG                   |

Log Print Date And Time: 23/12/2013 10:27:31

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Engineer

Ground Level

Arch Henderson LLP

**Exploratory Hole Log** 

Hole ID.

A54

Sheet 1 of 2

Employer Aberdeen Harbour Board

-6.64m CD

Coordinates 397212.14 E, 804882.50 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend                                | Depth                      | Datum<br>Level             |                | Sampling                       |           |     |          | ount A<br>Recov |    | In Situ Te<br>Details  | st Instal ation |
|--|---------------------------------------|----------------------------|----------------------------|----------------|--------------------------------|-----------|-----|----------|-----------------|----|------------------------|-----------------|
|  |                                       |                            | Level                      | [              | Details                        | Dia.      | TCR | SCR      | RQD             | IF | Details                | ation           |
| Medium dense grey slightly silty slightly gravelly fine to coarse SAND. Gravel is subangular to rounded fine of mixed igneous and metamorphic lithologies.   |                                       | -                          |                            | D001 D002 B003 | 0.50-0.95<br>0.50-1.00         |           |     |          |                 |    | SPT11<br>0.50 0.       | 95 -            |
|  |                                       | -                          |                            | D005<br>B006   | 1.50-1.95<br>1.50-2.00         |           |     |          |                 |    | SPT17<br>1.50 1.       | 95              |
|  |                                       |                            |                            | D007 D008 B009 | 2.20<br>2.50-2.95<br>2.50-3.00 |           |     |          |                 |    | SPT20<br>2.50 2.       | 95 -            |
|  |                                       |                            |                            | D011<br>B012   | 3.50-3.95<br>3.50-4.00         |           |     |          |                 |    | SPT27<br>3.50 3.       | 95 -            |
| No recovery. OBSTRUCTION. (Driller's description)  | 2.00.000                              | 4.30 -                     | -10.94                     |                |                                |           |     |          |                 |    |                        |                 |
| Grey subangular to subrounded fine to medium GRAVEL of granite and schist.   |                                       | 4.50 -<br>4.65 _<br>4.90 - | -11.14<br>-11.29<br>-11.54 | 4.5            | 0 5.20                         | 107       | 57  | NA       | NA              |    |                        |                 |
| Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mixed igneous and metamorphic lithologies.  | 0 0 0                                 | 5.20 -<br>5.35 _           | -11.84<br>-11.99           |                |                                |           |     |          |                 |    | SPT51<br>5.20 5.       | 65 -            |
| Assumed zone of no recovery. Boulder CLAY. (Driller's description)   | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 5.55 <u> </u>              | -12.19                     | 5.2            | 0 6.00                         | 107       | 44  | NA       | NA              |    |                        |                 |
| Multicoloured subangular to rounded fine to medium GRAVEL of mixed igneous and metamorphic lithologies.  |                                       | 6.00 —                     | -12.64                     |                |                                |           |     |          |                 |    |                        |                 |
| Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mixed igneous and metamorphic lithologies.  Assumed zone of no recovery. Boulder CLAY. (Driller's         |                                       |                            |                            | 6.0            | 0 7.00                         | 107       | 85  | NA       | NA              |    |                        |                 |
| description)  Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mixed igneous and metamorphic lithologies.  from 6.85m to 7.00m assumed zone of no recovery |                                       | 7.40                       | -14.04                     | 7.0            | 0 8.00                         | 107       | 40  | NA       | NA              | ļ  | SPT50/85mm<br>7.00 7.  | 16 -            |
| Assumed zone of no recovery. Boulder CLAY. (Driller's description)   | P 0 0 0                               | 8.00 —                     | -14.64                     |                |                                |           |     |          |                 | NA |                        |                 |
| Stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies. from 8.50m to 8.55m angular medium gravel of granite                       |                                       |                            |                            | 8.0            |                                | 107<br>92 | 90  | NA<br>NA | NA<br>NA        |    | SPT50/220mm<br>8.50 8. | 37 -            |
| from 8.90m to 9.00m assumed zone of no recovery  | 130                                   | j -                        |                            |                |                                |           |     |          |                 |    |                        |                 |
| from 9.18m to 9.34m 1 No very strong pink and grey boulder of granite  |                                       | -                          |                            | 9.0            | 0 10.00                        | 92        | 74  | NA       | NA              |    |                        |                 |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:27:34

Form No. SIEXPHOLELOG Issue Date 22/10/2012



Project No. TA7148 Engineer

Employer

Arch Henderson LLP Aberdeen Harbour Board **Exploratory Hole Log** 

Hole ID. A54

Sheet 2 of 2

Ground Level -6.64m CD Coordinates 397212.14 E, 804882.50 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend  | Depth                      | Datum            | Sar   | mpling |      |     |     | ount A<br>Recov |                 | In Situ Test                  | Insta |
|---|---|----------------------------|------------------|-------|--------|------|-----|-----|-----------------|-----------------|-------------------------------|-------|
|   |   |                            | Level            | Deta  | ails   | Dia. | TCR | SCR | RQD             | IF              | Details                       | ation |
| Remaining Detail : 9.74m - 10.00m : from 9.74m to 10.00m assumed zone of no recovery  |   | -                          |                  | 10.00 | 11.00  | 92   | 66  | NA  | NA              |                 | SPT50/80mm <sub>10.16</sub> - |       |
| Assumed zone of no recovery. Boulder CLAY. (Driller's description)  |   | 10.66<br>-<br>-<br>11.00 — | -17.30<br>-17.64 |       |        |      |     |     |                 |                 |                               |       |
| Stiff brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of granite and schist. Cobbles are   | 0 0 0   | 11.00                      | -17.89           |       |        |      |     |     |                 |                 | -                             |       |
| subangular of schist.  Brown and grey subangular to angular fine to medium GRAVEL of  | ****  | 11.65 _<br>-               | -18.29           | 11.00 | 12.00  | 92   | 90  | 20  | 10              |                 |                               |       |
| schist and granite. from 11.55m to 11.65m assumed zone of no recovery   |   | =                          |                  |       |        |      |     |     |                 |                 |                               |       |
| Strong pink and grey coarse crystalline GRANITE.  Discontinuities: 1) 10-30 degrees very closely to closely spaced planar rough locally stained orangish brown. 2) 60-80 degrees closely to medium spaced planar rough stained orangish brown.  from 11.65m to 11.75m recovered as non intact core (angular coarse gravel sized fragments) at 11.84m 1 No discontinuity 0 degrees planar rough stained brown  |   | -                          |                  | 12.00 | 13.50  | 92   | 100 | 83  | 30              |                 | -                             |       |
| at 11.88m 1 No incipient fracture 0 degrees planar from 11.92m to 12.00m recovered as non intact core (angular coarse gravel sized fragments) at 12.64m 1 No discontinuity 0 degrees planar rough clean at 12.68m 1 No discontinuity 0 degrees planar rough clean from 12.82m to 13.00m recovered as non intact core (angular coarse gravel sized fragments) at 13.16m 1 No discontinuity 0 degrees planar rough clean from 13.30m to 13.90m recovered as non intact core (angular coarse gravel sized fragments) | *****<br>****<br>****<br>****<br>****<br>****<br>****         |                            |                  | 13.50 | 15.00  | 92   | 100 | 65  | 23              | NI<br>80<br>250 | -                             |       |
| at 14.05m 1 No incipient fracture 0 degrees planar from 14.30m to 14.33m 1 No incipient fracture 30 degrees planar from 14.36m to 14.46m recovered as non intact core (angular cobble sized fragments) from 14.49m to 14.53m 1 No discontinuity 10-70 degrees curved rough clean from 14.68m to 14.85m recovered as non intact core (angular medium to coarse gravel sized fragments and angular cobble sized fragments) from 14.90m to 15.25m recovered as non intact core (angular                              | *****<br>****<br>****<br>****<br>****<br>****<br>****<br>**** |                            | -23.14           | 15.00 | 16.50  | 92   | 100 | 80  | 62              |                 |                               |       |
| rrom 14.90m to 15.25m recovered as non intact core (angular medium to coarse gravel sized fragments) at 15.49m 1 No incipient fracture 0 degrees planar from 15.70m to 15.85m recovered as non intact core (angular cobble sized fragments)  Exploratory hole complete at 16.50 m.  |   | 16.50                      | -23.14           |       |        |      |     |     |                 |                 |                               |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Part of the Bachy Soletanche Group



| Project                          | . Nam          | іе Вау                  | of Nigo                 | g Har                | rbour Dev                | /elop        | ment                                | : Ground             | Inves         | tigatio     | on           |                         |                         | Fynlo                         | raton   | Hole L  | 00                      | Нс   | ole ID.                 |                          |
|----------------------------------|----------------|-------------------------|-------------------------|----------------------|--------------------------|--------------|-------------------------------------|----------------------|---------------|-------------|--------------|-------------------------|-------------------------|-------------------------------|---|---|-------------------------|--|-------------------------|--------------------------|
| Project                          |                | TA7                     |                         |                      |                          |              |                                     |                      |               |             |              |                         |                         | LXPIO                         | ratory  | TIOIC L   | Jg                      | ļ  | <b>\</b> 57             |                          |
| Engine                           |                |                         | h Hende                 |                      |                          |              |                                     |                      |               |             |              |                         |                         |                               |   |   |                         |  |                         |                          |
| Employ<br>Ground                 |                |                         | raeen F<br>8m CD        | 1агис                | our Board                | —            | —                                   | Coor                 | rdinates      | 3           | 9720         | 08.04 E,                | 80480                   | 9.81 N N                      | ational Gr  | id  |                         | Гп   | eader                   |                          |
| Date Sta                         |                |                         | 8/2013                  |                      |                          |              |                                     |                      | Comple        |             |              |                         |                         |                               |   |   | tion Verti              | cal  |                         |                          |
| Тор                              | Base           | Туре                    | Date Sta                | arted                | Date Ende                | d C          | Crew                                | Section<br>Logged By | Cor<br>y Barr | re C        | Core<br>Bit  | F                       | Equipr                  | nent                          | :   | Shoring /<br>Support  | F                       | Remarks  |                         |                          |
| 0.00<br>8.20                     | 8.20<br>17.30  | CP<br>RC                | 06/08/2<br>07/08/2      |                      | 07/08/201<br>08/08/201   | 3            | DS<br>MM                            | TW<br>TW             | Geob          | ore Im      | npreg        | D                       | Dando<br>Deltabas       |                               |   | X-F1  |                         |  |                         |                          |
| 17.30                            | 32.00          | RC                      | 08/08/2                 |                      | 11/08/201                | 3            | MM                                  | TW                   | T61:          | 16 Im       | npreg        | D                       | Deltabas                |                               |   |   |                         |  |                         |                          |
|                                  |                |                         |                         |                      |                          |              |                                     |                      |               |             |              |                         |                         |                               |   |   |                         |  |                         |                          |
| ı <u> </u>                       |                |                         |                         |                      |                          |              |                                     |                      |               | $\perp$     |              | l                       |                         |                               |   |   |                         |  |                         |                          |
|                                  |                |                         |                         | PR                   | ROGRESS                  |              |                                     |                      |               |             |              |                         |                         |                               |   | WATER STR   | IKES                    |  |                         |                          |
| Date                             | _   T          | ime                     | Hole<br>depth           | Casi<br>dep          | sing Wate<br>oth depti   |              | _                                   | Remar                | ks            | _           | _            | Date                    | е                       | Time                          | Strike<br>depth   | Rise to depth   | Time<br>taken           | Cas<br>at strik<br>time  | sing dep<br>ke to       | oth<br>o seal<br>flow    |
| 06/08/20<br>07/08/20             |                | 2130<br>0700            | 5.80<br>5.80            | 5.80<br>5.80         |                          |              | d of Shi<br>art of Sh               |                      |               |             | $\exists$    |                         |                         |                               |   | +   | to rise                 | Line   | +                       | low                      |
| 07/08/20<br>07/08/20             | 013   1        | 1300<br>1930            | 8.40<br>11.90           | 8.40<br>8.40         | -8.90<br>-7.30           | End<br>End   | d of CP/<br>d of Shi                | /Start of Rot<br>ift | ary           |             |              |                         |                         |                               |   |   |                         |  |                         |                          |
| 08/08/20<br>08/08/20<br>10/08/20 | )13   2        | 0700<br>2000<br>0700    | 11.90<br>20.00<br>20.00 | 8.40<br>13.4<br>13.4 | 40 -6.90                 | ) End        | art of Sh<br>Id of Shi<br>art of Sh | ift                  |               |             |              |                         |                         |                               |   |   |                         |  |                         |                          |
| 10/08/20<br>11/08/20             | 013 2          | 2000<br>0700            | 29.50<br>29.50          | 16.4<br>16.4         | 40 -7.10<br>40 -7.90     | ) End<br>Sta | id of Shi<br>art of Sh              | ift<br>nift          |               |             |              |                         |                         |                               |   |   |                         |  |                         |                          |
| 11/08/20                         | /13            | 1900                    | 32.00                   | 16.4                 | 40 -7.70                 | End          | id of Hol                           | ıe                   |               |             |              |                         |                         |                               |   |   |                         |  |                         |                          |
|                                  |                |                         |                         |                      |                          |              |                                     |                      |               |             |              |                         |                         |                               |   |   |                         |  |                         |                          |
|                                  |                |                         |                         | ARIF F               | PERCUSSIO                | N DE.        | TAILS                               |                      |               |             | $\dashv$     |                         |                         |                               |   | SPT DETA  | II Ç                    |  |                         | -                        |
|                                  | Strata         | •                       |                         | Chis                 | selling                  | Rem          | narks                               |                      |               |             | $\dashv$     | Depth                   | Туре                    |                               |   | ow count /  | Hammer                  |  | Casing                  |                          |
| from<br>8.20                     |                | to<br>84.00             | Start t<br>hhm          | nm                   | Duration<br>hhmm<br>0200 |              | selling                             |                      |               |             |              | 0.50                    | SPT                     | pen<br>N=11 (2,3              | etration i  | ı mm  | No.<br>AR362            | ratio<br>%   | depth<br>N/A            | depth<br>-9.80           |
| 0.20                             |                | 84.∪∪                   | 100                     | 10                   | 0200                     | Cins         | anny                                |                      |               |             |              | 1.50<br>2.50            | SPT<br>SPT              | N=16 (3,1<br>N=17 (2,1        | 3,3,4,4,5)<br>2,4,4,4,5)                                |   | AR362<br>AR362          | 75<br>75<br>75   | 1.50<br>2.50            | -9.50<br>-9.00           |
|                                  |                |                         |                         |                      |                          |              |                                     |                      |               |             |              | 3.50<br>4.50<br>6.00    | SPT<br>SPT<br>SPT       | N=21 (3,4                     | 4,4,5,6,6)<br>4 4 6 6 7)                                | 16172/5)  | AR362<br>AR362<br>AR362 | 75<br>75   | 3.50<br>4.50<br>6.00    | -8.10<br>-6.80<br>-6.30  |
|                                  |                |                         |                         |                      |                          |              |                                     |                      |               |             |              | 7.00<br>9.00            | SPT                     | 50/215m<br>50/295m            | nm (9,15,16<br>nm (8,10,11                              | ,16,17,3/5)<br>,19,15/65)<br>,13,13,13/70)                                  | AR362<br>AR362          | 75<br>75   | 7.50<br>9.00            | -6.80<br>-11.30          |
|                                  |                |                         |                         | ROTAF                | RY FLUSH D               | ETAII        |                                     |                      |               |             |              | 10.50<br>11.90<br>14.20 | SPT(C<br>SPT(C<br>SPT(C | 50/225m<br>50/215m<br>50/135n | nm (7,12,13<br>nm (7,13,14<br>nm (11.14/                | ,13,13,13/70)<br>,13,13,13/70)<br>,16,18,3/0)<br>,20,16/65)<br>50,27,23/60) | AR362<br>AR362<br>AR362 | 75<br>75<br>75   | 10.50<br>11.90<br>13.40 | -11.00<br>-6.80<br>-8.30 |
| Fron<br>dept                     |                | To<br>depth             | _                       |                      | Flush<br>type            |              | ref                                 | lush<br>turn<br>%    |               | ush<br>lour | _            | 15.80<br>17.30          | SPT(C                   | 50/1/0m<br>50/200m            | ım (8,10,13<br>ım (6,8,15,2                             | ,19,18/20)<br>21,14/50)   | AR362<br>AR362          | 75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75 | 13.40<br>13.40          | -10.20<br>-9.90          |
| 8.40<br>12.70                    |                | 12.70<br>14.20          | $\top$                  |                      | Water<br>Water           |              | !                                   | 0<br>50              | Br            | rown        | $\neg$       | 18.80<br>20.00<br>21.80 | SPT(C<br>SPT(C<br>SPT(C | 50/10011<br>50/5mm<br>50/75mr | im (17,8/10<br>(25/0,50/5<br>n (17,8/5,4<br>n (25/70,46 | ),34,16/25)<br>)<br>3,7/0)  | AR362<br>AR362<br>AR362 | 75<br>75<br>75   | 13.40<br>13.40<br>16.40 | -9.90<br>-8.70<br>-8.00  |
| 14.20<br>15.20<br>18.80          |                | 15.20<br>18.80<br>20.30 |                         |                      | Water<br>Water<br>Water  | l            | !                                   | 0<br>50<br>0         | Br            | rown        |              | 23.30<br>24.50          | SPT(C                   | :)I 50/80mr                   | n (14.11/3(   | ).38.12/5)  | AR362<br>AR365<br>AR362 | 75<br>75<br>75   | 16.40<br>16.40<br>16.40 | -8.90<br>-9.80<br>-10.10 |
| 20.30<br>21.80                   |                | 21.80<br>23.20          |                         |                      | Water<br>Water           | l            | !                                   | 50<br>0              |               | lear        |              | 27.50                   | SPT(C                   | 50/55mr<br>50/160m            | ım (7,10,13   | ,17,20/10)  | AR362<br>AR362          | 75   | 16.40                   | -10.10                   |
| 23.20<br>27.50                   |                | 27.50<br>32.00          |                         |                      | Water<br>Water           | ļ            |                                     | 50<br>0              | CI            | lear        |              |                         |                         |                               |   |   |                         |  | 1                       |                          |
| НО                               | LE DIA         | METER                   | / CASING                | à                    |                          | DY           | NAMI                                | C SAMPLIN            | NG            |             | $\neg$       |                         |                         |                               |   |   |                         |  | İ                       |                          |
| Hole<br>diameter                 | Depth          |                         |                         | pth of<br>ising      | Тор                      | Base         | Dia                                 |                      | Time<br>hmmss | Recov       | <i>r</i> ery |                         |                         |                               |   |   |                         |  | İ                       |                          |
| 200<br>150                       | 8.40<br>16.40  | 0 15                    | 00 8                    | 3.40<br>6.40         |                          |              |                                     |                      |               |             |              |                         |                         |                               |   |   |                         |  | İ                       |                          |
| 145<br>116                       | 17.30<br>32.00 |                         |                         |                      |                          |              |                                     |                      |               |             |              |                         |                         |                               |   |   |                         |  | 1                       |                          |
|                                  |                |                         |                         |                      |                          |              |                                     |                      |               |             |              |                         |                         |                               |   |   |                         |  | 1                       |                          |
|                                  | 11             | VISTALLA                | ATION DE                | TAILS                |                          | —            | <u></u>                             | IPE CONST            | TRUCTI        | ON          | $\dashv$     |                         |                         |                               |   |   |                         |  | 1                       |                          |
| Distance                         | ID             |                         |                         | Respo                | onse zone                | ID           | F                                   | Pipe                 | Dia.          | Туре        |              |                         |                         |                               |   |   |                         |  | İ                       |                          |
| from G.L                         |                |                         |                         | Top                  | p Base                   | H            | Тор                                 | Base                 | of pipe       | pip         | ie           |                         |                         |                               |   |   |                         |  | İ                       |                          |
|                                  |                |                         |                         |                      |                          |              |                                     |                      | I             |             |              |                         |                         |                               |   |   |                         |  | İ                       |                          |
|                                  | <u></u>        |                         |                         |                      | NOVELLA DE               |              | Щ                                   | $\bot$               |               |             | 4            |                         | <u></u>                 |                               | * Seating   | blows only.   |                         |  |                         |                          |
| Top of                           | f E            | Base of                 |                         | BA<br>Mater          | ACKFILL DET              | AILS         |                                     | Remai                |               |             | $\dashv$     |                         |                         |                               |   | GENERAL N   | OTES                    |  |                         |                          |
| section<br>0.00                  | n s            | ection<br>27.00         |                         | Arising              |                          | ┼            | —                                   |                      |               |             | $\dashv$     |                         |                         |                               |   |   |                         |  |                         |                          |
| 27.00                            |                | 32.00                   |                         | Grou                 | í                        |              |                                     |                      |               |             |              |                         |                         |                               |   |   |                         |  |                         |                          |
|                                  |                |                         |                         |                      |                          |              |                                     |                      |               |             |              |                         |                         |                               |   |   |                         |  |                         |                          |
|                                  |                |                         |                         |                      |                          |              |                                     |                      |               |             |              |                         |                         |                               |   |   |                         |  |                         |                          |
| NOTES:                           | ΔII de         | nthe in                 | metres a                | all diar             | meters in m              |              | etres                               |                      |               |             |              |                         |                         |                               |   |   |                         |  |                         |                          |
| NOTES.                           | Wate           | r strike r              |                         | in mir               | nutes, hard              |              |                                     | in hhmm              |               |             |              |                         |                         |                               |   |   |                         | 1  |                         |                          |
|                                  |                |                         |                         |                      | Log Print Da             | ate Ar       | ıd Tim                              | e: 23/12/2           | 2013 1        | 0:27:54     | -            |                         |                         |                               |   |   | SOI                     | L eng  | inee                    | RING                     |

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

# **Exploratory Hole Log**

Hole ID.

A57

Sheet 1 of 4

Ground Level -6.28m CD Coordinates 397208.04 E, 804809.81 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend                                  | Depth        | Datum  |              | Sampling               |      | Blo<br>Sam | w Co | unt Ai | nd<br>erv |                   | ı Test          | Ins |
|--|---|--------------|--------|--------------|------------------------|------|------------|------|--------|-----------|-------------------|-----------------|-----|
| _ 555p.i.5. 5. 5ata  | Logona                                  |              | Level  |              | Details                | Dia. | TCR        | SCR  |        | IF        | Det               | ails            | ati |
| edium dense grey slightly gravelly silty fine to coarse SAND.  |   | } =          |        | D001         | 0.00                   |      |            |      |        |           |                   |                 |     |
| avel is angular to rounded fine of granite and schist.   |   | =            |        |              |                        |      |            |      |        |           |                   | -               |     |
|  |   | -            |        |              | 0.50-0.95<br>0.50-1.00 |      |            |      |        |           | SPT11<br>0.50     | 0.95            |     |
|  |   | ( ) <u> </u> |        |              |                        |      |            |      |        |           |                   | 3               |     |
|  |   | _            |        |              |                        |      |            |      |        |           |                   | -               |     |
|  |   | -            |        | D004         | 1.20                   |      |            |      |        |           |                   | 3               |     |
|  |   | ] =          |        | D005<br>B006 | 1.50-1.95<br>1.50-2.00 |      |            |      |        |           | SPT16<br>1.50     | 1.95 -          |     |
|  |   | -            |        |              |                        |      |            |      |        |           |                   | 1               |     |
|  |   | -            |        |              |                        |      |            |      |        |           |                   |                 |     |
|  |   | 1            |        | D007         | 2.20                   |      |            |      |        |           |                   | 1               |     |
|  |   | -            |        | D008         | 2.50-2.95              |      |            |      |        |           | SPT17             | 2.95 -          |     |
|  |   | } =          |        | B009         | 2.50-3.00              |      |            |      |        |           | 2.50              | 2.93            |     |
|  |   | _            |        |              |                        |      |            |      |        |           |                   | _               |     |
|  |   | =            |        | D010         | 3.20                   |      |            |      |        |           |                   | 1               |     |
|  |   | =            |        | D011         | 3.50-3.95              |      |            |      |        |           | SPT21             | 1               |     |
|  |   | -            |        | B012         | 3.50-4.00              |      |            |      |        |           | 3.50              | 3.95 -          |     |
|  |   | } =          |        |              |                        |      |            |      |        |           |                   | 3               |     |
|  |   | _            |        | D013         | 4.20                   |      |            |      |        |           |                   | 1               |     |
|  |   | į -          |        | D01/         | 4.50-4.95              |      |            |      |        |           | CDT22             | 7               |     |
|  |   | ] [          |        | B015         | 4.50-5.00              |      |            |      |        |           | SPT23<br>4.50     | 4.95 -          |     |
|  |   | =            |        |              |                        |      |            |      |        |           |                   | 1               |     |
|  |   | =            |        |              |                        |      |            |      |        |           |                   | 1               |     |
|  |   | _            |        |              |                        |      |            |      |        |           |                   | 1               |     |
| Thomas distant and the control of th | X X X 4                                 | 5.60         | -11.88 | D016         | 5.60                   |      |            |      |        |           |                   | -               |     |
| ff brown slightly sandy gravelly CLAY with low cobble<br>ntent. Cobbles are subangular to subrounded of granite and  | 2000                                    | =            |        |              |                        |      |            |      |        |           |                   | 3               |     |
| nist. Sand is fine to coarse. Gravel is angular to rounded<br>e to coarse of mixed igneous and metamorphic lithologies.  | 0 10.0                                  | _            |        | D017<br>B018 | 6.00<br>6.00-6.50      |      |            |      |        |           | SPT50/230<br>6.00 | 0mm —<br>6.38 — |     |
|  | 20.20.20                                | _            |        |              |                        |      |            |      |        |           |                   | 3               |     |
|  | 0 0                                     | _            |        |              |                        |      |            |      |        |           |                   | 13              |     |
|  | P 10 10                                 | _            |        |              |                        |      |            |      |        |           |                   | 2               |     |
|  | 0 000                                   | =            |        | D019         | 7.00                   |      |            |      |        |           | SPT50/215<br>7.00 | 5mm —<br>7.37 = |     |
|  | 2 2 2                                   | =            |        |              |                        |      |            |      |        |           |                   | _               |     |
|  | 0 0 0                                   | -            |        | D020         |                        |      |            |      |        |           |                   | 1               |     |
|  |   | =            |        | B021         | 7.50-8.00              |      |            |      |        |           |                   | 12              |     |
|  | 0 - 0 - 0                               | _            |        |              |                        |      |            |      |        |           |                   | -               |     |
|  | P 10 10 10                              | =            |        |              |                        |      |            |      |        |           |                   | 3               |     |
|  | 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | =            |        |              |                        |      |            |      | Ţ      |           |                   | 1               |     |
|  | 0.00                                    | =            |        | 0.11         | 0 000                  | 107  | F0         | NA   | ,,     |           |                   | 1               |     |
| from 8.74m to 8.80m 1 No strong grey boulder of granite  | 0 10 0                                  | 8.87         | -15.15 | 8.40         | 0 9.20                 | 107  | 59         | NA   | NA     |           | SPT(C)50/2        |                 |     |
| sumed zone of no recovery. Sandy boulder CLAY. (Driller's scription)   | P-0-0                                   | 9.20 -       | -15.48 |              |                        |      |            |      |        |           | 9.00              | 9.45 -          |     |
| ff extremely high strength brown slightly sandy gravelly   |   | -            |        |              |                        |      |            |      |        |           |                   | -               |     |
| AY. Gravel is angular to rounded fine to coarse of mixed   |   | =            |        |              |                        |      |            |      |        |           |                   | 2               |     |
| neous and metamorphic lithologies.   | 1                                       | ] -          |        | 9.20         | 0 10.50                | 107  | 83         | NA   | NA     |           |                   | 1 1             |     |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:27:59

Form No. SIEXPHOLELOG Issue.Revision No. 1.05 Issue Date 22/10/2012



#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 A57 Engineer Arch Henderson LLP

Employer Aberdeen Harbour Board Ground Level -6.28m CD Coordinates 397208.04 E, 804809.81 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend    | Depth    | Datum<br>Level | Sam   | pling |      |     |      | ount A<br>Recov |     | In Situ Test<br>Details           | Inst |
|---|-----------|----------|----------------|-------|-------|------|-----|------|-----------------|-----|-----------------------------------|------|
|   |           |          | Level          | Detai | ls    | Dia. | TCR | SCR  | RQD             | IF  | Details                           | atio |
| Stiff extremely high strength brown slightly sandy gravelly   |           | -        |                |       |       |      |     |      |                 |     |                                   |      |
| CLAY. Gravel is angular to rounded fine to coarse of mixed  |           | i -      |                |       |       |      |     |      |                 |     | 1                                 |      |
| gneous and metamorphic lithologies.   |           | _        |                |       |       |      |     |      |                 |     | SPT(C)50/225mm -                  |      |
| from 10.28m to 10.50m assumed zone of no recovery   | 1         | -        |                |       |       |      |     |      |                 |     | 10.50 10.88 -                     |      |
|   |           | ğ _      |                |       |       |      |     |      |                 |     | -                                 |      |
|   |           | _        |                |       |       |      |     |      |                 |     | _                                 |      |
|   |           | -        |                |       |       |      |     |      |                 |     | -                                 |      |
|   | 135       | 5 - 2    |                | 10.50 | 11.90 | 107  | 93  | NA   | NA              |     | -                                 |      |
|   |           | _        |                |       |       |      |     |      |                 |     | -                                 |      |
|   |           | -        |                |       |       |      |     |      |                 |     | -                                 |      |
| from 11.70m to 11.90m assumed zone of no recovery   | 7.7       | _        |                |       |       |      |     |      |                 |     | -                                 |      |
| · · · · · · · · · · · · · · · · · · ·   | 4-7-5     | _        |                |       |       |      |     |      |                 |     | SPT(C)50/215mm -<br>11.90 12.27-  |      |
|   |           | 12.17    | -18.45         |       |       |      |     |      |                 |     | 11.90 12.27                       |      |
| Assumed zone of no recovery. Boulder CLAY. (Driller's   |           | 12.17    | -16.45         | 11.90 | 12.70 | 107  | 34  | NA   | NA              |     | -                                 |      |
| description)  | 7-7-3     |          |                |       |       |      |     |      |                 |     | j                                 |      |
|   | 3-2-0-    |          |                |       |       |      |     |      |                 |     |                                   |      |
| Grey subangular to subrounded fine to coarse GRAVEL of granite  | 30.00     | 12.70 -  | -18.98         |       |       |      |     |      |                 |     | 3                                 |      |
| and schist with low cobble content. Cobbles are subangular of   | 59-49-59  | 12.94_   | -19.22         |       |       |      |     |      |                 |     | 1                                 |      |
| granite. (Driller notes boulder clay).  | 0.00      | \        |                |       |       |      |     |      |                 |     | l -                               |      |
| Assumed zone of no recovery. Boulder CLAY. (Driller's   | 0 0       | ), I     |                |       |       |      |     |      |                 |     | _                                 |      |
| description)  | 0.0.0     | -        |                | 12.70 | 14.20 | 107  | 48  | NA   | NA              |     | -                                 |      |
| accompany   | 9 2 2     | _        |                |       |       |      |     |      |                 |     | -                                 |      |
|   | 0 0 0     | _        |                |       |       |      |     |      |                 |     | 3                                 |      |
|   | 0-0-0     | -        |                |       |       |      |     |      |                 |     | -                                 |      |
|   | 0000      | _        |                |       |       |      |     |      |                 |     | T.                                |      |
| Stiff brown slightly sandy gravelly CLAY. Gravel is subangular  | -         | 14.20 -  | -20.48         |       |       |      |     |      |                 |     | SPT(C)50/135mm =<br>14.20 14.46 = |      |
| to subrounded fine to coarse of mixed igneous and metamorphic   |           | -        |                |       |       |      |     |      |                 |     | 14.20 14.46                       |      |
| ithologies.   | DEC       | _        |                |       |       |      |     |      |                 |     | 3                                 |      |
|   | TES       | -        |                | 14.20 | 15.20 | 107  | 100 | NA   | NA              |     | -                                 |      |
|   | -         | -        |                |       |       |      |     |      |                 |     | -                                 |      |
|   |           |          |                |       |       |      |     |      |                 |     |                                   |      |
|   |           | <u>-</u> |                |       |       |      |     |      |                 |     | -                                 |      |
| Assumed zone of no recovery. Boulder CLAY. (Driller's   | 0-40-     | 15.35    | -21.63         |       |       |      |     |      |                 |     | _                                 |      |
| description)  | 0 00      | _        |                | 15.20 | 15.80 | 107  | 70  | NA   | NA              |     | -                                 |      |
| from 15.37m to 15.43m 1 No strong red boulder of granite  | 20 10     | 15.00    | 22.00          |       |       |      |     |      |                 |     | CDT/C)E0 /170                     |      |
| Califf house and in halo and do a more than CLAV with the and the more than a   | 0-10-5    | 15.80 -  | -22.08         |       |       |      |     |      |                 |     | SPT(C)50/170mm -<br>15.80 16.12 - |      |
| Stiff brown slightly sandy gravelly CLAY with medium cobble content. Gravel is subangular to subrounded fine to coarse of | 0 0 0     | 7        |                |       |       |      |     |      |                 |     | -                                 |      |
| mixed igneous and metamorphic lithologies. Cobbles are  | 20-10-    | 16.20 -  | -22.48         |       |       |      |     |      |                 |     | -                                 |      |
| subangular of schist.   | 20.00     | ] [      |                |       |       |      |     |      |                 |     | -                                 |      |
| •   | 20 10     | _        |                | 15.80 | 17.30 | 107  | 78  | NA   | NA              |     |                                   |      |
| Assumed zone of no recovery. Boulder CLAY. (Driller's description)  | 0 0 0     | -        |                |       |       |      |     |      |                 |     | 17                                |      |
| aescription)  | p 0 0     | 1        |                |       |       |      |     |      |                 |     | 3                                 |      |
|   | 9 5 5     | _        |                |       |       |      |     |      |                 |     | _                                 |      |
|   | 0 0 0     | F        |                |       |       |      |     |      |                 | 816 |                                   |      |
| Stiff very high strength brown sandy gravelly CLAY with low   | 0 0       | 17.30 -  | -23.58         |       |       |      |     |      |                 | NA  | SPT(C)50/200mm =<br>17.30 17.65 = |      |
| cobble content. Gravel is subangular to rounded fine to coarse  | 0 100     | -        |                |       |       |      |     |      |                 |     |                                   |      |
| of mixed igneous and metamorphic lithologies. Cobbles are   | 0 - 0 - 0 | ) I      |                |       |       |      |     |      |                 |     | 1                                 |      |
| ubangular of granite and schist.  | 00-00-    | 0 ]      |                |       |       |      |     |      |                 |     |                                   |      |
| from 17.80m to 17.97m 1 No strong grey boulder of schist  | 2000      | -        |                | 17.30 | 18.80 | 92   | 97  | NA   | NA              |     | -                                 |      |
|   | 10 10 2   | 9 -      |                |       |       |      |     |      |                 |     |                                   |      |
|   | 2000      | . ]      |                |       |       |      |     |      |                 |     |                                   |      |
|   | 0 0 0     | -        |                |       |       |      |     |      |                 |     | l la                              |      |
|   | 0 0 0     | š        |                |       |       |      |     |      |                 |     |                                   |      |
|   | 0 0 0     | =        |                |       |       |      |     |      |                 |     | SPT(C)50/100mm -<br>18.80 18.99 - |      |
|   | 0 0 0     |          |                |       |       |      |     |      |                 |     | 10.00 10.39                       |      |
|   |           | 19.10 -  | -25.38         | l     |       |      | l   |      |                 |     |                                   |      |
| ssumed zone of no recovery. Boulder CLAY. (Driller's  | 9-6-16    | -        |                |       |       |      |     |      |                 |     |                                   |      |
| Assumed zone of no recovery. Boulder CLAY. (Driller's lescription)  | 0 0 0     | =        |                | 10.00 | 20.00 | 107  | 2/  | NIA. | , na            |     | 13                                |      |
|   | 0 0 0     |          |                | 18.80 | 20.00 | 107  | 24  | NA   | NA              |     | 1                                 |      |
|   | 0 0 0     |          |                | 18.80 | 20.00 | 107  | 24  | NA   | NA              |     | -                                 |      |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG

Issue Date 22/10/2012



Sheet 2 of 4

# Project Name Bay of Nigg Harbour Development Ground Investigation Project No. TA7148 Engineer Arch Henderson LLP Hole ID. Exploratory Hole Log A57

Employer Aberdeen Harbour Board

Ground Level -6.28 m CD Coordinates 397208.04 E, 804809.81 N National Grid
Hole Type CP+RC Inclination Vertical

| Description of Strata  | Legend                                | Depth                  | Datum<br>Level   | Sam   | pling |      |     |     | ount A<br>Recov |                            | In Situ Test<br>Details       | Inst  |
|--|---------------------------------------|------------------------|------------------|-------|-------|------|-----|-----|-----------------|----------------------------|-------------------------------|---|
|  |                                       |                        | Level            | Deta  | ils   | Dia. | TCR | SCR | RQD             | IF                         | Details                       | atio  |
| Stiff brown slightly sandy gravelly CLAY with low cobble content. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies. Cobbles are subangular of granite.   | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 20.00 _                | -26.28           | 20.00 | 20.30 | 107  | 100 | NA  | NA              |                            | SPT(C)50/5m20.01 -<br>20.00   |   |
| from 20.00m to 20.14m angular to subangular fine to coarse gravel of schist and granite from 20.30m to 20.45m angular to subrounded fine to medium gravel of schist and granite  | 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 | 20.90                  | -27.18           | 20.30 | 21.80 | 107  | 42  | NA  | NA              |                            | _                             |   |
| Assumed zone of no recovery. Boulder CLAY. (Driller's (description)  | 0 0 0                                 | 21.30 -                | -27.58           |       |       |      |     |     |                 |                            |                               |   |
| Stiff brown slightly sandy gravelly CLAY with low cobble content. Gravel is subangular to subrounded fine to coarse of mixed igneous and metamorphic lithologies. Cobbles are subangular of granite.   |                                       | -<br>-<br>-<br>-       | 20.50            |       |       |      |     |     |                 |                            | SPT(C)50/75mm - 21.80 21.96 - |   |
| Assumed zone of no recovery. Boulder CLAY. (Driller's description)   |                                       | 22.30                  | -28.58           | 21.80 | 23.30 | 107  | 40  | NA  | NA              |                            |                               |   |
| Stiff brown slightly sandy gravelly CLAY. Gravel is subangular to rounded fine to coarse of mixed lithologies.   |                                       | 23.30                  | -29.58           | 23.30 | 24.50 | 107  | 48  | NA  | NA              |                            | SPT(C)50/75mm - 23.30 23.45   |   |
| Assumed zone of no recovery. Boulder CLAY. (Driller's description)   | P 9 9                                 | 24.00                  | -30.28           |       |       |      |     |     |                 |                            | [<br>]:                       |   |
| Stiff brown slightly sandy gravelly CLAY with low cobble content. Gravel is subangular to rounded fine to coarse of mixed igneous and metamorphic lithologies. Cobbles are subangular to subrounded of granite and schist.   |                                       | 24.50 -                | -30.78           | 24.50 | 26.00 | 107  | 100 | NA  | NA              |                            | SPT(C)50/80mm - 24.50         |   |
| Assumed zone of no recovery. Boulder CLAY. (Driller's description)   |                                       | 26.16 _                | -32.44<br>-33.28 | 26.00 | 27.50 | 107  | 20  | 7   | 0               | NA                         | SPT(C)50/55mm — 26.00 26.12 · |   |
| Assumed zone of no recovery. Weathered GRANITE. (Driller's description)  Extremely to very weak grey and reddish brown coarse  | *****                                 | 27.34                  | -33.62           |       |       |      |     |     |                 | NI                         | SPT(C)50/160mm ·              |   |
| crystalline GRANITE. Discontinuities: 1) 20-30 degrees closely spaced planar rough stained dark brown. from 27.50m to 27.55m recovered as non intact core (subrounded coarse gravel sized fragments) from 27.64m to 27.75m recovered as non intact core (subrounded coarse gravel sized fragments) | *****                                 | 27.87<br>28.10<br>     | -34.15<br>-34.38 | 27.50 | 28.50 | 107  | 60  | 30  | 0               | 45<br>80<br>80<br>80<br>NA | 27.50 27.81 -                 |   |
| Weak grey coarse crystalline GRANITE. Discontinuities: 1) 70-80 degrees very closely spaced planar rough stained brown.  | *****                                 | 28.50 -<br>-<br>-<br>- | -34.78           |       |       |      |     |     |                 | NI<br>40<br>60             |                               |   |
| Assumed zone of no recovery. GRANITE. (Driller's description)  Strong grey coarse crystalline GRANITE. Discontinuities: 1)   |                                       | 29.00                  | -35.28           | 28.50 | 29.50 | 107  | 100 | 40  | 0               |                            | <u> </u>                      | # 19 10 10 10 10 10 10 10 10 10 10 10 10 10 |
| 70-90 degrees closely spaced planar rough stained brown. from 28.58m to 28.64m recovered as non intact core (angular medium gravel sized fragments) from 28.64m to 28.78m recovered as non intact core (angular  |                                       |                        |                  |       |       |      |     |     |                 | NI                         |                               |   |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 A57 Engineer Arch Henderson LLP Employer Aberdeen Harbour Board

Ground Level -6.28m CD Coordinates 397208.04 E, 804809.81 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend | Depth                                     | Datum            | Sar   | npling |      | Blo<br>  San | ow Co<br>nple I | ount A<br>Recov | and<br>ery     | In Situ Test          | Insta |
|---|--------|---|------------------|-------|--------|------|--------------|-----------------|-----------------|----------------|-----------------------|-------|
|   |        |   | Level            | Deta  | ails   | Dia. | TCR          | SCR             |                 | IF             | Details               | ation |
| 8.50m - 29.00m : Remaining Detail : 28.64m - 28.78m : medium ravel sized fragments)   | *****  | 30.10 -                                   | -36.38           | 29.50 | 30.50  | 107  | 70           | 0               | 0               | NA             | -                     |       |
| 9.00m - 30.10m : Strong grey coarse crystalline GRANITE.<br>ecovered as non intact core (angular fine to coarse gravel<br>ized fragments).<br>Detail 29.57m - 29.76m : from 29.57m to 29.76m weak<br>Detail 30.00m - 30.10m : from 30.00m to 30.10m weak<br>from 30.00m to 30.10m weak  |        | 30.50                                     | -36.78           | 30.50 | 32.00  | 107  | 70           | 30              | 0               | NI<br>NI<br>60 | -<br>-<br>-           |       |
| ssumed zone of no recovery. GRANITE. (Driller's description)  Medium strong to strong grey coarse crystalline GRANITE. ecovered as non intact core (sandy angular to subangular fine o coarse gravel sized fragments. Sand sized fragments are  | *****  | 31.50                                     | -37.78<br>-38.28 |       |        |      |              |                 |                 | NA             | -<br>-<br>-           |       |
| ne to coarse) from 30.02m to 30.10m intact with many incipient fractures 70-80 degrees very closely spaced stained brown from 30.23m to 30.40m intact. Discontinuities: 1) 10-20 degrees closely spaced planar rough clean. 2) 70-80 degrees closely spaced planar rough clean ssumed zone of no recovery. GRANITE. (Driller's description) |        | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |                  |       |        |      |              |                 |                 |                | -                     |       |
| xploratory hole complete at 32.00 m.  |        | -<br>-<br>-<br>-<br>-<br>-                |                  |       |        |      |              |                 |                 |                | -                     |       |
|   |        | -<br>-<br>-<br>-<br>-                     |                  |       |        |      |              |                 |                 |                |                       |       |
|   |        | -<br>-<br>-<br>-<br>-                     |                  |       |        |      |              |                 |                 |                |                       |       |
|   |        | -<br>-<br>-<br>-<br>-                     |                  |       |        |      |              |                 |                 |                | -<br>-<br>-<br>-<br>- |       |
|   |        | -<br>-<br>-<br>-<br>-                     |                  |       |        |      |              |                 |                 |                | -<br>-<br>-<br>-      |       |
|   |        | -<br>-<br>-<br>-<br>-                     |                  |       |        |      |              |                 |                 |                | -<br>-<br>-<br>-      |       |
|   |        | -   |                  |       |        |      |              |                 |                 |                | -<br>-<br>-           |       |
|   |        | -<br>-<br>-<br>-<br>-                     |                  |       |        |      |              |                 |                 |                |                       |       |
|   |        | -   |                  |       |        |      |              |                 |                 |                |                       |       |
|   |        | -   |                  |       |        |      |              |                 |                 |                |                       | 1     |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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SOIL ENGINEERING Part of the Bachy Soletanche Group

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| Project  | t Nam  | ie Bay  | of Ni   | gg Ha   | rbour Dev  | elop  | men  | t Grour  | nd Inve         | stiga             | tion             |  |   | F۷  | nlor  | aton  | Hole   | ء ا د          | 00   | Но   | ole ID.  |   |
|--|--|---|---|---|--|---|--|--|-----------------|-------------------|------------------|--|---|---|---|---|--|----------------|--|--|--|---|
| Projec   |  |   | 148   |   |  |   |  |  |                 |                   |                  |  |   | _^  | фіоп  | atory   | 11010  |                | 9  | ,  | 459  |   |
| Engine<br>Employ   |  |   | h Hen   |   | n LLP<br>our Board   |   |  |  |                 |                   |                  |  |   |   |   |   |  |                |  | н  | leader   |   |
| Ground   |  |   | 4m CD   | Tiaib   | our board  |   |  | Co   | ordinate        | s                 | 3971             | 72.37 E,   | 8047  | 66.2  | 6 N Nat   | ional Gr  | id   |                |  |  | Cauci  |   |
| Date Sta   | arted  | 29/0  | 07/2013   | 3   |  |   |  | Da   | te Comp         | leted             | 05/08            | 3/2013   |   |   |   |   | Inc  | clinat         | ion Verti  | cal  |  |   |
| Тор  | Base   | Туре  | Date S  | tarted  | Date Ende  | d C   | rew  | Sectio<br>Logged   | n Co<br>By Ba   | ore<br>rrel       | Core<br>Bit      |  | Equip   | men   | nt  | 90  | horing /<br>Support  |                | F  | Remarks  |  |   |
| 0.00<br>9.00<br>30.00  | 9.00<br>30.00<br>31.00                               | CP<br>RC<br>RC  | 29/07<br>30/07<br>05/08   | /2013<br>/2013<br>/2013                               | 30/07/201<br>05/08/201<br>05/08/201  | 3   | KL<br>MM<br>MM   | DT<br>DT<br>DT   |                 | oore S<br>116     | Impreg<br>Impreg |  | Dando<br>Deltaba<br>Deltaba                     | ase 52  | 20  |   |  |                |  |  |  |   |
|  |  |   |   |   |  |   |  |  |                 |                   |                  |  |   |   |   |   |  |                |  |  |  |   |
| Date   | Ιτ   | ime   | Hole  |   | ROGRESS<br>sing Wate   | ır l  |  | Rem  | arke            |                   |                  | Dat  | to  | Т   | Time  | Strike a  | WATER<br>at Rise   |                | KES<br>Time  |  | sing de  | nth   |
|  |  |   | depth   | de  | pth dept   | h   |  |  | aiks            |                   |                  | Dat  |   | '   | iiiie   | depth   | dep  | th             | taken<br>to rise   | at stril<br>time   | e t  | to seal<br>flow   |
| 29/07/20<br>30/07/20<br>30/07/20<br>30/07/20<br>31/07/20<br>02/08/20<br>05/08/20<br>05/08/20 | 013 (013 (13 (14 (14 (14 (14 (14 (14 (14 (14 (14 (14 | 1900<br>0700<br>1400<br>2000<br>07700<br>1930<br>0700<br>1320<br>0700<br>1930 | 6.00<br>6.00<br>9.00<br>9.80<br>9.80<br>19.00<br>19.00<br>25.50<br>25.50<br>31.00 | 6.0<br>6.0<br>9.0<br>9.3<br>19.1<br>19.2<br>25.25.30. | 00 -8.10<br>00 -5.10<br>80 -8.10<br>80 -9.00<br>00 -14.8<br>00 -15.3<br>50 -4.74 | Sta<br>End<br>Sta<br>O End<br>O Sta<br>O Sta<br>O Sta | d of Sh<br>rt of Sh<br>d of CP<br>d of Sh<br>rt of Sh<br>d of Sh<br>rt of Sh<br>d of Sh<br>rt of Sh<br>d of Ho | nift<br>/Start of R<br>ift<br>nift<br>ift<br>nift<br>ift<br>nift | Rotary          |                   |                  |  |   |   |   |   |  |                |  |  |  |   |
|  |  |   |   | CABLE   | PERCUSSIO  | N DET   | AILS   |  |                 |                   |                  |  |   |   | L   |   | SPT D  | ETAI           | LS   |  |  |   |
| Hard   | l Strata   | Depth<br>to   | Star  | Chis<br>t time  | selling<br>Duration  | Rem   | narks  |  | _               |                   |                  | Depth  | Туре  | е   |   | ental blo   | w count  | /              | Hammer<br>No.  | Energy<br>ratio  | Casing<br>depth  |   |
| 4.10   |  | 4.20  | hh<br>1   | <u>mm</u>   | 0200   | Chis  | elling   |  | _               |                   |                  | 0.50   | SPT   | N:  | •   |   |  |                | AR362  | %<br>75<br>75  | N/A  | -6.00<br>-7.20  |
| 4.20<br>7.10<br>8.10<br>9.00   |  | 4.60<br>7.30<br>8.30<br>9.00  | 0   | 345<br>900<br>015<br>200                              | 0200<br>0045<br>0045<br>0200   | Chise<br>Chise  | elling<br>elling<br>elling<br>elling   |  |                 |                   |                  | 1.50<br>2.50<br>3.50<br>4.50<br>5.50<br>7.50<br>9.00<br>10.00                          | SPT<br>SPT<br>SPT(0<br>SPT<br>SPT<br>SPT<br>SPT | N:<br>N:<br>N:<br>C) 50<br>50<br>50<br>50<br>50<br>50 | =16 (2,3,4<br>=15 (2,3,4,5<br>=23 (3,4,5<br>0/5mm (2<br>0/220mm<br>0/245mm<br>0/10mm (6,8,7 | 3,2,3,3)<br>4,3,4,5)<br>2,3,4,6)<br>5,5,6,7)<br>5,50,50/5<br>1,7,9,13,1<br>1,7,10,12<br>(25/5,50/                 | )<br>2,25/70)<br>15,15,8/2<br>10)<br>15)<br>3,15,12/5<br>4,15,11/3   | !0)            | AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362                   | 75<br>75<br>75<br>75<br>75<br>75                               | 1.50<br>2.50<br>3.50<br>4.50<br>5.50<br>7.50<br>9.00<br>10.00                          | -7.00<br>-6.90<br>-6.70<br>-7.50<br>-7.00   |
| Fror   |  | То  |   | ROTA  | RY FLUSH [<br>Flush  | ETAIL   |  | ush  |                 | lush              |                  | 11.50<br>13.00<br>14.50  | SPT<br>SPT<br>SPT                               | 50  | 0/275mm<br>0/260mm<br>0/0mm (2  | 1 (4,8,10,1<br>1 (5,4,10,1<br>:5/0.50/0   | 3,15,12/5<br>4,15,11/3<br>)  | 15)            | AR362<br>AR362<br>AR362  | 75<br>75<br>75<br>75   | 11.50<br>13.00<br>14.50  | -14.80<br>-14.60<br>-14.60<br>-14.60  |
| 9.00<br>9.80<br>30.00  |  | 9.80<br>30.00<br>31.00  |   |   | Water<br>Water<br>Water<br>Water   |   | 1  | turn<br>%<br>LOO<br>90<br>0                                      | В               | rown<br>rown<br>- |                  | 16.00<br>17.50<br>19.00<br>20.50<br>21.00<br>22.50<br>24.00<br>25.50<br>27.00<br>28.50 | SPT(  | c) 50   | 0/0mm (1  | (6,10,12<br>(7,18/25,!<br>(25/25,50<br>(5,20/10,!<br>(5,9,10,1<br>(4,3,11,1<br>(7,10,12<br>(8,11,14<br>(0,14,50/( | 4,15,11/3<br>) 18,20/70<br>50/10)<br>/25)<br>50/10)<br>3,20,7/15<br>2,14,16/7<br>18,20/10<br>16,15,5/5<br>))<br>8,12/85) | s)<br>'o)<br>) | AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362 | 75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75 | 16.00<br>17.50<br>19.00<br>20.50<br>21.00<br>22.50<br>24.00<br>25.50<br>27.00<br>28.50 | -14.30<br>-14.50<br>-14.80<br>-15.80<br>-15.80<br>-15.80<br>-4.74<br>-4.98<br>-5.15 |
| НС   | LE DIA   | METER   | / CASIN   | IG  | ĺ  | DY  | NAMI   | C SAMPI  | ING             |                   |                  | -  |   |   |   |   |  |                |  |  |  |   |
| Hole<br>diameter<br>200  | Depth  | n of Ca<br>e dian   | sing D  | epth of<br>casing                                     | Тор  | Base  |  | ameter   | Time<br>hhmms   |                   | covery<br>%      | -  |   |   |   |   |  |                |  |  |  |   |
| 146<br>139<br>116  | 30.0<br>30.1<br>31.0                                 | 0 1   | 46  | 30.00<br>30.10  |  |   |  |  |                 |                   |                  |  |   |   |   |   |  |                |  |  |  |   |
|  |  | NSTALL  | ATION [   | ETAILS  | 5  |   | Р  | IPE CON  | STRUCT          | ION               |                  |  |   |   |   |   |  |                |  |  |  |   |
| Distance<br>from G.L   |  | Т   | ype   | Resp<br>To  | oonse zone<br>op Base  | ID  | Тор  | Pipe<br>Base   | Dia.<br>of pipe |                   | pe of            |  |   |   |   |   |  |                |  |  |  |   |
|  |  |   |   | D   | ACKFILL DE   | LVII C  |  |  |                 |                   |                  |  |   |   |   | * Seating   | GENERA   |                | TEC  |  |  |   |
| Top o<br>sectio<br>0.00  | n s  | Base of<br>ection<br>31.00  |   | Mate<br>Arisin  | rial   | AILS  |  | Ren  | narks           |                   |                  |  |   |   |   |   | GENERA   | AL INC         | DIES   |  |  |   |
| NOTES  | Wate   | r strike  | rise tim  | e in mi<br>iations                                    | meters in n<br>nutes, hard<br>, see key<br>Log Print Da                          | l strat   | a time   |  |                 | 10:28:            | 21               | <u> </u>   |   |   |   |   |  |                | SOI  | L eng  | inec   | ering   |

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Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Ground Level

**Exploratory Hole Log** 

Hole ID.

A59

Sheet 1 of 4

Engineer Arch Henderson LLP Employer Aberdeen Harbour Board

-6.64m CD Coordinates

397172.37 E, 804766.26 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend | Depth                              | Datum<br>Level | Sampling  |      |     |          | ount<br>Reco |    | In Situ Test Details      | Install-<br>ation |
|--|--------|------------------------------------|----------------|---|------|-----|----------|--------------|----|---------------------------|-------------------|
|  | 100    |                                    | Level          | Details   | Dia. | TCR | SCR      | RQD          | IF | Details                   | ation             |
| Medium dense grey slightly silty slightly gravelly fine to coarse SAND. Gravel is angular to subrounded fine to medium of granite and schist.  |        |                                    |                | D001 0.00  D002 0.50-0.95 B003 0.50-1.00  D004 1.00             |      |     |          | •            | 1  | SPT11<br>0.50 0.95        |                   |
|  |        | -                                  |                | D005 1.50-1.95<br>B006 1.50-2.00<br>D007 2.00                   |      |     |          |              |    | SPT16<br>1.50 1.95        |                   |
|  |        | -                                  |                | D008 2.50-2.95<br>B009 2.50-3.00<br>D010 3.00                   |      |     |          |              |    | SPT15<br>2.50 2.95        |                   |
|  |        |                                    |                | D011 3.50-3.95<br>B012 3.50-4.00                                |      |     |          |              |    | SPT23<br>3.50 3.95        |                   |
| No recovery. BOULDER. (Driller's description)  Stiff brown slightly gravelly sandy CLAY with low cobble  | 000    | 4.10<br>-<br>-<br>4.60             | -10.74         | B014 4.50-5.00  |      |     |          |              |    | SPT(C)50/5mm<br>4.50 4.51 |                   |
| content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of granite, dolerite, schist and quartzite.   |        | -                                  |                | D015 5.00<br>B016 5.50-6.00                                     |      |     |          |              |    | SPT50/220mm<br>5.50 5.87  |                   |
| from 6.00m to 9.00m driller notes small sand lenses  |        | _                                  |                | D017 6.00   |      |     |          |              |    | 5.50 5.67                 |                   |
|  |        | -                                  |                | D018 7.00<br>B019 7.00-7.50<br>D020 7.50-7.90<br>B021 7.50-8.00 |      |     |          |              |    | SPT50/245mm<br>7.50 7.90  |                   |
|  |        | -                                  |                | D022 8.00   |      |     |          |              |    | _                         |                   |
| Strong pink and grey BOULDER of granite.   | 000    | 9.00                               | -15.64         | D023 9.00   |      |     |          |              |    | SPT50/10mm - 9.00 9.02    |                   |
| Stiff extremely high strength brown slightly gravelly sandy CLAY with low cobble content. Sand is fine to coarse. Gravel is angular fine to coarse of granite, dolerite and schist. Cobbles are angular to subrounded of granite and dolerite. |        | 9.20<br>-<br>-<br>-<br>-<br>-<br>- | -15.84         | 9.00 9.80<br>9.80 10.00   |      |     | NA<br>NA | NA<br>NA     |    |                           |                   |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG Issue Date 22/10/2012



#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 A59 Engineer Arch Henderson LLP

Employer Aberdeen Harbour Board Ground Level -6.64m CD Coordinates 397172.37 E, 804766.26 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend | Depth   | Datum  | San   | npling |      |     |     | ount A<br>Recov |    | In Situ Test   | Insta |
|---|--------|---|--------|-------|--------|------|-----|-----|-----------------|----|--|-------|
| 2006. paos di Galaca  | Logona | Dopt  | Level  | Deta  | ils    | Dia. | TCR | SCR |                 | IF | Details  | ation |
| Stiff extremely high strength brown slightly gravelly sandy CLAY with low cobble content. Sand is fine to coarse. Gravel is angular fine to coarse of granite, dolerite and schist.  Cobbles are angular to subrounded of granite and dolerite. from 10.00m to 10.10m strong boulder of granite |        |   |        | 10.00 | 11.50  | 102  | 100 | NA  | NA              |    | SPT49 10.45  |       |
| from 11.91m to 12.00m strong boulder of dolerite  |        | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |        | 11.50 | 13.00  | 102  | 100 | NA  | NA              |    | SPT50/275mm - 11.50 11.93  |       |
| from 14.30m to 14.50m assumed zone of no recovery   |        |   |        | 13.00 | 14.50  | 102  | 87  | NA  | NA              |    | SPTS0/260mm  |       |
| from 14.50m to 14.70m strong grey boulder of dolerite   |        |   |        | 14.50 | 16.00  | 102  | 93  | NA  | NA              |    | SPT50/0mm<br>14.50 14.50 -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |       |
| from 15.90m to 16.00m assumed zone of no recovery  from 17.25m to 17.50m assumed zone of no recovery  |        |   |        | 16.00 | 17.50  | 102  | 83  | NA  | NA              |    | SPT50/220mm —— 16.00 16.37 —— ——————————————————————————————————   |       |
| from 17.58m to 17.75m strong light grey granite boulder   |        | -   |        | 17.50 | 19.00  | 102  | 100 | NA  | NA              |    | SPT50/10mm   |       |
| Assumed zone of no recovery. Stiff boulder CLAY with cobbles and boulders. (Driller's description)  |        | 19.50   | -26.14 | 19.00 | 20.50  | 102  | 34  | NA  | NA              |    | SPT50/25mm<br>19.00 19.05 -<br>-<br>-<br>-<br>-<br>-<br>-  |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG

Issue Date 22/10/2012



Sheet 2 of 4

#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 A59 Engineer Arch Henderson LLP

Employer Aberdeen Harbour Board

Ground Level -6.64m CD Coordinates 397172.37 E, 804766.26 N National Grid Hole Type CP+RC Inclination

| Description of Strata  | Legend                                   | Depth    | Datum<br>Level | San   | npling |      |      | ow Co<br>nple F |       |    | In Situ Test<br>Details           | Ir<br>at |
|--|--|----------|----------------|-------|--------|------|------|-----------------|-------|----|-----------------------------------|----------|
|  |  |          | revei          | Deta  | ils    | Dia. | TCR  | SCR             | RQD   | IF | Details                           | a        |
| ssumed zone of no recovery. Stiff boulder CLAY with cobbles nd boulders. (Driller's description)                       | 0 0 0                                    | -        |                |       |        |      |      |                 |       | NA |                                   |          |
|  | p  | 20.50 -  | -27.14         |       |        |      |      |                 |       | .  | SPT50/10mm -                      |          |
| ff extremely high strength brown slightly gravelly sandy<br>AY with low cobble content. Sand is fine to coarse. Gravel | 20 20 20                                 | , :      |                |       |        | 400  |      |                 |       |    | 20.50 20.60                       | ı        |
| angular to subrounded fine to coarse of granite, dolerite  | 0 0                                      | 9 -      |                | 20.50 | 21.00  | 102  | 70   | NA              | NA    |    |                                   |          |
| d schist.  | 200                                      | -        |                |       |        |      |      |                 |       |    | SPT(C)50/240mm-<br>21.00 21.39    |          |
| from 20.85m to 21.00m assumed zone of no recovery  | 10 - 10                                  | ( -      |                |       |        |      |      |                 |       |    | 21.00 21.39                       |          |
|  | 000                                      | , I      |                |       |        |      |      |                 |       |    | -                                 | 3        |
|  | 2000                                     | _        |                |       |        |      |      |                 |       |    |                                   |          |
|  | 200                                      | 5 [      |                | 21.00 | 22.50  | 102  | 87   | NA              | NA    |    |                                   |          |
|  | 0 00                                     | J -      |                |       |        |      |      |                 |       |    |                                   |          |
|  | 22.20.20                                 | -        |                |       |        |      |      |                 |       |    | -                                 | -        |
|  | 0 0                                      | =        |                |       |        |      |      |                 |       |    | -                                 |          |
| from 22.30m to 22.50m assumed zone of no recovery  | 2 - 6                                    | S =      |                |       |        |      |      |                 |       | .  | SPT(C)53/295mm                    |          |
|  | 30 - 0 P                                 | =        |                |       |        |      |      |                 |       |    | SPT(C)53/295mm -<br>22.50 22.95 - |          |
|  | P  | -        |                |       |        |      |      |                 |       |    | 1                                 |          |
|  | 0.00                                     | -        |                |       |        |      |      |                 |       |    | _                                 |          |
|  | 00-00-0                                  | 6 -      |                | 22.50 | 24.00  | 102  | 100  | NA              | NA    |    |                                   |          |
|  | 0.00                                     | 5 -      |                | 22.00 | 2 1.00 | 102  | 100  |                 |       |    | -                                 |          |
|  | 1010                                     |          |                |       |        |      |      |                 |       |    | 1                                 |          |
|  | 0 0                                      | 1        |                |       |        |      |      |                 |       |    | -                                 |          |
|  | 70.00                                    | -        |                |       |        |      |      |                 |       |    | ODT(0)50 # 00                     | 3        |
|  | 20 - 0.                                  | -        |                |       |        |      |      |                 |       |    | SPT(C)50/160mm-<br>24.00 24.31    |          |
|  | 0 0                                      | 1 -      |                |       |        |      |      |                 |       |    |                                   | 1        |
|  | 20.00                                    | _        |                |       |        |      |      |                 |       |    | -                                 |          |
|  | 33 - 02                                  | 9 - 1    |                |       |        |      |      |                 |       |    |                                   |          |
|  | 0 000                                    | -        |                | 24.00 | 25.50  | 102  | 80   | NA              | NA    |    | -                                 |          |
|  | 22 20 20                                 | ) -      |                |       |        |      |      |                 |       |    | _                                 |          |
|  | 0.000                                    | 1 -      |                |       |        |      |      |                 |       |    | -                                 | 1        |
|  | - A                                      | ) I      |                |       |        |      |      |                 |       |    |                                   |          |
| from 25.40m to 25.50m assumed zone of no recovery  | 10 10 10                                 | _        |                |       |        |      |      |                 |       |    | SPT(C)50/230mm -<br>25.50 25.88 - |          |
|  | - 0 - 0 - P                              | 9 -      |                |       |        |      |      |                 |       |    |                                   |          |
|  | 00000                                    | h -      |                |       |        |      |      |                 |       |    | 1                                 |          |
|  | 33.40                                    | -        |                |       |        |      |      |                 |       |    | -                                 |          |
|  | 0 000                                    | -        |                | 25.50 | 27.00  | 102  | 100  | NA              | NA    |    | -                                 |          |
|  | 0 00                                     | _        |                |       |        |      |      |                 |       |    | -                                 |          |
|  | 00000                                    | 2 -      |                |       |        |      |      |                 |       |    | -                                 |          |
|  | 9 0 0 0                                  | -        |                |       |        |      |      |                 |       |    |                                   |          |
|  | 0 10                                     | -        |                |       |        |      |      |                 |       |    | SPT(C)50/0mm                      |          |
|  | 0 0 0                                    | 7 -      |                |       |        |      |      |                 |       |    | 27.00 27.15                       |          |
|  | P - 10 - 10 - 10 - 10 - 10 - 10 - 10 - 1 | ) I      |                |       |        |      |      |                 |       |    | -                                 |          |
|  | 0 0 0                                    | 2 - 1    |                |       |        |      |      |                 |       |    | 1                                 |          |
|  | 0 00                                     | 8 =      |                | 27.00 | 28.50  | 102  | 93   | NA              | NA    |    |                                   |          |
|  | 0 0 0                                    | j        |                |       |        |      |      |                 |       |    |                                   |          |
|  | 0 10 0                                   | 2        |                |       |        |      |      |                 |       |    | Ī                                 |          |
|  | 0 0 0                                    | 8 T      |                |       |        |      |      |                 |       |    |                                   |          |
| from 28.40m to 28.50m assumed zone of no recovery  | P - 0 - 6                                | -        |                |       |        |      |      |                 |       |    | SPT(C)50/235mm                    |          |
| •  | 0 0 0 0                                  | =        |                |       |        |      |      |                 |       |    | 28.50 28.74                       |          |
|  | 0 102                                    | ) =      |                |       |        |      |      |                 |       |    |                                   |          |
|  | S - 0 - 2                                | <u> </u> |                |       |        |      |      |                 |       |    | -                                 |          |
|  | 0 10'6                                   | -        |                | 28.50 | 30.00  | 102  | 66   | NA              | NA    |    |                                   |          |
| from 29.30m to 29.50m strong light grey granite boulder  | 8 6 6                                    | Y =      |                | 20.30 | 50.00  | 102  | - 50 | 1471            | . 4/1 |    |                                   |          |
|  |  | 29.50 -  | -36.14         |       |        |      |      |                 |       |    |                                   |          |
| ssumed zone of no recovery. SAND and GRAVEL. (Driller's  | 34.7.4.4.9                               | -        |                |       |        |      | 1    |                 |       |    |                                   | 1        |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Sheet 3 of 4

Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 A59 Engineer Arch Henderson LLP Employer Aberdeen Harbour Board Sheet 4 of 4

Ground Level -6.64m CD Coordinates 397172.37 E, 804766.26 N National Grid

Hole Type CP+RC Inclination

|  |             |                   | Datama         | C                  | _     | DI  | ow Co  | ount / | \nd | In Situ Test |                 |
|--|-------------|-------------------|----------------|--------------------|-------|-----|--------|--------|-----|--------------|-----------------|
| Description of Strata  | Legend      | Depth             | Datum<br>Level | Samplin<br>Details | Dia.  | Sar | nple l | Recov  | ery | Details      | Instal<br>ation |
| escription)  | A: 11:11:11 | 30.00 _           | -36.64         | Details            | Dia.  | ick | JCK    | KQD    |     | -            |                 |
| ight grey angular to rounded medium to coarse GRAVEL of ranite and quartz. |             | -<br>-<br>30.50 - | -37.14         | 30.00 31.0         | 0 102 | 50  | 0      | 0      |     | -<br>-<br>-  |                 |
| ssumed zone of no recovery. COBBLES and BOULDERS. (Driller's escription)   |             | -                 |                |                    |       |     |        |        |     | -<br>-<br>-  |                 |
| xploratory hole complete at 31.00 m.                                       | 9.03        | 31.00             | -37.64         |                    |       |     |        |        |     | <br>-<br>-   |                 |
|  |             | -<br>-<br>-       |                |                    |       |     |        |        |     |              |                 |
|  |             | -                 |                |                    |       |     |        |        |     | -<br>-<br>-  |                 |
|  |             | -                 |                |                    |       |     |        |        |     | -            |                 |
|  |             | -<br>-<br>-       |                |                    |       |     |        |        |     | -<br>-       |                 |
|  |             | -<br>-<br>-       |                |                    |       |     |        |        |     | -<br>-<br>-  |                 |
|  |             | -                 |                |                    |       |     |        |        |     | -<br>-<br>-  |                 |
|  |             | -<br>-<br>-       |                |                    |       |     |        |        |     | -<br>-       |                 |
|  |             | -<br>-            |                |                    |       |     |        |        |     | -            |                 |
|  |             | -<br>-<br>-       |                |                    |       |     |        |        |     | -<br>-<br>-  |                 |
|  |             | -<br>-<br>-       |                |                    |       |     |        |        |     | -<br>-<br>-  |                 |
|  |             | -<br>-<br>-       |                |                    |       |     |        |        |     | -            |                 |
|  |             | -                 |                |                    |       |     |        |        |     | -<br>-       |                 |
|  |             | -                 |                |                    |       |     |        |        |     | -<br>-<br>-  |                 |
|  |             | -<br>-<br>-       |                |                    |       |     |        |        |     | -<br>-<br>-  |                 |
|  |             | -<br>-            |                |                    |       |     |        |        |     |              |                 |
|  |             | -                 |                |                    |       |     |        |        |     | -<br>-       |                 |
|  |             | -                 |                |                    |       |     |        |        |     | -<br>-       |                 |
|  |             | -<br>-            |                |                    |       |     |        |        |     | -<br>-       |                 |
|  |             | -<br>-<br>-       |                |                    |       |     |        |        |     | -<br>-       |                 |
|  |             | -<br>-<br>-       |                |                    |       |     |        |        |     | -<br>-       |                 |
|  |             | -<br><br>-        |                |                    |       |     |        |        |     | -<br>-<br>-  |                 |
|  |             | -<br>-<br>-       |                |                    |       |     |        |        |     | -<br>-<br>-  |                 |
|  |             | -                 |                |                    |       |     |        |        |     | -<br>-       | ]               |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Issue.Revision No. 1.05

Form No. SIEXPHOLELOG

Log Print Date And Time: 23/12/2013 10:28:35

Part of the Bachy Soletanche Group Issue Date 22/10/2012



|   |                        | e Bay                | of Nigg                 | g Har                    | rbour Dev            | elop       | ment  | Ground              | l Inves              | tigati      | ion          |                         |  | Evn          | lora   | tory F                                | Hole Lo               | 20                      | Ho               | ole ID.                 |                          |  |  |  |
|---|------------------------|----------------------|-------------------------|--------------------------|----------------------|------------|---|---------------------|----------------------|-------------|--------------|-------------------------|--|--------------|--|---------------------------------------|-----------------------|-------------------------|------------------|-------------------------|--------------------------|--|--|--|
| Project   |                        | TA7                  |                         |                          |                      |            |   |                     |                      |             |              |                         |  | Lyb          | iora   | tory i                                | IOIC LO               | <i>y</i> 9              | L                | 463                     |                          |  |  |  |
| Engineer Arch Henderson LLP Employer Aberdeen Harbour Board |                        |                      |                         |                          |                      |            |   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
| Employ<br>Ground  |                        |                      | rdeen F<br>7m CD        | larbo                    | our Board            |            |   | Cool                | rdinates             |             | 20721        | 11.49 E,                | 20467  | 70 E1 N      | ' Natio                                      | and Grid                              |                       |                         | H                | eader                   | $\dashv$                 |  |  |  |
| Date Sta  |                        |                      | 7m CD<br>07/2013        |                          |                      |            |   |                     | rainates<br>e Comple |             |              | •                       | 80407  | / 3.31 IV    | livano                                       | Mai Giiu                              | Inclinat              | tion Vertic             | cal              |                         |                          |  |  |  |
| Тор   | Base                   |                      | Date Sta                | arted                    | Date Ende            | d C        | Crew  | Section             | Cor                  |             | Core<br>Bit  |                         | Equipr   | ment         |  | Sho                                   | oring /               |                         |                  |                         |                          |  |  |  |
| 0.00  | 9.30                   | СР                   | 08/07/2                 | 2013                     | 09/07/2013 KL TW     |            |   |                     |                      |             |              | Dando                   |  |              | Sup  | ppořt                                 |                       |                         |                  |                         |                          |  |  |  |
| 9.30  | 25.50                  | RC                   | 10/07/2                 | 013                      | 11/07/201            | 3   1      | MM  | TW                  | T611                 | 16          | PCD          |                         | Deltaba  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
|   |                        |                      |                         |                          |                      |            |   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
|   |                        |                      |                         |                          |                      |            |   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
| PROGRESS  |                        |                      |                         |                          |                      |            |   |                     |                      |             | <u> </u>     |                         |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
| Date  | Ті                     | me                   | Hole                    | PR<br>Cas                |                      | -          |   | Remar               | rke                  |             |              | Date                    |  | Time         |  | W<br>Strike at                        | /ATER STRI<br>Rise to | <u> </u>                |                  |                         |                          |  |  |  |
|   |                        |                      | depth                   | dep                      | pth depth            | h          |   |                     |                      |             |              | Date                    | e  | Hins         |  | depth                                 | depth                 | taken<br>to rise        | at strik<br>time | κe i to                 | seal<br>low              |  |  |  |
| 08/07/20<br>09/07/20  | 013 0                  | 900                  | 5.00<br>5.00            | 5.0<br>5.0               | -6.20                | Sta        | d of Shif<br>art of Shi                       |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
| 09/07/20<br>10/07/20  | 013 0                  | 900                  | 9.30<br>9.30            | 9.30<br>9.30             | 30 -7.80<br>30 -7.20 | Enc<br>Sta | d of CP<br>art of Ro                          | tary                |                      |             |              |                         |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
| 10/07/20<br>11/07/20<br>11/07/20                            | 013 0                  | .900<br>.700<br>.515 | 20.30<br>20.30<br>25.50 | 10.5<br>10.5<br>10.5     | 50 -7.20             | Sta        | End of Shift<br>Start of Shift<br>End of Hole |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
| 11,0.,2   | 13                     | 313                  | 25.50                   | 10                       |                      |            | 101110.                                       | 5                   |                      |             |              | 1                       |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
|   |                        |                      |                         |                          |                      |            |   |                     |                      |             |              | 1                       |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
|   |                        |                      |                         |                          |                      |            |   |                     |                      |             |              | 1                       |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
|   |                        |                      |                         |                          |                      | 上          |   |                     |                      |             |              | <u> </u>                |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
| Usual   | 2                      | AL                   | CA                      |                          | PERCUSSIO            |            |   |                     |                      |             |              | - 1                     | I  | 1 100        |  | · 11-1                                | SPT DETAI             |                         |                  | - ·                     | 101-6-4                  |  |  |  |
| Hard<br>from  | Strata                 | Depth<br>to          | Start t                 | time                     | Belling Duration     | Rem        | narks   |                     |                      |             |              | Depth                   | Туре   |              |  | ntal blow<br>ation in n               |                       | Hammer<br>No.           | Energy<br>ratio  | Casing depth            | Water<br>depth           |  |  |  |
| 5.00<br>5.00  | +                      | 5.00<br>5.20         | hhmm                    |                          |                      | Chis       | Chiselling<br>Chiselling                      |                     |                      |             |              | 1.00<br>2.00            | SPT<br>SPT                                       | N=12         | (2,3,3,7                                     | 2,3,4)                                |                       | AR362<br>AR362          | 75<br>75         | 1.00<br>2.00            | -8.50<br>-9.00           |  |  |  |
| 8.20<br>8.80  | 8.20 8.40 1330 0100    |                      | Chise                   | Chiselling<br>Chiselling |                      |            |   |                     |                      | SPT<br>SPT  | N=14<br>N=11 | (2,2,3,2,               | 2,3,4)<br>4,5,4)<br>3,3,5)<br>2,4,4)<br>9,10,13) |              | AR362<br>AR362                               | 75<br>75<br>75<br>75                  | 3.00                  | -9.10                   |                  |                         |                          |  |  |  |
|   |                        | ·                    |                         |                          |                      |            | ·   |                     |                      |             |              | 4.00<br>6.50<br>8.50    | SPT<br>SPT                                       | 1 30/03      | (5,6,7,9<br>5mm (4                           | 9,10,13)<br>,9,10,40/1(<br>5/10,50/1( | 0)                    | AR362<br>AR362          | 75<br>75<br>75   | 4.00<br>6.50<br>8.50    | -9.40<br>-10.00<br>-8.10 |  |  |  |
|   |                        |                      |                         |                          |                      |            |   |                     |                      |             |              | 10.30<br>12.80<br>14.30 | SPT(C<br>SPT(C<br>SPT(C                          | 'N 50/5r     | nm //. 0                                     | ) EN/E1                               | 0)                    | AR362<br>AR362<br>75    | 75               | 9.30<br>10.50<br>10.50  | -7.50<br>7.90<br>8.10    |  |  |  |
| From  |                        |                      | F                       | ROTA                     | RY FLUSH D           | ETAIL      |   | -1.                 |                      | · - L       |              | 15.80<br>17.30          | SPT(C  | N=40<br>N=31 | (3,5,8,2,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 | 8,10,14)<br>10,9,13)<br>6,8,10)       |                       | AR362<br>AR362          | 75<br>75<br>75   | 10.50<br>10.50          | -8.50<br>-8.80           |  |  |  |
| Fron<br>dept  |                        | To<br>depth          |                         |                          | Flush<br>type        | ,          | ret   | ush<br>turn<br>%    |                      | ush<br>Iour |              | 18.80<br>20.30          | SPT(C<br>SPT(C<br>SPT(C                          | .)I 50/5r    | nm (25.<br>. (7.6.7.)                        | 710,5075)<br>9.8.10)                  |                       | AR362<br>AR362          | 75<br>75<br>75   | 10.50<br>10.50          | -9.00<br>-9.70           |  |  |  |
| 9.30  |                        | 25.50                |                         |                          | Air/Mist             |            |   | .00                 | G                    | rey         |              | 21.80<br>23.20<br>24.00 | SPT  | N=49         | (3,7,9,                                      | 9,11,12)<br>12,14,14)<br>4,6,12,11,1  | 1 16/70)              | AR362<br>AR362<br>AR362 | 75<br>75<br>75   | 10.50<br>10.50<br>10.50 | -7.30<br>-7.50<br>-7.90  |  |  |  |
|   |                        |                      |                         |                          |                      | ,          | l   |                     |                      |             |              |                         | "  | 00,20        | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,      | .,0,12,11,1                           | .1,10,10,             | 7002                    |                  | 10.00                   | 1.00                     |  |  |  |
|   |                        |                      |                         |                          |                      | ,          | l   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  | 1                       |                          |  |  |  |
|   |                        |                      |                         |                          |                      | ,          | l   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  | 1                       |                          |  |  |  |
|   |                        |                      |                         |                          |                      |            |   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  | 1                       |                          |  |  |  |
|   |                        | -                    | / CASING                | a<br>pth of              | Тор                  | DYI        |   | C SAMPLII<br>ameter | NG<br>Time           | Door        | very         |                         |  |              |  |                                       |                       |                         |                  | 1                       |                          |  |  |  |
| Hole<br>diameter  | Depth                  | diam                 | neter ca                | sing                     | ТОР                  |            | Dia   |                     | hmmss                |             |              |                         |  |              |  |                                       |                       |                         |                  | 1                       |                          |  |  |  |
| 200<br>139<br>116   | 9.30<br>10.20<br>25.50 | ) 13                 |                         | 9.30<br>0.50             |                      |            |   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  | 1                       |                          |  |  |  |
| 110   | 23.30                  | <b>'</b>             |                         |                          |                      |            |   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  | 1                       |                          |  |  |  |
|   |                        |                      |                         |                          |                      |            |   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  | 1                       |                          |  |  |  |
|   |                        | ISTALL /             | ATION DE                | TAILS                    | <u>.</u>             | —          |   | IPE CONS            | TDUCTION             | ON.         | _            | İ                       |  |              |  |                                       |                       |                         |                  | 1                       |                          |  |  |  |
| Distance  | _                      |                      | ype                     |                          | onse zone            | ID         | Р   | Pipe                | Dia.                 | Туре        | e of         |                         |  |              |  |                                       |                       |                         |                  | 1                       |                          |  |  |  |
| from G.L.   |                        |                      |                         | To                       | p Base               | H          | Тор   | Base                | of pipe              | pi          | ipe          |                         |  |              |  |                                       |                       |                         |                  | 1                       |                          |  |  |  |
|   |                        | Ì                    |                         |                          |                      |            | l   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  | 1                       |                          |  |  |  |
|   |                        | Ì                    |                         |                          |                      |            | l   |                     |                      |             |              |                         |  |              | *  | Seating blo                           | ows only.             |                         |                  | 1                       |                          |  |  |  |
|   |                        |                      |                         | BA                       | ACKFILL DET          | AILS       |   |                     |                      |             |              |                         |  |              |  | G                                     | ENERAL NO             | OTES                    |                  |                         |                          |  |  |  |
| Top of section  |                        | ase of<br>ection     | 1                       | Mater                    | rial                 |            |   | Rema                | rks                  |             |              |                         |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
| 0.00  |                        | 25.50                |                         | Grou                     | it                   |            |   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
|   |                        |                      |                         |                          |                      |            |   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
|   |                        |                      |                         |                          |                      |            |   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
|   |                        |                      |                         |                          |                      |            |   |                     |                      |             |              |                         |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
| NOTES   | Alldo                  | nthe in              | matras s                | ما الما                  | meters in m          | illime     | ++00  |                     |                      |             |              | <u> </u>                |  |              |  |                                       |                       |                         |                  |                         |                          |  |  |  |
| NOTES.  | Water                  | strike ı             |                         | in mir                   | nutes, hard          |            |   | in hhmm             | I                    |             |              |                         |  |              |  |                                       |                       |                         | 1                |                         |                          |  |  |  |
|   | 101 40                 |                      | abbievia                |                          | Log Print Da         | ite An     | d Time  | 23/12/              | 2013 10              | 0:28:4      | 4            |                         |  |              |  |                                       |                       | SOIL                    | L eng            | inee                    | RING                     |  |  |  |

Log Print Date And Time: 23/12/2013 10:28:44

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Engineer

Arch Henderson LLP

**Exploratory Hole Log** 

Hole ID.

A63

Sheet 1 of 3

Employer Aberdeen Harbour Board Ground Level -6.57m CD

Coordinates 397211.49 E, 804673.51 N National Grid

| Description of Strata  | Legend                                | Depth                       | Datum            |                               | Sampling                               |      | Blo<br>San | ow Co<br>nple | ount A<br>Recov | nd<br>ery | In Situ Test Details |                       | Insta |
|--|---------------------------------------|-----------------------------|------------------|-------------------------------|--|------|------------|---------------|-----------------|-----------|----------------------|-----------------------|-------|
|  |                                       |                             | Level            |                               | Details                                | Dia. | TCR        | SCR           | RQD             | IF        | Det                  | aiis                  | atio  |
| dedium dense grey slightly silty slightly gravelly fine to nedium SAND. Gravel is fine to medium.  | XXX                                   |                             |                  | D001<br>B002                  |  |      |            |               |                 |           |                      | -                     |       |
|  | X                                     |                             |                  | D003<br>ES004<br>D005<br>B006 | 1.00                                   |      |            |               |                 |           | SPT12<br>1.00        | 1.45 -                |       |
|  | X X X                                 |                             |                  | D007<br>ES008<br>D009<br>B010 | 2.00                                   |      |            |               |                 |           | SPT15<br>2.00        | 2.45 -                |       |
|  | X                                     |                             |                  | ES012<br>D013                 | 3.00<br>3.00<br>3.00-3.45<br>3.00-3.50 |      |            |               |                 |           | SPT14<br>3.00        | 3.45 -                |       |
|  |                                       | -                           |                  | D015<br>ES016<br>D017<br>B018 | 4.00<br>4.00-4.45                      |      |            |               |                 |           | SPT11<br>4.00        | 4.45 -                |       |
| from 5.00m to 6.00m driller notes boulder obstruction  |                                       |                             |                  |                               |  |      |            |               |                 |           |                      |                       |       |
| tiff brown slightly sandy slightly gravelly CLAY with medium<br>obble content. Gravel is angular to rounded fine to coarse of<br>ranite, schist and quartzite. Cobbles are subangular to | × × × × × × × × × × × × × × × × × × × | 6.00                        | -12.57           | D019<br>ES020<br>B021         | 6.00                                   |      |            |               |                 |           |                      |                       |       |
| rounded of granite and schist.   | 0 0                                   | =                           |                  | D022                          |  |      |            |               |                 |           | SPT39<br>6.50        | 6.95 -<br>-<br>-<br>- |       |
|  | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |                             |                  |                               | 7.50-8.00                              |      |            |               |                 |           |                      |                       |       |
|  | 0.00                                  |                             |                  | D025                          | 8.00                                   |      |            |               |                 |           |                      | -                     |       |
|  |                                       |                             |                  | B026                          |  |      |            |               |                 |           | SPT50/85             |                       |       |
| from 8.80m to 9.30m driller notes boulder obstruction  | P 0 10 P                              | -                           |                  |                               |  |      |            |               |                 |           |                      | -                     |       |
| rong grey BOULDER of granite.  | 000                                   | 9.00 <del>-</del><br>9.13 - | -15.57<br>-15.70 |                               |  |      |            |               |                 |           |                      | -                     |       |
| rong grey and pink BOULDER of granite.   | 122                                   | 9.18                        | -15.75           |                               |  |      |            |               |                 |           |                      | -                     |       |
| iff grey slightly sandy gravelly CLAY. Gravel is subangular  | \$ 50.50<br>\$0.40                    | 9.47 -                      | -16.04           |                               |  |      |            |               |                 |           |                      | -                     | ***** |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:28:48

SOIL ENGINEERING Part of the Bachy Soletanche Group

#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 A63

Employer Aberdeen Harbour Board

Sheet 2 of 3

Ground Level -6.57m CD Coordinates 397211.49 E, 804673.51 N National Grid

Hole Type CP+RC Inclination

Arch Henderson LLP

Engineer

| Description of Strata   | Legend  | Depth              | Datum<br>Level   | Sar   | npling |      |     |     | ount A<br>Recov |    | In Situ Test<br>Details   | Inst         |
|---|---|--------------------|------------------|-------|--------|------|-----|-----|-----------------|----|---|--------------|
|   | 7 196   |                    | Level            | Deta  | ails   | Dia. | TCR | SCR | RQD             | IF | Details   | atio         |
| Assumes zone of no recovery. Silty CLAY with granite and boulders. (Driller's description)                              | 0.00 B  | 10.30              | -16.87           |       |        |      |     |     |                 |    | SPT(C)50/10mm -   |              |
| Grey subangular coarse GRAVEL of granite.   |   | 10.57              | -17.14           |       |        |      |     |     |                 |    | 10.30 10.32 -   | ******       |
| Stiff grey slightly sandy gravelly CLAY. Gravel is angular to rounded fine to coarse of granite and schist.             |   | 10.76 _<br>10.86 _ | -17.33<br>-17.43 | 10.30 | 11.60  | 92   | 43  | NA  | NA.             |    | -   | 77777        |
| Strong red BOULDER of granite.  | 2020<br>2020  |                    |                  | 10.50 | 11.00  | 32   | 13  | 147 | IWA             |    | -   |              |
| Assumed zone of no recovery. Silty CLAY with granite boulders.<br>Driller's description)                                |   | =                  |                  |       |        |      |     |     |                 |    | -   |              |
| Grey and red angular to subrounded fine to medium GRAVEL of granite, schist and quartzite.                              | 8 - 0 - 0 O   | 11.60 -            | -18.17<br>-18.37 |       |        |      |     |     |                 |    | -<br>-  | eses<br>Gess |
| Assumed zone of no recovery. Silty CLAY with granite boulders.<br>(Driller's description)                               |   |                    |                  | 11.60 | 12.80  | 92   | 16  | NA  | NA              |    | -   |              |
|   | 000   | 12.80              | -19.37           |       |        |      |     |     |                 |    | SPT(C)50/5mm -  | 2000         |
| Grey, red and pink slightly clayey slightly sandy angular to<br>subrounded fine to coarse GRAVEL of granite and schist. |   | 13.15              | -19.72           |       |        |      |     |     |                 |    | 12.80 12.96 -   |              |
| Assumed zone of no recovery. Silty CLAY with granite boulders. (Driller's description)                                  | \$1.50  |                    |                  | 12.80 | 14.30  | 92   | 23  | NA  | NA              |    | -   |              |
| Grey, red and brown angular to subrounded fine GRAVEL of granite.   | 2028  | 14.30 -            | -20.87<br>-21.07 |       |        |      |     |     |                 |    | SPT(C)38  |              |
| Grey and red slightly sandy clayey angular to rounded fine to coarse GRAVEL of granite and schist.                      | 0.38 5<br>50.30 50  | 14.75              | -21.32           |       |        |      |     |     |                 |    | -<br> -<br> -   |              |
| Assumed zone of no recovery. Silty CLAY with granite boulders.<br>(Driller's description)                               |   |                    |                  | 14.30 | 15.80  | 92   | 30  | NA  | NA              |    | -<br>-<br>-<br>-  |              |
| Grey and red slightly sandy clayey subangular to subrounded<br>fine to medium GRAVEL of granite and schist.             | 8000  | 15.80 -<br>15.95_  | -22.37<br>-22.52 |       |        |      |     |     |                 |    | SPT(C)40<br>15.80 16.25   |              |
| Assumed zone of no recovery. Silty CLAY with granite boulders.<br>(Driller's description)                               | 18 (19 19 19 19 19 19 19 19 19 19 19 19 19 1  | 17.30              | -23.87           | 15.80 | 17.80  | 92   | 10  | NA  | NA              |    |   |              |
| Stiff grey slightly sandy gravelly CLAY. Gravel is angular to rounded fine to medium of granite and schist.             | 2000  | 17.48 -            | -24.05           |       |        |      |     |     |                 |    | 17.30 17.75 -   |              |
| Assumed zone of no recovery. SIlty CLAY with granite boulders (Driller's description)                                   | # C   |                    |                  | 17.80 | 18.80  | 92   | 12  | NA  | NA              | NA | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |              |
| Red and grey subangular to subrounded medium to coarse GRAVEL of granite.   | 0.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>20.00<br>2 | 18.80 -            | -25.37           |       |        |      |     |     |                 |    | SPT(C)50/5mm -<br>18.80 18.82 -<br>-<br>-<br>-<br>-   |              |
|   |   |                    |                  | 18.80 | 20.30  | 92   | 40  | NA  | NA              |    | -<br>-  |              |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:28:50

Form No. SIEXPHOLELOG

Issue.Revision No. 1.05



#### Project Name Bay of Nigg Harbour Development Ground Investigation **Exploratory Hole Log** Project No. TA7148

Engineer Arch Henderson LLP

Employer

Hole ID.

A63 Sheet 3 of 3

Ground Level -6.57m CD Coordinates 397211.49 E, 804673.51 N National Grid

Hole Type CP+RC Inclination

Aberdeen Harbour Board

| Description of Strata  | Legend  | Depth                         | Datum                      | San   | npling |      |     |     | ount A<br>Recov |    |                    | u Test  | Inst |
|--|---|-------------------------------|----------------------------|-------|--------|------|-----|-----|-----------------|----|--------------------|---------|------|
|  |   | _                             | Level                      | Deta  | ails   | Dia. | TCR | SCR | RQD             | İF | Det                | ails    | atio |
| Red and grey subangular to subrounded medium to coarse GRAVEL<br>of granite.<br>from 20.00m to 20.10m very clayey<br>from 20.10m to 20.30m assumed zone of no recovery | =0.8.⇒<br>8.⇒0.00   | 20.30 -                       | -26.87<br>-27.05           |       |        |      |     |     |                 |    | SPT(C)34<br>20.30  | 20.75   |      |
| Grey and red very angular to subangular fine to medium GRAVEL<br>of granite and schist.<br>from 20.44m to 20.48m very clayey   | \$\frac{1}{2}\frac{1}{2 | =                             |                            | 20.30 | 21.80  | 92   | 12  | NA  | NA              |    |                    | -       |      |
| Assumed zone of no recovery. Silty CLAY with cobbles.<br>(Driller's description)   |   |                               | 20.27                      |       |        |      |     |     |                 |    | SPT(C)41           |         |      |
| No recovery. SAND and GRAVEL. (Driller's description)  |   | 21.80 -                       | -28.37                     | 21.80 | 23.20  | 92   | 0   | NA  | NA              |    | 21.80              | 22.25 - |      |
| No recovery. Sandy silty CLAY and cobbles. (Driller's description)   | 50.8<br>50.8<br>50.8<br>50.8<br>50.8<br>50.8<br>50.8<br>50.8  | 23.50 -                       | -30.07                     |       |        |      |     |     |                 |    | SPT49<br>23.20     | 23.65   |      |
|  | 8-20-8-30<br>8-20-8-30<br>8-20-8-30<br>8-20-8-30<br>8-20-8-30<br>8-20-8-30<br>8-20-8-30<br>8-20-8-30  |                               |                            | 23.20 | 24.80  | 92   | 0   | NA  | NA              |    | SPT50/299<br>24.00 | 5mm     |      |
| Multicoloured angular to rounded fine to medium GRAVEL of mixed igneous and metamorphic lithologies.  Firm brown slightly gravelly sandy CLAY. Gravel is angular to    | \$ 5 8 5<br>\$ 0 8 5<br>\$ 0 8 5  | 24.80 -<br>25.00 -<br>25.10 - | -31.37<br>-31.57<br>-31.67 | 24.80 | 25.50  | 92   | 42  | NA  | NA              | ł  |                    | -       |      |
| subrounded fine to medium of granite and schist.  Assumed zone of no recovery. Sandy silty CLAY and cobbles.  Exploratory hole complete at 25.50 m.                    |   | 25.50                         | -32.07                     |       |        |      |     |     |                 |    |                    |         |      |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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| ,  |                                 | ,   |                                      | ,g Ha                  | rbou  | r Deve                           | lopm     | nent              | t Groun  | d Inve   | estiga                                       | ation   |  |   | Fxnl  | orat   | ory I  | Hole Lo   | 00   | Ho                                     | ole ID.  |  |
|--|---------------------------------|---|--------------------------------------|------------------------|---|----------------------------------|----------|-------------------|--|--|--|---|--|---|---|--|--|---|--|--|--|--|
| Projec   |                                 |   | 7148                                 |                        |   |                                  |          |                   |  |  |  |   |  |   | LAPIN   | Jiac   | Ory i  | TOIC L  | Jy   | ŗ                                      | B61  |  |
| Engine<br>Employ   |                                 |   | h Hend<br>erdeen I                   |                        |   |                                  |          |                   |  |  |  |   |  |   |   |  |  |   |  |  | Header   |  |
| Ground   |                                 |   | 88m CD                               | Пагы                   | Jui   | Daiu                             |          | —                 | Cor  | ordinate   | es   | 3972  | 41.41 E,   | 80470                                     | 02.42 N ľ   | Nation   | nal Grid   |   |  |  | eauci  |  |
| Date Sta   | arted                           | 11/0                                      | 07/2013                              |                        |   |                                  |          | _                 | Dat  | te Com   | pleted                                       | 16/07   | 7/2013   |   |   |  |  | Inclina   | tion Vert  | ical                                   |  |  |
| Тор  | Base                            | Туре                                      | Date Sta                             | arted                  | Date  | e Ended                          | l Cre    | ew                | Section<br>Logged B  | n C<br>By B  | Core<br>Barrel                               | Core<br>Bit   | ļ .  | Equip                                     | ment  |  | Sho<br>Su  | oring /<br>pport  |  | Remarks                                |  |  |
| 0.00<br>5.00<br>26.50  | 5.00<br>26.50<br>36.80          | CP<br>RC<br>RC                            | 11/07/2<br>12/07/2<br>15/07/2        | /2013                  | 15/0  | 707/2013<br>707/2013<br>707/2013 | M        | KL<br>1M<br>1M    | DT<br>DT<br>DT   | S  | SWF<br>6116                                  | Impreg<br>Impreg  |  |   | 3000<br>ase 520<br>ase 520  |  |  |   |  |  |  |  |
|  |                                 |   |                                      |                        | ı   |                                  |          |                   |  |  |  |   |  |   |   |  | ı  |   |  |  |  |  |
|  |                                 |   |                                      | Pſ                     | ROGRE   | ESS                              |          | _                 |  |  | _  | <del>'                                    </del>  |  |   |   |  | v  | VATER STR   | IKES   |  |  |  |
| Date   | Ti                              | ime                                       | Hole<br>depth                        | Cas<br>de              | sing<br>epth                                    | Water<br>depth                   |          | _                 | Rema   | arks   |  |   | Dat  | :e  | Time  |  | trike at<br>depth  | Rise to<br>depth  | Time<br>taken                                      | at stri                                | asing dep<br>ike to                                | pth<br>o seal<br>flow                          |
| 11/07/20<br>12/07/20<br>12/07/20<br>12/07/20<br>13/07/20<br>13/07/20<br>15/07/20<br>15/07/20<br>16/07/20 | 17/2013   0700                  |   |                                      |                        |   |                                  |          |                   |  |  |  |   |  |   | to rise   | time   |  | low   |  |  |  |  |
|  |                                 |   |                                      | <br>CABLE              | PERC!   | USSION                           | DET#     | AILS              |  | —  | —  | —   |  |   |   |  |  | SPT DETA  | ILS  |  |  |  |
| Hard<br>from   |                                 | Depth<br>to                               |                                      | t time                 | Dui   | iration                          | Rema     | rks               |  |  |  |   | Depth  | Туре                                      | pe  | enetrat  | tal blow<br>tion in n  |   | Hammer<br>No.                                      | r Energy<br>ratio                      | Casing depth                                       |  |
| 4.50<br>4.65<br>4.85<br>5.00   | hhmm   hhmm                     |   |                                      |                        |   |                                  |          |                   | 0.50<br>1.50<br>2.50<br>3.50<br>4.50<br>6.00<br>7.50<br>9.00 | SPT<br>SPT<br>SPT<br>SPT(C<br>SPT<br>SPT<br>SPT(C<br>SPT(C | N=9 (1,<br>N=14 (2<br>N=25 (2                | ,2,1,2,3,<br>,2,1,2,3,<br>,2,2,3,3,<br>im (25/5<br>0mm (9,<br>0mm (8,<br>mm (25,<br>(4.6,7,8, | ,2)<br>,3)<br>4,4)<br>7,12)<br>5,50/0)<br>,14,22,26<br>,15,19,25<br>/50,50/10<br>10,12)<br>,9,10,40/3<br>/70,50/30<br>10,11)<br>,8,10,18,2<br>,18,750,30 | i,2/0)<br>i,6/0)<br>0)                    | AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362 | 75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75<br>75 | N/A<br>1.50<br>2.50<br>3.50<br>4.50<br>6.00<br>6.00<br>6.00<br>10.50       | -9.40<br>-9.20<br>-9.30<br>-8.70<br>-8.30<br>-9.30<br>-9.40<br>-9.00<br>-8.30 |  |  |  |  |
| Fror   | m                               | То  |                                      | ROTA                   | RY FLU  | LUSH DE                          | TAILS    |                   | lush   |  | Flush  |   | 12.00<br>13.50<br>15.00  | SPT(C<br>SPT(C<br>SPT(C                   | 50/105<br>50/30r  | mm (6,<br>mm (25,  | 9,10,40/3<br>/70,50/3/<br>10.11)   | 30)<br>0)   | AR362<br>AR362<br>AR362                            | 75<br>75<br>65                         | 10.50<br>10.50<br>10.50<br>10.50                   | -8.30<br>-9.80<br>-10.30<br>-11.00             |
| dept   | th                              | depth                                     |                                      |                        | type  | е                                | $\perp$  | ret               | turn<br>%  | c  | colour                                       | r   | 16.50<br>18.00   | SPT(C<br>SPT(C<br>SPT(C                   | 50/195<br>50/115  | 4,3,7,0,.<br>5mm (3,<br>5mm (7,                                      | 8,10,18,2<br>,18/50,3(   | 22/45)<br>0,20/40)  | AR362<br>AR362                                     | 75<br>75                               | 10.50<br>10.50                                     | -1.00  |
| 5.00<br>13.50<br>16.50<br>30.00<br>31.50   | 0                               | 13.50<br>16.50<br>30.00<br>31.50<br>36.80 |                                      | ,                      | Water<br>Water<br>Air/Mis<br>Air/Mis<br>Air/Mis | er<br>list<br>list               |          | 10<br>10<br>10    | 100<br>100<br>100<br>100<br>100                              | Brov<br>E<br>Bro   | Brown<br>own/Gre<br>Brown<br>own/Gre<br>Grey | een<br>I  | 19.50<br>21.00<br>22.50<br>24.00<br>25.50<br>28.00   | SPT(C<br>SPT(C<br>SPT(C<br>SPT(C<br>SPT(C | C) 50/150<br>C) 50/10m<br>C) 50/95m   | 0mm (25<br>mm (10,<br>mm (7,1  | ,9,11,39/7<br>5/25,20,3<br>,12,50/10<br>.0,19,31/2<br>5,50/0)<br>/10,50/10 | 30/75)<br>0)<br>(20)  | AR362<br>AR362<br>AR362<br>AR362<br>AR362<br>AR362 | 75<br>75<br>75<br>75<br>75<br>75<br>75 | 10.50<br>10.50<br>10.50<br>10.50<br>10.50<br>28.00 | -3.00<br>5.10<br>3.20<br>1.20<br>2.30<br>-8.10 |
| Н  | DI E DIAI                       | METER                                     | / CASING                             |                        | $\top$  |                                  | DYN      | IAMI <sup>r</sup> | C SAMPLI   | ING  |  |   |  |   |   |  |  |   |  |  |  |  |
| Hole   | Depth                           | of Cas                                    | sing De                              | epth of                |   | op F                             | Base     |                   | ameter   | Time   |  | ecovery   |  |   |   |  |  |   |  |  |  |  |
| diameter<br>200<br>150<br>139<br>116   | 5.00<br>10.50<br>28.00<br>36.80 | ) 1                                       | 200 5<br>150 1                       | 5.00<br>10.50<br>28.00 |   |                                  |          |                   |  | hhmms  | 38   | %   |  |   |   |  |  |   |  |  |  |  |
|  | IN                              | JSTALL/                                   | ATION D                              | ETAILS                 | .—<br>з   |                                  | —        | —<br>Р'           | IPE CON  | STRUC  | TION   |   | 1  |   |   |  |  |   |  |  |  |  |
| Distance<br>from G.L   |                                 |   |                                      |                        |   |                                  |          | /pe of<br>pipe    |  |  |  |   |  |   |   |  |  |   |  |  |  |  |
| <del> </del>   | للل                             |   |                                      |                        | ACKE!   | ILL DETA                         | AII S    |                   | Щ.   |  | Ш  | !   |  |   |   | * S  | Seating blo  | ows only.<br>iENERAL N  | IOTES  |  | <u></u>  |  |
| Top o  |                                 |   |                                      |                        |   |                                  | .11.5    | —                 | Rem  | narks  |  |   |  |   |   |  |  | ENLIVALIT   | 0113   |  |  |  |
| 9.00   | ection section                  |   |                                      |                        |   |                                  |          |                   |  |  |  |   |  |   |   |  |  |   |  |  |  |  |
| NOTES  | Water                           | strike                                    | metres, a<br>rise time<br>f abbrevia | e in mii<br>iations,   | inutes,<br>s, see k                             | s, hard s<br>key                 | strata 1 | time              | e in hhmn  |  | 10.20  | 2:02  |  |   |   |  |  |   | 50   | IL end                                 | ines   | אחופי  |
|  |                                 |   |                                      | ,                      | Log Pr  | . IIIL Dat'                      | z ANO    | HIME              | e: 23/12/  | ./ ZUI3  | 10.29  | 1.UZ  |  |   |   |  |  |   | 301  | 110                                    | ,  |  |

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Engineer

Arch Henderson LLP

# **Exploratory Hole Log**

Hole ID.

B61

Sheet 1 of 4

Employer Aberdeen Harbour Board Ground Level -7.88m CD

Coordinates

397241.41 E, 804702.42 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend | Depth                 | Datum<br>Level   | Sampling   |      |     |     | ount .<br>Reco |    | In Situ Test<br>Details    | Install |
|---|--------|-----------------------|------------------|--|------|-----|-----|----------------|----|----------------------------|---------|
|   |        |                       | Level            | Details  | Dia. | TCR | SCR | RQD            | IF | Details                    | ation   |
| Medium dense grey slightly silty slightly gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse of mixed igneous and metamorphic lithologies including granite, dolerite, schist and gneiss.   |        |                       |                  | D001 0.00  D002 0.50-0.95 B003 0.50-1.00  D004 1.00 ES005 1.00 |      |     |     | 1              | •  | SPT8<br>0.50 0.95          |         |
|   |        |                       |                  | D006 1.50-1.95<br>B007 1.50-2.00                               |      |     |     |                |    | SPT9<br>1.50 1.95          |         |
|   |        |                       |                  | D010 2.50-2.95<br>B011 2.50-3.00                               |      |     |     |                |    | SPT14<br>2.50 2.95         |         |
|   |        |                       |                  | D012 3.00<br>ES013 3.00<br>D014 3.50-3.95<br>B015 3.50-4.00    |      |     |     |                |    | SPT25<br>3.50 3.95         |         |
| No recovery. BOULDER. (Driller's description)   | 0 0 0  | 4.50 –                | -12.38           | D016 4.00<br>ES017 4.00  |      |     |     |                |    | SPT(C)50/0mm<br>4.50 4.51  |         |
| Stiff to very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies including schist, granite, quartzite and dolerite.  |        | 5.00                  | -12.88<br>-13.26 | 5.00 6.00  | 92   | 38  | 12  | 12             |    | -                          |         |
| from 5.00m to 5.13m 1 No very strong dolerite boulder Assumed zone of no recovery. Sandy boulder CLAY. (Driller's description) No recovery. Sandy boulder CLAY. (Driller's description)   |        | 6.00 —                | -13.88           | -D018 6.00-6.30  |      |     |     |                |    | SPT50/150mm -<br>6.00 6.30 |         |
|   |        |                       |                  | 6.00 7.50  | 92   | 0   | 0   | 0              |    | -                          |         |
| Stiff to very stiff brown slightly gravelly sandy CLAY with high cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies including schist, granite, quartzite and dolerite. Cobbles are angular to subrounded of granite, dolerite and schist.  |        | 7.50 -<br>7.72 -<br>- | -15.38<br>-15.60 | 7.50 8.25  | 92   | 29  | 0   | 0              |    | SPT50/150mm<br>7.50 7.80   |         |
| Assumed zone of no recovery. Sandy boulder CLAY. (Driller's description)  Stiff to very stiff brown slightly gravelly sandy CLAY with   |        | 8.25 _<br>8.45 _<br>- | -16.13<br>-16.33 | 8.25 9.00  | 92   | 27  | 0   | 0              |    |                            |         |
| high cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies including schist, granite, quartzite and dolerite. Cobbles are angular to subrounded of granite, dolerite and schist.  Assumed zone of no recovery. Sandy boulder CLAY. (Driller's |        | 9.00 —                | -16.88           |  |      |     |     |                | 1  | SPT50/10mm -<br>9.00 9.06  |         |
| description)  | 0.00   | =                     |                  | 9.00 10.50   | 92   | 33  | 0   | 0              |    |                            |         |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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SOIL ENGINEERING Part of the Bachy Soletanche Group

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

Hole ID.

**Exploratory Hole Log** 

B61

Sheet 2 of 4

Ground Level -7.88m CD Coordinates 397241.41 E, 804702.42 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend                                  | Depth                                  | Datum<br>Level   | San   | npling |      |     |     | ount A<br>Recov |    | In Situ Test<br>Details               | Insta                                  |
|--|---|--|------------------|-------|--------|------|-----|-----|-----------------|----|---------------------------------------|--|
|  | 77.74                                   |  | Level            | Deta  | ails   | Dia. | TCR | SCR | RQD             | IF | Details                               | ation                                  |
| 9.00m - 9.50m : Very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies including schist, granite, quartzite and dolerite.  Detail 9.00m - 9.10m : from 9.00m to 9.10m recovered as angular coarse gravel |   | 10.50 -                                | -18.38<br>-18.68 |       |        |      |     |     |                 |    | SPT(C)37 -<br>10.50 10.95 -           |  |
| 9.50m - 10.50m : Assumed zone of no recovery. Sandy boulder<br>CLAY. (Driller's description)   | 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 11.50                                  | -19.38           | 10.50 | 11.50  | 92   | 30  | 0   | 0               |    |                                       |  |
| Very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies schist, granite, quartzite and dolerite.  | 9 9 5<br>9 9 6                          | -                                      | 13.50            | 11.50 | 12.00  | 92   | 100 | 20  | 20              |    |                                       |  |
| Assumed zone of no recovery. Sandy boulder CLAY. (Driller's description)   | 0 0 0 0                                 | 12.50                                  | -20.38           |       |        |      |     |     |                 |    | 12.00 12.26 -<br>-                    |  |
| Very stiff brown slightly gravelly sandy CLAY with high cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies including schist, granite, quartzite and dolerite. Cobbles are angular to subrounded of granite, dolerite and schist.    |   |  | 20.30            | 12.00 | 13.50  | 92   | 33  | 6   | 0               |    | <u>-</u>                              |  |
| Assumed zone of no recovery. Sandy boulder CLAY. (Driller's description)  Very stiff brown slightly gravelly sandy CLAY with high cobble   | P 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 13.50                                  | -21.38           |       |        |      |     |     |                 |    | SPT(C)50/30mm 13.50 13.60             |  |
| very still brown stignity gravely sainty CLAY with high cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies including schist, granite, quartzite and dolerite. Cobbles are angular to subrounded of granite and schist.              |   | 14.05 _                                | -21.93           | 13.50 | 15.00  | 92   | 37  | 0   | 0               |    | -<br>-<br>-<br>-<br>-                 |  |
| Assumed zone of no recovery. Sandy boulder CLAY. (Driller's description)   | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0   | 15.00                                  | -22.88           |       |        |      |     |     |                 |    | <br><br><br><br>SPT(C)36              |  |
| Very stiff brown slightly gravelly sandy CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies including granite, schist, dolerite and quartzite. Cobbles are angular to subrounded of granite and schist.            |   | 15.40 -                                | -23.28           | 15.00 | 16.50  | 92   | 27  | 8   | 8               |    | 15.00 15.45                           |  |
| Assumed zone of no recovery. Sandy boulder CLAY. (Driller's description) from 16.90m to 17.05m 1 No cobble of very strong grey speckled pink and white granite   |   | -<br>-<br>-<br>-<br>-<br>16.50 -       | -24.38           |       |        |      |     |     |                 |    |                                       |  |
| Very stiff brown slightly gravelly sandy CLAY with high cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies including granite, schist, dolerite and quartzite. Cobbles are angular to subrounded of granite and schist.              |   | 10.30 -<br>-<br>-<br>-<br>-<br>17.20 - | -25.08           | 16.50 | 18.00  | 92   | 47  | 20  | 10              |    | 16.50 16.85 -<br>-<br>-               |  |
| Assumed zone of no recovery. Sandy boulder CLAY. (Driller's description)   |   |  |                  | 10.00 | 10.00  | 02   |     | 20  | 10              |    | -                                     |  |
| Very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies including granite, schist and quartzite.  |   | 18.00—<br>18.20 —                      | -25.88<br>-26.08 |       |        |      |     |     |                 |    | SPT(C)50/115mm—<br>18.00 18.24 -<br>- |  |
| Assumed zone of no recovery. Sandy boulder CLAY. (Driller's description)   |   |  |                  | 18.00 | 19.50  | 92   | 13  | 0   | 0               |    | -<br>-<br>-<br>-                      |  |
| Very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of   |   | 19.50                                  | -27.38           |       |        |      |     |     |                 |    | SPT(C)50/145mm -<br>19.50 19.80 -     | ************************************** |
|  | 0 - 0                                   | 19.90                                  | -27.78           |       |        |      |     |     |                 |    | -                                     |  |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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SOIL ENGINEERING Part of the Bachy Soletanche Group

Project No. TA7148

Engineer

Employer

**Exploratory Hole Log** 

Hole ID.

B61

Sheet 3 of 4

Ground Level -7.88m CD Coordinates 397241.41 E, 804702.42 N National Grid

Hole Type CP+RC Inclination

Arch Henderson LLP

Aberdeen Harbour Board

| Description of Strata  | Legend                                  | Depth                             | Datum<br>Level   | Sam   | pling |      |     |     | ount A<br>Recov |    | In Situ Test<br>Details                        | Insta  |
|--|---|-----------------------------------|------------------|-------|-------|------|-----|-----|-----------------|----|--|--------|
|  |   |                                   | Level            | Detai | ils   | Dia. | TCR | SCR | RQD             | IF | Details  | atioi  |
| 19.50m - 19.90m : mixed lithologies including granite, schist and quartzite.   | 0 0 0                                   | =                                 |                  | 19.50 | 21.00 | 92   | 27  | 0   | 0               |    | 1  |        |
| 19.90m - 21.00m : Assumed zone of no recovery. Sandy boulder CLAY. (Driller's description)   | 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | =                                 |                  |       |       |      |     |     |                 | NA |  |        |
| Very stiff brown slightly gravelly sandy CLAY with high cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite. Cobbles are angular to subrounded of granite and schist. from 21.00m to 21.25m recovered as angular to subrounded |   | 21.00                             | -28.88<br>-29.48 | 21.00 | 22.50 | 92   | 40  | 17  | 11              |    | SPT(C)50/150mm—<br>21.00 21.18 -               |        |
| fine to coarse gravel and cobbles of granite and schist  Assumed zone of no recovery. Sandy boulder CLAY. (Driller's description)  | P - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - | _                                 |                  | 21.00 | 22.50 | 92   | 40  | 17  | 11              |    | <u> </u>                                       |        |
| Very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite and schist.   |   | 22.50                             | -30.38<br>-30.83 |       |       |      |     |     |                 |    | SPT(C)50/10mm - 22.50 22.66                    | 500000 |
| Assumed zone of no recovery. Sandy boulder CLAY. (Driller's description)   |   |                                   |                  | 22.50 | 24.00 | 92   | 30  | 0   | 0               |    |  |        |
| Very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite and schist.   | P 0 0                                   | 24.00 —                           | -31.88<br>-32.18 |       |       |      |     |     |                 |    | SPT(C)50/95mm<br>24.00 24.25                   |        |
| Assumed zone of no recovery. Sandy boulder CLAY. (Driller's description)   |   |                                   |                  | 24.00 | 25.50 | 92   | 20  | 0   | 0               |    |  |        |
| Very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite and schist.  from 25.50m to 25.65m 1 No very strong granite cobble or boulder   |   | 25.50 -<br>-<br>25.80 -<br>-<br>- | -33.38<br>-33.68 | 25.50 | 26.50 | 92   | 30  | 15  | 15              |    | SPT(C)50/0mm -<br>25.50 25.51 -<br>-<br>-<br>- |        |
| Assumed zone of no recovery. Sandy boulder CLAY. (Driller's description)   | 9 8 9 9                                 | 26.50                             | -34.38           |       |       |      |     |     |                 |    |  |        |
| No recovery. Sandy boulder CLAY. (Driller's description)   |   |                                   |                  | 26.50 | 28.00 | 92   | 0   | 0   | 0               |    |  |        |
| Very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite and schist.   |   | 28.00                             | -35.88           | 28.00 | 28.50 | 92   | 60  | 50  | 50              |    | SPT(C)50/10mm<br>28.00 28.02<br>               |        |
| from 28.88m to 29.00m 1 No very strong granite cobble  |   |                                   |                  | 28.50 | 30.00 | 92   | 63  | 63  | 48              |    |  |        |
| from 29.40m to 29.50m 1 No very strong granite cobble  | P 0 0 0                                 | 29.50                             | -37.38           |       |       |      |     |     |                 |    |  | 11414  |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG

Issue.Revision No. 1.05



#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 B61 Engineer Arch Henderson LLP Employer Aberdeen Harbour Board Sheet 4 of 4

Ground Level -7.88m CD Coordinates 397241.41 E, 804702.42 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend    | Depth      |        |       |       |      | San | nple l | Recov | ery | In Situ Test | Instal                                  |
|---|-----------|------------|--------|-------|-------|------|-----|--------|-------|-----|--------------|---|
|   |           |            | Level  | Deta  | ails  | Dia. | TCR | SCR    |       | IF  | Details      | ation                                   |
| escription)   |           | 30.00 _    | -37.88 |       |       |      |     |        |       |     |              |   |
| ery stiff brown slightly gravelly sandy CLAY. Sand is fine to   |           |            |        |       |       |      |     |        |       |     |              |   |
| oarse. Gravel is angular to subrounded fine to coarse of  |           | -          |        |       |       |      |     |        |       |     |              |   |
| ranite and schist.  |           | -          |        | 30.00 | 31.50 | 92   | 100 | 85     | 85    |     |              | 7777777                                 |
|   |           | _          |        |       |       |      |     |        |       |     |              | ********                                |
|   |           | -          |        |       |       |      |     |        |       |     | ( -          |   |
| Veak dark greyish grey SCHIST. Recovered as non intact core   |           | 31.30 -    | -39.18 |       |       |      |     |        |       |     |              |   |
| angular fine to coarse gravel sized fragments).   | ****      | 31.50 -    | -39.38 |       |       |      |     |        |       |     |              |   |
| Medium strong pinkish grey GRANITE. Recovered as non intact   | * * * * * |            |        | 31.50 | 32.00 | 92   | 60  | 0      | 0     |     |              |   |
| ore (angular medium to coarse gravel sized fragments).<br>from 31.80m to 32.00m assumed zone of no recovery | *****     |            |        |       |       |      |     |        |       |     | -            |   |
| ,   | * * * * * |            |        |       |       |      |     |        |       |     |              |   |
|   | *****     | , :        |        |       |       |      |     |        |       |     |              | 50000000                                |
|   | ****      |            |        | 32.00 | 33.50 | 92   | 86  | 0      | 0     |     |              |   |
|   | ****      | ) <u> </u> |        | 32.00 | 33.30 | 52   | 00  | U      | "     |     |              |   |
|   | * * * * * | _          |        |       |       |      |     |        |       |     | -            |   |
| f 22 20m t- 22 50m  | *****     | -          |        |       |       |      |     |        |       |     | I.           | 532377777                               |
| from 33.30m to 33.50m assumed zone of no recovery   | *****     | y .        | -      |       |       |      |     |        |       |     |              | 217227                                  |
|   | *****     | -          |        |       |       |      |     |        |       |     |              |   |
|   | ****      | -          |        |       |       |      |     |        |       |     | Ę            |   |
|   | *****     | -          |        | 22.50 | 25.00 | 02   | 02  | 0      | 0     |     |              |   |
|   | *****     | _          |        | 33.50 | 35.00 | 92   | 93  | 0      | 0     |     |              |   |
|   | * * * * * | -          |        |       |       |      |     |        |       |     |              | 200000000000000000000000000000000000000 |
|   | *****     | -          |        |       |       |      |     |        |       |     | ,            |   |
| from 34.90m to 35.00m assumed zone of no recovery   | ****      | -          |        |       |       |      |     |        |       |     |              |   |
|   | ++++      | =          |        |       |       |      |     |        |       |     |              |   |
|   | *****     | =          |        | 35.00 | 35.80 | 92   | 100 | 0      | 0     |     |              | ********                                |
|   | * * * * * | =          |        |       |       |      |     |        |       |     | 1.           | 22211231                                |
|   | ****      | , :        | •      |       |       |      |     |        |       |     |              |   |
|   | ****      | 40         |        |       |       |      |     |        |       |     | -            |   |
|   | * * * * * | -          |        | 35.80 | 36.80 | 92   | 100 | 0      | 0     |     |              | #1##1111                                |
|   | *****     | _          |        |       |       |      |     |        |       |     |              |   |
|   | ++++      | 36.80 -    | -44.68 |       |       |      |     |        |       |     |              |   |
| xploratory hole complete at 36.80 m.  |           | _          |        |       |       |      |     |        |       |     | _            |   |
|   |           | -          |        |       |       |      |     |        |       |     |              |   |
|   |           | =          |        |       |       |      |     |        |       |     |              |   |
|   |           | =          |        |       |       |      |     |        |       |     |              |   |
|   |           | -          |        |       |       |      |     |        |       |     |              |   |
|   |           | -          |        |       |       |      |     |        |       |     | -            | 1                                       |
|   |           | -          |        |       |       |      |     |        |       |     |              | 1                                       |
|   |           | -          |        |       |       |      |     |        |       |     | ]            | 1                                       |
|   |           | -          |        |       |       |      |     |        |       |     | ]            | 1                                       |
|   |           | -          |        |       |       |      |     |        |       |     |              | ]                                       |
|   |           | -          |        |       |       |      |     |        |       |     |              | }                                       |
|   |           | -          |        |       |       |      |     |        |       |     |              | }                                       |
|   |           | -          |        |       |       |      |     |        |       |     |              | 1                                       |
|   |           | _          |        |       |       |      |     |        |       |     |              | 1                                       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Issue.Revision No. 1.05

Form No. SIEXPHOLELOG

Log Print Date And Time: 23/12/2013 10:29:17

Issue Date 22/10/2012

Part of the Bachy Soletanche Group

SOIL ENGINEERING

|                      |               | е Вау         | of Nigg                    | Harb               | our Dev                                 | elop     | ment                  | Ground               | Inves         | tigation           |           |                  | Evnlo      | ratory          | Hole Lo           | 20            | Нс         | ole ID.  |        |
|----------------------|---------------|---------------|----------------------------|--------------------|---|----------|-----------------------|----------------------|---------------|--------------------|-----------|------------------|------------|-----------------|-------------------|---------------|------------|----------|--------|
| Project              |               | TA7           |                            |                    |   |          |                       |                      |               |                    |           |                  | LAPIO      | iatory          | TOTE L            | <i>,</i> 9    | (          | 79       |        |
| Engine               |               |               | n Hender                   |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
| Employ<br>Ground I   |               |               | rdeen Ha<br>Om CD          | arbou              | Ir Boaru                                |          |                       | Coor                 | dinates       | 3970               | )82.70 E, | 80492            | 20.10 N Na | ational Grid    |                   |               | יר         | eader    |        |
| Date Sta             |               |               | 9/2013                     |                    |   |          |                       |                      |               | eted 21/0          |           |                  |            |                 |                   | tion Verti    | cal        |          |        |
| Тор                  | Base          | Туре          | Date Start                 | ted D              | ate Ende                                | d C      | Crew                  | Section<br>Logged By | Cor<br>Barr   | re Core<br>rel Bit |           | Equip            | ment       | Sh<br>Su        | oring /<br>ipport | F             | Remarks    |          |        |
| 0.00<br>0.90         | 0.90<br>8.00  | CP<br>RC      | 20/09/20:                  |                    | 20/09/2013<br>21/09/2013                |          | AOH<br>RJ             | TW<br>TW             | T611          | 16 Impre           | g         | Dando<br>Deltaba |            |                 | -                 |               |            |          |        |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
|                      |               |               |                            | PRO                | GRESS                                   |          |                       |                      |               |                    |           |                  |            |                 | NATER STRI        | IKES          |            |          |        |
| Date                 | Ti            | me            | Hole<br>depth              | Casing<br>depth    | g Wate<br>h depth                       | r<br>1   |                       | Remar                | ks            |                    | Dat       | te               | Time       | Strike at depth | Rise to depth     | Time<br>taken | at strik   | sing dep | o seal |
| 20/09/20<br>21/09/20 | 13 1          | 900           | 0.90<br>0.90               | 0.80               | -7.10<br>-5.00                          |          | d of CP<br>art of Shi |                      |               |                    | †         |                  |            |                 |                   | to rise       | time       | +        | flow   |
| 21/09/20             | 13   1        | .500          | 8.00                       | 0.80               | -8.60                                   |          | d of Hol              |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
|                      |               |               |                            |                    |   | $\perp$  |                       |                      |               |                    | <u> </u>  |                  |            |                 |                   |               |            |          |        |
| ⊔ard                 | Strata        | Donth         |                            | BLE PER<br>Chisell | RCUSSIO                                 |          | TAILS<br>narks        |                      |               |                    | Depth     | Туре             | Increr     | nental blow     | SPT DETAI         | ILS<br>Hammer | Energy     | Casing   | Water  |
| from                 |               | to            | Start tir                  | me <sub>I</sub>    | Duration<br>hhmm                        | Kem      | idikə                 |                      |               |                    | Бери      | Type             |            | etration in     |                   | No.           | ratio<br>% | depth    | depth  |
| 0.80                 | $\top$        | 0.90          | 1630                       |                    | 0200                                    | Chise    | elling                |                      |               |                    | 0.50      | SPT(C            | 50/245m    | ım (3,4,4,5,7,3 | 34/20)            | AR360         | 75         | N/A      | -9.80  |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            | İ        |        |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            | İ        |        |
|                      | $\perp$       |               |                            |                    | =:::::::::::::::::::::::::::::::::::::: | <u> </u> |                       |                      |               |                    | 4         |                  |            |                 |                   |               |            | İ        |        |
| From                 |               | To            | K                          | F                  | FLUSH D                                 | ETAIL    | Flu                   | ush                  |               | ush                | -         |                  |            |                 |                   |               |            | İ        |        |
| 0.90                 | <u> </u>      | depth<br>6.70 |                            |                    | type<br>/ater                           | _        |                       | turn<br>%<br>0       |               | lour               | 1         |                  |            |                 |                   |               |            | İ        |        |
| 6.70                 |               | 8.00          |                            |                    | /ater                                   |          | 7                     | 70                   | Bro           | own                |           |                  |            |                 |                   |               |            | İ        |        |
|                      |               |               |                            |                    |   |          | i                     |                      |               |                    |           |                  |            |                 |                   |               |            | İ        |        |
|                      |               |               |                            |                    |   |          | i                     |                      |               |                    |           |                  |            |                 |                   |               |            | Ì        |        |
|                      |               |               |                            |                    |   |          | 1                     |                      |               |                    |           |                  |            |                 |                   |               |            | Ì        |        |
| НО                   |               |               | / CASING                   |                    |   | DY       | NAMIC                 | C SAMPLIN            | 1G            |                    |           |                  |            |                 |                   |               |            | Ì        |        |
| Hole<br>diameter     | Depth<br>hole |               |                            |                    | Тор                                     | Base     | Dia                   |                      | Time<br>hmmss | Recovery<br>%      |           |                  |            |                 |                   |               |            | Ì        |        |
| 155<br>116           | 0.90<br>8.00  | 15            | 0.9                        | 0                  |   |          |                       |                      |               |                    | 1         |                  |            |                 |                   |               |            | Ì        |        |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            | Ì        |        |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            | Ì        |        |
|                      | L             | ICTALLA       | TION DET                   |                    |   | —        | ㅗ                     | IDE CONCI            |               |                    | 1         |                  |            |                 |                   |               |            | Ì        |        |
| Distance             |               |               |                            |                    | nse zone                                | ID       |                       | IPE CONST<br>Pipe    | Dia.          | Type of            | 1         |                  |            |                 |                   |               |            | Ì        |        |
| from G.L.            | -             |               |                            | Top                | Base                                    |          | Тор                   | Base                 | of pipe       | pipe               | -         |                  |            |                 |                   |               |            | ī        |        |
|                      |               | Ì             |                            |                    |   |          | i                     |                      |               |                    |           |                  |            |                 |                   |               |            | Ì        |        |
|                      |               | Ì             |                            |                    |   |          | i                     |                      |               |                    |           |                  |            | * Seating b     | lows only.        |               |            | Ì        |        |
|                      |               |               |                            |                    | KFILL DET                               | AILS     |                       |                      |               |                    |           |                  |            | G               | SENERAL NO        | OTES          |            |          |        |
| Top of section       | n se          | ase of ection |                            | laterial           |   |          |                       | Remai                | rks           |                    |           |                  |            |                 |                   |               |            |          |        |
| 0.00<br>0.90         |               | 0.90<br>8.00  |                            | risings<br>Grout   |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
|                      |               |               |                            |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
| NOTES:               |               |               | metres, all                |                    |   |          |                       |                      |               |                    |           |                  |            |                 |                   |               |            |          |        |
|                      | For de        | tails of      | rise time ir<br>abbreviati | ons, se            | ites, nard<br>ee key                    | strata   | a time                | in nnmm              |               |                    |           |                  |            |                 |                   |               |            |          |        |
|                      |               |               |                            | Loç                | g Print Da                              | te An    | d Time                | e: 23/12/2           | 2013 10       | ີ່ 0:29:32         |           |                  |            |                 |                   | SOI           | L eng      | inee     | RING   |

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

**Exploratory Hole Log** 

Hole ID.

C79

Sheet 1 of 1

Ground Level -6.59m CD Coordinates 397082.70 E, 804920.10 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend                                | Depth            | Datum<br>Level   | Sa     | ampling |      |     |     | unt A<br>Recov |                 | In Situ Test<br>Details         | Ins  |
|--|---------------------------------------|------------------|------------------|--------|---------|------|-----|-----|----------------|-----------------|---------------------------------|------|
|  |                                       |                  | Level            | De     | tails   | Dia. | TCR | SCR | RQD            | IF              | Details                         | alic |
| Medium dense brown slightly silty gravelly fine to medium AND. Gravel is angular to rounded fine to medium of mixed gneous and metamorphic lithologies.  |                                       | -                |                  | D001 0 | 0.00    |      |     |     |                |                 | SPT(C)50/245mm -<br>0.50 0.90 - |      |
| No recovery. Possible rockhead. (Driller's description)  |                                       | 0.80 -<br>0.90 - | -7.39<br>-7.49   |        |         |      |     |     |                |                 | -                               |      |
| Medium strong to strong coarse crystalline pink and grey<br>3RANITE. Discontinuities: 1) 10-30 degrees very closely to<br>closely spaced planar rough stained brown. 2) 60-80 degrees<br>closely to medium spaced planar rough stained brown.<br>from 0.90m to 1.01m recovered as non intact core (angular<br>coarse gravel sized fragments)<br>from 0.90m to 1.58m discontinuities: 2) very closely to<br>closely spaced  | *****                                 |                  |                  | 0.90   | 2.20    | 92   | 100 | 93  | 45             |                 |                                 |      |
| from 1.14m to 1.22m 1 No discontinuity 50 degrees planar rough clean from 1.36m to 1.43m weak. Recovered as non intact core (angular fine to medium gravel sized fragments) from 1.45m to 1.58m discontinuities: 2) with clay smearing on surfaces   | *****                                 |                  |                  | 2.20   | 3.20    | 92   | 100 | 97  | 63             |                 | :<br>:<br>:<br>:                |      |
| from 1.62m to 1.74m 1 No incipient fracture 80 degrees planar from 1.97m to 2.00m weak. Recovered as non intact core (angular fine to medium gravel sized fragments) from 2.01m to 2.35m 2 No incipient fractures very closely spaced 8 degrees planar from 2.57m to 2.88m strong grey gneiss from 3.03m to 3.20m weak to medium strong with 3 No incipient fractures 30-60 degrees very closely spaced planar from 3.74m to 3.95m discontinuities: 2) perpendicular through core axis   | ****                                  |                  |                  | 3.20   | 4.80    | 92   | 100 | 93  | 70             | NI<br>90<br>300 | -                               |      |
| from 3.91m to 3.98m 1 No discontinuity 50 degrees planar rough brown from 4.15m to 4.50m 5 No incipient fractures very closely spaced 80-90 degrees planar from 4.27m to 4.32m 1 No discontinuity 40 degrees planar rough stained brown from 4.86m to 5.00m 1 No incipient fracture 80-90 degrees planar from 5.00m to 5.78m 1 No discontinuity 80-90 degrees planar rough stained brown from 5.13m to 5.30m recovered as non intact core (angular to subangular fine to coarse gravel sized fragments) from 5.46m to 5.50m recovered as non intact core (angular        | * * * * * * * * * * * * * * * * * * * | 6.13             | -12.72           | 4.80   | 6.70    | 92   | 100 | 63  | 38             |                 |                                 |      |
| medium gravel sized fragments) from 5.80m to 5.88m 1 No discontinuity 50 degrees planar rough stained brown from 5.90m to 6.00m recovered as non intact core (angular fine to medium gravel sized fragments) from 6.00m to 6.13m 3 No discontinuities 50-60 degrees very closely spaced planar rough stained brown   | * * * * * * * * * * * * * * * * * * * |                  |                  | 6.70   | 7.60    | 92   | 100 | 18  | 0              |                 | -<br>-<br>-<br>-<br>-           |      |
| Weak locally very weak coarse crystalline pink and grey GRANITE stained dark brown. Recovered as non intact core slightly sandy very angular to subangular fine to coarse gravel sized fragments. Sand sized fragments are fine to coarse).  from 6.33m to 6.39m clayey from 6.70m to 6.92m intact core. Weak to medium strong with 3 No discontinuities 10-30 degrees very closely to closely spaced planar rough stained brown and 1 No discontinuity 60-70 degrees planar rough stained brown from 7.67m to 7.89m 1 No discontinuity 80-90 degrees planar rough clean | ****                                  | 8.00             | -14.33<br>-14.59 | 7.60   | 8.00    | 92   | 100 | 60  | 50             |                 |                                 |      |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:29:35

SOIL ENGINEERING Part of the Bachy Soletanche Group

| Project Name | Bay of Nigg Harbour Development Ground Investigation |                      | Hole ID.      |
|--------------|--|----------------------|---------------|
| Project No.  | TA7148   | Exploratory Hole Log | C79           |
| Engineer     | Arch Henderson LLP                                   |                      | C/9           |
| Employer     | Aberdeen Harbour Board                               |                      | Sheet 1+ of 1 |

397082.70 E, 804920.10 N National Grid Ground Level -6.59m CD Coordinates

Hole Type CP+RC Inclination

|                     | Description of Strata                                     |        | Legend | Depth | Datum | Sampling |      | Blo<br>San | ow Co<br>nple F | ount A<br>Recov | And<br>ery | In Situ Test | Instal |
|---------------------|---|--------|--------|-------|-------|----------|------|------------|-----------------|-----------------|------------|--------------|--------|
|                     | ·   |        |        |       | Level | Details  | Dia. |            |                 | RQD             | İF         | Details      | ation  |
| Remaining Detail    | : 7.88m - 7.93m : from 7.88m to 7.93<br>80 degrees planar | m 1 No | /      | -     |       |          |      |            |                 |                 |            | -            |        |
| Exploratory hole co |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | _     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -<br>-       |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | _     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | =     |       |          |      |            |                 |                 |            | =            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | _     |       |          |      |            |                 |                 |            |              |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -<br>-       |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            | -      |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | =            |        |
|                     |   |        |        | _     |       |          |      |            |                 |                 |            | _            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -<br>-       |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -<br>-       |        |
|                     |   |        |        | _     |       |          |      |            |                 |                 |            |              |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | <u>-</u>     |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | _     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            | 1      |
|                     |   |        |        | =     |       |          |      |            |                 |                 |            | =            |        |
|                     |   |        |        | _     |       |          |      |            |                 |                 |            |              |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | =            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            |              |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -<br>-       | -      |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | =     |       |          |      |            |                 |                 |            | -            |        |
|                     |   |        |        | -     |       |          |      |            |                 |                 |            | _            | 1      |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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| _                    |                                       | e Bay                | of Nigg               | g Harl             | bour Dev               | elopi   | ment             | Ground          | l Inves         | tigatio        | n            |              |                    | Fynlo                   | ratory  | Hole Lo            | 00               | Н                    | ole ID.      |                |
|----------------------|---------------------------------------|----------------------|-----------------------|--------------------|------------------------|---------|------------------|-----------------|-----------------|----------------|--------------|--------------|--------------------|-------------------------|---|--------------------|------------------|----------------------|--------------|----------------|
| Project              |                                       | TA7                  |                       |                    |                        |         |                  |                 |                 |                |              |              |                    | LAPIO                   | ratory  | I IOIC L           | og               | (                    | 281          |                |
| Engine               |                                       |                      | n Hende               |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
| Employ<br>Ground     |                                       |                      | rdeen F<br>7m CD      | larbo              | ur Board               |         |                  | Coor            | dinates         | 20             | 707          | 76 10 E      | 907.91             | 17 00 NI NI             | ational Grid  | <u> </u>           |                  | Н                    | eader        |                |
| Date Sta             |                                       |                      | 9/2013                |                    |                        |         |                  |                 |                 | eted 22        |              |              | 0040.              | L7.50 N N               | ational Gill  | ı<br>Inclina       | tion Vert        | ical                 |              |                |
| Тор                  | Base                                  |                      | Date Sta              | rted               | Date Ende              | d Cı    | rew              | Section         | Coi             |                | ore<br>lit   |              | Equip              | ment                    | ŞI  | noring /<br>upport |                  | Remarks              |              |                |
| 0.00                 | 2.80                                  | СР                   | 22/09/2               | 013                | 22/09/201              | 3 A     | ЮН               | Logged By<br>TW | / Barı          | rel B          | lit          |              | Dando              | 3000                    | S   | upport             |                  |                      |              |                |
| 2.80<br>4.40         | 4.40<br>8.00                          | RO<br>RC             | 22/09/2<br>22/09/2    | 013                | 22/09/201<br>22/09/201 | 3       | RJ<br>RJ         | TW<br>TW        | T61             |                | 4 RF<br>oreg | ! C          | Oeltaba<br>Oeltaba | se 515<br>se 515        |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
| Date                 | Ті                                    | me                   | Hole                  | PRO                | OGRESS<br>ng Wate      | r       |                  | Remai           | rke             |                | 4            | Dat          |                    | Time                    | Strike a  | WATER STR          | Time             |                      | sing dep     | ıth            |
|                      |                                       | ille                 | depth                 | dept               | th dept                | n       |                  |                 |                 |                |              | Dat          | C                  | Tillie                  | depth   | depth              | taken<br>to rise | at stril<br>time     | κe i to      | seal<br>low    |
| 22/09/20<br>22/09/20 | )13 1<br>)13 1                        | 200<br>530           | 2.80<br>8.00          | 2.50<br>4.40       |                        |         | of CP/<br>of Hol | Start of Ro     | tary            |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      | 2013 1530 8.00 4.40 -9.00 End of Hole |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      | CABLE PERCUSSION DETAILS              |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      | CA                    | ABLE PI            | ercussio               | N DET   | AILS             |                 |                 |                |              |              |                    |                         |   | SPT DETA           | ILS              |                      |              |                |
| Hard<br>from         | Strata                                | Depth<br>to          | Start t               | Chise              | elling<br>Duration     | Rem     | arks             |                 |                 |                |              | Depth        | Туре               |                         | mental blov<br>etration in  |                    | Hammer<br>No.    | Energy ratio         | Casing depth | Water<br>depth |
| 2.50                 |                                       | 2.80                 | hhm<br>100            |                    | 0200                   | Chise   | lling            |                 |                 |                | $\dashv$     | 0.50         | SPT(C              | C) N=23 (3,4            | 4,4,5,6,8)  |                    | AR362            | 75<br>75             | N/A          | -8.30<br>-7.30 |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              | 1.50<br>2.50 | SPT(C              | N=23 (4,4<br>5) 50/15mr | 4,4,5,6,8)<br>4,5,5,6,7)<br>n (75/10,50/<br>n (8,10,11,39<br>n (25/70,50/ | 15)                | AR362<br>AR362   | 75<br>75<br>75<br>75 | 1.50<br>2.50 | -6.00          |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              | 3.50<br>5.90 | SPT(C              | 50/95mr<br>50/70mr      | n (8,10,11,39<br>n (25/70,50/   | 720)<br>70)        | AR362<br>AR362   | 75<br>75             | 3.50<br>4.40 | -6.40<br>-7.10 |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      | F                     | ROTAR              | Y FLUSH D              | ETAILS  | S                |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
| Fron<br>dept         |                                       | To<br>depth          |                       |                    | Flush<br>type          |         | ret              | ush<br>turn     |                 | ush<br>Iour    |              |              |                    |                         |   |                    |                  |                      |              |                |
| 2.80                 |                                       | 8.00                 |                       |                    | Water                  |         |                  | .00             |                 | own            |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
| НО                   | LE DIAN                               | ΛETER.               | / CASING              | ì                  |                        | DYI     | NAMI             | C SAMPLII       | NG              |                |              |              |                    |                         |   |                    |                  |                      |              |                |
| Hole<br>diameter     | Depth<br>hole                         |                      |                       | oth of<br>sing     | Тор                    | Base    | Dia              |                 | Time<br>hmmss   | Recove         | ry           |              |                    |                         |   |                    |                  |                      |              |                |
| 150                  | 4.40                                  |                      |                       | .00                |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      | TION DE               |                    |                        |         |                  | IPE CONS        |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
| Distance<br>from G.L |                                       | ly                   | /pe                   | Respo<br>Top       | nse zone<br>Base       | ID      | Тор              | Pipe<br>  Base  | Dia.<br>of pipe | Type o<br>pipe |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    | CIVETT                 |         |                  |                 |                 |                | 4            |              |                    |                         |   | olows only.        | OTES             |                      |              |                |
| Top o                | f P                                   | ase of               |                       | BA0<br>Materi      | CKFILL DET             | AILS    |                  | Rema            | rks             |                | $\dashv$     |              |                    |                         | -   | GENERAL N          | UIES             |                      |              |                |
| sectio<br>0.00       | n se                                  | ection<br>8.00       |                       | Arising            |                        |         |                  | Nend            |                 |                | _            |              |                    |                         |   |                    |                  |                      |              |                |
| 0.00                 |                                       | 0.00                 |                       | ,og                |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       |                    |                        |         |                  |                 |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
| NOTES:               | All de                                | oths in              | metres, a             | ll dian            | neters in m            | illimet | tres.            | . ,.            |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      | Water<br>For de                       | strike i<br>tails of | rise time<br>abbrevia | ın min<br>tions, s | utes, hard<br>see key  | strata  | time             | ın hhmm         |                 |                |              |              |                    |                         |   |                    |                  |                      |              |                |
|                      |                                       |                      |                       | Lo                 | og Print Da            | te And  | d Time           | 23/12/          | 2013 1          | 0:29:43        |              |              |                    |                         |   |                    | SOI              | L end                | inee         | RING           |

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 C81 Engineer Arch Henderson LLP

Employer Aberdeen Harbour Board Ground Level -6.27m CD Coordinates

397076.10 E, 804817.90 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend                                   | Depth                | Datum  | Sampling                    |      | Blo<br>San | ow Co<br>nple F | ount A<br>Recove | nd<br>ery | In Situ Test                             | Ins |
|---|--|----------------------|--------|-----------------------------|------|------------|-----------------|------------------|-----------|--|-----|
| ,   |  |                      | Level  | Details                     | Dia. |            | _               | RQD              | IF        | Details                                  | ati |
| Medium dense brown slightly silty gravelly fine to coarse AND. Gravel is angular to subrounded fine to coarse of mixed gneous and metamorphic lithologies.  from 0.50m to 1.00m very gravelly   |  |                      |        | D001 0.50<br>B002 0.50-1.00 |      |            |                 |                  |           | SPT(C)23<br>0.50 0.95<br>                |     |
|   |  |                      |        | D003 1.50<br>B004 1.50-2.00 |      |            |                 |                  |           | SPT(C)23                                 |     |
| otary openhole drilling. COBBLES and BOULDERS with sand.  |  | 2.50<br><br><br><br> | -8.77  | D005 2.50<br>B006 2.50      |      |            |                 |                  |           | SPT(C)50/15mm -<br>2.50 2.53 -<br>-<br>- |     |
|   | 7 10 10 10 10 10 10 10 10 10 10 10 10 10 | -                    |        |                             |      |            |                 |                  |           | SPT(C)50/95mm -<br>3.50 3.75 -           |     |
| tiff very high strength brown slightly sandy slightly ravelly CLAY with low cobble content. Sand is fine to coarse. iravel is angular to rounded fine to coarse of granite, chist, gneiss and granite. Cobbles are subangular of granite.  at 4.40m extremely high strength |  | 4.40 -               | -10.67 | 4.40 5.90                   | 92   | 100        | NA              | NA               |           |  |     |
|   |  |                      |        | 5.90 8.00                   | 92   | 100        | NA              | NA               | NA        | SPT(c)50/70mm - 5.90 6.04                |     |
| xploratory hole complete at 8.00 m.   |  | 8.00                 | -14.27 |                             |      |            |                 |                  |           |  |     |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Sheet 1 of 1

| -                    |               | -              |                          | ı Harl         | bour Dev                 | elopi  | ment     | Ground               | Invest        | tigation         | l           |                      |                      | Explo                | raton                                    | v Hc            | ale I c          | )O                      | Нс                               | le ID.               |                         |
|----------------------|---------------|----------------|--------------------------|----------------|--------------------------|--------|----------|----------------------|---------------|------------------|-------------|----------------------|----------------------|----------------------|--|-----------------|------------------|-------------------------|----------------------------------|----------------------|-------------------------|
| Project              |               | TA7            |                          |                |                          |        |          |                      |               |                  |             |                      |                      | LAPIO                | ratory                                   | <i>y</i> 110    | ne Lo            | '9                      | (                                | 283                  |                         |
| Engine               |               |                | n Hende                  |                |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
| Employ<br>Ground     |               |                | rdeen H<br>4m CD         | larbo          | our Board                |        |          | Coor                 | dinates       | 396              | <del></del> | 26.20 E, 8           | <u> </u><br>80470    | 0.27 N N             | ational G                                | rid             |                  |                         | Гп                               | eader                |                         |
| Date Sta             |               |                | 7/2013                   |                |                          |        |          |                      |               | eted 27/         |             | •                    |                      |                      |  |                 | Inclinati        | ion Verti               | cal                              |                      |                         |
| Тор                  | Base          | Туре           | Date Sta                 | rted           | Date Ended               | d C    | rew      | Section<br>Logged By | Cor<br>Barr   | re Cor<br>rel Bi | e<br>t      | F                    | Equipn               | ment                 |  | Shorin<br>Suppo | ıg /<br>ort      | R                       | Remarks                          |                      |                         |
| 0.00<br>2.50         | 2.50<br>10.10 | CP<br>RC       | 27/07/20<br>27/07/20     |                | 27/07/2013<br>27/07/2013 |        | TP<br>WW | DT<br>DT             | T611          |                  |             |                      | Dando<br>eltabas     |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          |                |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          |                |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          |                |                          |        | $\perp$  |                      | l _           |                  |             |                      |                      |                      |  |                 | $\perp$          |                         |                                  |                      |                         |
|                      |               |                |                          | PRO            | OGRESS                   |        |          |                      |               |                  | $\Box$      |                      |                      |                      |  |                 | ER STRII         | KES                     |                                  |                      |                         |
| Date                 | _   T         | ime            | Hole<br>depth            | Casii<br>dept  | ng Wate<br>th depth      | r<br>n |          | Remar                | ks            |                  | 1           | Date                 | 9                    | Time                 | Strike<br>dept                           | at R            | Rise to<br>depth | Time<br>taken           | at strik                         | sing dep             | o seal                  |
| 27/07/20<br>27/07/20 |               | L500<br>L930   | 2.50<br>10.10            | 2.35<br>2.50   |                          |        | d of CP/ | Start of Rot         | ary           |                  | 7           | ·                    | _                    |                      |  | +               |                  | to rise                 | time                             | +                    | flow                    |
| 21701723             | 13            | .530           | 10.10                    | 2.50           | =0.00                    | Liis   | 101110.  | e                    |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          |                |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          | İ              |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          | İ              |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          | II.            |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          |                |                          |        |          |                      |               |                  | 4           |                      |                      |                      |  |                 |                  |                         | <u></u>                          |                      |                         |
| ∐ard                 | Strata        | Donth          | CA                       |                | ERCUSSION                | N DET  |          |                      |               |                  | 4           | Depth                | Туре                 | Increr               | mental bl                                |                 | T DETAIL         | LS<br>Hammer            | Energy                           | Casing               | Water                   |
| from                 |               | to             | Start t                  | ime            | Duration<br>hhmm         | Kem    | ains     |                      |               |                  |             | Бери                 | Type                 |                      | netration                                |                 |                  | No.                     | ratio<br>%                       | depth                |                         |
| 2.30                 |               | 2.50           | 130                      |                | 0200                     | Chise  | lling    |                      |               |                  | 1           | 1.00<br>2.00         | SPT(C                | N=26 (4,!<br>50/75mr | 5,7,5,7,7)<br>n (9,16,50,<br>n (6,11,50, | /75)            |                  | AR360<br>AR360          |                                  | 1.00<br>2.00         | -2.60<br>-2.70          |
|                      |               |                |                          |                |                          |        |          |                      |               |                  |             | 4.00<br>5.55<br>7.15 | SPT<br>SPT(C)<br>SPT | 50/75mr<br>50/100m   | n (6,11,50.<br>nm (7,16,5<br>(25/0,50/   | 0/100)          |                  | AR360<br>AR360<br>AR360 | 75<br>75<br>75<br>75<br>75<br>75 | 2.50<br>2.50<br>2.50 | -2.50<br>-4.50<br>-6.40 |
|                      |               |                |                          |                |                          |        |          |                      |               |                  |             | 8.65                 | SPT                  | 50/80mr              | n (11,16,5                               | 0/80)           |                  | AR360                   | 75<br>75                         | 2.50                 | -8.10                   |
|                      |               |                |                          |                | . =:                     |        |          |                      |               |                  | $\dashv$    |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
| Fron                 |               | То             |                          |                | RY FLUSH D               | ETAIL: | Flu      | ush                  |               | ush              | $\dashv$    |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
| dept<br>2.50         | h             | depth<br>7.15  | $\dashv$                 |                | type<br>Water            | _      | (        | turn<br>%<br>.00     |               | lour<br>own      | 4           |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
| 7.15                 |               | 10.10          |                          |                | Water                    |        |          | .00                  |               | rey              |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          |                |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          |                |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          |                |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
| НО                   |               |                | / CASING                 | i              |                          | DYI    | NAMIC    | C SAMPLIN            | 1G            |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
| Hole<br>diameter     | Depth<br>hole | of Cas<br>diam |                          | oth of<br>sing | Тор                      | Base   | Dia      |                      | Time<br>hmmss | Recover<br>%     | у           |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
| 200<br>116           | 2.50<br>10.10 | 20             | )0 2.<br>39 2            | .35<br>.50     |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          |                |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          |                |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               | ICTALLA        | TION DE                  | TALLC          |                          |        |          | IPE CONST            | FDLICTIC      |                  | $\dashv$    |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
| Distance             |               |                |                          |                | onse zone                | ID     |          | Pipe                 | Dia.          | Type of          | ┨           |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
| from G.L.            |               |                |                          | Top            | ) Base                   |        | Тор      | Base                 | of pipe       | pipe             | $\dashv$    |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          | ı              |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          | ı              |                          |        |          |                      |               |                  |             |                      |                      |                      | * Seatin                                 | g blows         | only.            |                         |                                  |                      |                         |
|                      |               |                |                          |                | CKFILL DET               | AILS   |          |                      |               |                  | $\Box$      |                      |                      |                      |  | GEN             | ERAL NO          | TES                     |                                  |                      |                         |
| Top of section       | n s           | Base of ection |                          | Materi         |                          |        |          | Remar                | rks           |                  | ╛           |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
| 0.00                 |               | 10.10          | ,                        | Arising        | S                        |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          |                |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          |                |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
|                      |               |                |                          |                |                          |        |          |                      |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
| NOTES:               |               |                |                          |                | neters in m              |        |          | in the same          |               |                  |             |                      |                      |                      |  |                 |                  |                         | 4                                |                      |                         |
|                      |               |                | rise time i<br>abbreviat |                | nutes, hard<br>see key   | strata | a time   | ın nnmm              |               |                  |             |                      |                      |                      |  |                 |                  |                         |                                  |                      |                         |
| Unched               | ked           |                |                          | Lo             | og Print Da              | te And | d Time   | : 23/12/2            | 2013 10       | ີ່ 0:29:51       |             | -                    |                      |                      |  |                 |                  | SOII                    | L eng                            | ınee                 | RING                    |

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Project No. TA7148 Engineer

Employer

Arch Henderson LLP Aberdeen Harbour Board **Exploratory Hole Log** 

Hole ID. **C83** 

Sheet 1 of 2

Ground Level -3.74m CD Coordinates 396926.20 E, 804700.27 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend | Depth  | Datum | S     | Sampling  |      | Blo | ow Co | unt A<br>Recov | nd<br>erv | In Situ Test   | 1113 |
|---|--------|--|-------|-------|-----------|------|-----|-------|----------------|-----------|--|------|
|   | 9      |  | Level | D     | etails    | Dia. |     |       |                | IF        | Details  | ati  |
| ledium dense grey slightly silty slightly gravelly fine to<br>parse SAND. Gravel is angular to subrounded fine to coarse of<br>ranite and schist.   |        |  |       | ES001 | 1.00-1.45 |      |     |       |                |           | SPT(C)26 — 1.00 1.45   |      |
| o recovery. HARD STRATA. (Driller's description)  |        | 2.30   | -6.04 | D005  | 2.00-2.30 |      |     |       |                |           | SPT(C)50/75mm  |      |
| tiff high strength reddish brown slightly gravelly sandy LAY with medium cobble content. Sand is fine to coarse. ravel is angular to subrounded fine to coarse of granite, chist and quartzite. Cobbles are angular to subrounded of ranite and schist.  at 3.60m extremely high strength |        | 2.50 -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | -6.24 | 2.50  | 4.00      | 92   | 90  | NA    | NA             |           | -  |      |
| from 3.85m to 4.00m assumed zone of no recovery  iff greyish brown slightly gravelly sandy CLAY with low abble content. Sand is fine to coarse. Gravel is angular to abrounded fine to coarse of granite and schist. Cobbles are agular to subrounded of granite and schist.              |        | 4.00   | -7.74 | 4.00  | 5.55      | 92   | 100 | NA    | NA             |           | SPT50/75mm   |      |
|   |        |  |       | 5.55  | 7.15      | 92   | 100 | 0     | 0              | NA        | 5.55 5.80  |      |
|   |        |  |       | 7.15  | 8.65      | 92   | 93  | 0     | 0              |           | SPTSO/0mm 7.15 7.15  |      |
| from 8.55m to 8.65m assumed zone of no recovery   |        |  |       | 8.65  | 10.10     | 92   | 100 | 0     | 0              |           | SPT50/80mm<br>8.65 8.88 -<br>-<br>-<br>-<br>-<br>-<br>-<br>- |      |

Issue Date 22/10/2012

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG Issue,Revision No. 1.05



Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 C83 Engineer Arch Henderson LLP

Employer Aberdeen Harbour Board

| Ground Level | -3.74m CD | Coordinates | 396926.20 E, 804700.27 N National Grid |
|--------------|-----------|-------------|--|
| Hole Type    | CP+RC     | Inclination | Vertical                               |

| Description of Strata  | Legend | Depth       | Datum<br>Level | Sampling |      | Sar | nple l | ount A<br>Recov | nd<br>ery | In Situ Test<br>Details | Install<br>ation |
|--|--------|-------------|----------------|----------|------|-----|--------|-----------------|-----------|-------------------------|------------------|
|  |        |             | Level          | Details  | Dia. | TCR | SCR    | RQD             | IF        | Details                 |                  |
| Stiff greyish brown slightly gravelly sandy CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite and schist. Cobbles are angular to subrounded of granite and schist. | 0      | 10.10 -     | -13.84         |          |      |     |        |                 |           | -<br>-<br>-             |                  |
| subrounded fine to coarse of granite and schist. Cobbles are<br>angular to subrounded of granite and schist.   |        | -           |                |          |      |     |        |                 |           | -<br>-<br>-             |                  |
| Exploratory hole complete at 10.10 m.  |        | -<br>-      |                |          |      |     |        |                 |           | -<br>-<br>-             |                  |
|  |        | -           |                |          |      |     |        |                 |           |                         |                  |
|  |        | -           |                |          |      |     |        |                 |           | -<br>-<br>-             |                  |
|  |        | -           |                |          |      |     |        |                 |           | -                       |                  |
|  |        | -           |                |          |      |     |        |                 |           | -                       |                  |
|  |        | -           |                |          |      |     |        |                 |           | -                       |                  |
|  |        | -           |                |          |      |     |        |                 |           | -                       |                  |
|  |        | -           |                |          |      |     |        |                 |           |                         |                  |
|  |        | -           |                |          |      |     |        |                 |           | -                       |                  |
|  |        | -           |                |          |      |     |        |                 |           | -                       |                  |
|  |        | =           |                |          |      |     |        |                 |           | -                       |                  |
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|  |        | -           |                |          |      |     |        |                 |           | -                       |                  |
|  |        |             |                |          |      |     |        |                 |           | =                       |                  |
|  |        | -           |                |          |      |     |        |                 |           | -<br>-                  |                  |
|  |        | -<br>-<br>- |                |          |      |     |        |                 |           | -<br>-<br>-             |                  |
|  |        | -           |                |          |      |     |        |                 |           | -<br>-<br>-             |                  |
|  |        | -           |                |          |      |     |        |                 |           | <br>-<br>-              |                  |
|  |        | -<br>-      |                |          |      |     |        |                 |           | -<br>-<br>-             |                  |
|  |        | -           |                |          |      |     |        |                 |           | -                       |                  |
|  |        | -           |                |          |      |     |        |                 |           | -                       |                  |
|  |        | -           |                |          |      |     |        |                 |           | -<br>-<br>-             |                  |
|  |        | -           |                |          |      |     |        |                 |           | -<br>-<br>-             |                  |
|  |        | -           |                |          |      |     |        |                 |           | -                       |                  |
|  |        | -           |                |          |      |     |        |                 |           | -                       |                  |
|  |        | -           |                |          |      |     |        |                 |           | -                       | 1                |
|  |        | -<br>-      |                |          |      |     |        |                 |           | =                       |                  |
|  |        | =           |                |          |      |     |        |                 |           | -                       | 1                |
|  |        | -<br>-      |                |          |      |     |        |                 |           | -<br>-                  | 1                |
|  |        | -<br>-<br>- |                |          |      |     |        |                 |           | -<br>-                  |                  |
|  |        | -           |                |          |      |     |        |                 |           | -                       |                  |

Issue Date 22/10/2012

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Sheet 2 of 2

| •                       |              | -                         |                        | Har         | bour Dev                   | elop   | men                  | t Grour          | nd Inves       | stigatio     | n          |                      |                     | Explo               | ratory l  | Hole L           | OΠ   |                   | Но               | le ID.               |                           |
|-------------------------|--------------|---------------------------|------------------------|-------------|----------------------------|--------|----------------------|------------------|----------------|--------------|------------|----------------------|---------------------|---------------------|---|------------------|------|-------------------|------------------|----------------------|---------------------------|
| Projec                  |              |                           | 148                    |             |                            |        |                      |                  |                |              |            |                      |                     | LAPIO               | idtory  | TOIC E           | og   |                   | (                | 284                  |                           |
| Engine<br>Employ        |              |                           | h Hende<br>erdeen H    |             | our Board                  |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   | Н                | eader                |                           |
| Ground                  |              |                           | 1m CD                  | 11 50       | our Bourd                  |        |                      | Co               | ordinates      | s 39         | 970!       | 59.53 E,             | 80470               | 03.63 N Na          | ational Grid  |                  |      |                   |                  | -                    |                           |
| Date Sta                | arted        | 20/0                      | 07/2013                |             |                            |        |                      | Da               | te Compl       |              |            | 7/2013               |                     |                     |   | Inclina          | tion | Verti             | cal              |                      |                           |
| Тор                     | Base         | Туре                      | Date Star              | ted         | Date Ende                  | d C    | Crew                 | Sectio<br>Logged | n Co<br>By Bar | ore Correl E | ore<br>Bit |                      | Equip               | ment                | Sh<br>Su  | oring /<br>pport |      | R                 | Remarks          |                      |                           |
| 0.00<br>1.00            | 1.00<br>7.40 | CP<br>RC                  | 20/07/20<br>20/07/20   | 13<br>13    | 20/07/201<br>21/07/201     | 3      | TP<br>WW             | DT<br>DT         | T61            | l16 Im       | preg       |                      | Dando<br>Deltaba    | 3000<br>se 515      |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              | . 1                       |                        |             | OGRESS                     |        |                      |                  |                |              |            | ļ <u>.</u>           |                     |                     |   | WATER STR        | _    |                   |                  |                      |                           |
| Date                    |              | ime                       | Hole<br>depth          | Casi<br>dep | ing Wate<br>oth dept       | r<br>h |                      | Rem              | arks           |              |            | Dat                  | te                  | Time                | Strike at<br>depth  | Rise to<br>depth | tal  | me<br>ken<br>rise | at strik<br>time | sing der<br>te t     | oth<br>o seal<br>flow     |
| 20/07/20<br>20/07/20    | 013 :        | 1330<br>1345              | 1.00<br>1.00           | 1.00        | 0 -9.90                    | Sta    | d of CP<br>art of R  | otary            |                |              |            |                      |                     |                     |   |                  |      | 1100              |                  |                      |                           |
| 20/07/20                | 013 1        | 1900<br>1000              | 3.30<br>3.30           | 2.00        | 0 -13.00                   | ) Sta  | d of Sh<br>art of Sl | nift             |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
| 21/07/20                | 013 .        | 1900                      | 7.40                   | 2.00        | 0 -12.40                   | En     | d of Ho              | ле               |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   | CDT DETA         |      |                   |                  |                      |                           |
| Hard                    | l Strata     | Depth                     |                        |             | PERCUSSIO<br>elling        |        | narks                |                  |                |              |            | Depth                | Туре                | Incren              | nental blow   | SPT DETA         |      | nmer              | Energy           | Casing               | Water                     |
| from                    | 1            | to                        | Start ti<br>hhmr       | ne<br>1     | Duration<br>hhmm           |        |                      |                  |                |              |            |                      |                     | pen                 | etration in   | mm               | N    | lo.               | ratio<br>%       | depth                | depth                     |
| 1.00                    |              | 1.00                      | 1130                   |             | 0200                       | Chis   | elling               |                  |                |              |            | 1.00<br>1.40<br>3.30 | SPT(C<br>SPT<br>SPT | 50/0mm<br>50/0mm    | (25/0,50/0)<br>(13,12/70,50<br>(11,14,50/0)<br>(25/0,50/0)<br>9,7,11,10,11) | /0)              | AR3  | 360<br>360<br>360 | 75<br>75<br>75   | 1.00<br>1.00<br>2.00 | -10.30<br>-9.20<br>-13.00 |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            | 4.80<br>5.80         | SPT<br>SPT          | 50/0mm<br>N=39 (7,9 | (11,14,50/0)<br>(25/0,50/0)<br>9,7,11,10,11)                                |                  | AR3  | 360<br>360<br>360 | 75<br>75<br>75   | 2.00<br>2.00<br>2.00 | -12.80<br>-12.60          |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           | R                      | ΤΔΕ         | <br>RY FLUSH D             | FΤΔΙΙ  | s                    |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
| Fror<br>dept            |              | To<br>depth               |                        | יואוי       | Flush<br>type              | LIAIL  | F                    | lush<br>turn     |                | lush         |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
| 1.00                    |              | 3.30                      | <u> </u>               |             | Water                      |        | :                    | %<br>100         | Ві             | rown         |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
| 3.30                    |              | 7.40                      |                        |             | Water                      |        |                      | 80               | Ві             | rown         |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             | •                          |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           | / CASING               |             | - 1                        |        |                      | C SAMPI          |                | 15           |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
| Hole<br>diameter        |              | e dian                    | sing Dept<br>neter cas | ng          | Тор                        | Base   | Di                   | ameter           | Time<br>hhmmss | Recove       | ery        |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
| 200<br>116              | 1.00<br>7.40 |                           | 00 1.0                 | 0           |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         | <u> </u>     | NSTALLA                   | ATION DET              | AILS        |                            |        |                      | IPE CON          | STRUCTI        | ION          |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
| Distance                |              | Т                         | уре Г                  |             | onse zone                  | ID     | T                    | Pipe             | Dia.           | Туре         |            | 1                    |                     |                     |   |                  |      |                   |                  |                      |                           |
| from G.L                | -            |                           |                        | Top         | p Base                     |        | Тор                  | Base             | of pipe        | e pipe       | <u> </u>   |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     | * Seating b   | ows only.        |      |                   |                  |                      |                           |
| T                       | <u> </u>     | )f                        |                        | BA<br>later | CKFILL DE                  | AILS   |                      | Daw              | narks          |              |            |                      |                     |                     | G   | ENERAL N         | OTES |                   |                  |                      |                           |
| Top o<br>sectio<br>0.00 | n s          | Base of<br>ection<br>7.40 |                        | Grou        |                            |        |                      | кеп              | агкѕ           |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
| 0.00                    |              |                           |                        |             | •                          |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
|                         |              |                           |                        |             |                            |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      |                   |                  |                      |                           |
| NOTES                   |              |                           |                        |             | neters in m<br>nutes, hard |        |                      | e in hhmi        | m              |              |            |                      |                     |                     |   |                  |      |                   | 4                |                      |                           |
|                         |              |                           | abbreviati             | ons,        | see key                    |        |                      |                  |                |              |            |                      |                     |                     |   |                  |      | 50"               | 000              | IDOO                 | חוחר                      |
| 1                       |              |                           |                        | L           | og Print Da                | te An  | d Tim                | e: 23/12         | 2/2013 1       | 10:30:02     |            |                      |                     |                     |   |                  | 1 5  | JUIL              | L eng            | 11166                | KIIIG                     |

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 C84 Engineer Arch Henderson LLP

Ground Level -5.21m CD Coordinates 397059.53 E, 804703.63 N National Grid

Hole Type CP+RC Inclination

Aberdeen Harbour Board

Employer

| Description of Strata   | Legend | Depth                 | Datum  | !             | Sampling          |      |     |          | ount A<br>Recov |    | In Situ Te          | 11151 |
|---|--------|-----------------------|--------|---------------|-------------------|------|-----|----------|-----------------|----|---------------------|-------|
| 2000, priori di diata   | Logona | Zopui                 | Level  | D             | etails            | Dia. |     | <u> </u> | RQD             | IF | Details             | atio  |
| irey slightly silty very gravelly fine to coarse SAND. Gravel<br>a angular to subrounded fine to coarse of granite, schist and<br>uartzite.   |        |                       |        | ES001<br>B002 | 0.30<br>0.30-1.00 |      |     |          |                 |    |                     |       |
| trong grey BOULDER of granite.  | 000    | 1.00                  | -6.21  | 1.00          | 1.40              | 92   | 100 | NA       | NA              |    |                     | 00    |
| tiff brown slightly sandy slightly gravelly CLAY with low to nedium cobble content. Gravel is angular to subrounded fine to oarse of granite, schist and quartzite. Cobbles are angular os subrounded of granite, schist and gneiss.  from 1.95m to 2.10m angular coarse gravel of schist and |        | 1.40 -                | -6.61  | 1.40          | 2.10              | 92   | 100 | NA       | NA              |    | SPT50/0mm<br>1.40 1 | 55    |
| granite   |        |                       |        | 2.10          | 3.30              | 92   | 91  | NA       | NA              |    |                     |       |
| from 3.20m to 3.30m assumed zone of no recovery   |        |                       |        | 3.30          | 4.80              | 92   | 97  | NA       | NA              | NA | SPT50/0mm<br>3.30 3 | 4.45  |
| from 4.75m to 4.80m assumed zone of no recovery   |        |                       |        | 4.80          | 5.80              | 92   | 85  | NA       | NA              |    | SPT50/0mm<br>4.80 4 | i.80  |
| from 5.65m to 5.80m assumed zone of no recovery   |        |                       |        |               |                   |      |     |          |                 |    | SPT39<br>5.80 6     | 5.25  |
| at 7.10m gravelly   |        |                       |        | 5.80          | 7.40              | 92   | 100 | NA       | NA              |    |                     |       |
| xploratory hole complete at 7.40 m.   |        | 7.40 -                | -12.61 |               |                   |      |     |          |                 |    |                     |       |
|   |        | -                     |        |               |                   |      |     |          |                 |    |                     |       |
|   |        | -<br>-<br>-<br>-<br>- |        |               |                   |      |     |          |                 |    |                     |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Sheet 1 of 1

| -                                |                      | -          |                      | Har              | bour Dev                 | elopmen                | nt Ground  | Invest  | igation             |                      |                     | Fxnlor                   | atory l                                | Hole I (             | 20                      | Ho                               | ole ID.              |                         |
|----------------------------------|----------------------|------------|----------------------|------------------|--------------------------|------------------------|------------|---------|---------------------|----------------------|---------------------|--------------------------|--|----------------------|-------------------------|----------------------------------|----------------------|-------------------------|
| Project                          |                      | TA7        |                      |                  |                          |                        |            |         |                     |                      |                     | LAPIOI                   | atory i                                | TOIC E               | <b>J</b>                | (                                | 287                  |                         |
| Engine                           |                      |            | h Hende              |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
| Employ<br>Ground                 |                      |            | rdeen F<br>5m CD     | larbo            | ur Board                 |                        | Coor       | dinates | 3068                | 50 5/ F              | 80/60               | 06.18 N Na               | tional Grid                            |                      |                         | H-                               | eader                |                         |
| Date Sta                         |                      |            | 7/2013               |                  |                          |                        |            |         | 3900<br>ted 02/0    |                      | 80400               | 70.10 IV IVA             | tional Grid                            | Inclinat             | tion Vertic             | cal                              |                      |                         |
| Тор                              | Base                 |            | Date Sta             | rted             | Date Ende                | d Crew                 | Section    | Core    | Core                |                      | Equip               | ment                     | Sho                                    | oring /<br>pport     | R                       | emarks                           |                      |                         |
| 0.00                             | 1.10                 | СР         | 31/07/20             | 013              | 31/07/2013               | 3 TP                   | Logged By  | Barre   |                     |                      | Dando               | 3000                     | Su                                     | pport                |                         |                                  |                      |                         |
| 1.10<br>1.20                     | 1.20<br>8.50         | RO<br>RC   | 31/07/20<br>31/07/20 | 013<br>013       | 31/07/2013<br>02/08/2013 | 3 WW<br>3 WW           | WW<br>DT   | T611    | Tricone<br>6 Impreg |                      |                     | se 515<br>se 515         |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
| Date                             | Ti                   | me         | Hole                 | Casi             | ng Wate                  | r                      | Remar      | ks      |                     | Dat                  | e                   | Time                     | Strike at                              | VATER STR<br>Rise to | Time                    | Ca                               | sing dep             | th                      |
|                                  |                      |            | depth                | dep              | th depth                 | ו                      |            |         |                     |                      |                     |                          | depth                                  | depth                | taken<br>to rise        | at strik<br>time                 | ke ī to              | seal<br>low             |
| 31/07/20<br>31/07/20<br>02/08/20 | 013   1              | 515<br>930 | 1.10<br>5.20         | 1.10             | -9.00                    | End of Sh              |            | ary     |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
| 02/08/20                         |                      | 700<br>450 | 5.20<br>8.50         | 1.20<br>1.20     |                          | Start of S<br>End of H |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
| Hard                             | Strata               | Denth      | CA                   | BLE P<br>Chise   | ERCUSSIO                 | N DETAILS<br>Remarks   |            |         |                     | Depth                | Туре                | Increm                   | ental blow                             | SPT DETA             | ILS<br>Hammer           | Energy                           | Casing               | Water                   |
| from                             |                      | to         | Start t              | ime <sub>I</sub> | Duration<br>hhmm         | Kemarks                |            |         |                     | Бери                 | Турс                |                          | etration in r                          |                      | No.                     | ratio<br>%                       | depth                | depth                   |
| 1.00                             |                      | 1.10       | 131                  |                  | 0200                     | Chiselling             |            |         |                     | 1.00<br>1.10         | SPT(C               | 50/0mm (<br>50/0mm (     | 25/0,50/0)<br>25/0,50/0)               |                      | AR360<br>AR360          |                                  | 1.00<br>1.10         | -4.30<br>-4.70          |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     | 2.20<br>3.70         | SPT<br>SPT          | N=56 (9,1)<br>N=73 (6,8) | 1,12,12,16,16,16,14,17,18,24)<br>50/5) | 5)                   | AR360<br>AR360          | 75<br>75<br>75<br>75<br>75<br>75 | 1.20<br>1.20         | -6.00<br>-7.40<br>-4.60 |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     | 5.20<br>6.75<br>8.50 | SPT<br>SPT<br>SPT(C | 30/5mm (<br>30/75mm      | 50/5)<br>(8,14,30/75)<br>(14,34/20)    |                      | AR360<br>AR360<br>AR360 | 75<br>75<br>75                   | 1.20<br>1.20<br>1.20 | -4.60<br>-7.50<br>-7.15 |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     | 0.50                 | 31 1(0              | 30/33/1111               | (11,51,20)                             |                      | 741300                  | , 3                              | 1.20                 | 7.13                    |
| Fron                             | n I                  | То         | F                    |                  | Y FLUSH D                |                        | lush       | Flu     | ch                  |                      |                     |                          |  |                      |                         |                                  |                      |                         |
| dept                             |                      | depth      |                      |                  | type                     |                        | eturn<br>% | colo    |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
| 1.20                             |                      | 8.50       |                      | '                | Water                    |                        | 100        | Bro     | wn                  | 1                    |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
| HOle                             |                      |            | / CASING             |                  | Тор                      |                        | IC SAMPLIN |         | Recovery            | -                    |                     |                          |  |                      |                         |                                  |                      |                         |
| diameter                         | hole                 | dian       | neter cas            | sing             | ТОР                      | Dasc D                 |            | nmmss   | %<br>%              |                      |                     |                          |  |                      |                         |                                  |                      |                         |
| 200<br>139<br>116                | 1.10<br>1.20<br>8.50 |            | 00 1.<br>39 1.       | .10<br>.20       |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
| 110                              | 0.50                 |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  | IN                   | ISTALLA    | ATION DE             | TAILS            |                          |                        | PIPE CONST | DUCTIO  | N                   | 1                    |                     |                          |  |                      |                         |                                  |                      |                         |
| Distance                         | ID                   |            |                      |                  | onse zone                | ID                     | Pipe       | Dia.    | Type of             | 1                    |                     |                          |  |                      |                         |                                  |                      |                         |
| from G.L                         |                      |            |                      | Top              | Base                     | Тор                    | Base       | of pipe | pipe                | -                    |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          | * Seating bl                           | ows only.            |                         |                                  |                      |                         |
|                                  |                      |            |                      | BA               | CKFILL DET               | AILS                   |            |         |                     |                      |                     |                          |  | ENERAL N             | OTES                    |                                  |                      |                         |
| Top of section                   |                      | ase of     | , I                  | Materi           | ial                      |                        | Remar      | ks      |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
| 0.00                             |                      | 8.50       |                      | Arising          | JS .                     |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
|                                  |                      |            |                      |                  |                          |                        |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
| NOTEC                            | , All -1             | a+b = !    | mature               | : ام اا          |                          | illing-to-             |            |         |                     |                      |                     |                          |  |                      |                         |                                  |                      |                         |
| INOTES:                          | Water                | strike     |                      | in min           |                          |                        | e in hhmm  |         |                     |                      |                     |                          |  |                      |                         | 4                                |                      |                         |

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Form No. SIEXPHOLEHDR

soil engineering

Part of the Bachy Soletanche Group

#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 C87

Employer Aberdeen Harbour Board Ground Level -2.85m CD Coordinates

396858.54 E, 804606.18 N National Grid

Hole Type CP+RC Inclination

Arch Henderson LLP

Engineer

| Description of Strata  | Legend | Depth                                | Datum  | 5             | Sampling  |      | Blo<br>San | ow Co<br>nple F | ount A | nd<br>ery | In Situ Test                                    | 1115 |
|--|--------|--------------------------------------|--------|---------------|-----------|------|------------|-----------------|--------|-----------|---|------|
|  |        |                                      | Level  | D             | etails    | Dia. |            | SCR             |        | IF        | Details   | atio |
| ledium dense grey slightly silty slightly gravelly fine to<br>parse SAND. Gravel is angular to subrounded fine to medium of<br>anite and schist.   |        |                                      |        | B002<br>ES001 | 0.00-1.00 |      |            |                 |        |           |   |      |
|  |        | 1.10 -                               | -3.95  | D003          | 1.00-1.10 |      |            |                 |        |           | SPT(C)50/0mm -<br>1.00 1.00                     |      |
| otary openhole drilling. HARD STRATA. (Driller's description)  tiff very high strength greyish brown slightly gravelly sandy  LAY with low cobble content. Sand is fine to coarse. Gravel  angular to subrounded fine to coarse of granite, dolerite,  chist and quartzite. Cobbles are angular to subrounded fine to coarse of granite and schist.  from 1.20m to 1.30m strong grey boulder of dolerite.  |        | 1.20                                 | -4.05  | 1.20          | 2.20      | 92   | 100        | NA              | NA     |           | SPT(C)50/0mr <b>b</b> .10<br>1.10<br>—<br>SPT56 |      |
| Recovered as angular coarse gravel sized fragments   |        |                                      |        | 2.20          | 3.70      | 92   | 100        | NA              | NA     |           | 2.20 2.65                                       |      |
|  |        |                                      |        | 3.70          | 5.20      | 92   | 100        | NA              | NA     | NA        | SPT73<br>3.70 4.15                              |      |
|  |        |                                      |        | 5.20          | 6.75      | 92   | 100        | NA              | NA     |           | SPT50/5mm<br>5.20 5.21                          |      |
|  |        |                                      |        | 6.75          | 7.15      | 92   | 87         | NA              | NA     |           | SPT30/75mm<br>6.75 6.98                         |      |
| from 7.01m to 7.15m assumed zone of no recovery  | 0 0 0  | =                                    |        | 0.13          | . 1.13    | 32   | 01         | IVA             | INA    |           | Ī   |      |
|  |        |                                      |        | 7.15          | s 8.50    | 92   | 100        | NA              | NA     |           | -   |      |
| at 8.45m extremely high strength  xploratory hole complete at 8.50 m.  |        | 8.50 -<br>-<br>-                     | -11.35 |               |           |      |            |                 |        |           | SPT(C)50/95mm<br>8.50 8.60                      | _    |
| inguistics of the control of the con |        | -<br>-<br>-<br>-<br>-<br>-<br>-<br>- |        |               |           |      |            |                 |        |           | -   |      |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Sheet 1 of 1

Part of the Bachy Soletanche Group

| -                    |               | -              |                       | g Harl         | bour Dev                   | elop      | ment                 | Ground              | Inves         | tigatio       | n        |              |                     | Fxplor               | atory H                                | Hole Lo          | oa               | Ho                               | le ID.               |                  |
|----------------------|---------------|----------------|-----------------------|----------------|----------------------------|-----------|----------------------|---------------------|---------------|---------------|----------|--------------|---------------------|----------------------|--|------------------|------------------|----------------------------------|----------------------|------------------|
| Project              |               | TA7            |                       |                |                            |           |                      |                     |               |               |          |              |                     | -xpioi               | acory i                                | 1010 20          | 79               | C                                | 288                  |                  |
| Engine               |               |                | n Hende               |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
| Employ<br>Ground I   |               |                | raeen F<br>5m CD      | arbo           | ur Board                   |           |                      | Cool                | rdinates      | 39            | 698      | 86 52 F 3    | 80461               | 4.01 N Na            | tional Grid                            |                  |                  | Н                                | eader                |                  |
| Date Sta             |               |                | 7/2013                |                |                            |           |                      |                     |               | eted 24       |          |              |                     |                      |  | Inclinat         | ion Verti        | cal                              |                      |                  |
| Тор                  | Base          | Туре           | Date Sta              | rted           | Date Ende                  | d C       | rew                  | Section<br>Logged B | Cor<br>y Barr | re Co         | re       | E            | Equip               | ment                 | Sho                                    | oring /<br>pport | F                | Remarks                          |                      |                  |
| 0.00                 | 1.00          | СР             | 22/07/2               | 013            | 22/07/201                  | 3         | TP                   | DT                  |               |               |          |              | Dando               | 3000<br>se 515       | Ju                                     | рроге            |                  |                                  |                      |                  |
| 1.00                 | 8.25          | RC             | 22/07/2               | 013            | 24/07/201                  | 3         | ww                   | DT                  | T611          | 16 lmp        | reg      | D            | eltaba              | se 515               |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       | PRO            | OGRESS                     |           |                      |                     |               |               |          |              |                     |                      | v                                      | VATER STRI       | KES              |                                  |                      |                  |
| Date                 | Ti            | me             | Hole                  | Casii          | ng Wate                    | r         |                      | Rema                | rks           |               |          | Date         | e                   | Time                 | Strike at                              | Rise to          | Time             | Cas                              | sing dep             | th               |
| 22/07/20             | 12 1          | 630            | depth<br>1.00         | 1.00           |                            |           | d of CD              | Start of Ro         | tary          |               | 4        |              |                     |                      | depth                                  | depth            | taken<br>to rise | at strik<br>time                 | e to                 | seal<br>low      |
| 23/07/20<br>23/07/20 | 13 0<br>13 1  | 700<br>900     | 1.00<br>5.40          | 1.00           | -3.50<br>-8.00             | Sta<br>En | rt of Sh<br>d of Shi | ift                 | cury          |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
| 24/07/20<br>24/07/20 |               | 700<br>330     | 5.40<br>8.25          | 1.00<br>2.50   |                            |           | rt of Sh<br>d of Hol |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       | ABLE PI        | <u> </u>                   | N DE      | TAILS                |                     |               |               | $\dashv$ |              | J                   |                      |  | spt detai        | LS               |                                  |                      |                  |
|                      | Strata        |                |                       | Chise          |                            |           | narks                |                     |               |               | 7        | Depth        | Туре                |                      | nental blow                            |                  | Hammer           | Energy                           | Casing               | Water            |
| from<br>1.00         |               | 1.00           | Start t<br>hhm<br>123 | ım             | hhmm<br>0200               | Chic      | elling               |                     |               |               | _        | 1.00         | CDT/C               |                      | etration in r                          | nm               | No.              | ratio<br>%                       | depth<br>1.00        | depth<br>-7.90   |
| 1.00                 |               | 1.00           | 123                   |                | 0200                       | CIIIS     | ening                |                     |               |               |          | 2.70<br>4.20 | SPT(C<br>SPT<br>SPT | I N=34 (7.7          | 25/0,50/0)<br>25/0,50/0)<br>,7,7,9,11) |                  | AR360<br>AR360   | 75<br>75<br>75<br>75<br>75<br>75 | 1.00<br>1.00<br>1.00 | -11.00<br>-10.40 |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          | 5.40<br>6.60 | SPT<br>SPT          | 50/150mr<br>50/0mm ( | n (6,7,11,25,1<br>25/0,50/0)           | 14/0)            | AR360<br>AR360   | 75<br>75                         | 1.00<br>2.50         | -7.00<br>-7.50   |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          | 8.10         | SPT                 | 50/0mm (             | 11,25,50/0)                            |                  | AR360            | /5                               | 2.50                 | -9.00            |
|                      |               |                | F                     | ROTAR          | Y FLUSH D                  | ETAII     | .S                   |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
| From<br>dept         |               | To<br>depth    |                       |                | Flush<br>type              |           | FI                   | ush<br>:urn         |               | ush<br>lour   |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
| 1.00                 | "             | 8.25           |                       |                | Water                      |           |                      | 0                   |               | - Ioui        | $\dashv$ |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
| НО                   | LE DIA        | METER          | / CASING              |                |                            |           |                      | SAMPLI              | NG            |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
| Hole<br>diameter     | Depth<br>hole | of Cas<br>dian |                       | oth of<br>sing | Тор                        | Base      | Dia                  |                     | Time<br>hmmss | Recove<br>%   | ry       |              |                     |                      |  |                  |                  |                                  |                      |                  |
| 200<br>116           | 1.00<br>8.25  |                | 00 2                  | .50            |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               | 4        |              |                     |                      |  |                  |                  |                                  |                      |                  |
| Distance             |               |                | TION DE               |                | nse zone                   | ID        |                      | PE CONS             | TRUCTION Dia. | ON<br>Type of | f        |              |                     |                      |  |                  |                  |                                  |                      |                  |
| from G.L.            |               |                | 7,60                  | Тор            |                            | טו        | Тор                  | Base                | of pipe       | pipe          |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      | * Seating blo                          | ows only         |                  |                                  |                      |                  |
|                      |               |                |                       | BAG            | CKFILL DET                 | AILS      |                      | 1                   | <u> </u>      | <u> </u>      |          |              | <u> </u>            | 1                    |  | ENERAL NO        | OTES             |                                  |                      |                  |
| Top of section       |               | ase of         | ı                     | Materi         | al                         |           |                      | Rema                | ırks          |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
| 0.00                 |               | 8.25           |                       | Arising        | S                          |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
|                      |               |                |                       |                |                            |           |                      |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
| NOTEC                | Δ111 -        | a+h - !        |                       | - ⊶الم اا      |                            | :11:      | ++                   |                     |               |               |          |              |                     |                      |  |                  |                  |                                  |                      |                  |
| NOTES:               | Water         | strike         |                       | in min         | neters in m<br>lutes, hard |           |                      | in hhmm             |               |               |          |              |                     |                      |  |                  |                  | đ                                |                      |                  |
| Unchec               |               | cails Ul       | appleAlg              |                | og Print Da                | te An     | d Time               | e: 23/12/           | 2013 10       | 0:30:20       |          |              |                     |                      |  |                  | SOI              | L eng                            | inee                 | RING             |

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Engineer

Employer

Arch Henderson LLP Aberdeen Harbour Board

# **Exploratory Hole Log**

Hole ID.

**C88** 

Sheet 1 of 1

Ground Level -4.75m CD Coordinates 396986.52 E, 804614.01 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend           | Depth                                      | Datum          |               | Sampling  |      |     |     | ount A<br>Recov |    | In Situ             | Test   | Inst |
|--|------------------|--|----------------|---------------|-----------|------|-----|-----|-----------------|----|---------------------|--|------|
| becomplied of older  | Logena           | Берин                                      | Level          |               | etails    | Dia. | TCR | SCR | RQD             | IF | Deta                | ils  | atio |
| Grey slightly silty very gravelly fine to coarse SAND with low obble content. Gravel is angular to subrounded fine to nedium of granite, schist and quartzite. Cobbles are angular o subrounded of granite schist and gneiss.                                      |                  |  |                | B002<br>ES001 | 0.00-1.00 |      |     | ı   |                 |    |                     | Let defeated defeat                          |      |
| Strong pink and grey BOULDER of granite.   | 0,00             | 1.00 —                                     | -5.75          | 1.00          | ) 1.20    | 92   | 100 | NA  | NA              |    | SPT(C)50/0r<br>1.00 | nm —   |      |
| Stiff very high strength brown slightly sandy slightly gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite. Cobbles are angular to subrounded of granite and schist. |                  | 1.20 = = = = = = = = = = = = = = = = = = = | -5.95          | 1.20          | 2.70      | 92   | 96  | NA  | NA              |    |                     |  |      |
| Assumed zone of no recovery. Stiff greyish brown slightly<br>andy boulder CLAY with occasional cobbles. (Driller's<br>lescription)   |                  | 2.65 _<br>2.70 _<br>-<br>-                 | -7.40<br>-7.45 |               |           |      |     |     |                 |    | SPT50/0mm<br>2.70   | 2.70 -                                       |      |
| Stiff brown slightly gravelly sandy CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite. Cobbles are angular to subrounded of granite and schist.                                |                  |  |                | 2.70          | ) 4.20    | 92   | 100 | NA  | NA              |    |                     | 1. Characters                                |      |
| from 5.20m to 5.40m, 6.40m to 6.60m and 6.90m to 7.00m   |                  |  |                | 4.20          | 5.40      | 92   | 83  | NA  | NA              | NA | SPT34<br>4.20       | 4.65   |      |
| assumed zone of no recovery  |                  |  |                | 5.40          | ) 6.60    | 92   | 83  | NA  | NA              |    | SPT50/150r<br>5.40  | nm -<br>5.70 -<br>-<br>-<br>-<br>-<br>-<br>- |      |
| from 6.40m to 6.60m assumed zone of no recovery  | 0 0 0 0<br>5 0 0 |  |                | 6.60          | 7.00      | 92   | 75  | NA  | NA NA           |    | SPT50/0mm<br>6.60   | 6.60   |      |
| from 6.90m to 7.00m assumed zone of no recovery  |                  |  |                |               |           |      |     |     |                 |    |                     | activity in                                  |      |
| Assumed zone of no recovery. Stiff greyish brown slightly andy boulder CLAY with occasional cobbles. (Driller's lescription)   |                  | 7.52 -<br>-<br>-<br>-<br>-<br>-            | -12.27         | 7.00          | ) 8.25    | 92   | 47  | NA  | NA              |    | SPT50/0mm<br>8.10   |  |      |
| exploratory hole complete at 8.25 m.   |                  | 8.25                                       | -13.00         |               |           |      |     |     |                 |    |                     |  |      |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG

Issue.Revision No. 1.05



| -                     |              | -              |                       | g Har               | rbour Dev                | /elop      | ment         | : Ground             | l Invest      | tigati        | on          |              |                  | Fynlo                 | rator   | Hole L               | 00              | Н              | ole ID.        |                         |
|-----------------------|--------------|----------------|-----------------------|---------------------|--------------------------|------------|--------------|----------------------|---------------|---------------|-------------|--------------|------------------|-----------------------|---|----------------------|-----------------|----------------|----------------|-------------------------|
| Project               |              | TA7            |                       |                     | _                        |            |              |                      |               |               |             |              |                  | Lybio                 | latory  | 11010 -              | .og             | (              | C96            |                         |
| Engine                |              |                | h Hende               |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
| Employ<br>Ground      |              |                | erdeen F<br>2m CD     | Тагыс               | our Board                | 1          |              | Coor                 | rdinates      |               | 39702       | 28.28 E,     | 80441            |                       | lational Gr   | id                   |                 |                | leader         | $\longrightarrow$       |
| Date Sta              |              |                | 08/2013               |                     |                          |            |              |                      | e Comple      |               |             | •            |                  |                       |   | Inclina              | ation Vert      | ical           |                |                         |
| Тор                   | Base         | Туре           | Date Sta              | arted               | Date Ende                | d (        | Crew         | Section<br>Logged By | Cor<br>y Barr | re            | Core<br>Bit | E            | Equipr           | ment                  |   | Shoring /<br>Support |                 | Remarks        |                |                         |
| 0.00<br>4.50          | 4.50<br>7.30 | CP<br>RC       | 19/08/2<br>19/08/2    | 1013                | 19/08/201<br>19/08/201   | 13         | TP<br>WW     | DT<br>DT             | T611          |               |             |              | Dando<br>Deltaba | 3000                  |   | мрроге               |                 |                |                |                         |
| 4.50                  | 1.50         | RC             | 13/00/2               | 013                 | 13/00/201                | 3          | VVVV         | וט                   | 1013          | 10            | mpreg       |              | )ellava          | 26 212                |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                | <u> </u>              | PR                  | ROGRESS                  | —          | —            |                      |               |               | $\neg$      |              |                  |                       |   | WATER STR            | L<br>RIKES      |                |                | $\overline{}$           |
| Date                  | Ti           | ime            | Hole<br>depth         | Casi<br>dep         | sing Wate                | er<br>th   |              | Remar                | rks           |               |             | Date         | e                | Time                  | Strike a  | Rise to depth        | Time<br>taken   | Ca<br>at stril | sing dep       | oth<br>o seal           |
| 19/08/20              |              | 700            | 4.50                  | 4.30                | 30 -8.40                 | ) En       |              | /Start of Rot        | tary          |               | -           | -            |                  |                       | - чора  |                      | to rise         | time           | f              | flow                    |
| 19/08/20              | 013 0        | 1930<br>1810   | 5.70<br>5.70          | 4.50<br>4.50        | 50 -5.50                 | ) Sta      | nd of Shi    | nift                 | -             |               |             |              |                  |                       |   |                      |                 |                |                |                         |
| 20/08/20              | 13   1       | .045           | 7.30                  | 4.50                | -8.50                    | En         | nd of Hol    | .e                   |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                | C.F                   | ABLE F              | PERCUSSIO                | N DE       | TAILS        |                      |               |               |             |              |                  |                       |   | SPT DETA             | \ILS            | _1             |                |                         |
| Hard<br>from          | Strata I     | Start t        |                       | selling<br>Duration |                          | marks      |              |                      |               |               | Depth       | Туре         |                  | mental blo            |   | Hammer<br>No.        | Energy<br>ratio | Casing depth   | Water<br>depth |                         |
| 4.30                  | -            | to<br>4.50     | hhm<br>150            | nm                  | hhmm<br>0200             |            | selling      |                      |               |               | $\dashv$    | 0.50         | SPT(C            | · ·                   |   |                      | AR362           | 75<br>75       | N/A            |                         |
|                       |              |                |                       | ·                   |                          |            |              |                      |               |               |             | 1.50<br>2.50 | SPT(C            | N=28 (4,<br>N=37 (5,  | ,5,5,7,6,5)<br>,6,6,7,7,8)<br>,7,8,9,9,11)<br>,9,9,11,11,1:<br>n (25/0,50/0 | -1                   | AR362<br>AR362  | 75<br>75       | 1.50<br>2.50   | -7.80<br>-7.90<br>-8.10 |
|                       |              |                |                       | ŀ                   |                          |            |              |                      |               |               |             | 3.50<br>4.50 | SPI(C            | .) N=44 (b,<br>50/0mm | 9,9,11,11,1<br>1 (25/0,50/0   | 3)                   | AR362<br>AR362  | 75<br>75<br>75 | 3.50<br>4.30   | -8.20<br>-8.40          |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       | ROTAF               | RY FLUSH D               | DETAL      |              |                      |               |               |             | 1            |                  |                       |   |                      |                 |                |                |                         |
| Fron<br>dept          |              | To<br>depth    | ,                     |                     | Flush<br>type            |            | ret          | lush<br>turn         |               | lush<br>olour |             |              |                  |                       |   |                      |                 |                |                |                         |
| 4.50                  | +            | 7.30           |                       |                     | Water                    |            |              | %<br>100             | Ora           | ange          | -           |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            | <u> </u>     |                      |               |               |             | ļ            |                  |                       |   |                      |                 |                |                |                         |
| HO<br>Hole            | Depth        |                | / CASING              | G<br>pth of         | Тор                      | DY<br>Base |              | C SAMPLII<br>ameter  | NG<br>Time    | Reco          | vorv        |              |                  |                       |   |                      |                 |                |                |                         |
| diameter<br>200       | hole         | diam           | neter ca              | asing<br>4.50       | Тор                      |            |              |                      | nhmmss        |               |             |              |                  |                       |   |                      |                 |                |                |                         |
| 116                   | 4.50<br>7.30 |                | JU 4                  | .50                 |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       | IN           | JSTALL/        | ATION DE              | TAILS               | ,<br>;                   | —          | P            | IPE CONS             | TRUCTIO       | ON            |             | İ            |                  |                       |   |                      |                 |                |                |                         |
| Distance<br>from G.L. |              | T <sub>1</sub> | уре                   |                     | onse zone                | ID         |              | Pipe                 | Dia.          | Туре          |             | İ            |                  |                       |   |                      |                 |                |                |                         |
| ITOTTI G.L.           | +++          |                |                       | Top                 | p Base                   | <u> </u>   | Тор          | Base                 | of pipe       | pi            | pe          |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              | I              |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          | L          | $oxed{oxed}$ |                      |               |               |             |              |                  |                       | * Seating   | blows only.          |                 |                | <u> </u>       |                         |
| T                     |              |                |                       |                     | ACKFILL DET              | TAILS      |              |                      |               |               |             |              |                  |                       |   | GENERAL N            | IOTES           |                |                |                         |
| Top of section 0.00   | n se         | ection         |                       | Mater               |                          | ــــــ     |              | Rema                 | rks           |               |             |              |                  |                       |   |                      |                 |                |                |                         |
| 4.50                  |              | 4.50<br>7.30   |                       | Arising<br>Grout    | js<br>it                 |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                |                       |                     |                          |            |              |                      |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
| NOTES:                |              |                |                       |                     | meters in m              |            |              | · · le le mann       |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
|                       |              |                | rise time<br>abbrevia |                     | nutes, hard<br>, see key | l Strai    | :a time      | in hnmm              |               |               |             |              |                  |                       |   |                      |                 |                |                |                         |
| Unched                | ked          |                |                       | l                   | Log Print Da             | ate Ar     | nd Time      | e: 23/12/            | 2013 10       | 0:30:2        | 9           |              |                  |                       |   |                      | SOI             | L eng          | inee           | RING                    |

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Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Inclination

Project No. TA7148

Engineer

Ground Level

**Exploratory Hole Log** Arch Henderson LLP

Hole ID.

C96

Sheet 1 of 1

Employer

Aberdeen Harbour Board

Coordinates 397028.28 E, 804417.35 N National Grid

Hole Type CP+RC

-4.22m CD

| Description of Strata  | Legend Depth Level Sampling  Details  B001 0.00-0.50 |        |        |  |      |     | w Co<br>ple F | Recov | ery             | In Situ Test<br>Details   | Inst |
|--|--|--------|--------|--|------|-----|---------------|-------|-----------------|---------------------------|------|
|  |  |        | 20001  | Details  | Dia. | TCR | SCR           | RQD   | IF              | Details                   | 30.0 |
| Medium dense grey and greyish brown slightly silty slightly gravelly fine to coarse SAND. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, schist, gneiss and quartz.   |  | -      |        | ES002 0.50<br>B003 0.50-0.95<br>ES004 1.00             |      |     |               |       |                 | SPT(C)23<br>0.50 0.95     |      |
|  |  |        |        | D005 1.50<br>B006 1.50-1.95<br>ES007 2.00<br>D008 2.00 |      |     |               |       |                 | SPT(C)28<br>1.50 1.95     | -    |
|  |  |        |        | B009 2.50-2.95<br>ES010 3.00                           |      |     |               |       |                 | SPT(C)37<br>2.50 2.95     | -    |
|  |  |        |        | D011 3.00<br>B012 3.50-3.95                            |      |     |               |       |                 | SPT(C)44<br>3.50 3.95     |      |
| Weak locally medium strong grey coarse crystalline GRANITE with localised patches of orange staining penetrating full  | *****  | 4.50 - | -8.72  | ES013 4.00<br>D014 4.00                                |      |     |               |       |                 | SPT(C)50/0mm<br>4.50 4.50 |      |
| core diameter. Discontinuities: 1) 30-40 degrees closely spaced planar rough with orange staining on surfaces. 2) 70-80 degrees medium spaced planar rough with brown staining on fracture surfaces.  from 4.50m to 4.70m and 4.85m to 5.00m extremely weak. Recovered as non intact core (angular coarse gravel sized | *****  |        |        | 4.50 5.70  | 90   | 100 | 63            | 0     |                 |                           |      |
| fragments) from 5.10m to 5.25m medium strong from 5.40m to 5.50m and 6.35m to 6.60m very weak. Recovered as non intact core (angular coarse gravel sized fragments)  from 6.50m to 6.80m medium strong   | *****  |        |        | 5.70 7.30  | 90   | 100 | 90            | 24    | NI<br>80<br>200 |                           |      |
| from 7.10m to 7.20m very weak. Recovered as non intact core<br>(angular coarse gravel sized fragments)   | *****  | 7.30   | -11.52 |  |      |     |               |       |                 |                           |      |
| Exploratory hole complete at 7.30 m.   |  |        |        |  |      |     |               |       |                 |                           |      |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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|                       |                          | •                             |                      | Harb           | our Dev                       | elopr       | nent      | Ground               | Invest          | tigati      | on          |              |                   | Fxnlo               | ratory                                    | Hole Lo            | oa             | Но            | ole ID.      |                |
|-----------------------|--------------------------|-------------------------------|----------------------|----------------|-------------------------------|-------------|-----------|----------------------|-----------------|-------------|-------------|--------------|-------------------|---------------------|---|--------------------|----------------|---------------|--------------|----------------|
| Project               |                          | TA7                           |                      |                |                               |             |           |                      |                 |             |             |              |                   | LAPIO               | racory                                    | TIOIC E            | 9              | [             | 098          |                |
| Engine                |                          |                               | n Hende              |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               | eader        |                |
| Employ<br>Ground      |                          |                               | 7m CD                | arbou          | ur Board                      |             |           | Coor                 | dinates         |             | 39719       | 95.66 E,     | 80442             | 5.09 N Na           | ational Gri                               | d                  |                |               | sauei        |                |
| Date Sta              |                          |                               | 8/2013               |                |                               |             |           |                      | Comple          |             |             | •            |                   |                     |   | Inclina            | tion Verti     | cal           |              |                |
| Тор                   | Base                     | Туре                          | Date Star            | rted D         | Date Endec                    | d Cr        | rew       | Section<br>Logged By | Cor<br>Barr     | re<br>rel   | Core<br>Bit | E            | Equipr            | nent                | S   | horing /<br>upport | F              | Remarks       |              |                |
| 0.00<br>2.10          | 2.10<br>4.10             | CP<br>RC                      | 18/08/20<br>18/08/20 | )13 :          | 18/08/2013<br>18/08/2013      | 3 .         | TP<br>/IM | DT<br>DT             | T611            |             | mpreg       | l<br>D       | Dando<br>Deltabas | 3000                |   | ирре. :            |                |               |              |                |
| 2.10                  | 4.10                     | inc.                          | 10/00/20             | '13            | 10/00/2010                    | ,           | /livi     | DI                   | 101.            |             | libica      | _            | Jenasa.           | PE 313              |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      | PRO            | GRESS                         |             |           |                      |                 |             |             |              |                   |                     |   | WATER STR          | IKES           |               |              |                |
| Date                  | Ti                       | me                            | Hole<br>depth        | Casin          | ng Water<br>h depth           | r           |           | Remar                | rks             |             |             | Date         | е                 | Time                | Strike a<br>depth                         | t Rise to depth    | Time<br>taken  | Ca:           | sing dep     | oth<br>o seal  |
| 18/08/20              |                          | 500                           | 2.10                 | 2.00           | -8.60                         | End         |           | Start of Rot         | tary            |             |             |              |                   |                     |   |                    | to rise        | time          | f            | low            |
| 18/08/20              | )13   1                  | 930                           | 4.10                 | 2.10           | -7.10                         | End         | of Hole   | е                    |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       | CABLE PERCUSSION DETAILS |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     | SPT DETA                                  | ILS                | •              |               |              |                |
| Hard<br>from          |                          | rata Depth Chiselling Remarks |                      |                |                               |             |           |                      |                 |             |             | Depth        | Туре              |                     | nental blo<br>etration in                 |                    | Hammer<br>No.  | Energy ratio  | Casing depth | Water<br>depth |
| 2.00                  | +                        | 2.10                          | 1300                 | m              | Duration hhmm 0200 Chiselling |             |           |                      |                 |             |             | 0.50         | SPT(C             |                     |   |                    | AR362          | %<br>75<br>75 | N/A          | -8.20<br>-8.30 |
|                       |                          |                               |                      |                | ŀ                             |             |           |                      |                 |             |             | 1.50<br>2.10 | SPT(C<br>SPT(C    | N=50 (7,8<br>50/0mm | 5,6,6,5,8)<br>8,11,11,13,1<br>(25/0,50/0) | 5)                 | AR362<br>AR362 | 75<br>75      | 1.50<br>2.00 | -8.30<br>-8.50 |
|                       |                          |                               |                      |                | ŀ                             |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               | <br>         |                |
|                       |                          |                               |                      |                | ļ                             |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               | <br>         |                |
|                       |                          |                               | R                    |                | / FLUSH DI                    | ETAILS      |           |                      |                 |             |             |              |                   |                     |   |                    |                |               | <br>         |                |
| Fron<br>dept          |                          | To<br>depth                   |                      |                | Flush<br>type                 |             | ret       | ush<br>turn          |                 | ush<br>Iour |             |              |                   |                     |   |                    |                |               | <br>         |                |
| 2.10                  |                          | 4.10                          |                      | W              | Vater                         |             | 9         | %<br>90              | G               | rey         |             |              |                   |                     |   |                    |                |               | <br>         |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               | <br>         |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               | <br>         |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
| HOle                  | LE DIAN<br>Depth         |                               | / CASING<br>sing Dep | th of          | Тор                           | DYN<br>Base |           | SAMPLIN<br>meter     | NG<br>Time      | Reco        | verv        |              |                   |                     |   |                    |                |               |              |                |
| diameter<br>200       | hole<br>2.10             | dian                          | neter cas            | sing<br>00     |                               |             | ļ         |                      | hmmss           |             |             |              |                   |                     |   |                    |                |               |              |                |
| 116                   | 4.10                     |                               | 2.                   |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       | IN                       | ISTALLA                       | TION DET             | ΓAILS          |                               |             | PI        | PE CONST             | TRUCTIO         | ON          |             |              |                   |                     |   |                    |                |               |              |                |
| Distance<br>from G.L. |                          | Ty                            | уре                  | Respor<br>Top  | nse zone<br>  Base            | ID          |           | Pipe<br>  Base       | Dia.<br>of pipe | Туре        | of<br>pe    |              |                   |                     |   |                    |                |               |              |                |
| Hom G.L.              | •                        |                               |                      | ТОР            | Busc                          |             | тор       | Dasc                 | or pipe         | Pi          | pc          |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                | ot                            |             |           |                      |                 |             |             |              |                   |                     |   | blows only.        |                |               |              |                |
| Top of                | : Гр                     | ase of                        |                      | BAC<br>Materia | KFILL DET                     | AILS        |           | Rema                 |                 |             |             |              |                   |                     |   | GENERAL N          | OTES           |               |              |                |
| section<br>0.00       | n se                     | ection<br>2.10                |                      | Arisings       |                               |             |           | Кеша                 |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
| 2.10                  |                          | 4.10                          | <b>'</b>             | Grout          |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
|                       |                          |                               |                      |                |                               |             |           |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
| NOTES:                | All de                   | oths in                       | metres, al           | l diame        | eters in mi<br>utes, hard     | illimet     | res.      | in hhmm              |                 |             |             |              |                   |                     |   |                    |                | 4             |              |                |
|                       | For de                   | tails of                      | abbreviat            | ions, se       | ee key                        | Strata      | time      |                      |                 |             |             |              |                   |                     |   |                    |                |               |              |                |
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Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 D98 Engineer Arch Henderson LLP Employer Aberdeen Harbour Board Sheet 1 of 1

Ground Level -7.57m CD Coordinates 397195.66 E, 804425.09 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend | Depth  | Datum<br>Level |           | Sampling  | 1    | San | nple l | ount A<br>Recov | ery    | In Situ<br>Deta                      |  | Insta |
|--|--------|--------|----------------|-----------|-----------|------|-----|--------|-----------------|--------|--------------------------------------|--|-------|
| Medium dense grey slightly silty fine to coarse SAND.  | X      | -      | 2010.          |           | 0.00-0.50 | Dia. | TCR | SCR    | RQD             | IF     |                                      |  |       |
| from 1.50m to 2.00m dense  |        | -      |                | B003 D004 |           |      |     |        |                 |        | SPT(C)25<br>0.50<br>SPT(C)50<br>1.50 | 0.95 -                                       |       |
|  |        | 2.00 — | -9.57          | 8006      | 1.50-1.95 |      |     |        |                 |        |                                      | -  |       |
| No recovery. SCHIST. (Driller's description)  Medium strong grey GNEISS with medium spaced thin bands of weak thinly foliated (<1mm) grey inclusions schist.  Discontinuities: 1) 20-30 degrees very closely locally closely spaced planar rough with slight yellow and brown staining on surfaces. 2) 80-90 degrees medium spaced planar rough with dark brown staining on surfaces.  |        | 2.10   | -9.67          | 2.10      | 3.10      | 90   | 90  | 65     | 11              | NI     | SPT(C)50/0i<br>2.10                  | mm -<br>2.10 -<br>-<br>-<br>-<br>-<br>-<br>- |       |
| from 2.10m to 2.25m weak grey schist. Recovered as non intact core (angular coarse gravel sized fragments) from 2.32m to 2.40m thin band of weak thinly foliated (<1mm) grey schist from 2.60m to 2.70m weak grey schist. Recovered as non intact core (angular coarse gravel sized fragments) from 3.00m to 3.10m assumed zone of no recovery from 3.10m to 3.35m weak grey schist. Recovered as non intact core (angular coarse gravel sized fragments) from 3.80m to 4.00m recovered as non intact core (angular coarse gravel sized fragments) |        | 4.10   | -11.67         | 3.10      | 4.10      | 90   | 100 | 55     | 0               | 45 110 |                                      |  |       |
| Exploratory hole complete at 4.10 m.   |        |        |                |           |           |      |     |        |                 |        |                                      |  |       |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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| ,                                |                 | •                    |                             | ا Hark               | bour Dev                    | elopm   | ent (                           | Ground              | Invest          | igati        | on          |                              |                   | Fxplo                           | ratory <sup> </sup>  | Hole Lo                  | oa                      | Нс                   | ole ID.             |                 |
|----------------------------------|-----------------|----------------------|-----------------------------|----------------------|-----------------------------|---------|---------------------------------|---------------------|-----------------|--------------|-------------|------------------------------|-------------------|---------------------------------|--|--------------------------|-------------------------|----------------------|---------------------|-----------------|
| Project                          |                 |                      | 7148<br>h.Uanda             |                      |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  | 10.0 =                   | 79                      | Г                    | 099                 |                 |
| Engine<br>Employ                 |                 |                      | h Hende<br>erdeen H         |                      | LLP<br>our Board            |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         | н                    | eader               |                 |
| Ground                           |                 |                      | 9m CD                       | albo                 | UI DUaiu                    |         |                                 | Coord               | dinates         |              | 39714       | 46.90 E,                     | <br>80455         | 8.10 N Na                       | ational Grid   |                          |                         |                      | sauei               |                 |
| Date Sta                         | rted            | 20/0                 | 08/2013                     |                      |                             |         |                                 | Date                | Complet         |              |             |                              |                   |                                 |  | Inclinat                 | tion Verti              | cal                  |                     |                 |
| Тор                              | Base            | Туре                 | Date Star                   | rted                 | Date Ended                  | d Cre   | w L                             | Section<br>ogged By | Core<br>Barre   | e (          | Core<br>Bit | F                            | Equipn            | nent                            | Sh   | oring /<br>ipport        | F                       | Remarks              |                     |                 |
| 0.00<br>4.10                     | 4.10<br>7.10    | CP<br>RC             | 20/08/20                    | 013                  | 20/08/2013<br>21/08/2013    | 3 TP    | Р                               | DT<br>DT            |                 |              |             |                              | Dando<br>Deltabas |                                 |  | FI .                     |                         |                      |                     |                 |
|                                  | 1.20            |                      | 20,02                       |                      | 21/00/                      |         | .                               | ٠.                  |                 |              |             |                              | rona.             | 36 020                          |  |                          |                         |                      |                     |                 |
|                                  |                 |                      |                             |                      |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      |                     |                 |
|                                  |                 |                      |                             |                      |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      |                     |                 |
| <u>_</u>                         |                 |                      |                             | PRO                  | OGRESS                      |         |                                 |                     |                 |              | $\neg$      |                              |                   |                                 | 1  | NATER STRI               | IKES                    |                      |                     |                 |
| Date                             | Tir             | ime                  | Hole<br>depth               | Casir<br>dept        | ng Wate                     | r       |                                 | Remark              | ks              |              |             | Date                         | е                 | Time                            | Strike at depth  | Rise to depth            | Time<br>taken           | at strik             | sing dep<br>ke   to | o seal          |
| 20/08/20                         |                 | 1830                 | 4.10                        | 4.10                 | ) -9.80                     | End of  | of CP                           |                     |                 |              |             | -                            | $\overline{}$     |                                 | <del>  '</del>   | <u> </u>                 | to rise                 | time                 | 1                   | flow            |
| 20/08/20<br>21/08/20<br>21/08/20 | 013 0           | 1930<br>1730<br>1930 | 4.10<br>4.10<br>7.10        | 4.10<br>4.10<br>5.40 | ) NR                        | Start o | of Shift<br>of Shift<br>of Hole | ft                  |                 |              |             |                              |                   |                                 |  |                          |                         |                      |                     |                 |
| 21,00,2                          | 13              | 330                  | , ,,,,,                     | J                    | 55                          | Line c  | 1116.0                          |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      |                     | •               |
|                                  |                 |                      |                             | ı                    |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      |                     |                 |
|                                  |                 |                      |                             | ı                    |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      |                     |                 |
|                                  |                 |                      |                             |                      |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      |                     |                 |
|                                  |                 |                      |                             |                      |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      |                     |                 |
|                                  |                 |                      | CA                          |                      |                             |         |                                 |                     |                 |              |             |                              |                   | SPT DETAI                       |  |                          |                         |                      |                     |                 |
| Hard<br>from                     | l Strata I<br>า | Depth<br>to          | Start time   Duration   per |                      |                             |         |                                 |                     |                 |              |             | nental blow<br>etration in I |                   | Hammer<br>No.                   | ratio  | Casing depth             | Water<br>depth          |                      |                     |                 |
| 3.70                             | +               | 4.10                 | 1630                        |                      | 0200                        |         |                                 |                     | $\dashv$        | 0.50<br>1.50 | SPT(C       | N=13 (3,3                    | 3,4,3,3,3)        |                                 | AR360<br>AR360   | %<br>75<br>75            | N/A<br>1.50             | -10.70<br>-10.50     |                     |                 |
|                                  |                 |                      |                             |                      | I                           | 1       |                                 |                     |                 |              |             | 3.50<br>4.10                 | SPT(C             | N=20 (4,-<br>) 50/0mm<br>50/0mm | 3,4,3,3,3)<br>4,5,4,5,6)<br>(11,14,50/0)<br>(25/0,50/0)<br>(25/0,50/0) |                          | AR360<br>AR360<br>AR360 | 75<br>75<br>75<br>75 | 3.50<br>4.10        | -10.20<br>-9.80 |
|                                  |                 |                      |                             |                      |                             |         |                                 |                     |                 |              |             | 5.60                         | SPT(C             | 50/0mm                          | (25/0,50/0)  |                          | AR360                   | 75                   | 4.10                | -10.00          |
|                                  |                 |                      | $\perp$                     |                      |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
| Fror                             |                 |                      | R                           |                      | Y FLUSH D                   | ETAILS  | - Slu                           | - h                 | Eli             | ·sh          |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
| Fron<br>dept                     |                 | To<br>depth          | 1                           |                      | Flush<br>type               |         | Flus<br>retu<br>%               | urn                 | Flu<br>colo     |              |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
| 4.10<br>5.60                     |                 | 5.60<br>7.10         |                             |                      | Water<br>Water              |         | 10<br>70                        | 00                  | Brov<br>Orar    |              |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
|                                  |                 |                      |                             |                      |                             |         |                                 |                     |                 | -            |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
|                                  |                 |                      |                             |                      |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
|                                  |                 |                      |                             |                      |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
| НС                               | LE DIAI         | METER                | / CASING                    | <u>. T</u>           |                             | DVN/    |                                 | SAMPLIN             | JG              | —            | -           |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
| Hole                             | Depth           | of Cas               | sing Dep                    | oth of               | Тор                         | Base    | _                               | meter 1             | Time            | Recov        |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
| diameter<br>116                  | 7.10            |                      |                             | sing<br>.40          |                             |         | +                               | hh                  | hmmss           | %            |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
|                                  |                 |                      |                             |                      |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
|                                  |                 |                      |                             |                      |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
|                                  |                 |                      |                             | $\Box$               |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
|                                  |                 |                      | ATION DET                   |                      |                             |         |                                 | PE CONST            |                 |              |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
| Distance<br>from G.L             |                 | Ty<br>               | уре                         | Respo<br>Top         | onse zone<br>D   Base       | ID T    |                                 | ipe<br>  Base   c   | Dia.<br>of pipe | Type<br>pip  |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
|                                  |                 |                      |                             |                      |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
|                                  |                 | l                    |                             | ı                    |                             |         |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      | <br>                |                 |
|                                  |                 | —                    |                             | RΔ                   | CKFILL DET                  | .VII C  |                                 |                     |                 | —            | $\dashv$    | <del> </del>                 | <u> </u>          |                                 | * Seating bl   | lows only.<br>SENERAL NO | OTES                    |                      |                     |                 |
| Top o                            |                 | Base of              | 1                           | Materia              |                             | AILS    |                                 | Remar               | rks             |              | $\dashv$    |                              |                   |                                 |  | IEINEIMAL IN             | J1E3                    |                      |                     |                 |
| sectio<br>0.00                   |                 | ection<br>7.10       | -                           | Arisings             | S                           |         |                                 |                     |                 |              | _           |                              |                   |                                 |  |                          |                         |                      |                     |                 |
|                                  |                 |                      |                             |                      | ļ                           | 1       |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      |                     |                 |
|                                  |                 |                      |                             |                      |                             | 1       |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      |                     |                 |
|                                  |                 |                      |                             |                      |                             | 1       |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      |                     |                 |
|                                  | Ш               |                      |                             |                      |                             | Ш       |                                 |                     |                 |              |             |                              |                   |                                 |  |                          |                         |                      |                     |                 |
| NOTES:                           | Water           | r strike ı           | rise time i                 | in min               | neters in mi<br>nutes, hard |         |                                 | in hhmm             |                 |              |             |                              |                   |                                 |  |                          |                         | 4                    |                     |                 |
| Unched                           |                 | tails of             | fabbreviat                  |                      | see key<br>og Print Da      | to And  | Time                            | . 22/12/2           | 2012 10         | 13.05.       |             |                              |                   |                                 |  |                          | SOI                     | L eng                | IDEE                | BIUG            |
| unched                           | .keu            |                      |                             | LC                   | og Pillit Da                | le Anu  | i iiiie.                        | . 23/12/2           | -012 IO         | ∕.3U.4₹      | )           |                              |                   |                                 |  |                          | 301                     | - 0110               |                     |                 |

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

# **Exploratory Hole Log**

Hole ID.

D99

Sheet 1 of 1

Ground Level -6.29m CD

Coordinates

397146.90 E, 804558.10 N National Grid

Hole Type CP+RC Inclination

| Legend | Depth                          | Datum  | Sampling  | _                                |                        |   |                                    |  | In Situ Test                                 | Inst   |
|--------|--------------------------------|--------|---|----------------------------------|------------------------|---|------------------------------------|--|--|--|
|        |                                | Levei  | Details   | Dia.                             | TCR                    | SCR   | RQD                                | IF                                       | Details                                      | atio   |
|        |                                |        | B001 0.00-0.50<br>ES002 0.50<br>B003 0.50-0.95          |                                  |                        |   |                                    |  | SPT(C)13<br>0.50 0.95                        |  |
|        |                                |        | ES005 1.50<br>B006 1.50-1.95<br>D007 2.00<br>ES008 2.00 |                                  |                        |   |                                    |  | SPT(C)20<br>1.50 1.95                        |  |
|        |                                |        | D009 3.00<br>ES010 3.50<br>B011 3.50-3.70               |                                  |                        |   |                                    |  | SPT(C)50/0mm<br>3.50 3.65                    |  |
|        | 4.10                           | -10.39 |   |                                  |                        |   |                                    |  | SPT(C)50/0mm<br>4.10 4.10                    |  |
|        | 5.00 —                         | -11.29 | 4.10 5.60   | 90                               | 66                     | NA  | NA                                 |  | <u>.</u>                                     |  |
| 000    | 5.60                           | -11.89 |   |                                  |                        |   |                                    | NA                                       | SPT(C)50/0mm<br>5.60 5.60                    |  |
|        | 6.00                           | -12.29 | 5.60 7.10   | 90                               | 100                    | NA  | NA                                 |  |  |  |
| 70. 12 | 7.10<br><br><br>               | -13.39 |   |                                  |                        |   |                                    |  |  |  |
|        |                                |        |   |                                  |                        |   |                                    |  | -<br>-<br>-                                  |  |
|        | <br> -<br> -<br> -<br> -<br> - |        |   |                                  |                        |   |                                    |  | :<br>-                                       |  |
|        |                                | 4.10   | Legend Depth Level  4.1010.39  5.0011.29  6.0012.29     | Legend   Depth   Level   Details | Level   Details   Dia. | Legend   Depth   Level   Details   Dia.   TCR | Leyel   Details   Dia.   TCR   SCR | Level   Details   Dia.   TCR   SCR   RQD | Level   Details   Dia   TCR   SCR   RQD   IF | Legend   Depth   Level   Details   Dia.   TCR   SCR   RQD   IF   Details |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

Unchecked Log Print Date And Time: 23/12/2013 10:30:47

Form No. SIEXPHOLELOG

Issue.Revision No. 1.05



|                       |                       | -                |                              | Harl و               | bour Dev            | elop         | ment      | : Ground             | l Invest        | tigatio     | on          |                |                              | Fynlor                              | ratory ł                             | Hole Lo          | 20                      | Нс             | ole ID.      |                  |
|-----------------------|-----------------------|------------------|------------------------------|----------------------|---------------------|--------------|-----------|----------------------|-----------------|-------------|-------------|----------------|------------------------------|-------------------------------------|--------------------------------------|------------------|-------------------------|----------------|--------------|------------------|
| Project               |                       |                  | 7148                         |                      | _                   |              |           |                      |                 |             |             |                |                              | Lybici                              | atory                                | IOIC L           | <i>J</i> 9              | D              | 100          |                  |
| Engine                |                       |                  | h Hende                      |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
| Employ<br>Ground I    |                       |                  | erdeen F<br>.06m CD          | larbo                | our Board           | —            | —         | Coor                 | rdinates        | 3           | 39730       | <br>03.23 E, { | <u> </u><br>80448            | 33.34 N Na                          | tional Grid                          |                  |                         | r-1            | eader        |                  |
| Date Sta              |                       |                  | 08/2013                      |                      |                     |              |           |                      | e Comple        |             |             |                |                              |                                     |                                      | Inclinat         | tion Vertic             | cal            |              |                  |
| Тор                   | Base                  | Туре             | Date Sta                     | irted                | Date Ende           | d C          | Crew      | Section<br>Logged By | Cor<br>y Barr   | e C         | Core<br>Bit | E              | Equipr                       | ment                                | Sho<br>Su                            | oring /<br>pport | R                       | Remarks        |              |                  |
| 0.00<br>3.10          | 3.10<br>4.00          | CP<br>RC         | 10/08/20                     | .013                 | 10/08/201           |              | TT<br>TT  | TW<br>TW             | T611            |             | npreg       |                | Dand0<br>Deltabas            | 3000                                |                                      | pp=::            |                         |                |              |                  |
| 3.10                  | 4.00                  | , ne             | 10,00,1                      | 013                  | 10/00/202           | ,            | "         | 100                  | 1012            |             | lhica       | -              | tilas.                       | 26.313                              |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              | PRO                  | OGRESS              |              |           |                      |                 |             |             |                |                              |                                     | V                                    | VATER STRI       | IKES                    |                |              |                  |
| Date                  | Ti                    | me               | Hole<br>depth                | Casir<br>dept        | ing Wate            | r<br>h       |           | Remar                | rks             |             |             | Date           | е                            | Time                                | Strike at depth                      | Rise to<br>depth | Time<br>taken           | at strik       | sing dep     | o seal           |
| 10/08/20              |                       | 800              | 3.10<br>4.00                 | 3.10<br>3.10         | 0 -15.70            | 0 End        | nd of CP/ | /Start of Rot        | tary            |             | $\dashv$    |                |                              |                                     | -                                    | -                | to rise                 | time           | +            | flow             |
| 10/08/20              | 13   4                | .000             | 4.00 3.10 -15.00 End of Hole |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
| I                     |                       |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
| _<br>                 |                       |                  |                              |                      |                     |              |           |                      |                 |             |             | SPT DETAI      |                              |                                     | <del>-</del>                         |                  |                         |                |              |                  |
| Hard<br>from          | Start time   Duration |                  |                              |                      |                     |              |           |                      |                 | Depth       | Туре        |                | nental blow<br>etration in r |                                     | Hammer<br>No.                        | Energy<br>ratio  | Casing depth            | Water<br>depth |              |                  |
| 3.00                  | +                     | 3.10             | hhmm hhmm                    |                      |                     |              |           |                      |                 |             | $\dashv$    | 0.50<br>1.50   | SPT<br>SPT                   | N=20 (3,3<br>N=25 (4,5<br>N=23 (3,6 | ,5,5,4,6)                            |                  | AR362<br>AR362          | %<br>75<br>75  | N/A<br>1.50  | -15.30<br>-15.70 |
|                       |                       |                  |                              | 1600 0200 Chiselling |                     |              |           |                      |                 |             |             | 2.50<br>3.10   | SPT<br>SPT                   | N=23 (3,6<br>50/0mm (               | ,5,5,7,8)<br>,4,6,6,7)<br>25/5,50/0) |                  | AR362<br>AR362<br>AR362 | 75<br>75<br>75 | 2.50<br>3.10 | -15.40<br>-15.20 |
|                       |                       |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       | $\perp$               |                  |                              |                      |                     | L_           |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
| From                  | <u> </u>              | То               | F                            |                      | RY FLUSH D<br>Flush | ETAIL        |           | lush                 | Flu             | ush         | _           |                |                              |                                     |                                      |                  |                         |                |              |                  |
| deptl                 |                       | depth            |                              |                      | type                | !            | ret       | turn<br>%            | col             | lour        |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
| 3.10                  |                       | 4.00             |                              | \                    | Water               |              | 1         | 100                  | Bro             | own         |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     | !            |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     | l            |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     | l            |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
| НО                    | LE DIAI               | METER            | / CASING                     | à                    |                     | DY           | /NAMI     | C SAMPLII            | MG              |             | $\dashv$    |                |                              |                                     |                                      |                  |                         |                |              |                  |
| Hole<br>diameter      | Depth<br>hole         |                  |                              | pth of<br>sing       | Тор                 | Base         | Dia       |                      | Time            | Recov       | ery/        |                |                              |                                     |                                      |                  |                         |                |              |                  |
| 150<br>116            | 3.10<br>4.00          | 1:               |                              | 3.10                 |                     |              | +         |                      | 1111111155      | 70          |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
| 116                   | 4.00                  |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
| Distance.             |                       |                  | ATION DE                     |                      |                     | _            |           | IPE CONS             |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
| Distance<br>from G.L. |                       |                  | уре                          | Top                  | onse zone<br>p Base | ID           | Тор       | Pipe<br>Base         | Dia.<br>of pipe | Type<br>pip |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       | ı                |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       | ı                |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     | * C - * 1-1                          |                  |                         |                |              |                  |
|                       |                       |                  |                              | BA                   | CKFILL DET          | LLL<br>FAILS | <u> </u>  |                      |                 |             | $\dashv$    |                |                              |                                     | * Seating bl                         | iENERAL NO       | <br>OTES                |                |              |                  |
| Top of section        |                       | ase of<br>ection | ı                            | Materia              | ial                 |              |           | Rema                 | ırks            |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
| 0.00<br>3.10          |                       | 3.10<br>4.00     |                              | Arising:<br>Grout    | is<br>t             |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
|                       |                       |                  |                              |                      |                     |              |           |                      |                 |             |             |                |                              |                                     |                                      |                  |                         |                |              |                  |
| NOTES:                | All do                | nthe in          | motros a                     | all dian             | neters in m         | illim        | otros     |                      |                 |             |             | <u> </u>       |                              |                                     |                                      |                  |                         |                |              |                  |
| NOTES.                | Water                 | strike :         | rise time i<br>f abbreviat   | in min               | nutes, hard         | strat        | ia time   | in hhmm              | I               |             |             |                |                              |                                     |                                      |                  |                         | 4              |              |                  |
|                       |                       |                  |                              |                      | og Print Da         | ate Ar       | nd Time   | e: 23/12/            | 2013 10         | ):30:52     | <u> </u>    |                |                              |                                     |                                      |                  | SOII                    | L eng          | inee         | RING             |

Log Print Date And Time: 23/12/2013 10:30:52

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 D100 Engineer Arch Henderson LLP

Ground Level -11.06m CD Coordinates 397303.23 E, 804483.34 N National Grid

Hole Type CP+RC Inclination

Aberdeen Harbour Board

Employer

| Description of Strata  | Legend                                | Depth | Datum<br>Level   | Sampling  |      | Blo<br>San | ow Co<br>nple F | Recov | nd<br>ery           |                        | u Test<br>tails  | Insta |
|--|---------------------------------------|-------|------------------|---|------|------------|-----------------|-------|---------------------|------------------------|--|-------|
|  |                                       |       | Levei            | Details   | Dia. | TCR        | SCR             | RQD   | IF                  | De                     | Lalis  | atioi |
| Medium dense grey slightly silty slightly gravelly fine to nedium SAND. gravel is fine. (Driller notes occasional oulders).  |                                       |       |                  | D001 0.00-0.10  D002 0.50-0.95 B003 0.50-1.00  D004 1.00-1.20  D005 1.50-1.95 |      |            |                 |       |                     | SPT20<br>0.50<br>SPT25 | 0.95   |       |
|  | × × × × × × × × × × × × × × × × × × × | -     |                  | D007 2.00-2.20<br>D008 2.50-2.95<br>B009 2.50-3.00                            |      |            |                 |       |                     | 1.50<br>SPT23<br>2.50  | 1.95 -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |       |
| Strong pink and grey medium crystalline GRANITE. Discontinuities: 1) 50-60 degrees medium spaced undulating oough clean.  from 3.50m to 3.72m 1 No discontinuity 80 degrees planar rough clean  at 3.85m 1 No discontinuity 0-10 degrees planar rough clean from 3.87m to 4.00m assumed zone of no recovery.  Exploratory hole complete at 4.00 m. |                                       | 4.00  | -14.16<br>-15.06 | 3.10 4.0  | 0 92 | 86         | 86              | 67    | 200<br>1200<br>2600 | SPT50/On 3.10          | 3.11 -   |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:30:55

Form No. SIEXPHOLELOG Issue.Revision No. 1.05 Issue Date 22/10/2012



Sheet 1 of 1

| _                    |              | -  |                           | Hark           | oour Dev              | elopn  | nent             | Ground          | Inves           | tigat  | ion         |                      |                         | Explo                | raton   | , н           | ole I d             | 00               | Но               | ole ID.              |                         |
|----------------------|--------------|--|---------------------------|----------------|-----------------------|--------|------------------|-----------------|-----------------|--------|-------------|----------------------|-------------------------|----------------------|---|---------------|---------------------|------------------|------------------|----------------------|-------------------------|
| Project              |              | TA7  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         | LXPIO                | ratory  | y 1 1         | OIC LC              | 9                | D                | 101                  |                         |
| Engine               |              |  | n Hende                   |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
| Employ<br>Ground     |              |  | rdeen H<br>Om CD          | arbo           | ur Board              |        |                  | Coor            | dinates         |        | 20721       | 50 00 E              | 90/57                   | 74.50 N N            | ational G   | rid           |                     |                  | Н                | eader                |                         |
| Date Sta             |              |  | 9/2013                    |                |                       |        |                  |                 | Comple          |        |             |                      | 00437                   | 4.30 N N             | ational G   | Πü            | Inclinat            | ion Vert         | cal              |                      |                         |
| Тор                  | Base         | Туре   | Date Star                 | ted [          | Date Ende             | d Cre  | ew .             | Section         | Cor             | re.    | Core<br>Bit | I                    | Equipr                  | ment                 |   | Shori<br>Supp | ng <sub>.</sub> /   | F                | Remarks          |                      |                         |
| 0.00                 | 4.80         | СР   | 24/09/20                  | 13             | 24/09/201             | 3 AC   | )'H              | Logged By<br>DT |                 |        | Bit         |                      | Dando                   | 3000                 |   | Supp          | ort                 |                  |                  |                      |                         |
| 4.80                 | 8.80         | RC   | 24/09/20                  | 13             | 26/09/201             | 3 RJ   | /TT              | DT              | T61:            | 16     | mpreg       | D                    | eltaba                  | se 515               |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
| Date                 | Ti           | me   | Hole                      | Casir          | OGRESS<br>ng Wate     | r      |                  | Remar           | ks              |        |             | Date                 | e                       | Time                 | Strike  |               | TER STRI<br>Rise to | Time             | Ca               | sing dep             | ıth                     |
|                      |              |  | depth                     | dept           | th depti              | ו      |                  |                 |                 |        |             | Dut                  |                         | 111110               | dept  | h             | depth               | taken<br>to rise | at stril<br>time | κe i to              | seal<br>low             |
| 24/09/20<br>24/09/20 | 13 1         | 300<br>800   | 4.80<br>6.80              | 4.50<br>4.50   | -8.90                 | End    | of Shif          |                 | ary             |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
| 26/09/20<br>26/09/20 |              | 700<br>800   | 6.80<br>8.80              | 4.50<br>8.80   |                       |        | of Shi<br>of Hol |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
| Hard                 | Strata I     | CABLE PERCUSSION DETAILS  Depth Chicalling Pemarks Depth |                           |                |                       |        |                  |                 |                 |        | Depth       | Туре                 | Increi                  | mental bl            |   | PT DETAI      | LS<br>Hammer        | Energy           | Casing           | Water                |                         |
| from                 |              | to   |                           |                |                       |        |                  |                 |                 |        |             | Берин                | lype                    | per                  | netration   | in mr         | n                   | No.              | ratio<br>%       | depth                | depth                   |
| 4.50                 |              | 4.80   | 1100                      |                | hhmm 0200 Chiselling  |        |                  |                 |                 |        |             | 0.50<br>1.50         | SPT(C                   | N=19 (3,<br>N=27 (3, | 3,4,4,5,6)<br>4,6,7,7,7)<br>4,5,7,8,8)<br>6,6,7,7,8)<br>nm (10,12,7 |               |                     | AR360<br>AR360   | 75<br>75         | N/A<br>1.50          | -9.60<br>-9.10          |
|                      |              |  |                           |                | 0200 Cniselling       |        |                  |                 |                 |        |             | 2.50<br>3.50<br>4.50 | SPT(C<br>SPT(C<br>SPT(C | N=28 (4,<br>N=28 (6, | 4,5,7,8,8)<br>6,6,7,7,8)  | 45.05         | (7.0)               | AR360<br>AR360   | 75<br>75<br>75   | 2.50<br>3.50<br>4.50 | -8.30<br>-7.80<br>-7.20 |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             | 4.50<br>5.80         | SPT(C                   | 50/145n<br>50/85mr   | nm (10,12,<br>n (25/65,4  | 0,10/1        | 10)                 | AR360<br>AR360   | 75<br>75         | 4.50<br>4.50         | -7.20<br>-7.20          |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
| Fron                 | n I          | То   | R                         |                | Y FLUSH D<br>Flush    | ETAILS |                  | ush             | Fli             | ush    |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
| dept                 |              | depth  |                           |                | type                  |        | ret              | urn<br>%        |                 | lour   |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
| 4.80                 |              | 8.80   |                           | V              | Nater                 |        | 1                | 00              | Br              | own    |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
| НО                   | I F DIAN     | /FTFR  | / CASING                  |                |                       | DYN    | AMIC             | SAMPLIN         | JG              |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
| Hole                 | Depth        | of Cas   | sing Dept                 |                | Тор                   | Base   |                  | meter           | Time            |        | very        |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
| diameter<br>150      | hole<br>8.80 |  | neter cas                 |                |                       |        |                  | h               | hmmss           | %      | )           |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      | IN           | STALLA   | TION DET                  | AILS           | •                     |        | PI               | PE CONST        | RUCTIO          | ON     |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
| Distance<br>from G.L |              | Ту   | /pe                       | Respo<br>Top   | nse zone<br>I Base    | ID .   | F<br>Top         | Pipe<br>  Base  | Dia.<br>of pipe | Туре   | e of<br>ipe |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           | ·              |                       |        | •                |                 |                 | ·      |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                | 01/51::               |        |                  |                 |                 |        |             |                      |                         |                      | * Seatin  |               |                     |                  |                  |                      |                         |
| Top o                | f p          | ase of   | N.                        | BAC<br>lateria | CKFILL DET            | AILS   |                  | Rema            | rks             |        |             |                      |                         |                      |   | GEN           | NERAL NO            | JIES             |                  |                      |                         |
| sectio<br>0.00       | n se         | ection<br>8.80   |                           | risings        |                       |        |                  | Nema            | 110             |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
| 3.00                 |              |  |                           | 9              | -                     |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           |                |                       |        |                  |                 |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
| NOTES:               |              |  |                           |                | neters in m           |        |                  | in bb           |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  | rise time ii<br>abbreviat |                | utes, hard<br>see key | sırata | ume              | ın nnmm         |                 |        |             |                      |                         |                      |   |               |                     |                  |                  |                      |                         |
|                      |              |  |                           | Lo             | og Print Da           | te And | Time             | : 23/12/2       | 2013 10         | 0:30:5 | 9           |                      |                         |                      |   |               |                     | SOI              | L eng            | inee                 | RING                    |

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Engineer

Arch Henderson LLP

**Exploratory Hole Log** 

Hole ID.

D101

Sheet 1 of 1

Employer Aberdeen Harbour Board Ground Level

-9.00m CD

Coordinates

397259.00 E, 804574.50 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend | Depth                                | Datum<br>Level   | Sampling                    |      |     |       | ount A<br>Recov |       | In Situ Test<br>Details         | lr<br>a  |
|---|--------|--------------------------------------|------------------|-----------------------------|------|-----|-------|-----------------|-------|---------------------------------|--|
|   |        |                                      | Lovei            | Details                     | Dia. | TCR | SCR   | RQD             | IF    | Dotails                         | ľ  |
| Medium dense brown slightly silty slightly gravelly fine to<br>coarse SAND. Gravel is angular to subrounded fine to coarse of<br>nixed igneous and metamorphic lithologies including granite,<br>chist, gneiss and quartz.  |        | -                                    |                  | D001 0.50<br>B002 0.50-1.00 |      |     |       |                 |       | SPT(C)19<br>0.50 0.95           |  |
|   |        | -                                    |                  | D003 1.50<br>B004 1.50-2.00 |      |     |       |                 |       | SPT(C)27<br>1.50 1.95           | de la constant de la  |
|   |        |                                      |                  | B006 2.50-3.00              |      |     |       |                 |       | SPT(C)28<br>2.50 2.95           | and and and administration   |
|   |        |                                      |                  | D007 3.50<br>B008 3.50-4.00 |      |     |       |                 |       | SPT(C)28<br>3.50 3.95           | Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Salar Sa   |
| New York Clay (Dilled de victor)  |        |                                      | -13.80           | D009 4.50<br>B010 4.50      |      |     |       |                 |       | SPT(C)50/145mm<br>4.50 4.80     | Salar Salar Salar Salar Salar  |
| No recovery. Boulder CLAY. (Driller's description)  |        |                                      |                  | 4.80 5.80                   | 89   | 0   | NA    | NA              |       |                                 | Salara de la constanta de la c |
| Stiff brown slightly sandy slightly gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss, schist and quartz. Cobbles are angular to subrounded of granite and gneiss. |        | 5.80<br><br><br><br><br><br>         | -14.80           | 5.80 6.80                   | 89   | 90  | NA    | NA              |       | SPT(C)50/85mm<br>5.80 5.95<br>— | dent of the second of the second   |
| from 6.70m to 6.80m assumed zone of no recovery  Assumed zone of no recovery. Stiff boulder CLAY with large granite boulders. (Driller's description).  |        | 7.35                                 | -16.35           | 6.80 7.80                   | 89   | 55  | NA    | NA              | NA NA | -                               | Salara de la constante de la c |
| Stiff brown slightly sandy slightly gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss, schist and quartz.  |        | 7.80 -<br>-<br>-<br>-<br>-<br>8.30 - | -16.80<br>-17.30 | 7.80 8.80                   | 89   | 50  | NA NA | NA NA           |       | <u>-</u>                        |  |
| Cobbles are angular to subrounded of granite and gneiss.  Assumed zone of no recovery. Stiff boulder CLAY with large granite boulders. (Driller's description).  Exploratory hole complete at 8.80 m.   |        | 8.80                                 | -17.80           |                             |      |     |       |                 |       |                                 |  |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:31:02

SOIL ENGINEERING Part of the Bachy Soletanche Group

| Project              | Nam      | e Bay          | of Nig            | g Har        | rbour Dev                  | elop   | ment     | Groun               | d Inve             | stiga | tion         |  |            | Cypla                  |                          | اماما                |                  | Н                | le ID.      |                  |
|----------------------|----------|----------------|-------------------|--------------|----------------------------|--------|----------|---------------------|--------------------|-------|--------------|--|------------|------------------------|--------------------------|----------------------|------------------|------------------|-------------|------------------|
| Project              | t No.    | TA7            | 148               |              |                            |        |          |                     |                    |       |              |  |            | Explo                  | ratory l                 | iole L               | og               | Ь                | 102         |                  |
| Engine               |          | Arc            | h Hend            | ersor        | ı LLP                      |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  | D                | 102         |                  |
| Employ               |          |                |                   | Harbo        | our Board                  |        |          |                     |                    |       |              |  | 22.15      |                        |                          |                      |                  | Н                | eader       |                  |
| Ground<br>Date Sta   |          |                | 12m CD<br>08/2013 |              |                            |        |          |                     | ordinate<br>e Comp |       |              |  | 80453      | 34.08 N Na             | ational Grid             | Inclina              | tion Verti       | ical             |             |                  |
| Тор                  | Base     | Туре           | Date Sta          | arted        | Date Ende                  | d C    | Crew     | Sectior<br>Logged E | _                  | ore   | Core<br>Bit  |  | Equipr     | ment                   | Sho                      | oring /<br>pport     | ſ                | Remarks          |             |                  |
| 0.00                 | 3.00     | СР             | 08/08/2           | 2013         | 08/08/201                  | 3      | TP       | Logged E<br>TW      | Ву Ва              | rrel  | Bit          | <del>                                       </del> | Dando      | 3000                   | Su                       | pport                |                  |                  |             | -                |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   | DD           | OCDECC                     |        |          |                     |                    |       |              |  |            |                        |                          | VATED CTD            | IIVEC            |                  |             |                  |
| Date                 | Ti       | me             | Hole              | Cas<br>dep   | OGRESS ing Wate            | er     |          | Rema                | arks               |       |              | Dat  | :e         | Time                   | Strike at                | VATER STR<br>Rise to | Time             | Ca               | sing der    |                  |
| 00 (00 (20           | 12 1     | 000            | depth             |              |                            |        | 1 .611.1 |                     |                    |       |              |  |            |                        | depth                    | depth                | taken<br>to rise | at stril<br>time | ce t        | o seal<br>flow   |
| 08/08/20             | )13   1  | 900            | 3.00              | 3.0          | 0 -13.30                   | En     | d of Hol | le                  |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              | -  |            |                        |                          |                      |                  |                  |             |                  |
| Hard                 | Strata I | Depth          | - C               |              | PERCUSSIO<br>selling       |        | narks    |                     |                    |       |              | Depth  | Туре       | Increr                 | nental blow              | SPT DETA             | Hammer           | Energy           | Casing      | Water            |
| from                 |          | to             | Start hhn         | time         | Duration<br>hhmm           |        |          |                     |                    |       |              | J Sopan  |            |                        | etration in r            |                      | No.              | ratio<br>%       | depth       |                  |
|                      |          |                |                   |              |                            |        |          |                     | _                  |       |              | 0.50<br>1.50                                       | SPT<br>SPT | N=18 (4,3<br>N=29 (5,6 | 3,5,4,4,5)<br>6,7,6,8,8) |                      | AR360<br>AR360   | 75<br>75         | N/A<br>1.50 | -13.20<br>-13.30 |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              | 2.50   | SPT        | N=42 (6,8              | 3,9,9,11,13)             |                      | AR360            | 75               | 2.50        | -13.30           |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
| Fron                 | n        | То             |                   | ROTAI        | RY FLUSH D                 | ETAIL  | FI       | ush                 | F                  | lush  |              |  |            |                        |                          |                      |                  |                  |             |                  |
| dept                 | h        | depth          |                   |              | type                       |        | ret      | turn<br>%           | С                  | olour |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
| НО                   | LE DIAN  | /IETER         | / CASINO          | <u> </u>     |                            | DY     | NAMIO    | C SAMPL             | ING                |       |              | 1  |            |                        |                          |                      |                  |                  |             |                  |
| Hole                 |          | of Cas         |                   | pth of       | Тор                        | Base   | Dia      | ameter              | Time               |       | overy        | 1  |            |                        |                          |                      |                  |                  |             |                  |
| diameter<br>150      | 3.00     |                |                   | sing<br>3.00 |                            |        |          |                     | hhmms              | S S   | %            | -  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      | IN       | STALL          | ATION DE          |              |                            |        | P        | IPE CONS            | STRUCT             | ION   |              |  |            |                        |                          |                      |                  |                  |             |                  |
| Distance<br>from G.L |          | T              | ype               | Resp<br>To   | onse zone<br>p   Base      | ID     | Top      | Pipe<br>  Base      | Dia.<br>of pipe    |       | e of<br>oipe |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              | VCIVEUU DE                 | TAIL C |          |                     |                    |       |              | -  |            |                        | * Seating bl             |                      | OTEC             |                  |             |                  |
| Top of               | f B      | ase of         |                   | Mater        | ACKFILL DE                 | IAILS  |          | Rem                 | arks               |       |              |  |            |                        |                          | ENERAL N             | OTES             |                  |             |                  |
| section<br>0.00      | n se     | ection<br>3.00 |                   | Arising      | gs                         |        |          |                     |                    |       |              | -  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
|                      |          |                |                   |              |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      |                  |                  |             |                  |
| NOTES:               |          |                |                   |              | meters in m<br>nutes, hard |        |          | in hhmn             | n                  |       |              |  |            |                        |                          |                      |                  | 4                |             |                  |
|                      |          |                | abbrevia          | itions,      |                            |        |          |                     |                    |       |              |  |            |                        |                          |                      | 501              | L eng            | IDOC        | יחיים            |

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Project No. TA7148

Arch Henderson LLP Aberdeen Harbour Board **Exploratory Hole Log** 

Hole ID.

D102

Sheet 1 of 1

Ground Level -10.12m CD Coordinates

397409.67 E, 804534.08 N National Grid

Hole Type

Engineer

Employer

Inclination

| Description of Strata  | Legend                                | Depth                 | Datum  |                      | Sampling                  |      | Blo<br>San | ow Co | ount<br>Reco | And<br>very |               | u Test           | Insta |
|--|---------------------------------------|-----------------------|--------|----------------------|---------------------------|------|------------|-------|--------------|-------------|---------------|------------------|-------|
|  |                                       |                       | Level  | [                    | Details                   | Dia. | TCR        |       | RQD          |             | - De          | tails            | ation |
| Medium dense grey slightly gravelly silty fine to medium SAND.<br>Gravel is subangular to rounded fine to medium of granite,<br>schist and gneiss. | X                                     | -                     |        |                      | 0.00-0.50                 |      |            |       |              | 1           |               | į                |       |
|  | × × × × × × × × × × × × × × × × × × × |                       |        | D002<br>B003<br>D004 | 0.50-0.95                 |      |            |       |              |             | SPT18<br>0.50 | 0.95             |       |
|  | ×××                                   | -                     |        |                      |                           |      |            |       |              |             | SPT29         |                  |       |
| from 1.50m to 3.00m dense  | × × × ×                               |                       |        | B006                 | 1.50<br>1.50-1.95<br>2.00 |      |            |       |              |             | 1.50          | 1.95 ·           |       |
|  | × × × × × × × × × × × × × × × × × × × |                       |        | D008                 | 2.50<br>2.50-2.95         |      |            |       |              |             | SPT42<br>2.50 | 2.95 ·           |       |
| exploratory hole complete at 3.00 m.   | XXX                                   | 3.00                  | -13.12 | B009                 | 2.50-2.95                 |      |            |       |              |             | 2.50          | 2.93             |       |
| ,,   |                                       | -<br>-<br>-<br>-      |        |                      |                           |      |            |       |              |             |               |                  |       |
|  |                                       | -<br>-<br>-           |        |                      |                           |      |            |       |              |             |               | -<br>-<br>-      |       |
|  |                                       | -                     |        |                      |                           |      |            |       |              |             |               | -                |       |
|  |                                       | -<br>-<br>-           |        |                      |                           |      |            |       |              |             |               | -<br>-<br>-<br>- |       |
|  |                                       | -<br>-<br>-<br>-      |        |                      |                           |      |            |       |              |             |               |                  |       |
|  |                                       | -                     |        |                      |                           |      |            |       |              |             |               | -                |       |
|  |                                       | -                     |        |                      |                           |      |            |       |              |             |               | -<br>-<br>-      |       |
|  |                                       | -<br>-<br>-<br>-      |        |                      |                           |      |            |       |              |             |               | -<br>-<br>-<br>- |       |
|  |                                       | -                     |        |                      |                           |      |            |       |              |             |               | -<br>-<br>-<br>- |       |
|  |                                       | -<br>-<br>-<br>-      |        |                      |                           |      |            |       |              |             |               | -<br>-<br>-      |       |
|  |                                       | -<br>-<br>-<br>-      |        |                      |                           |      |            |       |              |             |               |                  |       |
|  |                                       | -<br>-<br>-<br>-<br>- |        |                      |                           |      |            |       |              |             |               | -<br>-<br>-      |       |
|  |                                       | -<br>-<br>-           |        |                      |                           |      |            |       |              |             |               | -                |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:22:16

SOIL ENGINEERING Part of the Bachy Soletanche Group

Form No. SIEXPHOLELOG

Issue.Revision No. 1.05

| Project              | . Nam         | -                |                          | Harb                      | bour Dev              | elop   | ment        | Ground               | Inves         | tigatio      | n          |                      |                         | Fynlo                                | ratory                                      | Hole Lo               | 20                      | Нс                               | ole ID.              |                            |
|----------------------|---------------|------------------|--------------------------|---------------------------|-----------------------|--------|-------------|----------------------|---------------|--------------|------------|----------------------|-------------------------|--------------------------------------|---|-----------------------|-------------------------|----------------------------------|----------------------|----------------------------|
| Project              |               | TA7              |                          |                           |                       |        |             |                      |               |              |            |                      |                         | LAPIO                                | ratory                                      | TIOIC LO              | <i>J</i> 9              | D                                | 104                  |                            |
| Engine               |               |                  | n Hende                  |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
| Employ<br>Ground I   |               |                  | rdeen H<br>Om CD         | arpot                     | ur Board              |        |             | Coor                 | dinates       | 36           | 746        | 62.40 E,             | <u> </u>                | 35.20 N N                            | ational Gri                                 | d                     |                         | Гп                               | eader                |                            |
| Date Sta             |               |                  | 9/2013                   |                           |                       |        |             |                      |               | eted 23      |            |                      |                         |                                      |   |                       | tion Verti              | cal                              |                      |                            |
| Тор                  | Base          | Туре             | Date Sta                 | rted [                    | Date Ende             | d C    | rew         | Section<br>Logged By | Cor<br>Barr   | re Co        | ore<br>Bit | F                    | Equipr                  | ment                                 | S   | horing /<br>Support   | P                       | Remarks                          |                      |                            |
| 0.00<br>8.25         | 8.25<br>11.60 | CP<br>RC         | 22/09/20<br>23/09/20     |                           | 23/09/2013            |        | IC<br>/W/RJ | DT<br>DT             | T611          |              | oreg       |                      | Dando<br>Deltaba        |                                      |   | Tri -                 |                         |                                  |                      |                            |
|                      |               |                  | 20. 2                    | -                         | 20, 02.               | Ĭ      |             | Ξ.                   |               |              | ,,,,,      |                      |                         | JC 0                                 |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          | PRC                       | OGRESS                |        |             |                      |               |              |            |                      |                         |                                      |   | WATER STR             | IKES                    |                                  |                      |                            |
| Date                 | T             | me               | Hole<br>depth            | Casin<br>dept             | ng Wate<br>th depth   | r<br>h |             | Remar                | ks            |              |            | Date                 | е                       | Time                                 | Strike a<br>depth                           | Rise to depth         | Time<br>taken           | at strik                         | sing dep             | o seal                     |
| 22/09/20<br>23/09/20 |               | 1400<br>1700     | 8.25<br>10.60            | 7.95<br>8.00              |                       |        | of CP/      | Start of Rot         | ary           |              | $\neg$     |                      |                         |                                      |   | +                     | to rise                 | time                             | +                    | low                        |
| 23/09/20             | 13   1        | 300              | 11.60                    | 10.00                     |                       |        | d of Hole   |                      | Ilit          |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
| <u> </u>             |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
| ∐ard                 | Ctrata        | D-n+h            | CA                       |                           |                       |        |             |                      |               |              |            |                      |                         |                                      | SPT DETAI                                   |                       | F-250V                  | Carino                           | Motor                |                            |
| Hard<br>from         | Strata        | Depth<br>to      | Start time   Duration    |                           |                       |        |             |                      |               |              |            |                      | Туре                    |                                      | nental blo<br>etration ir                   |                       | Hammer<br>No.           | Energy<br>ratio<br>%             | Casing depth         | Water<br>depth             |
| 7.95                 |               | 8.25             |                          | hhmm hhmm 0200 Chiselling |                       |        |             |                      |               |              |            | 0.50<br>1.50         | SPT(C                   | N=32 (4,0<br>N=41 (10                | 6,4,9,7,12)<br>0,12,12,10,9                 | .10)                  | AR360<br>AR360          | 75<br>75<br>75                   | N/A<br>1.50          | -12.80<br>-13.00           |
|                      |               |                  |                          |                           | 0 0200 Chiselling     |        |             |                      |               |              |            |                      | SPT(C<br>SPT(C<br>SPT(C | )  50/150m                           | ım (15,10,18<br>2,12,12,14,1                | 3,32)<br>4,12)        | AR360<br>AR360          | 75<br>75                         | 2.50<br>3.50         | -14.00<br>-14.20           |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            | 4.50<br>5.50<br>7.00 | SPT(C                   | (9,5<br>(1) N=48 (9,5<br>(2) 50/250m | n (9,16,50/5<br>8,9,9,16,14)<br>nm (10,10,1 | 60)<br>2,17,11,10/25) | AR360<br>AR360<br>AR360 | 75<br>75<br>75<br>75<br>75<br>75 | 4.50<br>5.50<br>7.00 | -14.00<br>-13.45<br>-13.45 |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            | 8.25<br>10.30        | SPT(C                   | 50/0mm                               | (25/0,50/0)<br>nm (7,9,14,1                 |                       | AR360<br>AR360          | 75<br>75                         | 7.95<br>NR           | -13.30<br>NR               |
| From                 |               | То               | R                        |                           | Y FLUSH D<br>Flush    | ETAIL  |             | ush                  |               | ush          | -          |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
| dept                 | h             | depth            |                          |                           | type                  |        | Q           | urn<br>%             |               | lour         |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
| 8.25<br>10.60        |               | 10.60<br>11.60   |                          |                           | Nater<br>Nater        |        |             | 00                   |               | lilky<br>own |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
| НО                   | LE DIA        | METER .          | / CASING                 |                           |                       | DY     | NAMIC       | SAMPLIN              | IG            |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
| Hole<br>diameter     | Depth         |                  |                          | th of<br>sing             | Тор                   | Base   | Dia         |                      | Time<br>hmmss | Recove       | ry         |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
| 200<br>121           | 8.25<br>10.00 | ) 12             | 00 8.                    | .00                       |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
| 116                  | 11.60         | )                |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      | <u> </u>      |                  |                          |                           |                       |        | Щ.          |                      |               |              | $\dashv$   |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
| Distance             |               |                  | TION DET                 |                           | nse zone              | ID     |             | PE CONST             | Dia.          | ON<br>Type o | f          |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
| from G.L.            |               | ,                |                          | Тор                       |                       |        | Тор         |                      | of pipe       | pipe         |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      | * Seating                                   | blows only.           |                         |                                  |                      |                            |
|                      |               |                  |                          | BAC                       | CKFILL DET            | AILS   |             |                      |               |              |            |                      |                         | '                                    |   | GENERAL N             | OTES                    |                                  |                      |                            |
| Top of<br>section    | n s           | ase of<br>ection |                          | Materia                   |                       |        |             | Remai                | rks           |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
| 0.00                 |               | 11.60            | ,                        | Arisings                  | S                     |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          |                           |                       |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
| NOTES:               |               |                  |                          |                           | neters in m           |        |             |                      |               |              |            |                      |                         |                                      |   |                       |                         | 4                                |                      |                            |
|                      |               |                  | rise time i<br>abbreviat |                           | utes, hard<br>see key | strata | a time      | in hhmm              |               |              |            |                      |                         |                                      |   |                       |                         |                                  |                      |                            |
|                      |               |                  |                          | Lo                        | og Print Da           | te An  | d Time      | : 23/12/2            | 2013 10       | 0:31:07      |            |                      |                         |                                      |   |                       | SOII                    | L eng                            | inee                 | RING                       |

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Project No. TA7148

Engineer

Hole Type

**Exploratory Hole Log** Arch Henderson LLP

Hole ID.

D104

Sheet 1 of 2

Employer Aberdeen Harbour Board Ground Level -9.80m CD Coordinates

> CP+RC Inclination

397462.40 E, 804685.20 N National Grid

| Description of Strata   | Legend                                | Depth                                | Datum<br>Level   | Sampling     |                   |      |     | ow Co<br>nple I |     |    | In Situ Test                | IIISta |
|---|---------------------------------------|--------------------------------------|------------------|--------------|-------------------|------|-----|-----------------|-----|----|-----------------------------|--------|
|   |                                       |                                      |                  | -            | Details           | Dia. | TCR | · -             | RQD | IF | Details                     | ation  |
| Loose to dense grey fine to coarse SAND.  |                                       | -<br>-<br>-                          |                  |              |                   |      |     | •               | •   | •  |                             |        |
| Dense grey slightly silty very gravelly fine to coarse SAND. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss, schist and quartz.   |                                       | 0.50 -<br>-<br>-<br>-<br>-<br>-<br>- | -10.30           |              | 0.50<br>0.50-1.00 |      |     |                 |     |    | SPT(C)32<br>0.50 0.95       |        |
|   |                                       |                                      |                  | D003<br>B004 | 1.50<br>1.50-2.00 |      |     |                 |     |    | SPT(C)41<br>1.50 1.95       |        |
|   |                                       |                                      |                  |              | 2.50<br>2.50-3.00 |      |     |                 |     |    | SPT(C)50/150mm<br>2.50 2.80 |        |
|   |                                       |                                      |                  | D007<br>D008 | 3.50<br>3.50-4.00 |      |     |                 |     |    | SPT(C)52<br>3.50 3.95       |        |
|   |                                       |                                      |                  |              | 4.50<br>4.50-5.00 |      |     |                 |     |    | SPT(C)50/50mm<br>4.50 4.70  |        |
|   |                                       |                                      |                  | D011<br>B012 | 5.50<br>5.50-6.00 |      |     |                 |     |    | SPT(C)48<br>5.50 5.95       |        |
|   |                                       |                                      |                  | D013         | 6.50<br>7.00-7.50 |      |     |                 |     |    | SPT(C)50/250mm-             |        |
|   |                                       |                                      |                  | D015         | 7.50              |      |     |                 |     |    | 7.00 7.40                   |        |
| No recovery. GRANITE boulder. (Driller's description)   | * * * * * * * * * * * * * * * * * * * | 7.95<br><br>8.25                     | -17.75<br>-18.05 |              |                   |      |     | 1               |     |    | -<br>SPT(C)50/0mm           |        |
| Firm brown slightly gravelly sandy CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite and gneiss. Cobbles are angular to subrounded of granite and gneiss.  from 8.25m to 8.40m strong grey boulder of granite |                                       |                                      |                  | 8.2          | 5 8.60            | 89   | 100 | NA              | NA  |    | 8.25 8.25                   |        |
|   |                                       |                                      | -19.60           | 8.6          | 0 10.30           | 89   | 71  | NA              | NA  |    |                             |        |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:31:10

Form No. SIEXPHOLELOG



TA7148

Project No.

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

**Exploratory Hole Log** 

Hole ID.

D104

Sheet 2 of 2

Ground Level -9.80m CD Coordinates 397462.40 E, 804685.20 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend     | d Depth | Datum<br>Level | Sampling |       |      | Blow Count And<br>Sample Recovery |    |     |    | In Situ Test                      | Inst |
|---|------------|---------|----------------|----------|-------|------|-----------------------------------|----|-----|----|-----------------------------------|------|
|   |            |         |                | Deta     | ils   | Dia. |                                   |    | RQD | IF | Details                           | atio |
| Assumed zone of no recovery. Stiff greyish brown slightly   | 0-0-0      | _       |                |          |       |      |                                   |    |     |    | -                                 |      |
| andy boulder clay with granite cobbles. (Driller's<br>description)  | p 0 0 0    |         |                |          |       |      |                                   |    |     |    | SPT(C)50/156mm ·<br>10.30 10.61 · |      |
|   | 0 0 0 0    | 10.60 - | -20.40         |          |       |      |                                   |    |     |    | 10.30 10.61                       |      |
| irm brown slightly gravelly sandy CLAY with medium cobble   | p 0 0 0    | -       | -20.40         | 10.60    | 10.90 | 89   | 100                               | NA | NA  |    | :                                 |      |
| ontent. Sand is fine to coarse. Gravel is angular to rounded<br>ne to coarse of mixed igneous and metamorphic lithologies | 0 0 0      | _       |                |          |       |      |                                   |    |     | 1  |                                   |      |
| ncluding granite and gneiss. Cobbles are angular to<br>ubrounded of granite and gneiss.                                   | 0 0 0      | =       |                | 10.90    | 11.60 | 89   | 100                               | NA | NA  |    |                                   |      |
| from 11.00m to 11.10m strong grey boulder of granite  |            | =       |                |          |       |      |                                   |    |     |    |                                   |      |
| xploratory hole complete at 11.60 m.  | 0 - 10 - 1 | 11.60   | -21.40         |          |       |      |                                   |    |     |    |                                   | 200  |
| plotatoly note complete at 11.00 m.   |            | -       |                |          |       |      |                                   |    |     |    |                                   |      |
|   |            | -       |                |          |       |      |                                   |    |     |    | -                                 | 1    |
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|   |            | _       |                |          |       |      |                                   |    |     |    | ]                                 | 1    |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:31:13

Part of the Bachy Soletanche Group

SOIL ENGINEERING

| _                                |                                    | -   |                       | ) Har                | bour Dev               | elop    | ment                             | Ground          | l Inves         | tigati      | on          |                      |                     | Fynlo   | rato                            | orv F            | Hole Lo   | 00                      | Но               | le ID.               |                           |
|----------------------------------|------------------------------------|---|-----------------------|----------------------|------------------------|---------|----------------------------------|-----------------|-----------------|-------------|-------------|----------------------|---------------------|---|---------------------------------|------------------|-----------|-------------------------|------------------|----------------------|---------------------------|
| Project                          |                                    | TA7   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     | LAPIC   | nacc                            | Луі              | TOIC LC   | 9                       | F                | 65                   |                           |
| Engine                           |                                    |   | h Hende               |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
| Employ<br>Ground                 |                                    |   | rdeen F<br>8m CD      | larbo                | ur Board               |         |                                  | Coor            | dinates         |             | 20720       | 12 E0 E              | 90/63               | 27.40 N N   | lations                         | d Grid           |           |                         | Н                | eader                |                           |
| Date Sta                         |                                    |   | 8/2013                |                      |                        |         |                                  |                 | Comple          |             |             | ,                    | 00402               | 27.40 IN IN   | Nationa                         | ii Giiu          | Inclinat  | ion Verti               | cal              |                      |                           |
| Тор                              | Base                               | Туре  | Date Sta              | rted                 | Date Ende              | d C     | Crew                             | Section         | Coi             | re (        | Core<br>Bit | I                    | Equipr              | ment  |                                 | Sho              | oring /   | R                       | emarks           |                      |                           |
| 0.00                             | 7.50                               | СР  | 28/08/2               |                      | 28/08/201              | 3       | TP                               | Logged By<br>TE |                 |             | Bit         |                      | Dando               | 3000  |                                 | Sup              | oport     |                         |                  |                      |                           |
| 7.50                             | 10.60                              | RC  | 29/08/2               | 013                  | 29/08/201              | 3       | ww                               | TE              | T61             | 16  In      | npreg       | D                    | eltaba              | se 515  |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       | DD                   | OCDECC                 |         |                                  |                 |                 |             |             |                      |                     |   |                                 | 10               | MTED CTDI | I/FC                    |                  |                      |                           |
| Date                             | Ti                                 | me  | Hole                  | Casi                 | OGRESS<br>ng Wate      | er      |                                  | Remar           | rks             | _           |             | Date                 | e                   | Time  | Str                             | ike at           | ATER STRI | Time                    | Ca               | sing dep             | th                        |
| 20 /20 /20                       | 10 1                               |   | depth                 | dep                  | th dept                | h       | 1 (60                            |                 |                 |             |             |                      |                     |   | d                               | epth             | depth     | taken<br>to rise        | at strik<br>time | ce i to              | seal<br>low               |
| 28/08/20<br>29/08/20<br>29/08/20 | 13 0                               | 900<br>730<br>900                                       | 7.50<br>7.50<br>10.60 | 7.40<br>7.40<br>7.50 | ) NR                   | Sta     | d of CP<br>irt of Ro<br>d of Hol |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
| 29/08/20                         | 13   1                             | 900   | 10.60                 | 7.50                 | -9.70                  | End     | u 01 H0                          | e               |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    | CABLE PERCUSSION DETAILS  rata Depth Chiselling Remarks |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  | CABLE PERCUSSION DETAILS           |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
| Hard                             | rd Strata Depth Chiselling Remarks |   |                       |                      |                        |         |                                  |                 |                 |             |             | Depth                | Туре                | Incre   | menta                           |                  | SPT DETAI | LS<br>Hammer            | Energy           | Casing               | Water                     |
| from                             |                                    | to  | Start t               | ime ı                | Duration<br>hhmm       | Iten    | iarito                           |                 |                 |             |             | Берип                | lype                | pe  | netrati                         | on in n          |           | No.                     | ratio<br>%       | depth                | depth                     |
| 7.40                             |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             | 0.50<br>1.50         | SPT<br>SPT          | N=17 (3<br>N=31 (5<br>N=34 (5<br>N=37 (6<br>N=41 (7<br>N=42 (7<br>5) 50/0mm | ,4,4,4,5<br>,6,7,7,8            | ,4)<br>,9)       |           | AR360<br>AR360          | 75<br>75         | N/A<br>1.50          | -9.30<br>-9.10            |
|                                  |                                    | 7.50 1615 0200 Chiselling                               |                       |                      |                        |         |                                  |                 |                 |             |             | 2.60<br>3.50<br>4.50 | SPT<br>SPT          | N=34 (5<br>N=37 (6  | ,7,8,8,9<br>,7,8,9,9            | ,9)<br>,11)      |           | AR360<br>AR360          | 75<br>75<br>75   | 2.50<br>3.50<br>4.50 | -8.90<br>-8.60<br>-8.40   |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             | 4.50<br>5.50<br>7.40 | SPT<br>SPT<br>SPT(C | N=41 (/<br>N=42 (7  | ,7,9,11,<br>,9,11,9,<br>o (25/0 | 10,11)<br>12,10) |           | AR360<br>AR360<br>AR360 | 75<br>75<br>75   | 4.50<br>5.50<br>7.40 | -8.40<br>-8.00<br>-7.70   |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             | 7.50<br>8.60         | ISPT(C              | 50/0mm<br>50/0mm<br>N=43 (7<br>N=56 (6                                      | n (25/0,<br>,7,8,9,1            | 50/0)<br>2,14)   |           | AR360<br>AR360          | 75<br>75<br>75   | 7.40<br>7.50         | -6.60<br>-10.00<br>-10.30 |
| Fron                             | 1                                  | То  | F                     |                      | Y FLUSH D              | ETAIL   |                                  | ush             | FI              | ush         |             | 9.50                 | SPT(C               | N=56 (6   | ,9,11,11                        | 1,14,20)         |           | AR360                   | 75               | 7.50                 | -10.30                    |
| dept                             |                                    | depth   |                       |                      | type                   |         | ret                              | turn<br>%       |                 | lour        |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
| 7.50                             |                                    | 10.60   |                       | ,                    | Water                  |         | 1                                | .00             | Br              | own         |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
| ПО                               | I E DIAN                           | 4ETED   | / CASING              |                      |                        | DV      | NIANAIA                          | SAMPLII         | NC.             |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
| Hole                             | Depth                              |   |                       | th of                | Тор                    | Base    |                                  |                 | Time            | Recov       | /ery        |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
| diameter<br>200                  | hole<br>7.40                       |   |                       | sing<br>.50          |                        |         |                                  | h               | hmmss           | %           | _           |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
| 121<br>116                       | 7.50<br>10.60                      |   |                       | .80                  |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  | IN                                 | ISTALLA   | ATION DE              | TAILS                |                        |         | P                                | IPE CONS        | TRUCTIO         | ON          |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
| Distance<br>from G.L             |                                    | Ty  | уре                   | Respo                | onse zone              | ID      | Top                              | Pipe<br>  Base  | Dia.<br>of pipe | Type<br>pip |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
| HOIH G.E                         |                                    |   |                       | 101                  | Buse                   |         | ТОР                              | Busc            | or pipe         | P'1         | ,.          |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   | * Se                            |                  | ows only. |                         |                  |                      |                           |
| To                               | :   -                              | 200 Cf  |                       | BA<br>Materi         | CKFILL DE              | TAILS   |                                  | De              | rke             |             |             |                      |                     |   |                                 | G                | ENERAL NO | OTES                    |                  |                      |                           |
| Top of section 0.00              | n se                               | ase of<br>ection<br>10.60                               |                       |                      | Rema                   | IKS     |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
| 0.00                             |                                    | 10.60   |                       | Arising              | 5                      |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   |                       |                      |                        |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
| NOTES:                           |                                    |   |                       |                      | neters in m            |         |                                  |                 |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
|                                  |                                    |   | rise time<br>abbrevia |                      | iutes, hard<br>see key | l strat | a time                           | ın hhmm         |                 |             |             |                      |                     |   |                                 |                  |           |                         |                  |                      |                           |
| Unched                           | ked                                |   |                       | Lo                   | og Print Da            | ite An  | d Time                           | e: 23/12/2      | 2013 1          | 0:31:19     | )           |                      |                     |   |                                 |                  |           | SOII                    | _ eng            | ınee                 | RING                      |

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Project No. TA7148

Engineer

Ground Level

**Exploratory Hole Log** Arch Henderson LLP

Hole ID.

E65

Sheet 1 of 2

Employer

Aberdeen Harbour Board -7.68m CD

Coordinates 397302.50 E, 804627.40 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend                                | Depth                           | Datum<br>Level | Samp                                  |      |      |     | nple l | ount A<br>Recov | ery |  | u Test<br>tails | Instal<br>ation |
|--|---------------------------------------|---------------------------------|----------------|---------------------------------------|------|------|-----|--------|-----------------|-----|--|-----------------|-----------------|
|  |                                       |                                 | Level          | Detail                                | s C  | Dia. | TCR | SCR    | RQD             | IF  | _ De                                   | talis           | ation           |
| Dense brown slightly silty slightly gravelly fine to coarse SAND. Gravel is angular to subrounded fine to medium of granite, schist and gneiss.  from 0.00m to 1.50m medium dense  | * * * * * * * * * * * * * * * * * * * | -                               |                | D002 0.50<br>B003 0.50-0              | ).95 |      |     |        | ,               |     | SPT17<br>0.50                          | 0.95            |                 |
|  | X                                     | -                               |                | D005 1.50<br>B006 1.50-1              | 1.95 |      |     |        |                 |     | SPT31<br>1.50                          | 1.95            |                 |
|  | × × × × × × × × × × × × × × × × × × × | -                               |                | D008 2.50<br>B009 2.50-2              | 2.95 |      |     |        |                 |     | SPT34<br>2.60                          | 3.05            |                 |
|  | X                                     | -                               |                | D011 3.50<br>B012 3.50-3              | 3.95 |      |     |        |                 |     | SPT37<br>3.50                          | 3.95 -          |                 |
| Dense brown slightly silty gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed igneous and metamorphic lithologies.   |                                       | 4.50 -<br>-<br>-<br>-<br>-<br>- | -12.18         | D014 4.50<br>B015 4.50-4              | i.95 |      |     |        |                 |     | SPT41<br>4.50                          | 4.95 -          |                 |
|  |                                       | -                               |                | D017 5.50<br>B018 5.50-1<br>D019 6.00 | 5.95 |      |     |        |                 |     | SPT42<br>5.50                          | 5.95 -          |                 |
| Very stiff high strength brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is  |                                       | 7.50                            | -15.18         |                                       |      |      |     |        |                 |     | SPT(C)50/<br>7.40<br>SPT(C)50/<br>7.50 | 7.40 -          |                 |
| angular to subrounded fine to coarse of mixed igneous and metamorphic lithologies. Cobbles are subangular to subrounded of granite, schist and gneiss.  from 7.50m to 7.60m subangular to subrounded coarse gravel of granite and schist and subangular to subrounded cobbles of granite |                                       | -                               |                | 7.50                                  | 8.60 | 92   | 95  | NA     | NA              |     | SPT(C)43<br>8.60                       | 9.20            |                 |
|  |                                       | -                               |                | 8.60                                  | 9.50 | 92   | 83  | NA     | NA              | NA  | SPT(C)56                               |                 |                 |
|  |                                       |                                 |                |                                       |      |      |     |        |                 |     | SPT(C)56<br>9.50                       | 10.10 -         |                 |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG Issue,Revision No. 1.05



TA7148

Project No.

Engineer

Hole Type

Arch Henderson LLP

**Exploratory Hole Log** 

Hole ID.

E65

Sheet 2 of 2

Employer Aberdeen Harbour Board Ground Level -7.68m CD Coordinates 397302.50 E, 804627.40 N National Grid

> CP+RC Inclination

| Description of Strata  | Legend | Depth | Datum  | Sampling   |      | Blo | ow Co | ount A<br>Recov | and<br>ery | In Situ Test | Install |
|--|--------|-------|--------|------------|------|-----|-------|-----------------|------------|--------------|---------|
| ·  |        | '     | Level  | Details    | Dia. |     | SCR   | RQD             | IF         | Details      | ation   |
| Very stiff high strength brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed igneous and metamorphic lithologies. Cobbles are subangular to subrounded of granite, schist and gneiss. |        | 10.60 | -18.28 | 9.50 10.60 | 92   | 100 | NA    | NA              |            |              |         |
| Exploratory hole complete at 10.60 m.  | 1      | -     |        |            |      |     |       |                 |            |              | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            | -       |
|  |        | -     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | _     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            |         |
|  |        | -     |        |            |      |     |       |                 |            | -            | -       |
|  |        | -     |        |            |      |     |       |                 |            | -            | }       |
|  |        | -     |        |            |      |     |       |                 |            |              | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            | }       |
|  |        | _     |        |            |      |     |       |                 |            | -            | }       |
|  |        | _     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            |              | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -<br>-       | ]       |
|  |        | -     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | _     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            |              | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            | }       |
|  |        | -     |        |            |      |     |       |                 |            |              | 1       |
|  |        | _     |        |            |      |     |       |                 |            |              | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | _     |        |            |      |     |       |                 |            | -            | }       |
|  |        | -     |        |            |      |     |       |                 |            | -            |         |
|  |        | -     |        |            |      |     |       |                 |            |              |         |
|  |        | -     |        |            |      |     |       |                 |            | -            |         |
|  |        | _     |        |            |      |     |       |                 |            |              | }       |
|  |        | -     |        |            |      |     |       |                 |            |              | 1       |
|  |        | -     |        |            |      |     |       |                 |            |              | 1       |
|  |        | _     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -<br>-       | }       |
|  |        | -     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            | }       |
|  |        | -     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -            | 1       |
|  |        | -     |        |            |      |     |       |                 |            | -<br>-       | 1       |
|  |        |       |        |            |      |     |       |                 |            |              | 1       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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| -                    |                         | e Bay   | of Nig             | g Har           | rbour Dev                  | elop   | ment                   | Ground           | Inves                                  | tigatio                              | n                   |                      |                         | Fynlo                    | nrat <i>i</i>          | arv F                      | Hole Lo               | 20                      | Но                   | ole ID.              |                          |
|----------------------|-------------------------|---|--------------------|-----------------|----------------------------|--------|------------------------|------------------|--|--------------------------------------|---------------------|----------------------|-------------------------|--------------------------|------------------------|----------------------------|-----------------------|-------------------------|----------------------|----------------------|--------------------------|
| Project              |                         | TA7   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         | LXPIC                    | Jian                   | Луі                        | TOIC L                | 9                       | F                    | 66                   |                          |
| Engine               |                         |   | n Hende            |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
| Employ<br>Ground     |                         |   | rdeen F<br>9m CD   | Harbo           | our Board                  |        |                        | Coo              | rdinates                               | 20                                   | 722                 | 22 60 5              | 8046.                   | 72.90 N N                | lation                 | l Crid                     |                       |                         | Н                    | eader                |                          |
| Date Sta             |                         |   | 9/2013             |                 |                            |        |                        |                  |  | eted 02                              |                     | ,                    | 8040                    | 7 2.30 N I               | vationi                | ii Giiu                    | Inclinat              | ion Verti               | cal                  |                      |                          |
| Тор                  | Base                    | _   | Date Sta           | arted           | Date Ende                  | d C    | rew .                  | Section          | Cor                                    |                                      | re<br>it            |                      | Equip                   | ment                     |                        | Sho                        | oring /               |                         | emarks               |                      |                          |
| 0.00                 | 10.40                   | СР  | 01/09/2            | 2013            | 02/09/201                  | 3      | TP                     | Logged B         | y Barı                                 |                                      |                     |                      | Dando                   | 3000                     |                        | Su                         | oport                 |                         |                      |                      |                          |
| 10.40<br>10.70       | 10.70<br>14.25          | RO<br>RC  | 02/09/2<br>02/09/2 |                 | 02/09/201<br>02/09/201     | 3      | ww<br>ww               | TE<br>TE         | T61:                                   |                                      | 4 RF<br>oreg        |                      |                         | ise 515<br>ise 515       |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
| Date                 | Т                       | me  | Hole               | Cas             | OGRESS<br>ing Wate         | r      |                        | Rema             | rks                                    |                                      |                     | Date                 | P                       | Time                     | Sti                    | ike at                     | VATER STRI<br>Rise to | Time                    | Ca                   | sing dep             | th                       |
| Date                 |                         |   | depth              | dep             | oth dept                   | h      |                        |                  | ins                                    |                                      |                     | Date                 |                         | Time                     | d                      | epth                       | depth                 | taken<br>to rise        | at stril             | κe i to              | seal<br>low              |
| 01/09/20<br>02/09/20 | 13 0                    | .900<br>700   | 10.10<br>10.10     | 10.1<br>10.1    | LO -9.60                   | Sta    | d of Shif<br>irt of Sh | ift              |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
| 02/09/20<br>02/09/20 |                         | .000<br>.900  | 10.40<br>14.25     | 10.2<br>11.0    |                            |        | d of CP/<br>d of Hol   | Start of Ro<br>e | tary                                   |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         | CABLE PERCUSSION DETAILS  |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      | 1_                      |                          |                        |                            | SPT DETAI             | _                       | _                    |                      |                          |
| Hard<br>from         |                         | ata Depth Chiselling Remarks<br>to Start time Duration<br>hhmm hhmm |                    |                 |                            |        |                        |                  |  |                                      |                     | Depth                | Туре                    |                          |                        | ll blow<br>on in n         | count /<br>nm         | Hammer<br>No.           | Energy<br>ratio      | Casing depth         | Water<br>depth           |
| 10.10                |                         | 10.40   | hhmm   hhmm        |                 |                            |        |                        |                  |  |                                      |                     | 0.50                 | SPT(C                   | C) N=17 (3               | 3,3,4,4,5              | ,4)                        |                       | AR360                   | 75<br>75             | N/A                  | -9.20<br>-9.30           |
|                      |                         |   |                    |                 |                            |        | 1.50<br>2.50<br>3.50   | ISPT(0           | C) N=20 (4<br>C) N=30 (5<br>C) N=38 (6 | +,5,4,5,5<br>5,6,7,7,7<br>\$ 8 8 9 1 | ,6)<br>,9)<br>1 10) |                      | AR360<br>AR360<br>AR360 | 75<br>75<br>75<br>75     | 1.50<br>2.50<br>3.50   | -9.40                      |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     | 3.50<br>4.50<br>5.50 | SPT(C<br>SPT(C<br>SPT(C | C) N=43 (7<br>C) N=43 (8 | 7,8,9,11,<br>8,9,11,1  | 11,12)<br>0,10,12)         |                       | AR360<br>AR360          | 75<br>75<br>75<br>75 | 3.50<br>4.50<br>5.50 | -9.40<br>-9.60<br>-9.70  |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     | 6.50<br>8.00<br>9.50 | SPT(0<br>SPT(0<br>SPT(0 | ~\  NI / 2 /c            | 7,11,12,:<br>9,10,11,: | 13,13,11<br>10,10,12       | 2)                    | AR360<br>AR360<br>AR360 | 75                   | 6.50<br>8.00<br>9.50 | -9.80<br>-9.90<br>-9.90  |
|                      |                         |   |                    | ROTAI           | RY FLUSH C                 | ETAIL  |                        |                  |  |                                      |                     | 10.20<br>11.00       | SPT(C                   | 50/0mr                   | n (25/5)<br>4,4,6,8,9  | 12,14,12<br>0,50/0)<br>,9) | *)                    | AR360<br>AR360<br>AR360 | 75<br>75<br>75       | 10.20<br>11.00       | -9.90<br>-9.90<br>-10.20 |
| Fron<br>dept         |                         | To<br>depth   |                    |                 | Flush<br>type              |        | ret                    | ush<br>:urn<br>% |  | ush<br>Iour                          |                     | 12.80                | SPT                     | N=31 (7                  | 7,4,5,6,9              | ,11)                       |                       | AR360                   | 75                   | 11.00                | -9.80                    |
| 10.40                |                         | 14.25   |                    |                 | Water                      |        |                        | 00               | Br                                     | own                                  |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   | / CASING           |                 | T                          |        |                        | SAMPLI           |  | I B                                  |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
| Hole<br>diameter     | Depth<br>hole           | dian  | neter ca           | pth of<br>ising | Тор                        | Base   | Dia                    | meter<br>h       | Time<br>hmmss                          | Recove<br>%                          | ry                  |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
| 200<br>121<br>116    | 10.20<br>11.00<br>14.25 | ) 1   |                    | 0.20<br>1.00    |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
| 116                  | 14.23                   | )   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         | ICTALL A  | TION DE            | TAU 6           |                            |        |                        | DE CONO          | TDUICTI                                |                                      | _                   |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
| Distance             |                         |   | TION DE            |                 | onse zone                  | ID     |                        | PE CONS          | Dia.                                   | Type o                               | f                   |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
| from G.L.            |                         |   |                    | To              |                            | -0     | Тор                    | Base             | of pipe                                | pipe                                 |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          | * \$^                  | atino bl                   | ows only.             |                         |                      |                      |                          |
|                      | 1                       |   |                    | B.A             | ACKFILL DET                | AILS   |                        | 1                | <u> </u>                               | <u> </u>                             | _                   |                      | 1                       |                          | Je                     |                            | ENERAL NO             | OTES                    |                      |                      |                          |
| Top of section       |                         | ase of<br>ection  |                    | Mater           | rial                       |        |                        | Rema             | ırks                                   |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
| 0.00                 |                         | 14.25   |                    | Arising         | gs                         |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       |                         |                      |                      |                          |
|                      |                         |   |                    |                 |                            |        |                        |                  |  |                                      |                     |                      |                         |                          |                        |                            |                       | <u> </u>                |                      |                      |                          |
| NOTES:               | Water                   | strike :  | rise time          | in mir          | meters in m<br>nutes, hard |        |                        | in hhmm          | ı                                      |                                      |                     |                      |                         |                          |                        |                            |                       |                         | 4                    |                      |                          |
| I los alter          |                         | tails of  | abbrevia           |                 |                            | +o ^-  | d Time                 | . 22/42/         | 2012 4                                 | 0.22.25                              |                     |                      |                         |                          |                        |                            |                       | SOII                    | . eng                |                      | Bluc                     |
| Unched               | кеа                     |   |                    | L               | .og Print Da               | ιιe An | u rime                 | . ∠3/12/         | ∠∪⊥3 1(                                | บ:ฮฮ:ฮ5                              |                     |                      |                         |                          |                        |                            |                       | 2011                    | 110                  |                      | VIII G                   |

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Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

TA7148

Arch Henderson LLP

**Exploratory Hole Log** 

Hole ID.

E66

Sheet 1 of 3

Employer Aberdeen Harbour Board Ground Level -8.19m CD

Project No.

Engineer

Coordinates

397333.60 E, 804672.90 N National Grid

Hole Type RO+RC Inclination

| Description of Strata  | Legend  | Depth            | Datum  |      | Sampling          |      | Blo<br>San | w Cou | unt A | nd<br>ery | In Situ          |   | Inst |
|--|---------|------------------|--------|------|-------------------|------|------------|-------|-------|-----------|------------------|---|------|
| 2000 paos o cada   | 2090114 | Dop              | Level  | [    | Details           | Dia. |            | SCR   |       | IF        | Deta             | ls  | atio |
| ledium dense grey slightly gravelly silty fine to coarse SAND.<br>ravel is subangular to rounded fine of granite, schist and<br>neiss. |         | -                |        |      | 0.00-0.50         |      |            | •     | 1     |           | SPT(C)17<br>0.50 | 0.95 -  |      |
|  |         | -<br>-<br>-<br>- |        | D003 | 1.00              |      |            |       |       |           |                  | land the state of |      |
|  |         | -                |        | B004 | 1.50-1.95         |      |            |       |       |           | SPT(C)20<br>1.50 | 1.95 -  |      |
|  |         | -                |        | B006 | 2.50-2.95         |      |            |       |       |           | SPT(C)30<br>2.50 | 2.95 -  |      |
| nse grey slightly gravelly silty fine to coarse SAND. Gravel<br>angular to rounded fine of mixed igneous and metamorphic<br>tologies.  |         | 3.20 -           | -11.39 | D007 | 3.50-3.95         |      |            |       |       |           | SPT(C)38<br>3.50 | 3.95 -  |      |
|  |         | -                |        | D009 | 4.00<br>4.50-4.95 |      |            |       |       |           | SPT(C)43<br>4.50 | 4.95 -  |      |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 E66 Engineer Arch Henderson LLP Employer Aberdeen Harbour Board

Ground Level -8.19m CD Coordinates 397333.60 E, 804672.90 N National Grid

Hole Type RO+RC Inclination

| Description of Strata |     | Legend   | Depth | Datum<br>Level |      | Sampling  |      | Blov<br>Sam | v Co<br>ple R | unt An<br>Recove | nd<br>ry | In Situ<br>Deta  |        | Inst |
|-----------------------|-----|----------|-------|----------------|------|-----------|------|-------------|---------------|------------------|----------|------------------|--------|------|
|                       |     |          |       | Levei          |      | Details   | Dia. | TCR         | SCR           |                  | IF       | Deta             | alis   | atic |
|                       |     | × × ×    |       |                | D011 | 5.00      |      |             |               |                  |          |                  |        |      |
|                       |     |          | -     |                |      |           |      |             |               |                  |          |                  |        |      |
|                       |     | *V.**\*  | -     |                |      |           |      |             |               |                  |          |                  | -      |      |
|                       |     |          | · -   |                |      |           |      |             |               |                  |          |                  |        |      |
|                       |     |          | -     |                | B012 | 5.50-5.95 |      |             |               |                  |          | SPT(C)43<br>5.50 |        |      |
|                       |     |          |       |                |      |           |      |             |               |                  |          |                  | 5.95 - |      |
|                       |     |          |       |                |      |           |      |             |               |                  |          |                  |        |      |
|                       |     |          | -     |                |      |           |      |             |               |                  |          |                  |        |      |
|                       |     |          | -     |                | D013 | 6.00      |      |             |               |                  |          |                  | -      |      |
|                       | 7-  |          | -     |                |      |           |      |             |               |                  |          |                  |        |      |
|                       | V   |          | -     |                |      |           |      |             |               |                  |          |                  |        |      |
|                       | 9   |          | } [   |                |      |           |      |             |               |                  |          |                  |        |      |
|                       |     |          | -     |                | B014 | 6.50-6.95 |      |             |               |                  |          | SPT(C)49<br>6.50 | 1      |      |
|                       |     |          | -     |                |      |           |      |             |               |                  |          | 6.50             | 6.95 - |      |
|                       |     |          | -     |                |      |           |      |             |               |                  |          |                  |        |      |
|                       |     |          | -     |                |      |           |      |             |               |                  |          |                  | -      |      |
|                       |     |          | -     |                | D015 | 7.00      |      |             |               |                  |          |                  |        |      |
|                       |     |          |       |                | D012 | 7.00      |      |             |               |                  |          |                  |        |      |
|                       |     |          |       |                |      |           |      |             |               |                  |          |                  |        |      |
|                       |     |          | -     |                |      |           |      |             |               |                  |          |                  |        |      |
|                       |     |          | -     |                |      |           |      |             |               |                  |          |                  | -      |      |
|                       |     |          | -     |                |      |           |      |             |               |                  |          |                  | - 1    |      |
|                       | W 1 |          | 1 ]   |                |      |           |      |             |               |                  |          |                  |        |      |
|                       |     |          | -     |                |      |           |      |             |               |                  |          |                  |        |      |
|                       | 1   |          | -     |                |      |           |      |             |               |                  |          |                  |        |      |
|                       |     |          | -     |                | B016 | 8.00-8.45 |      |             |               |                  |          | SPT(C)43<br>8.00 | -      |      |
|                       | 1   |          | -     |                |      |           |      |             |               |                  |          | 0.00             | 8.45 - |      |
|                       |     | X X X    | -     |                |      |           |      |             |               |                  |          |                  | -      |      |
|                       |     |          |       |                |      |           |      |             |               |                  |          |                  |        |      |
|                       |     |          | _     |                |      |           |      |             |               |                  |          |                  |        |      |
|                       |     |          |       |                |      |           |      |             |               |                  |          |                  | -      |      |
|                       |     |          | -     |                |      |           |      |             |               |                  |          |                  | -      |      |
|                       |     |          | -     |                |      |           |      |             |               |                  |          |                  | -      |      |
|                       |     |          | -     |                | D017 | 9.00      |      |             |               |                  |          |                  | 1      |      |
|                       |     | V. x . x |       |                | DOTA | 3.00      |      |             |               |                  |          |                  |        |      |
|                       |     |          | -     |                |      |           |      |             |               |                  |          |                  |        |      |
|                       |     | X X X    | -     |                |      |           |      |             |               |                  |          |                  | -      |      |
|                       | 1   |          | -     |                |      |           |      |             |               |                  |          |                  | -      |      |
|                       |     | XXXXX    | -     |                | B018 | 9.50-9.95 |      |             |               |                  |          | SPT(C)52<br>9.50 | -      |      |
|                       |     |          | -     |                |      |           |      |             |               |                  |          |                  | 9.95 - |      |
|                       |     |          |       |                |      |           |      |             |               |                  |          |                  |        |      |
|                       | 9.  | XX. 4    |       |                |      |           |      |             |               |                  |          |                  |        |      |
|                       | 1   | \$ 5 A S |       |                |      |           | 1    |             |               |                  |          |                  |        |      |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Sheet 2 of 3

### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 E66 Engineer Arch Henderson LLP Employer Aberdeen Harbour Board

Ground Level -8.19m CD Coordinates 397333.60 E, 804672.90 N National Grid

Hole Type RO+RC Inclination

| Description of Strata   | Legend                                  | Depth            | Datum<br>Level | San       | npling |      | Ble<br>Sar | ow Co<br>nple I | ount A<br>Recov | nd<br>ery |                   | tu Test<br>etails | In<br>at |
|---|---|------------------|----------------|-----------|--------|------|------------|-----------------|-----------------|-----------|-------------------|-------------------|----------|
|   |   |                  | Level          | Deta      | ils    | Dia. | TCR        | SCR             | RQD             | IF        | De                | talis             | al       |
| ard strata. (Driller's description)   | A Code                                  | 10.10 -          | -18.29         | D019 10.0 | 00     |      |            | •               |                 |           | CDT/C\FO          |                   |          |
|   |   | -                | 40.50          |           |        |      |            |                 |                 |           | SPT(C)50<br>10.20 | 10.25 ·           |          |
| otary openhole drilling. BOULDERS. (Driller's description)  | 0000                                    | 10.40 -          | -18.59         |           |        |      |            |                 |                 |           |                   |                   |          |
| o recovery. Stiff brown slightly sandy boulder CLAY. riller's description)  | 0 0                                     | 10.70 -          | -18.89         | 10.70     | 11.00  |      |            |                 |                 |           |                   |                   |          |
| ry stiff high strength brown slightly sandy gravelly CLAY   | F                                       | 11.00            | -19.19         | 10.70     | 11.00  | 92   | 0          | NA              | NA              |           | SPT32<br>11.00    | -                 |          |
| ith low cobble content. Sand is fine. Gravel is subangular to<br>unded of mixed igneous and metamorphic lithologies. Cobbles<br>e subangular to subrounded of granite and schist. | 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | }<br> -<br> -    |                | 11.00     | 11.60  | 92   | 53         | NA              | NA              |           | 11.00             | 11.45             |          |
| from 11.32m to 11.60m assumed zone of no recovery   |   | -<br>-           |                |           |        |      |            |                 |                 |           |                   | Ì                 |          |
|   |   | -<br>-<br>-      |                | 44.00     |        |      |            |                 |                 |           |                   |                   |          |
|   |   | -<br>-<br>-      |                | 11.60     | 12.80  | 92   | 100        | NA              | NA              | NA        |                   |                   |          |
|   |   | -                |                |           |        |      |            |                 |                 |           | SPT31<br>12.80    | 13.25             |          |
|   |   | -<br>-<br>-<br>- |                | 12.80     | 14.25  | 92   | 100        | NA              | NA              |           |                   |                   |          |
| cploratory hole complete at 14.25 m.  | 0 0                                     | 14.25 _<br>-     | -22.44         |           |        |      |            |                 |                 |           |                   |                   |          |
|   |   | -<br>-           |                |           |        |      |            |                 |                 |           |                   | •                 | -        |
|   |   | -                |                |           |        |      |            |                 |                 |           |                   |                   | 1        |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Sheet 3 of 3

| Project               | Nam           | •           |                  | Hark          | our Dev                | elop   | ment                | Ground              | Inves           | tigation          |     |                      |                         | Fynlo                | rator                    | ∿ F         | Hole Lo                | 20                      | Но                         | le ID.               |                         |
|-----------------------|---------------|-------------|------------------|---------------|------------------------|--------|---------------------|---------------------|-----------------|-------------------|-----|----------------------|-------------------------|----------------------|--------------------------|-------------|------------------------|-------------------------|----------------------------|----------------------|-------------------------|
| Project               |               | TA7         |                  |               |                        |        |                     |                     |                 |                   |     |                      |                         | LXPIO                | iatoi                    | уі          | TOIC LC                | <i>'</i> 9              | E                          | 69                   |                         |
| Engine                |               |             | n Hende          |               |                        |        |                     |                     |                 |                   |     |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
| Employ<br>Ground I    |               |             | rdeen H<br>Om CD | larboi        | ur Board               |        |                     | Coor                | dinates         | 397               | '30 | 6.30 E,              | 80477                   | 73.60 N N            | ational (                | Grid        |                        |                         | Гіч                        | eader                |                         |
| Date Sta              |               |             | 9/2013           |               |                        |        |                     |                     |                 | eted 04/          |     |                      | -                       |                      |                          |             | Inclinat               | tion Verti              | cal                        |                      |                         |
| Тор                   | Base          | Туре        | Date Sta         | rted [        | Date Ende              | d C    | rew                 | Section<br>ogged By | Cor<br>Barr     | re Cor<br>rel Bit | e   | E                    | Equip                   | ment                 |                          | Sho<br>Sup  | oring /<br>oport       | Ą                       | Remarks                    |                      |                         |
| 0.00<br>7.30          | 7.30<br>10.60 | CP<br>RC    | 03/09/20         |               | 03/09/201<br>04/09/201 |        | TF<br>MM            | DT<br>DT            | T61:            |                   | T   |                      | Dando<br>Oeltaba        | 3000<br>se 515       |                          |             |                        |                         |                            |                      |                         |
|                       | =,            |             |                  |               |                        |        |                     |                     |                 |                   | ٦   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   |     |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   |     |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  | PRC           | OGRESS                 |        |                     |                     |                 | <u> </u>          | 1   |                      |                         |                      |                          | V           | VATER STRI             | KES                     |                            |                      |                         |
| Date                  | Ti            | me          | Hole<br>depth    | Casir<br>dept | ng Wate                | r<br>h |                     | Remar               | ks              |                   | T   | Date                 | е                       | Time                 | Strik<br>dep             | e at<br>oth | Rise to<br>depth       | Time<br>taken           | at strik                   | sing dep             | seal                    |
| 03/09/20<br>03/09/20  |               | 700<br>900  | 7.30<br>7.30     | 7.00<br>7.00  |                        |        | d of CP<br>rt of Ro | tany                |                 |                   | †   |                      |                         |                      |                          |             |                        | to rise                 | time                       | +                    | low                     |
| 04/09/20              | 13 0          | 200         | 10.60            | 7.60          |                        |        | d of Hol            | e                   |                 |                   | 1   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | 1   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | 1   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | 1   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | 1   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 | 1                 |     |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       | ā             |             | CA               |               | RCUSSIO                |        |                     |                     |                 |                   | 4   |                      | -                       |                      |                          |             | SPT DETAI              |                         |                            |                      |                         |
| Hard<br>from          | Strata        | Depth<br>to | Start ti         |               | Duration               | Rem    | arks                |                     |                 |                   | 1   | Depth                | Туре                    |                      | mental b<br>etration     |             |                        | Hammer<br>No.           | ratio                      | Casing<br>depth      | Water<br>depth          |
| 6.90                  |               | 7.50        | 1500             |               | 0200                   | Chise  | elling              |                     |                 |                   | 1   | 0.50<br>1.50         | SPT(C                   | N=17 (3,<br>N=19 (3) | 3,4,5,4,4)<br>4 4 4 5 6) |             |                        | AR360<br>AR360          | 75<br>75<br>75             | N/A<br>1.50          | -6.60<br>-6.50          |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | 1   | 2.50<br>3.50         | SPT(C<br>SPT(C<br>SPT(C | :)  N=29 (4.         | 6,7,7,8,7)<br>8,9,10,9,1 | 11)         |                        | AR360<br>AR360          | 75<br>75                   | 2.50<br>3.50         | -6.40<br>-6.20          |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | 1   | 4.50<br>6.00<br>8.60 | SPT(C<br>SPT(C<br>SPT   | .JI IV=49 (8.        | IU.II.IZ                 | .12.14      | +)                     | AR360<br>AR360<br>AR360 | 75<br>75<br>75<br>75<br>75 | 4.50<br>6.00<br>7.20 | -6.10<br>-5.70<br>-9.60 |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | ╛   | 9.60                 | SPT                     | 50/235m<br>50/230m   | ım (6,10,                | 12,14       | ,18,6/5)               | AR360<br>AR360          | 75                         | 7.60                 | -9.70                   |
| From                  | 1             | То          | R                |               | Y FLUSH D<br>Flush     | ETAIL  |                     | ush                 | Fli             | ush               | 4   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
| dept                  |               | depth       |                  |               | type                   |        | ret                 | urn<br>%            |                 | lour              |     |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
| 7.30                  |               | 10.60       |                  | V             | Vater                  |        | 1                   | 00                  | Bro             | own               |     |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | 1   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | 1   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | 1   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
| НО                    | LE DIAI       | METER       | / CASING         |               |                        | DY     | NAMIO               | SAMPLIN             | NG              |                   | ┨   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
| Hole                  | Depth         | of Cas      |                  | th of         | Тор                    | Base   | Dia                 |                     | Time<br>hmmss   | Recover           | у   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
| diameter<br>200       | 7.30          | 20          |                  | sing<br>20    |                        |        |                     | n n                 | nmmss           | %                 | ┪   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
| 116                   | 10.60         | '           |                  |               |                        |        |                     |                     |                 |                   |     |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   |     |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | ╛   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
| D: .                  |               |             | TION DET         |               |                        |        |                     | PE CONST            |                 |                   | 4   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
| Distance<br>from G.L. |               | 13          | /pe              | Respo<br>Top  | nse zone<br>Base       | ID     | Тор                 | ipe<br>Base         | Dia.<br>of pipe | Type of pipe      | ╛   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | 1   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | 1   |                      |                         |                      | * C                      |             |                        |                         |                            |                      |                         |
|                       |               |             |                  | BAC           | CKFILL DET             | AILS   |                     |                     |                 | <u> </u>          | +   |                      |                         | 1                    | seati                    |             | ows only.<br>ENERAL NO | <br>DTES                |                            |                      | L                       |
| Top of section        |               | ase of      | N                | √ateria       | al                     |        |                     | Rema                | rks             |                   | †   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
| 0.00                  |               | 10.60       | ,                | Arisings      | S                      |        |                     |                     |                 |                   | 1   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   | 1   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   |     |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
|                       |               |             |                  |               |                        |        |                     |                     |                 |                   |     |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
| NOTES:                | All do        | athe in a   | motros al        | II diam       | eters in m             | illimo | troc                |                     |                 |                   | _   |                      |                         |                      |                          |             |                        |                         |                            |                      |                         |
| NOTES.                | Water         | strike r    |                  | n mini        | utes, hard             |        |                     | in hhmm             |                 |                   |     |                      |                         |                      |                          |             |                        |                         | 4                          |                      |                         |
|                       | . J. ut       | cuito UI    | Societ           |               | g Print Da             | te An  | d Time              | : 23/12/2           | 2013 10         | 0:31:30           |     |                      |                         |                      |                          |             |                        | SOI                     | L eng                      | inee                 | RING                    |

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

TA7148

Project No.

Engineer

Employer

Arch Henderson LLP Aberdeen Harbour Board **Exploratory Hole Log** 

Hole ID.

E69

Sheet 1 of 2

Ground Level -7.10m CD Coordinates 397306.30 E, 804773.60 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend | Depth  | Datum  |              | Sampling          |      | Blo | w Co | unt A<br>Recove | nd | In Situ T           |  |
|---|--------|--------|--------|--------------|-------------------|------|-----|------|-----------------|----|---------------------|--|
| Description of Strata   | Legend | Бериі  | Level  |              | etails            | Dia. |     | SCR  |                 | IF | Detail              | s a  |
| Medium dense grey slightly gravelly silty fine to coarse SAND.<br>iravel is angular to subrounded fine to medium of mixed<br>gneous and metamorphic lithologies including granite, schist,<br>neiss and quartz.   |        |        |        |              | 0.00-0.50         |      |     |      | L               |    | SPT(C)17<br>0.50    | 0.95   |
|   |        |        |        | D003         |                   |      |     |      |                 |    |                     | odrebed abada baraka   |
|   |        |        |        | B004         | 1.50-1.95<br>2.00 |      |     |      |                 |    | SPT(C)19<br>1.50    | 1.95   |
|   |        |        |        |              | 2.50-2.95         |      |     |      |                 |    | SPT(C)29<br>2.50    | 2.95   |
|   |        |        |        |              | 3.50-3.95         |      |     |      |                 |    | SPT(C)39<br>3.50    | 3.95 -   |
|   |        |        |        | D009         | 4.00              |      |     |      |                 |    |                     | adaption of the state of the st |
|   |        |        |        | B010<br>D011 | 4.50-4.95<br>5.00 |      |     |      |                 |    | SPT(C)40<br>4.50    | 4.95   |
|   |        |        |        |              |                   |      |     |      |                 |    |                     | anderdradendredande  |
|   |        |        |        | B012         | 6.00-6.45<br>6.50 |      |     |      |                 |    | SPT(C)49<br>6.00    | 6.45   |
| o recovery. Large granite and gneiss BOULDERS. (Driller's escription)   | 000    | 6.90 - | -14.00 |              |                   |      |     |      |                 |    |                     | returned returned  |
| ery stiff very high strength brown slightly gravelly sandy LAY with medium cobble content. Sand is fine to coarse, ravel is angular to subrounded fine to coarse of mixed jneous and metamorphic lithologies including granite, schist, neiss and quartz. Cobbles are angular to subangular of ranite, gneiss and schist. |        | 7.30 - | -14.40 | 7.30         | ) 8.60            | 93   | 100 | NA   | NA              |    |                     | . et el est est est est est est est est est est  |
|   |        |        |        |              |                   |      |     |      |                 |    | SPT50/235mr<br>8.60 | n -8.99 -  |
|   |        | -      |        | 8.60         | 9.60              | 93   | 100 | NA   | NA              | NA | SPT50/230mr         | u<br>chedichedenie   |
|   | 0 00   | =      |        |              |                   |      |     |      |                 |    | 9.60                | 9.98   |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG Issue.Revision No. 1.05 Issue Date 22/10/2012



Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 E69 Engineer Arch Henderson LLP

Employer Aberdeen Harbour Board

Ground Level -7.10m CD Coordinates 397306.30 E, 804773.60 N National Grid Hole Type CP+RC Inclination

| Description of Strata   | Legend | Depth                           | Datum<br>Level |      | npling |      | Blo<br>San |     | ount A<br>Recov |    | In Situ Test Details            | Install-<br>ation |
|---|--------|---------------------------------|----------------|------|--------|------|------------|-----|-----------------|----|---------------------------------|-------------------|
|   | , -    |                                 | Level          | Deta | ils    | Dia. | TCR        | SCR | RQD             | IF | Details                         | ation             |
| Very stiff very high strength brown slightly gravelly sandy CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed igneous and metamorphic lithologies including granite, schist, gneiss and quartz. Cobbles are angular to subangular of granite, gneiss and schist. | 0 0 0  | 10.60                           | -17.70         | 9.60 | 10.60  | 93   | 85         | NA  | NA              |    | -<br>-<br>-<br>-<br>-           |                   |
| from 10.26m to 10.45m 1 No very strong pink and grey boulder of granite from 10.45m to 10.60m assumed zone of no recovery  Exploratory hole complete at 10.60 m.  |        | -<br>-<br>-<br>-<br>-<br>-      |                |      |        |      |            |     |                 |    | -<br>-<br>-<br>-<br>-<br>-<br>- |                   |
|   |        | -                               |                |      |        |      |            |     |                 |    | -                               |                   |
|   |        | -                               |                |      |        |      |            |     |                 |    |                                 |                   |
|   |        |                                 |                |      |        |      |            |     |                 |    | -                               |                   |
|   |        | -                               |                |      |        |      |            |     |                 |    | -<br>-<br>-<br>-<br>-           |                   |
|   |        |                                 |                |      |        |      |            |     |                 |    | -<br>-<br>-<br>-<br>-<br>-      | -                 |
|   |        | -                               |                |      |        |      |            |     |                 |    | -<br>-<br>-<br>-<br>-           |                   |
|   |        |                                 |                |      |        |      |            |     |                 |    | -<br>-<br>-<br>-<br>-<br>-<br>- | -                 |
|   |        | -<br>-<br>-<br>-<br>-<br>-<br>- |                |      |        |      |            |     |                 |    | -<br>-<br>-<br>-<br>-<br>-      |                   |
|   |        |                                 |                |      |        |      |            |     |                 |    | -<br>-<br>-<br>-<br>            |                   |
|   |        | -<br>-<br>-<br>-<br>-           |                |      |        |      |            |     |                 |    | -<br>-<br>-<br>-<br>-<br>-      |                   |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Sheet 2 of 2

| 1                    |                                 | •                                |                  | ) Harl         | bour Dev    | elopi  | ment    | Ground              | l Inves      | tigati                  | on                   |                          |         | Fxnlo                | ratory   | Hole Lo              | 20                         | Но               | ole ID.              |                          |
|----------------------|---------------------------------|----------------------------------|------------------|----------------|-------------|--------|---------|---------------------|--------------|-------------------------|----------------------|--------------------------|---------|----------------------|--|----------------------|----------------------------|------------------|----------------------|--------------------------|
| Project              |                                 | TA7                              |                  |                |             |        |         |                     |              |                         |                      |                          |         | LXPIO                | ratory   | I TOIC L             | <b>J</b> 9                 | E                | 71                   |                          |
| Engine               |                                 |                                  | n Hende          |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
| Employ<br>Ground     |                                 |                                  | raeen F<br>8m CD | iarbo          | ur Board    |        |         | Coor                | dinates      |                         | 39732                | 26.90 E.                 | 80482   | 25.20 N N            | ational Grid   | <u> </u>             |                            | Н                | eader                |                          |
| Date Sta             |                                 |                                  | 9/2013           |                |             |        |         |                     | Comple       |                         |                      |                          |         |                      |  | Inclinat             | tion Verti                 | cal              |                      |                          |
| Тор                  | Base                            | Туре                             | Date Sta         | rted           | Date Ende   | d C    | rew     | Section<br>ogged By | Coi<br>Bari  | re (                    | Core<br>Bit          | I                        | Equip   | ment                 | ŞI   | noring /<br>upport   | F                          | Remarks          |                      |                          |
| 0.00                 | 10.30                           | CP                               | 13/09/2          | 013            | 13/09/201   |        | TP      | DT                  |              |                         |                      |                          | Dando   |                      |  | арроге               |                            |                  |                      |                          |
| 10.30                | 13.30                           | RC                               | 13/09/2          | 013            | 13/09/201   | 3   1  | ww      | DT                  | T61          | 16 In                   | npreg                | L                        | ректара | se 515               |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  | DD             | OGRESS      |        |         |                     |              |                         |                      |                          |         |                      |  | WATER STR            | IKEC                       |                  |                      |                          |
| Date                 | Ti                              | me                               | Hole             | Casii          | ng Wate     | r      |         | Remai               | rks          |                         |                      | Date                     | e       | Time                 | Strike a   | Rise to              | Time                       | Ca               | sing dep             | th .                     |
| 12/00/20             | 12 1                            | 730                              | depth<br>10.30   | dep            |             |        | Lof CD/ | Ctart of Da         | toni         |                         |                      | -                        |         |                      | depth  | depth                | taken<br>to rise           | at stril<br>time | ce to                | seal<br>low              |
| 13/09/20<br>13/09/20 |                                 | 940                              | 13.30            | 10.00<br>10.00 |             |        | of CP/  | Start of Ro         | tary         |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 | to Start time Duration hhmm hhmm |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 | CABLE PERCUSSION DETAILS         |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
| Hard                 | Strata Depth Chiselling Remarks |                                  |                  |                |             |        |         |                     |              |                         |                      | Depth                    | Туре    | Incre                | mental blov  | SPT DETA             | ILS<br>Hammer              | Energy           | Casing               | Water                    |
| from                 |                                 |                                  |                  | ime ı          | Duration    | Item   | unto    |                     |              |                         |                      | Берип                    | lype    | per                  | etration in  | mm                   | No.                        | ratio<br>%       | depth                | depth                    |
| 9.50                 |                                 | 10.30                            |                  |                |             |        |         |                     |              |                         |                      | 0.50<br>1.50             | SPT(C   | N=19 (3,<br>N=20 (4, | 4,4,5,5,5)<br>5,4,5,5,6)<br>7,6,7,6,6)<br>8,8,9,9,9)<br>9,10,9,10,11 |                      | AR360<br>AR360             | 75<br>75         | N/A<br>1.50          | -10.90<br>-10.70         |
|                      |                                 |                                  |                  |                |             |        |         |                     | 2.50<br>3.50 | SPT(C<br>SPT(C<br>SPT(C | N=25 (5,<br>N=35 (7, | 7,6,7,6,6)<br>8,8,9,9,9) |         | AR360<br>AR360       | 75<br>75<br>75   | 2.50<br>3.50<br>4.50 | -10.60<br>-10.30<br>-10.40 |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      | 4.50<br>6.00<br>7.50     | ISPT(C  | .)I N=40 (10         | 1.9.11.10.9.1  | .))                  | AR360<br>AR360<br>AR360    | 75<br>75<br>75   | 4.50<br>6.00<br>7.50 | -10.40<br>-9.80<br>-9.60 |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      | 9.00<br>9.50             | SPT/C   | \l NI_50 (1)         | 11,10,11,11,<br>),12,11,13,12<br>(25/0,50/0)                         | 1,14)                | AR360<br>AR360             | 75               | 9.00<br>9.50         | -9.10<br>-9.10           |
| Fron                 | n I                             | То                               | F                |                | Y FLUSH D   | ETAIL: |         | ush                 | FI           | ush                     |                      | 10.30<br>11.80           | SPT(C   | 50/0mm<br>N=35 (6,   | (25/0,50/0)<br>(25/0,50/0)<br>(25/0,50/0)<br>6,8,7,9,11)             |                      | AR360<br>AR360             | 75<br>75<br>75   | 10.00<br>10.00       | -8.40<br>-7.70           |
| dept                 |                                 | depth                            |                  |                | type        |        | ret     | urn<br>%            |              | lour                    |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
| 10.30                |                                 | 13.30                            |                  | ١              | Water       |        | 1       | 00                  | Br           | own                     |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      | I E DIAM                        | AFTED                            | / CACINIC        | . 1            |             | D)/I   |         | CANADILI            | NC.          |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
| Hole                 | Depth                           |                                  | / CASING         | th of          | Тор         | Base   |         | SAMPLII             | Time         | Recov                   | /erv                 |                          |         |                      |  |                      |                            |                  |                      |                          |
| diameter<br>200      | hole                            | dian                             | neter ca         | sing<br>0.00   |             |        |         |                     | hmmss        |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
| 116                  | 13.30                           |                                  |                  | ,.00           |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      | II.                             | ISTALL <i>A</i>                  | TION DE          | TAILS          |             |        | PI      | PE CONS             | TRUCTION     | DN.                     |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
| Distance             | ID                              |                                  | уре              | Respo          | nse zone    | ID     |         | ipe                 | Dia.         | Туре                    |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
| from G.L             | -                               |                                  |                  | Top            | Base        |        | Тор     | Base                | of pipe      | piţ                     | oe                   |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      | * Seating I  | olows only.          |                            |                  |                      |                          |
|                      |                                 |                                  |                  | BA             | CKFILL DE   | AILS   |         |                     |              |                         |                      |                          |         |                      |  | GENERAL N            | OTES                       |                  |                      |                          |
| Top of section       |                                 | ase of<br>ection                 | ı                | Materi         | ial         |        |         | Rema                | rks          |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
| 0.00                 |                                 | 13.30                            |                  | Arising        | S           |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
|                      |                                 |                                  |                  |                |             |        |         |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
| NOTES:               | ۸۱۱ ط                           | othe in                          | metres -         | II diam        | neters in m | illima | troc    |                     |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
| INOTES:              | Water                           | strike                           |                  | in min         | utes, hard  |        |         | in hhmm             |              |                         |                      |                          |         |                      |  |                      |                            |                  |                      |                          |
| Unched               |                                 | cuito UI                         | abbi cvid        |                | og Print Da | te And | d Time  | : 23/12/:           | 2013 1       | 0:31:41                 |                      |                          |         |                      |  |                      | SOI                        | L eng            | inee                 | RING                     |

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

# **Exploratory Hole Log**

Hole ID.

E71

Sheet 1 of 2

Ground Level -7.18m CD Coordinates 397326.90 E, 804825.20 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend             | Depth       | Datum  | Sampling                                      |      | Blo | w Count A | And | In Situ                        | Test   | Insta |
|--|--------------------|-------------|--------|---|------|-----|-----------|-----|--------------------------------|--------|-------|
| Description of Strata  | Legend             | Бериі       | Level  | Details                                       | Dia. | _   | SCR RQD   | IF  | Deta                           | ils    | ation |
| Medium dense grey slightly gravelly silty fine to coarse<br>SAND. Gravel is subangular to rounded fine to medium of mixed<br>igneous and metamorphic lithologies.                                      |                    | -           |        | B001 0.00-0.50<br>B002 0.50-0.95<br>D003 1.06 |      |     |           |     | SPT(C)19<br>0.50               | 0.95   |       |
|  |                    |             |        | B004 1.50-1.95  D005 2.00                     |      |     |           |     | SPT(C)20<br>1.50               | 1.95   |       |
|  |                    |             |        | B006 2.50-2.95<br>D007 3.00                   |      |     |           |     | SPT(C)25<br>2.50               | 2.95   |       |
| Medium dense grey slightly gravelly silty fine to coarse SAND.<br>Gravel is angular to rounded fine to coarse of mixed igneous<br>and metamorphic lithologies including granite, gneiss and<br>quartz. |                    | 3.40        | -10.58 | B008 3.50-3.95<br>D009 4.00                   |      |     |           |     | SPT(C)35<br>3.50               | 3.95 - |       |
|  |                    |             |        | B010 4.50-4.95  D011 5.00                     |      |     |           |     | SPT(C)40<br>4.50               | 4.95   |       |
|  |                    |             |        | B012 6.00-6.45  D013 6.50                     |      |     |           |     | SPT(C)40<br>6.00               | 6.45   |       |
|  |                    |             |        | B014 7.50-7.95 D015 8.00                      |      |     |           |     | SPT(C)44<br>7.50               | 7.95   |       |
|  |                    | 9.50        | -16.68 | B016 9.00-9.45                                |      |     |           |     | SPT(C)50<br>9.00<br>SPT(C)50/0 | 9.45 — |       |
| No recovery. Boulder CLAY with boulders. (Driller's description)   | -0,0<br>0,0<br>0,0 | -<br>-<br>- |        |   |      |     |           |     | 9.50                           | 9.50 - |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG Issue.Revision No. 1.05



Project No. TA7148

Ground Level

**Exploratory Hole Log** 

Hole ID.

E71

Sheet 2 of 2

Engineer Employer Aberdeen Harbour Board

-7.18m CD

Arch Henderson LLP

Coordinates 397326.90 E, 804825.20 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend           | Depth   | Datum  | Sam   | npling |      | Blo<br>San | ow Co<br>nple I | ount A<br>Recov | And<br>ery | In Situ           |       | Insta |
|---|------------------|---------|--------|-------|--------|------|------------|-----------------|-----------------|------------|-------------------|-------|-------|
| •   |                  |         | Level  | Deta  | ils    | Dia. | TCR        | SCR             | _               | İF         | Deta              | IIS   | ation |
| No recovery. Boulder CLAY with boulders. (Driller's description)  | -00 -0<br>-00 -0 | 10.30   | -17.48 |       |        |      |            |                 |                 |            | SBT/C\EO/Or       | -     |       |
| Stiff very high to extremely high strength brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed igneous and metamorphic lithologies including granite and gneiss. Cobbles are angular to subrounded of granite and gneiss.  from 11.50m to 11.60m 1 No subangular cobble of pink and grey granite |                  |         | 21.10  | 10.30 | 11.80  | 89   | 87         | NA              | NA              | NA         |                   | 10.30 |       |
| from 11.60m to 11.80m assumed zone of no recovery<br>from 11.85m to 11.94m 1 No subangular cobble of dark grey<br>gneiss  |                  |         |        | 11.80 | 13.30  | 89   | 100        | NA              | NA              | NA         | SPT(C)35<br>11.80 | 12.25 |       |
| from 13.27m to 13.30m assumed zone of no recovery   |                  | 13.30 - | -20.48 |       |        |      |            |                 |                 |            |                   | =     |       |
| Exploratory hole complete at 13.30 m.   |                  | -<br>-  |        |       |        |      |            |                 |                 |            |                   |       |       |
|   |                  | _       |        |       |        |      |            |                 |                 |            |                   | -     |       |
|   |                  | -       |        |       |        |      |            |                 |                 |            |                   | =     |       |
|   |                  | -       |        |       |        |      |            |                 |                 |            |                   | =     |       |
|   |                  | -       |        |       |        |      |            |                 |                 |            |                   | -     |       |
|   |                  | -       |        |       |        |      |            |                 |                 |            |                   | =     |       |
|   |                  | -       |        |       |        |      |            |                 |                 |            |                   | -     |       |
|   |                  | -       |        |       |        |      |            |                 |                 |            |                   | -     |       |
|   |                  | -       |        |       |        |      |            |                 |                 |            |                   | =     |       |
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|   |                  | -       |        |       |        |      |            |                 |                 |            |                   | -     |       |
|   |                  | -       |        |       |        |      |            |                 |                 |            |                   | =     |       |
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|   |                  | -       |        |       |        |      |            |                 |                 |            |                   | =     |       |
|   |                  | -       |        |       |        |      |            |                 |                 |            |                   | =     |       |
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|   |                  | _       |        |       |        |      |            |                 |                 |            |                   | =     |       |
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|   |                  | -       |        |       |        |      |            |                 |                 |            |                   | =     |       |
|   |                  | _       |        |       |        |      |            |                 |                 |            |                   | 7     |       |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG

Issue.Revision No. 1.05



|  |  | -  |  | Hark             | our Dev    | elop  | ment   | Ground    | Inves   | tigatior | 1   |          |       | Explo                  | ratory       | Hole I d   | 20         | Но             | ole ID.      |                |
|--|--|--|--|------------------|------------|-------|--------|-----------|---------|----------|-----|----------|-------|------------------------|--------------|------------|------------|----------------|--------------|----------------|
| ,  |  |  |  |                  |            |       |        |           |         |          |     |          |       | LAPIO                  | atory        | I TOIC L   | <i>-</i> 9 | E              | 72           |                |
| _  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  | iarboi           | ur Board   |       |        | Coor      | dinates | 39       | 729 | 95.90 E, | 80491 | 19.80 N Na             | ntional Grid | <br>ქ      |            | Н              | eader        |                |
|  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            | tion Verti | cal            |              |                |
| From   10   Start time   Duration   Start time   Duration   Start time   Start ti   |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  | March   Arch   Henderson   LLP   March   Arch   Henderson   LLP  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  | Arch Henderson LLP   |  |                  |            | ,     | 3      |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  | A7148   Arch Henderson LLP   Aberdeen Harbour Board   S.59m CD |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  | PRC              | OGRESS     |       |        |           |         |          |     |          |       |                        |              | WATER STR  | IKES       |                |              |                |
| Project No.   TA71468  |  | o seal   |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  | No.   TA7148   |  |                  |            |       |        |           |         |          |     |          |       | <u>'</u>               |              | to rise    | time       | 1              | low          |                |
| 14/09/20   | )13   1  | TA7148   |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  | TA7148   |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  | •  | •  | CA   | BLE PE           | ERCUSSIO   | N DET | AILS   |           |         |          |     |          | •     |                        | •            | SPT DETAI  | ILS        | •              | •            |                |
|  |  | •  |  | ime <sub>I</sub> | Duration   | Rem   | arks   |           |         |          |     | Depth    | Туре  |                        |              |            |            |                | Casing depth | Water<br>depth |
| Project   1  |  | -9.60  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
| Project No.   TA7148   |  |  |  | AR360            | 75<br>75   | 2.50  | -9.30  |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  |                  |            |       |        |           |         |          |     | 4.50     | SPT(C | N=42 (6,7<br>5) 50/0mm | ,9,11,10,12  |            | AR360      | 75<br>75<br>75 | 4.50         | -9.10          |
|  |  |  |  |                  |            |       |        |           |         |          |     |          | ,     |                        |              |            |            |                |              |                |
|  |  |  | R  |                  |            | ETAIL |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
| Project No.   TA7148   |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
| 6.50   | CABLE PERCUSSION DETAILS   Chiselling   Start time   hhmm   hhmm   hhmm   Chiselling   Chiselling   Start time   hhmm |  |  |                  |            |       |        |           | Br      | own      |     |          |       |                        |              |            |            |                |              |                |
|  |  | Strata Depth to Start time hhmm hhmm hhmm hhmm   Duration hhmm   Chiselling   Remarks   Duration hhmm   Chiselling   Chise |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  | Time   |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
| Project No.   TA7148   |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
| Project No.   TA71468   Target   |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
| Hard Strata Depth from to Start time hhmm   Duration hhmm   Start time hhmm   Duration hhmm   Duration hhmm   Start time hhmm   Duration hhmm   Duration hhmm   Start time hhmm   Duration hhmm   Start time hhmm   Duration hhmm   Start time hhmm   Start time hhmm   Duration hhmm   Start time hhmm   Start time hhmm   Start time hhmm   Start time hhmm   Start time hhmm   Start time hhmmmm   Start time hhmmm   Start time hhmmm   Start time hhmmm   Sta |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
| diameter   | hol  | e diam   | neter cas  | sing             | - 1        |       |        | h         | hmmss   |          | _   |          |       |                        |              |            |            |                |              |                |
| 121  | 6.50   | )   12   | 21 6.  | 50               |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  | II   | NSTALLA  | TION DE  | ΓAILS            | ļ          |       | PI     | PE CONST  | ruction | ON       |     |          |       |                        |              |            |            |                |              |                |
|  |  | Ty   | /pe  |                  |            | ID    |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
| ITOTTI G.L.  |  |  |  | ТОР              | Busc       |       | тор    | Buse      | or pipe | pipe     |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  |                  |            |       |        |           |         |          | _   |          |       |                        |              |            | <u> </u>   |                |              |                |
| Ton of   | f   c  | Rase of  | N.   |                  |            | AILS  |        | Rama      | rks     |          | 4   |          |       |                        |              | GENERAL NO | OTES       |                |              |                |
| Project No.   TA7148   |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
| Project No.   TA7148   Exploratory Hole Log  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
| Project No.  |  |  |  |                  |            |       |        |           |         |          |     |          |       |                        |              |            |            |                |              |                |
|  | For d  |  |  | ions, s          | see key    |       |        |           |         |          |     |          |       |                        |              |            |            |                |              | 015-           |
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Issue Date 22/10/2012

Part of the Bachy Soletanche Group

Issue.Revision No. 1.05

Form No. SIEXPHOLEHDR

Coordinates

Project No. TA7148

Ground Level

Arch Henderson LLP

**Exploratory Hole Log** 

Hole ID.

E72

Sheet 1 of 1

Engineer Employer

-5.59m CD

Aberdeen Harbour Board

397295.90 E, 804919.80 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend | Depth                                | Datum<br>Level   | Sampling                                 |      |     |     | unt And<br>Recover |                 | In Situ Test<br>Details | Ins   |
|---|--------|--------------------------------------|------------------|--|------|-----|-----|--------------------|-----------------|-------------------------|---|
|   |        |                                      | Level            | Details                                  | Dia. | TCR | SCR | RQD                | IF              | Details                 | atic  |
| Medium dense brown silty gravelly fine to coarse SAND. Gravel<br>s angular to rounded fine to coarse of mixed igneous and<br>netamorphic lithologies including granite, gneiss, schist and<br>juartz.   |        |                                      |                  | B001 0.00-0.50<br>B002 0.50-0.95         |      |     |     |                    |                 | SPT(C)15                |   |
| from 1.50m to 1.95m slightly gravelly   |        |                                      |                  | D003 1.00<br>B004 1.50-1.95<br>D005 2.00 |      |     |     |                    |                 | SPT(C)26 1.50 1.95      |   |
|   |        |                                      |                  | B006 2.50-2.95  D007 3.00                |      |     |     |                    |                 | -<br>-<br>-             |   |
|   |        |                                      |                  | B008 3.50-3.95  D009 4.00                |      |     |     |                    |                 | SPT(C)40 - 3.50 3.95    |   |
|   |        |                                      |                  | D010 5.00                                |      |     |     |                    |                 | SPT(C)42 - 4.50 4.95    |   |
| No recovery. Hard strata, BOULDERS and possible boulder clay. (Driller's description)   | 000    | 6.15                                 | -11.74           |  |      |     |     |                    |                 | SPT(C)50/0mm            |   |
| Very strong light grey BOULDER of gneiss.   | 000    | 6.50 -                               | -12.09<br>-12.25 |  |      |     |     |                    | NA              | -                       |   |
| Stiff brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist.  Extremely weak reddish brown speckled grey GNEISS. Recovered |        | 6.90 -<br>-<br>-<br>-<br>-<br>-<br>- | -12.49           | 6.50 8.00                                | 92   | 73  | 27  | 9                  | NI              | -                       |   |
| as non intact core (angular fine to coarse gravel sized fragments) and with dark brown staining penetrating full core diameter.   | ****   | 7.85 _<br>8.00 —                     | -13.44<br>-13.59 |  |      |     |     |                    | NA              | -<br>-                  |   |
| Assumed zone of no recovery. Decomposed GRANITE. (Driller's description)  Weak locally medium strong light grey GNEISS. Discontinuities:  |        |                                      |                  | 8.00 8.90                                | 92   | 100 | 55  | 11                 |                 | -<br> -<br> -<br> -     | 200   |
| 1) 40-50 degrees closely spaced planar rough stained brown on surfaces.  from 8.20m to 8.50m, 8.90m to 9.15m and 9.30m to 9.40m extremely weak dark reddish brown stained and recovered as non intact core (angular fine to coarse gravel sized fragments)        |        |                                      |                  | 8.90 9.60                                | 92   | 71  | 7   | 0                  | NA<br>NA<br>100 | -                       | STATE |
| from 9.10m to 9.20m reddish brown, recovered as non intact core (sandy clay. Sand is fine to coarse)  |        | 9.60                                 | -15.19           |  |      |     |     |                    | _               | -                       | 1.023   |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Unchecked Log Print Date And Time: 23/12/2013 10:31:54

Form No. SIEXPHOLELOG Issue.Revision No. 1.05



#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 E72 Engineer Arch Henderson LLP

Employer Ground Level -5.59m CD Coordinates 397295.90 E, 804919.80 N National Grid

Hole Type CP+RC Inclination

Aberdeen Harbour Board

| Description of Strata   | Legend | Depth | Datum | Sampling |      | Blo | งพ Cou<br>nple Re | int A | nd | In Situ Test | Insta |
|---|--------|-------|-------|----------|------|-----|-------------------|-------|----|--------------|-------|
| Description of Strata   | Legend | Бериі | Level | Details  | Dia. |     | SCR               | RQD   | IF | Details      | ation |
| emaining Detail : 9.40m - 9.60m : from 9.40m to 9.60m assumed |        | -     |       |          |      |     |                   |       |    | -            |       |
| ne of no recovery   |        | _     |       |          |      |     |                   |       |    | -            |       |
| ploratory hole complete at 9.60 m.                            |        | -     |       |          |      |     |                   |       |    | -            |       |
|   |        | -     |       |          |      |     |                   |       |    | -            | 1     |
|   |        | _     |       |          |      |     |                   |       |    | _            |       |
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|   |        | -     |       |          |      |     |                   |       |    | =            |       |
|   |        | =     |       |          |      |     |                   |       |    | -            |       |
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|   |        | -     |       |          |      |     |                   |       |    | -            |       |
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|   |        | -     |       |          |      |     |                   |       |    | -            | 1     |
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NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Sheet 1+ of 1

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| Coordinates    |         |  |
| Date Start   Date   Start    | r       |  |
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| PROGRESS  |         |  |
| Date   Time   Hole   depth   depth   depth   depth   depth   Remarks   Date   Time   Strike at   Rise to   depth   d |         |  |
| Date   Time   Hole   depth   depth   depth   depth   depth   Remarks   Date   Time   Strike at   Rise to   depth   d |         |  |
| Date   Time   Hole   depth   depth   depth   depth   depth   Remarks   Date   Time   Strike at   Rise to   depth   d |         |  |
| Remarks   Calibratian   Cali |         |  |
| 18/09/2013   0930  | to seal |  |
| 19/09/2013 0700 6.10 3.10 -7.10 End of Hole  CABLE PERCUSSION DETAILS  Hard Strata Depth from to Start time Duration hhmm hhmm hhmm hhmm hhmm hhmm hhmm hh   | flow    |  |
| Hard Strata Depth from to Start time Duration hhmm hhmm Duration hhmm hhmm   |         |  |
| Hard Strata Depth from to Start time Duration hhmm hhmm Duration hhmm hhmm   |         |  |
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| Project No.   TA7148   |         |  |
| Project No.   TA7468   |         |  |
| Hole Depth of Casing Depth of Top Base Diameter Time Recovery  |         |  |
| 155 3.10 150 3.10  |         |  |
| 116   6.10   |         |  |
|  |         |  |
|  |         |  |
|  |         |  |
|  |         |  |
|  |         |  |
|  |         |  |
|  |         |  |
| Top of Base of Material Remarks  |         |  |
| Exploratory Hole Log   |         |  |
| 3.10   6.10   Grout  |         |  |
|  |         |  |
|  |         |  |
| EXPLORATION   TAT148   |         |  |
| Water strike rise time in minutes, hard strata time in hhmm  |         |  |
|  |         |  |

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

**Exploratory Hole Log** 

Hole ID.

E74

Sheet 1 of 1

Ground Level -7.99m CD Coordinates 397299.50 E, 805021.10 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend                                 | Depth                                       | Datum          | Sam   | pling |      |     |          | ount A<br>Recov |                  | In Situ Test                      | Ins   |
|--|--|---|----------------|-------|-------|------|-----|----------|-----------------|------------------|-----------------------------------|---|
| •  | 7                                      |   | Level          | Detai | ls    | Dia. | TCR | SCR      | RQD             | IF               | Details                           | atio  |
| COBBLES and BOULDERS with sand lenses. (Driller's description)   | 0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0. |   |                |       |       |      |     |          |                 |                  | SPT(C)50/0mm - 0.40               |   |
| COBBLES and BOULDERS of mixed igneous and metamorphic<br>lithologies including granite and gneiss. Recovered as angular<br>cobble and boulder sized fragments.   | 0000                                   | 0.90 <del>-</del><br>1.00 <del>-</del><br>- | -8.89<br>-8.99 | 0.90  | 1.30  | 92   | 100 | NA       | NA              |                  | SPT(C)50/10mm -                   |   |
| Strong pink and grey BOULDER of granite.   | 000                                    |   |                | 1.30  | 1.70  | 92   | 100 | NA       | NA              |                  | 1.30 1.32                         |   |
| COBBLES and BOULDERS of mixed igneous and metamorphic ithologies including granite and gneiss. Recovered as angular cobble sized fragments.  | 10.0.0.0<br>0.0.0.0.0                  | 1.70 -<br>-<br>-<br>-<br>-                  | -9.69          | 1.70  | 2.40  | 92   | 76  | NA<br>NA | NA<br>NA        | NA               |                                   |   |
| from 2.21m to 2.40m assumed zone of no recovery  No recovery. BOULDERS with sand lenses. (Driller's description)   | 00000                                  | 2.40  | -10.39         | 2.40  | 3.10  | 92   | 0   | 0        | 0               |                  |                                   |   |
| Assumed zone of no recovery. BOULDERS with sand lenses (drillers descrption)   | 000                                    | 3.10 -                                      | -11.09         |       |       |      |     |          |                 | ·                | SPT(C)50/0mm - 3.10 - 3.10 - 3.10 |   |
| Strong pink and grey coarse crystalline GRANITE. Discontinuities: 1) 20-40 degrees closely locally very closely spaced planar rough locally clay smeared. 2) 70-90 degrees very closely to closely spaced planar rough stained brown.  from 3.50m to 3.65m 1 No incipient fracture 80 degrees planar from 3.77m to 3.88m many randomly orientated incipient  |  | 3.50<br><br><br><br><br><br><br>            | -11.49         | 3.10  | 4.60  | 92   | 70  | 65       | 45              |                  | -                                 | 10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000<br>10000 |
| fractures from 3.97m to 4.09m 1 No discontinuity 10 degrees planar stained dark brown from 4.15m to 4.22m recovered as non intact core (very angular medium gravel sized fragments) from 4.32m to 4.47m recovered as non intact core (very angular medium to coarse gravel sized fragments) from 4.60m to 6.10m discontinuities: 1) closely to medium spaced at 4.70m 1 No discontinuity 10-20 degrees undulating smooth clean | *****                                  |   | -14 09         | 4.60  | 6.10  | 92   | 90  | 78       | 61              | NI<br>170<br>320 | -                                 |   |
| from 4.92m to 5.02m 1 No discontinuity 70 degrees undulating smooth clean from 5.14m to 5.28m discontinuities: 2) perpendicular through core axis from 5.50m to 5.68m recovered as non intact core (very angular medium to coarse gravel sized fragments) from 5.95m to 6.10m assumed zone of no recovery  Exploratory hole complete at 6.10 m.  |  | 6.10  | -14.09         |       |       |      |     |          |                 |                  |                                   |   |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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SOIL ENGINEERING Part of the Bachy Soletanche Group

| Project              | Nar  |                    | -                |              | Hark        | oour De      | elop         | ment             | Ground   | d Inves  | tigatio | n   |         |        | Fynla             | Jra.             | ton, L                   | م ا ماما  | 00        | Нс       | le ID.   |                  |
|----------------------|--|--------------------|------------------|--------------|-------------|--------------|--------------|------------------|----------|----------|---------|-----|---------|--------|-------------------|------------------|--------------------------|-----------|-----------|----------|----------|------------------|
| -                    |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        | Lxpic             | Лa               | tory i                   | IOIE LO   | Jg        | F        | 75       |                  |
| _                    |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              | arbo        | ur Board     |              |                  | C        |          | 20      | 72. | /2 /0 F | 20505  | - O - F O - N - N |                  |                          |           |           | Н        | eader    |                  |
|                      |  |                    |                  |              |             |              |              |                  |          |          |         |     | •       | 80505  | 9.50 N I          | vatio            | nai Grid                 | Inclinat  | ion Vert  | cal      |          |                  |
| Тор                  | Base   | Тур                | e Da             | te Sta       | rted I      | Date Ende    | d C          | rew              | Section  | Co       | re Co   | re  |         | Equipr | ment              |                  | Sho                      | oring_/   |           | Remarks  |          |                  |
| 0.00                 |  | СР                 | 19               | 9/09/20      | 013         |              |              | TT               | DT       |          |         |     |         |        |                   |                  | Sul                      | oport     |           |          |          |                  |
| 4.00                 | 6.90   | RC                 | 20               | 0/09/20      | 013         | 20/09/201    | 3            | RJ               | DT       | T61      | 16 Imp  | reg |         | eltaba | se 515            |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              | DDC         | OGDESS       |              |                  |          |          |         |     |         |        |                   |                  | 1                        | ATED STDI | KEC       |          |          |                  |
| Date                 |  | Time               | T                | lole         | Casir       | ng Wate      | er           |                  | Rema     | ırks     |         |     | Dat     | e      | Time              | 5                | Strike at                | Rise to   | Time      | Ca       | sing dep | th .             |
| Project No.   TA7148 |  |                    | at strik<br>time | (e to        | seal<br>low |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
| 20/09/20             | )13  | Arch Henderson LLP |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  | Arch Henderson LLP |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      | Spineer  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      | ļ  |                    | <u> </u>         | CA           | BLE PE      | ERCUSSIO     | N DE         | ΓAILS            |          |          |         |     |         |        |                   |                  |                          | SPT DETAI | LS        |          |          |                  |
|                      |  |                    |                  | Start ti     |             |              |              | narks            |          |          | ,       |     | Depth   | Туре   |                   |                  |                          |           |           |          | Casing   | Water            |
|                      |  |                    |                  | hhmi         | m           | hhmm         |              | ellina           |          |          |         |     | 0.50    | SPT(C  |                   |                  |                          |           |           | %        | •        | -                |
| 0.90<br>1.25         |  | 1.00<br>1.50       |                  | 1145<br>1235 | 5           | 0030<br>0100 | Chis<br>Chis | elling<br>elling |          |          |         |     | 1.50    | SPT(C  | 50/50m<br>50/50m  | nm (25<br>nm (25 | 5/65,50/50<br>5/45,50/50 | o)<br>o)  | AR360     | 75<br>75 | 1.50     | -11.60<br>-11.70 |
| 3.80                 |  | 4.00               |                  | 1430         | 9           | 0100         | Chis         | elling           |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  | R            |             |              | ETAIL        |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              |             |              |              | ret              | urn      |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
| 4.00                 | Special   Spec |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  | No. TA7148         |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      | Arch Henderson LLP   |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
| Project No.   TA7148 |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
| Project No.          |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      | ,  |                    |                  |              |             | Top          |              |                  |          |          | Recove  | rv  |         |        |                   |                  |                          |           |           |          |          |                  |
| diameter             | ho   | ole dia            | mete             | er cas       | sing        |              |              | -                |          |          |         | .,  |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    | 130              | "            |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  | INSTAL             | LATIC            | ON DET       | ΓAILS       |              |              | PI               | PE CONS  | TRUCTION | ON      |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    | Туре             |              |             |              | ID           |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              | D 4 1       | OKEN SE      |              |                  |          |          |         |     |         |        | 1                 | *                |                          |           | )<br>DTFC |          |          |                  |
| Top of               | f  | Base of            | f                | N            |             |              | AILS         |                  | Rema     | arks     |         |     |         |        |                   |                  | G                        | ENEKAL NO | NIF2      |          |          |                  |
| section<br>0.00      |  | section<br>4.00    |                  | ,            | Arisings    | s            |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
| 4.00                 |  | 6.90               |                  |              | Grout       |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      |  |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
|                      | TA7148   |                    |                  |              |             |              |              |                  |          |          |         |     |         |        |                   |                  |                          |           |           |          |          |                  |
| NOTES:               | Wate   | er strik           | e rise           | time i       | n min       | utes, hard   |              |                  | in hhmm  | 1        |         |     |         |        |                   |                  |                          |           |           | 1        |          |                  |
|                      |  |                    |                  |              | ions, s     | see key      |              |                  |          |          | 0.22.62 |     |         |        |                   |                  |                          |           | 501       | - ADC    | IDAG     | DIDG             |
|                      |  |                    |                  |              | Lo          | og Print Da  | ite An       | d Time           | : 23/12/ | 2013 1   | υ:32:12 |     |         |        |                   |                  |                          |           | 201       | L CIIG   | וווככ    | KIIIG            |

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Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Engineer

Arch Henderson LLP

## **Exploratory Hole Log**

Hole ID.

E75

Sheet 1 of 1

Employer Aberdeen Harbour Board Ground Level -8.36m CD

Coordinates

397342.40 E, 805059.50 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend                                | Depth                      | Datum<br>Level | Samplir                          | _     | San | nple l | ount A<br>Recov | ery             | In Situ Test<br>Details        | Insta |
|--|---------------------------------------|----------------------------|----------------|----------------------------------|-------|-----|--------|-----------------|-----------------|--------------------------------|-------|
|  | 7.7                                   |                            |                | Details                          | Dia.  | TCR | SCR    | RQD             | IF              | 2 Stallo                       | 22.01 |
| Very dense slightly silty sandy angular to rounded fine to coarse GRAVEL of mixed igneous and metamorphic lithologies. Sand is fine to coarse. from 0.25m to 0.50m driller notes boulder   |                                       | -<br>-<br>-<br>-<br>0.60 - | -8.96          | D001 0.00-0.20<br>B002 0.50-0.60 |       |     |        |                 |                 | SPT(C)50/50mm -<br>0.50 0.62 - |       |
| Very dense brown slightly silty gravelly fine to coarse SAND. Gravel is very angular to rounded fine to coarse of mixed igneous of metamorphic lithologies. from 0.90m to 1.00m driller notes boulder from 1.25m to 1.50m driller notes boulder                                |                                       |                            |                | D003 1.00-1.20<br>B004 1.00-1.50 |       |     |        |                 |                 | SPT(C)50/50mm - 1.50 1.62 -    |       |
|  |                                       |                            |                | D005 2.00-2.20<br>B006 2.50-3.00 |       |     |        |                 |                 | -                              |       |
|  |                                       |                            |                |                                  |       |     |        |                 |                 | SPT(C)50/50mm<br>3.00 3.10     |       |
| No recovery. Pink and grey GRANITE. (Driller's description)  | *****                                 | 3.60                       | -11.96         | D007 3.50-3.60                   |       |     |        |                 |                 |                                |       |
| Very weak to weak pink and grey coarse crystalline GRANITE (locally with quartz mineralisation). Recovered as non intact core (slightly sandy angular to subrounded fine to coarse gravel sized fragments. Sand sized fragments are fine to medium).                           | * * * * * * * * * * * * * * * * * * * | 4.00                       | -12.36         | 4.00 5.                          | 30 92 | 100 | 0      | 0               |                 |                                |       |
| from 5.40m to 5.46m intact with 1 No discontinuity 90 degrees planar smooth clean and quartz mineralisation  from 5.89m to 6.02m intact with 1 No discontinuity 80 degrees planar smooth with quartz mineralisation from 5.99m to 6.02m 1 No 80-90 degrees thin vein of quartz | * * * * * * * * * * * * * * * * * * * |                            |                | 5.30 6.                          | 90 92 | 100 | 12     | 8               | NI<br>NI<br>130 | -                              |       |
| Exploratory hole complete at 6.90 m.   | ****                                  | 6.90 -                     | -15.26         |                                  |       |     |        |                 |                 |                                |       |
|  |                                       |                            |                |                                  |       |     |        |                 |                 |                                |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:32:15

SOIL ENGINEERING Part of the Bachy Soletanche Group

| ,               |                    | •       |              | Harb            | our Dev    | elopi  | ment   | Ground          | Invest  | tigati  | on    |           |            | Evnlo                  | ratory l               | ا ماما               | 20               | Но       | le ID.       |                  |
|-----------------|--------------------|---------|--------------|-----------------|------------|--------|--------|-----------------|---------|---------|-------|-----------|------------|------------------------|------------------------|----------------------|------------------|----------|--------------|------------------|
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            | LXPIO                  | atory                  | TOIC L               | 9                | Е        | 105          |                  |
| Engine          |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
| Employ          |                    |         |              | arbou           | r Board    |        |        | Coor            | dinatos |         | 20754 | 22 00 E 9 | 90455      | O DE NI NIA            | tional Grid            |                      |                  | Н        | eader        |                  |
| Date Sta        |                    |         |              |                 |            |        |        |                 |         |         |       |           | 60433      | 10.33 IN INA           | itional Grid           | Inclinat             | ion Verti        | cal      |              |                  |
| Тор             | Base               | Туре    | Date Star    | ted D           | ate Ende   | d Cı   | rew    | Section         | Core    | e. (    | Core  | E         | Equipr     | ment                   | Sho                    | oring <sub>.</sub> / | F                | emarks   |              |                  |
| 0.00            | 6.00               | СР      | 18/07/20     | 13 1            | 8/07/201   | 3      |        | Logged By<br>DT | Barr    | el      | Bit   | ı         | Dando      | 3000                   | Su                     | pport                |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
| Date            | Ιτί                | me      | Hole         |                 |            | r      |        | Remar           | ks      |         |       | Date      | e l        | Time                   |                        |                      |                  | Ca       | sina den     | th               |
|                 |                    |         | depth        | depth           | dept       | n      |        |                 |         |         |       | Dutt      |            | 11110                  | depth                  | depth                | taken<br>to rise | at strik | ce i to      | seal             |
| 18/07/20        | 013 2              | 000     | 6.00         | 6.00            | -15.20     | ) End  | of Hol | le              |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         | TAT148       |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    | TA7148  |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
| 11              | Charte             | D tl.   |              |                 |            |        |        |                 |         |         |       | D         | Ŧ          | I                      |                        |                      |                  | F        |              | 10/              |
| from            |                    | -       | Start tir    | me <sub>l</sub> | Duration   | Kem    | arks   |                 |         |         |       | Depth     | Туре       |                        |                        |                      | No.              | ratio    | depth        | depth            |
|                 |                    |         | 11111111     | "               | 1111111111 |        |        |                 |         |         |       | 1.00      | SPT        | N=16 (3,3<br>N=25 (3.5 | ,4,3,4,5)<br>6.5.6.8)  |                      | AR360<br>AR360   |          | 1.00         | -15.70<br>-15.60 |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       | 3.00      | SPT<br>SPT | N=30 (4,6<br>N=29 (4,5 | ,7,6,8,9)<br>,6,7,7,9) |                      | AR360            | 75<br>75 | 3.00<br>4.00 | -15.20           |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       | 5.00      | SPT        | N=40 (7,8              | ,9,9,11,11)            |                      | AR360            | 75       | 5.00         | -14.70           |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
| Fron            | <u>~ 1</u>         | To      | RO           |                 |            | ETAILS |        | uob             | FI.     | ıoh     |       |           |            |                        |                        |                      |                  |          |              |                  |
| dept            |                    |         |              |                 |            |        | ret    | turn            |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
| Hole            |                    |         |              | h of            | Top        |        |        |                 |         | Reco    | verv  |           |            |                        |                        |                      |                  |          |              |                  |
| diameter<br>200 | hole               | dian    | neter casi   | ing             |            |        |        |                 |         |         | ,     |           |            |                        |                        |                      |                  |          |              |                  |
| 200             | 0.00               |         | 0.0          | ,,              |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 | IN                 | ISTALL# | ATION DET    | AILS            | ļ          |        | PI     | IPE CONST       | RUCTIO  | DN O    |       |           |            |                        |                        |                      |                  |          |              |                  |
| Distance        |                    | T       | уре Б        |                 |            | ID     | F      |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
| from G.L        | -                  |         |              | тор             | Base       |        | тор    | Base            | or pipe | bit     | је    |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        | * Seating bl           | ows only.            |                  |          |              |                  |
|                 | _                  |         | 1            |                 |            | AILS   |        |                 |         |         |       |           |            |                        | G                      | ENERAL NO            | OTES             |          |              |                  |
| Top o<br>sectio | n se               | ection  |              |                 |            |        |        | Rema            | rks     |         |       |           |            |                        |                        |                      |                  |          |              |                  |
| 0.00            | Arch Henderson LLP |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
| NOTES           | Aberdam            |         |              |                 |            |        |        |                 |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 | Water              | strike  | rise time ir | n minu          | tes, hard  | strata | time   | in hhmm         |         |         |       |           |            |                        |                        |                      |                  |          |              |                  |
|                 |                    |         |              |                 |            | te And | d Time | e: 23/12/2      | 2013 10 | 0:22:22 | 2     |           |            |                        |                        |                      | SOII             | eng      | inee         | RING             |

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

TA7148

Project No.

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

**Exploratory Hole Log** 

Hole ID.

E105

Sheet 1 of 1

Ground Level -13.88m CD Coordinates 397563.99 E, 804558.35 N National Grid

Hole Type Inclination

| Description of Strata   | Legend | Depth  | Datum<br>Level | Sampling   |      | Blo<br>San | ow Cou   | ecove | nd<br>ery |               | u Test<br>ails        | Inst |
|---|--------|--------|----------------|--|------|------------|----------|-------|-----------|---------------|-----------------------|------|
|   |        |        | Level          | Details  | Dia. | TCR        | SCR      | RQD   |           | Det           | .all5                 | atio |
| Grey slightly silty gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse of granite, schist and quartzite.                    |        | -      | 1470           | B002 0.00-1.00<br>ES001 0.50                                     |      |            | <u>'</u> |       |           |               | -                     |      |
| Medium dense grey slightly silty gravelly fine to coarse SAND.<br>Gravel is angular to subrounded fine to coarse of granite,<br>schist and quartzite. |        | 0.90 - | -14.78         | D003 1.00-1.45<br>B004 1.00-1.45<br>ES005 1.50<br>B006 1.50-2.00 |      |            |          |       |           | SPT16<br>1.00 | 1.45                  |      |
|   |        | -      |                | D007 2.00-2.45<br>B008 2.00-2.45                                 |      |            |          |       |           | SPT25<br>2.00 | 2.45                  |      |
|   |        |        |                | ES009 2.50<br>B010 2.50-3.00                                     |      |            |          |       |           |               | -                     |      |
|   |        | -      |                | D011 3.00-3.45<br>B012 3.00-3.45                                 |      |            |          |       |           | SPT30<br>3.00 | 3.45                  |      |
|   |        | =      |                | ES013 3.50<br>B014 3.50-4.00                                     |      |            |          |       |           |               | -                     |      |
|   |        | -      |                | D015 4.00-4.45<br>B016 4.00-4.45                                 |      |            |          |       |           | SPT29<br>4.00 | 4.45 -<br>-<br>-      |      |
|   |        |        |                | ES017 4.50<br>B018 4.50-5.00<br>D019 5.00-5.45                   |      |            |          |       |           | SPT40         |                       |      |
| from 5.00m to 6.00m dense, very gravelly  |        | -      |                | B020 5.00-5.45<br>ES021 5.50                                     |      |            |          |       |           | 5.00          | 5.45 -<br>-<br>-<br>- |      |
|   |        | 6.00 — | -19.88         | B022 5.50-6.00   |      |            |          |       |           |               |                       |      |
| exploratory hole complete at 6.00 m.  |        |        |                |  |      |            |          |       |           |               |                       |      |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:22:25

SOIL ENGINEERING Part of the Bachy Soletanche Group

| Projec          | t Nam           | ie Bay                | of Nigg                    | Harbo              | our Dev           | elop    | men     | t Groun             | d Inves        | stiga      | tion        |                      |                   | Evnlo                  | ratory l                                      | ا مام ا          | 00                    |        | Но                         | le ID.               |                            |
|-----------------|-----------------|-----------------------|----------------------------|--------------------|-------------------|---------|---------|---------------------|----------------|------------|-------------|----------------------|-------------------|------------------------|---|------------------|-----------------------|--------|----------------------------|----------------------|----------------------------|
| Projec          |                 |                       | 148                        |                    |                   |         |         |                     |                |            |             |                      |                   | LXPIO                  | iatory i                                      | IOIE L           | og                    |        | E:                         | 106                  |                            |
| Engine          |                 |                       | h Hender                   |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            | eader                |                            |
| Emplo<br>Ground | _               |                       | rdeen Ha                   | rbour              | Боаги             |         |         | Cod                 | ordinates      | s          | 3975        | 99.89 E,             | 80454             | 43.38 N Na             | ational Grid                                  |                  |                       |        |                            | eauei                |                            |
| Date Sta        | arted           | 19/0                  | 07/2013                    |                    |                   |         |         | Dat                 | te Compl       | leted      | 19/07       | 7/2013               |                   |                        |   | Inclina          | tion V                | ertica | al                         |                      |                            |
| Тор             | Base            | Туре                  | Date Start                 | ed Da              | ate Ende          | d C     | rew     | Section<br>Logged I | n Co<br>By Bar | re<br>rrel | Core<br>Bit |                      | Equip             | ment                   | Sh<br>Su                                      | oring /<br>pport |                       | Re     | marks                      |                      |                            |
| 0.00            | 6.00            | СР                    | 19/07/201                  | 3 1                | 9/07/2013         | 3       | TP      | DT                  |                |            |             |                      | Dando             | 3000                   |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    | GRESS             |         |         |                     |                |            |             |                      |                   |                        |   | VATER STR        |                       |        |                            |                      |                            |
| Date            |                 | ime                   | Hole<br>depth              | Casing<br>depth    | Wate<br>depti     | r<br>h  |         | Rem                 | arks           |            |             | Dat                  | te                | Time                   | Strike at<br>depth                            | Rise to<br>depth | Tim<br>take<br>to ri: | en     | at strik<br>time           | sing der<br>e t      | oth<br>o seal<br>flow      |
| 19/07/2         | 013 :           | 1400                  | 6.00                       | 6.00               | -16.30            | ) End   | d of Ho | ole                 |                |            |             |                      |                   |                        |   |                  | 10 11                 |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
| Haro            | l Strata        | Denth                 |                            | LE PER<br>Chiselli | RCUSSIO           |         | AILS    |                     |                |            |             | Depth                | Туре              | Incren                 | nental blow                                   | SPT DETA         | ILS<br>Hamn           | ner F  | nergy                      | Casing               | Water                      |
| fron            |                 | to                    | Start tir                  | ne <sub>I</sub> [  | Duration<br>hhmm  | Item    | iains   |                     |                |            |             | Бери                 | Турс              |                        | etration in                                   |                  | No                    |        | ratio<br>%                 | depth                | depth                      |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             | 1.00<br>2.00         | SPT<br>SPT        | N=13 (2,3<br>N=25 (3,4 | 3,3,4,3,3)<br>4,5,7,7,6)                      |                  | AR36<br>AR36          | 0      |                            | 1.00<br>2.00         | -16.70<br>-16.80           |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             | 3.00<br>4.00<br>5.00 | SPT<br>SPT<br>SPT | N=32 (4,5<br>N=46 (6,7 | 5,7,8,7,10)<br>7,9,11,12,14)<br>3,11,12,12,15 | ١                | AR36<br>AR36<br>AR36  | 0      | 75<br>75<br>75<br>75<br>75 | 3.00<br>4.00<br>5.00 | -13.00<br>-17.70<br>-16.30 |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             | 3.00                 | 311               | 14-50 (7,0             | 3,11,12,12,13                                 | ,                | AKSO                  |        | 75                         | 3.00                 | -10.50                     |
|                 |                 |                       |                            | TARK               | F111611 B         | FT 4 11 |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
| From            |                 | То                    |                            | Fl                 | FLUSH D<br>ush    | EIAIL   | F       | lush                |                | lush       |             | -                    |                   |                        |   |                  |                       |        |                            |                      |                            |
| dept            | tn              | depth                 |                            | ty                 | уре               |         | re      | turn<br>%           | cc             | olour      |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
| НС              |                 |                       | / CASING                   |                    |                   |         |         | C SAMPL             | ING            |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
| Hole<br>diamete |                 | n of Ca<br>e diar     | sing Dept<br>neter casi    |                    | Тор               | Base    | Di      | ameter              | Time<br>hhmmss |            | overy<br>%  |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
| 200             | 6.00            | ) 2                   | 00 6.0                     | )                  |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 | 11              | UCTALL                | ATION DETA                 |                    |                   |         |         | PIPE CON            | STRUCTI        | ION        |             | ł                    |                   |                        |   |                  |                       |        |                            |                      |                            |
| Distance        | e ID            |                       |                            | espons             | se zone           | ID      |         | Pipe                | Dia.           | Тур        | e of        | ł                    |                   |                        |   |                  |                       |        |                            |                      |                            |
| from G.L        | -               |                       |                            | Тор                | Base              |         | Тор     | Base                | of pipe        | e t        | oipe        | -                    |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        | * Seating bl                                  | ows only.        |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    | KFILL DET         | AILS    |         |                     |                |            |             |                      |                   |                        | G   | ENERAL N         | OTES                  |        |                            |                      |                            |
| Top o           | n s             | Base of ection        |                            | aterial            |                   |         |         | Rem                 | narks          |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
| 0.00            |                 | 6.00                  | (                          | irout              |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
|                 |                 |                       |                            |                    |                   |         |         |                     |                |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
| NOTES           | : All de        | pths in               | metres, all                | diamet             | ters in m         | illime  | tres.   | to bloom            |                |            |             |                      |                   |                        |   |                  |                       |        | 4                          |                      |                            |
|                 | vvate<br>For de | i strike<br>etails of | rise time in<br>abbreviati | minut<br>ons, se   | es, nard<br>e key | strat   | a time  | : III nnmr          | 11             |            |             |                      |                   |                        |   |                  |                       |        |                            |                      |                            |
| 1               |                 |                       |                            | Log                | Print Da          | te An   | d Tim   | e: 23/12            | /2013 1        | 10:22:     | 30          |                      |                   |                        |   |                  | S                     | OIL    | eng                        | ınee                 | RING                       |

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

**Exploratory Hole Log** TA7148

Hole ID. E106

Sheet 1 of 1

Ground Level -14.70m CD Coordinates 397599.89 E, 804543.38 N National Grid

Hole Type СР Inclination

Arch Henderson LLP

Aberdeen Harbour Board

Engineer

Employer

| Description of Strata   | Legend                                | Depth       | Datum  | Sampling                                       |      | Ble<br>Sar | ow Co<br>nple I | ount Ar<br>Recove | nd<br>erv |               | u Test                | Instal |
|---|---------------------------------------|-------------|--------|--|------|------------|-----------------|-------------------|-----------|---------------|-----------------------|--------|
| 2000  | Logona                                | 20ptil      | Level  | Details  | Dia. |            |                 | RQD               | ,         | Det           | ails                  | ation  |
| Medium dense grey slightly silty slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to medium of granite, schist and quartzite. | X                                     |             |        | B002 0.00-1.00<br>ES001 0.50                   |      |            |                 |                   |           |               | -                     |        |
| Medium dense grey slightly silty slightly gravelly fine to  | × × × × × × × × × × × × × × × × × × × | 1.30 -      | -16.00 | D003 1.00-1.45<br>B004 1.00-1.45<br>ES005 1.50 |      |            |                 |                   |           | SPT13<br>1.00 | 1.45 -                |        |
| coarse SAND. Gravel is angular to subrounded fine to medium of granite, schist and quartzite.   |                                       | =           |        | B006 1.50-2.00<br>D007 2.00-2.45               |      |            |                 |                   |           | SPT25         | -                     |        |
|   |                                       |             |        | B008 2.00-2.45<br>ES009 2.50<br>B010 2.50-3.00 |      |            |                 |                   |           | 2.00          | 2.45 -                |        |
| from 3.00m to 3.80m dense   |                                       | =           |        | D011 3.00-3.45<br>B012 3.00-3.45               |      |            |                 |                   |           | SPT32<br>3.00 | -<br>-<br>-<br>3.45 - |        |
|   |                                       |             |        | ES013 3.50<br>B014 3.50-4.00                   |      |            |                 |                   |           |               |                       |        |
| Dense grey slightly silty slightly gravelly fine to coarse<br>SAND. Gravel is angular to subrounded fine to medium of<br>granite, schist and quartzite.     |                                       | 3.80 -      | -18.50 | D015 4.00-4.45<br>B016 4.00-4.45               |      |            |                 |                   |           | SPT46<br>4.00 | 4.45                  |        |
|   |                                       |             |        | ES017 4.50<br>B018 4.50-5.00                   |      |            |                 |                   |           |               |                       |        |
|   |                                       |             |        | D019 5.00-5.45<br>B020 5.00-5.45               |      |            |                 |                   |           | SPT50<br>5.00 | 5.45                  |        |
|   |                                       |             |        | ES021 5.50<br>B022 5.50-6.00                   |      |            |                 |                   |           |               | -                     |        |
| Exploratory hole complete at 6.00 m.  | 765590                                | 6.00        | -20.70 |  |      |            |                 |                   |           |               | -                     |        |
|   |                                       | -           |        |  |      |            |                 |                   |           |               | -                     |        |
|   |                                       | -           |        |  |      |            |                 |                   |           |               | -                     |        |
|   |                                       | -<br>-<br>- |        |  |      |            |                 |                   |           |               | -                     |        |
|   |                                       | -           |        |  |      |            |                 |                   |           |               | -                     |        |
|   |                                       | =           |        |  |      |            |                 |                   |           |               | -                     |        |
|   |                                       | -           |        |  |      |            |                 |                   |           |               | -                     |        |
|   |                                       | -<br>-<br>- |        |  |      |            |                 |                   |           |               | -                     |        |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:22:33

Form No. SIEXPHOLELOG Issue.Revision No. 1.05 Issue Date 22/10/2012



| Projec               | t Nam         | e Bay          | of Nigg                     | Harbo           | our Dev                  | elopm    | nent     | Ground               | d Inves          | tigat     | ion         |                      |                  | Evolo                  | ratory   | ا مام ا                 | 00         |           | Ho                               | le ID.               |  |
|----------------------|---------------|----------------|-----------------------------|-----------------|--------------------------|----------|----------|----------------------|------------------|-----------|-------------|----------------------|------------------|------------------------|--|-------------------------|------------|-----------|----------------------------------|----------------------|--|
| Projec               |               |                | '148                        |                 |                          |          |          |                      |                  |           |             |                      |                  | Expio                  | ratory   | JOIE L                  | by         |           | E.                               | 107                  |  |
| Engine               |               |                | h Hender                    |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
| Employ<br>Ground     | _             |                | erdeen Ha<br>15m CD         | rboui           | r Board                  |          | —        | Coo                  | rdinates         |           | 39760       | 00.63 E,             | 80450            | 04.87 N N              | ational Grid   |                         |            |           | Н                                | eader                |  |
| Date Sta             |               |                | 08/2013                     |                 |                          |          |          |                      | e Comple         |           |             |                      |                  |                        |  | Inclina                 | tion \     | Verti     | cal                              |                      |  |
| Тор                  | Base          | Туре           | Date Start                  | ed Da           | ate Ended                | d Cre    | ew       | Section<br>Logged By | n Cor<br>By Bari | re<br>rel | Core<br>Bit | F                    | Equip            | ment                   | Sh<br>Su   | oring /<br>ipport       |            | R         | emarks                           |                      |  |
| 0.00<br>3.00         | 3.00<br>4.50  | CP<br>RO       | 07/08/201<br>07/08/201      | .3 0            | 07/08/2013<br>07/08/2013 | 3 TF     | Ъ        | TW<br>TW             | 5 3/4            |           |             |                      | Dando<br>Deltaba |                        |  | FI                      |            |           |                                  |                      |  |
| 4.50                 | 6.00          | CP             | 07/08/201                   | .3 0            | 07/08/2013               |          |          | TW                   | T61:             |           | Impreg      |                      | Dando            |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               | _              |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            | _         |                                  |                      |  |
|                      | _             |                |                             |                 | GRESS                    |          |          |                      |                  |           |             |                      |                  |                        |  | WATER STR               |            |           |                                  |                      |  |
| Date                 | Ti            | me             | Hole<br>depth               | Casing<br>depth | g Water<br>depth         | 1        | _        | Rema                 | rks              | _         |             | Date                 | e                | Time                   | Strike at<br>depth   | Rise to<br>depth        | tak        | me<br>ken | at strik                         | sing dep             | oth<br>o seal<br>flow                          |
| 07/08/20             | 013 1         | .900           | 6.00                        | 6.00            | -14.60                   | End c    | of Hole  | e                    |                  |           |             |                      |                  |                        |  |                         | LO 1       | rise      | time                             | +'                   | low  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 | RCUSSION                 |          |          |                      |                  |           |             | <u> </u>             |                  |                        |  | SPT DETA                |            |           |                                  |                      | ı  |
| Hard<br>from         | d Strata<br>n | Depth<br>to    | Start tir                   |                 | Duration                 | Remar    | rks      |                      |                  |           |             | Depth                | Туре             |                        | nental blow<br>etration in   |                         | Hami<br>No |           | Energy<br>ratio                  | Casing depth         | Water<br>depth                                 |
| 2.95                 |               | 3.00           | 1100                        | +               | hhmm<br>0200             | Chiselli | ing      |                      |                  |           |             | 0.50<br>1.50         | SPT              | N=19 (3,4              | 4,5,5,6,3)<br>7 7 8 9 8)   |                         | AR3<br>AR3 | 60        | 75<br>75                         | N/A<br>1.50          | -13.20<br>-13.10                               |
|                      |               |                |                             |                 |                          | 1        |          |                      |                  |           |             | 2.50<br>3.50<br>4.50 | SPT<br>SPT(C     | N=47 (2,9<br>50/0mm    | 4,5,5,6,3)<br>7,7,8,9,8)<br>9,8,11,12,16)<br>(25/0,50/0)<br>11,11,10,9,12<br>10,10,11,10,1 |                         | AR3<br>AR3 | 360       | 75<br>75<br>75<br>75<br>75<br>75 | 2.50<br>3.50<br>4.50 | -13.10<br>-13.60<br>-13.90<br>-14.50<br>-14.60 |
|                      |               |                |                             |                 |                          | l        |          |                      |                  |           |             | 4.50<br>5.50         | SPT(C            | N=42 (8,:<br>N=43 (7,: | 1`1,11,10,9,12<br>10,10,11,10,1  | )<br>2)                 | AR3<br>AR3 | 360       | 75<br>75                         | 4.50<br>5.50         | -14.50<br>-14.60                               |
|                      |               |                |                             |                 |                          | <u> </u> |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
| Fror                 | m T           | То             | RC                          |                 | FLUSH DE                 | ETAILS   |          | ush                  | Fi               | lush      |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
| dept                 |               | depth          |                             |                 | уре                      |          | ret      | turn<br>%            |                  | olour     |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
| 3.00                 |               | 4.50           |                             | Air/            | /Mist                    |          | 10       | 100                  | Brown            | n & gre   | у           |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
| нс                   | DI F DIA      | MFTFR          | / CASING                    |                 |                          | DYN      | AMIC     | C SAMPLII            | ING              |           | -           |                      |                  |                        |  |                         |            |           |                                  |                      |  |
| Hole                 | Depth         | of Cas         | sing Deptl                  |                 | Тор                      | Base     |          | ameter               | Time             |           | overy       |                      |                  |                        |  |                         |            |           |                                  |                      |  |
| diametei<br>200      | 6.00          |                | neter casi<br>00 6.0        |                 | $\rightarrow$            |          | +        | n                    | hhmmss           | 9         | ò           |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                | ATION DET                   |                 |                          |          |          | IPE CONS             |                  | _         |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
| Distance<br>from G.L |               | T              | ype R                       | espons<br>Top   | ise zone<br>  Base       | ID T     | P<br>Top | Pipe<br>  Base       | Dia.<br>of pipe  |           | e of<br>ipe |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          |          |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             | BACI            | KFILL DET                | 'ΔII S   |          |                      | <u></u>          |           | _           | <b> </b>             |                  |                        | * Seating b  | lows only.<br>SENERAL N | OTES       |           |                                  |                      |  |
| Тор о                |               | ase of         | M                           | aterial         |                          | AILS     | —        | Rema                 | arks             |           |             |                      |                  |                        |  | - ILIVERAL IV           |            |           |                                  |                      |  |
| sectio<br>0.00       |               | ection<br>6.00 | A                           | risings         |                          |          |          |                      |                  |           | _           |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          | 1        |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          | 1        |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          | 1        |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
|                      |               |                |                             |                 |                          | Щ.       |          |                      |                  |           |             |                      |                  |                        |  |                         |            |           |                                  |                      |  |
| NOTES                | Water         | strike         | metres, all<br>rise time in | minut           | tes, hard                |          |          | in hhmm              | า                |           |             |                      |                  |                        |  |                         |            |           | 4                                |                      |  |
|                      | For de        | tails of       | abbreviation                |                 |                          |          | <u></u>  | 22.42                | (2012.1          | 0.00.0    |             |                      |                  |                        |  |                         |            | :OII      | . eng                            |                      | חוחה   |
|                      |               |                |                             | Loa             | a Print Da <sup>r</sup>  | te And   | Lime     | e: 23/12/            | 2013 1           | .0:33:2   | 28          |                      |                  |                        |  |                         | 3          | OIL       | - CIIG                           | lilee                | KIIIG  |

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

TA7148

Project No.

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

**Exploratory Hole Log** 

Hole ID.

E107

Sheet 1 of 1

Ground Level -13.15m CD Coordinates 397600.63 E, 804504.87 N National Grid

Hole Type CP+RO Inclination

| Description of Strata  | Legend                                    | Depth   | Datum<br>Level | !                    | Sampling                       |      | Sample I | ount And<br>Recovery | In Situ<br>Det     |   | Ins  |
|--|---|---|----------------|----------------------|--------------------------------|------|----------|----------------------|--------------------|---|--|
|  |   |   | Level          | D                    | etails                         | Dia. | TCR SCR  | RQD                  | Det                | alis  | atit   |
| Medium dense slightly silty slightly gravelly fine to coarse<br>SAND. Gravel is subangular to subrounded fine to medium of<br>mixed igneous and metamorphic lithologies. |   | -   |                | D002                 | 0.00-0.50<br>0.50<br>0.50-0.95 |      | ,        |                      | SPT19<br>0.50      | 0.95  |  |
| from 1.50m to 2.95m dense  |   |   |                |                      | 1.50<br>1.50-1.95              |      |          |                      | SPT32<br>1.50      | 1.95  |  |
|  |   | 2.95  | -16.10         |                      | 2.50<br>2.50<br>2.50-2.95      |      |          |                      | SPT47<br>2.50      | 2.95  |  |
| Rotary openhole drilling. COBBLES and BOULDERS. (Driller's description)  | 7, C, C, C, C, C, C, C, C, C, C, C, C, C, |   |                |                      |                                |      |          |                      | SPT(C)50/0<br>3.50 | 3.50  |  |
| Dense grey slightly gravelly silty fine to coarse SAND. Gravel is subangular to subrounded fine of mixed igneous and metamorphic lithologies.                            | 0.000000000000000000000000000000000000    | 4.50<br><br><br><br><br><br>  | -17.65         | D010<br>B011<br>D012 | 4.50<br>4.50-4.95<br>5.00      |      |          |                      | SPT(C)42<br>4.50   | 4.95 -  |  |
|  |   | 6.00  | -19.15         | D013                 | 5.50                           |      |          |                      | SPT(C)43<br>5.50   | 5.95 -<br>-<br>-<br>-   |  |
| Exploratory hole complete at 6.00 m.   |   | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |                |                      |                                |      |          |                      |                    | -   | 1<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |
|  |   | -   |                |                      |                                |      |          |                      |                    | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | -  |
|  |   | -   |                |                      |                                |      |          |                      |                    | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-   | -  |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:33:31

SOIL ENGINEERING Part of the Bachy Soletanche Group

|                                  |                |                   | •                    | ј На              | rbour Dev              | elop        | men                           | t Groun             | d Inves         | stigation        | l            |                      |                       | Fxnlo                               | ratory                                | Hole L                 | വ     |                   | Ho                   | ole ID.              |                            |
|----------------------------------|----------------|-------------------|----------------------|-------------------|------------------------|-------------|-------------------------------|---------------------|-----------------|------------------|--------------|----------------------|-----------------------|-------------------------------------|---------------------------------------|------------------------|-------|-------------------|----------------------|----------------------|----------------------------|
| Project                          |                |                   | 148                  |                   |                        |             |                               |                     |                 |                  |              |                      |                       | LAPIO                               | idtory                                | TIOIC L                | og .  |                   | E                    | 108                  |                            |
| Engine<br>Employ                 |                |                   | h Hende              |                   | n LLP<br>our Board     |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      | eader                |                            |
| Ground                           |                |                   | 64m CD               | Iaib              | oui boaiu              |             |                               | Coo                 | rdinates        | 397              | 748          | 7.08 E,              | 80446                 | 60.80 N Na                          | ational Gri                           | <u></u>                |       |                   |                      | Eauei                |                            |
| Date Sta                         | arted          | 11/0              | 7/2013               |                   |                        |             |                               | Dat                 | e Compl         | eted 13/         | ′07 <i>i</i> | /2013                |                       |                                     |                                       | Inclina                | tion  | Verti             | cal                  |                      |                            |
| Тор                              | Base           | Туре              | Date Sta             | ırted             | Date Ende              | d C         | rew                           | Section<br>Logged E | Cor<br>By Bar   | re Cor<br>rel Bi | re<br>t      |                      | Equipr                | ment                                | SI<br>S                               | noring /<br>upport     |       | R                 | Remarks              |                      |                            |
| 0.00<br>3.65                     | 3.65<br>6.65   | CP<br>RC          | 11/07/2<br>12/07/2   | 013<br>013        | 11/07/201<br>13/07/201 | 3 \         | TP<br>WW                      | DT<br>DT            | T61             | .16 Impr         | eg           |                      | Dando<br>Deltaba      | 3000<br>se 515                      |                                       |                        |       |                   |                      |                      |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  | 4            |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
| Date                             | Ті             | me                | Hole                 |                   | ROGRESS<br>sing Wate   | ır İ        |                               | Rema                | arke            |                  | 4            | Dat                  | · a                   | Time                                | Strike a                              | WATER STR              | _     | me                | Car                  | sing dep             | nth.                       |
|                                  |                |                   | depth                | de                | pth dept               | h           |                               |                     |                 |                  |              | Dat                  | ·C                    | Time                                | depth                                 | depth                  | tal   | ken<br>rise       | at strik<br>time     | e to                 | o seal<br>flow             |
| 11/07/20<br>11/07/20<br>11/07/20 | 013   1        | 700<br>710<br>900 | 3.65<br>3.65<br>3.85 | 3.6<br>3.6<br>3.6 | 55 -13.40              | ) Sta       | l of CF<br>rt of R<br>l of Sh | otary               |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
| 12/07/20<br>12/07/20             | 013 0<br>013 1 | 700<br>900        | 3.85<br>4.85         | 3.6<br>3.6        | S5 NR<br>S5 NR         | Star<br>Enc | rt of S<br>I of Sh            | hift<br>ift         |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
| 13/07/20<br>13/07/20             |                | 700<br>400        | 4.85<br>6.65         | 3.6<br>3.6        | 55 -14.60<br>55 -14.10 |             | rt of S<br>I of Ho            |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
|                                  |                |                   | CA                   | BLE               | PERCUSSIO              | N DET       | AILS                          |                     |                 |                  | 1            |                      |                       |                                     |                                       | SPT DETA               | ILS   |                   |                      |                      |                            |
| Hard<br>from                     | l Strata       | Depth<br>to       | Start t              | ime               | selling<br>  Duration  | Rem         | arks                          |                     |                 |                  |              | Depth                | Туре                  |                                     | nental blov<br>etration in            |                        |       | nmer<br>Io.       | Energy<br>ratio      | Casing depth         | Water<br>depth             |
| 3.60                             |                | 3.65              | 143                  | 0                 | 0100                   | Chise       |                               |                     |                 |                  | +            | 1.00                 | SPT                   | N=4 (1,1,7<br>N=7 (1,2,7            | 1,1,1,1)                              |                        | ARS   | 360               | %<br>75              | 1.00                 | -13.70<br>-13.80           |
| 3.65                             |                | 3.65              | 153                  | U                 | 0100                   | Chise       | eiling                        |                     |                 |                  |              | 2.00<br>3.00<br>3.65 | SPT<br>SPT(C<br>SPT(C | N=7 (1,2,3<br>N=34 (4,6<br>) 50/0mm | 1,2,2,2)<br>5,8,8,9,9)<br>(25/0,50/0) |                        | AR3   | 360<br>360<br>360 | 75<br>75<br>75<br>75 | 2.00<br>3.00<br>3.65 | -13.80<br>-13.80<br>-15.60 |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      | ,                     |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  | 4            |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
| Fror                             | n              | То                |                      | ROTA              | RY FLUSH D             | ETAIL       |                               | lush                | FI              | lush             | 4            |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
| dept<br>3.65                     |                | depth<br>6.65     |                      |                   | type<br>Air/Mist       |             |                               | eturn<br>%<br>100   |                 | olour            | ╝            |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
| 3.05                             |                | 0.00              |                      |                   | AIT/IVIISL             |             |                               | 100                 | ۲               | ink              |              |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  | ╛            |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
|                                  | ,              |                   | / CASING             |                   |                        |             |                               | C SAMPL             |                 | 1_               |              |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
| Hole<br>diameter                 | hole           | dian              |                      | sing              | Тор                    | Base        | Di                            | iameter             | Time<br>hhmmss  | Recover<br>%     | У            |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
| 200<br>116                       | 3.65<br>6.65   | 2                 | 00 3                 | .65               |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
|                                  | IN             | ISTALLA           | ATION DE             | TAILS             | 5                      |             | F                             | PIPE CONS           | STRUCTION       | ON               | ┪            |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
| Distance<br>from G.L             |                | T                 | ype                  | Resp              | onse zone              | ID          | Тор                           | Pipe<br>  Base      | Dia.<br>of pipe | Type of pipe     |              |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  | ┪            |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      | Ì                    |                            |
|                                  |                |                   |                      | R                 | ACKFILL DE             | TAILS       |                               |                     |                 |                  | +            |                      |                       |                                     |                                       | olows only.  GENERAL N | IOTES |                   |                      |                      |                            |
| Top o                            |                | ase of            |                      | Mate              |                        | AILS        |                               | Rem                 | arks            |                  | $\dagger$    |                      |                       |                                     |                                       | GLIVEINALIV            | OTLS  |                   |                      |                      |                            |
| sectio<br>0.00                   |                | ection<br>6.65    |                      | Grou              | ut                     |             |                               |                     |                 |                  | ┨            |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
|                                  |                |                   |                      |                   |                        |             |                               |                     |                 |                  |              |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
| NOTES                            | : All dei      | oths in           | metres a             | ll dia            | meters in m            | illime      | tres                          |                     |                 |                  | _            |                      |                       |                                     |                                       |                        |       |                   |                      |                      |                            |
|                                  | Water          | strike            |                      | in mi             | nutes, hard            |             |                               | e in hhmn           | n               |                  |              |                      |                       |                                     |                                       |                        |       |                   | 4                    |                      |                            |
| $\vdash$                         |                |                   |                      |                   | Log Print Da           | ite And     | d Tim                         | e: 23/12            | /2013 1         | 0:32:19          |              |                      |                       |                                     |                                       |                        | 9     | SOII              | L eng                | inee                 | RING                       |

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

**Exploratory Hole Log** 

Hole ID. E108

Sheet 1 of 1

Ground Level -12.64m CD Coordinates 397487.08 E, 804460.80 N National Grid

Hole Type CP+RC Inclination

| Dense dark grey very gravelly fine to coarse SAND. Grave is subangular for subcounded fine to mixed igneous and metamorphic lithologies.  Medium dense dark grey slightly silty gravelly fine to coarse SAND. Grave is subangular to subcounded fine to medium of mixed ingeous and metamorphic lithologies.  190 1003 100 1004 100 145 100 1004 100 145 100 1004 100 145 100 1004 100 145 100 1004 100 145 100 100 100 100 100 100 100 100 100 10   | Description of Strata  | Legend | Depth                           | Datum  | Sampling                         | l    |     |     | ount A<br>Recov |                 | In Situ          |                            | Inst |
|--|--|--------|---------------------------------|--------|----------------------------------|------|-----|-----|-----------------|-----------------|------------------|----------------------------|------|
| 1,90   |  |        |                                 | Level  | Details                          | Dia. | TCR | SCR | RQD             | IF              | Deta             | alls                       | atio |
| Medium dense dark grey slightly sitly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to medium of mixed ingeous and metamorphic lithologies.  from 1.90m to 3.60m driller notes clay bands  Dense dark grey very gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of granite and schist.  Strong to very strong grey speckled pink GRANITE. Discontinuties: 1) 2.00 degrees closely spaced planar rough clean. from 4.20m to 4.52m 1 No pink and white quartzite vein 10-80 degrees undulating (8-22mm) from 4.65m to 4.70m recovered as non intact core (angular coarse gravel sized fragments)  The coarse gravel sized fragments are coarse gravel sized fragments)  1.14.54  DO07 2.00-2.45  B008 2.00-2.45  B009 2.00- | Gravel is angular to subrounded fine of mixed igneous and  | X      |                                 |        |                                  |      |     | l.  |                 |                 |                  |                            |      |
| Medium dense dark grey slightly sitly gravelly fine to coarse SAND. Gravel is subangular from to subrounded fine to medium of mixed ingeous and metamorphic lithologies. from 1.90m to 3.60m driller notes clay bands  Dense dark grey very gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of granite and schist.  Strong to very strong grey speckled pink GRANITE. Discontinuities: 1) 20-30 degrees medium spaced planar rough clean. from 4.20m to 4.52m 1 No pink and white quartzite vein 10-80 degrees medium spaced planar rough clean. from 4.20m to 4.52m 1 No pink and white quartzite vein 10-80 degrees undulating (8-22mm) from 4.55m to 4.70m recovered as non intact core (angular coarse gravel sized fragments)  from 6.55m to 5.89m recovered as non intact core (angular coarse gravel sized fragments)  5.95 6.65 92 100 93 17  |  |        |                                 |        | D004 1.00-1.45<br>B005 1.00-1.45 |      |     |     |                 |                 |                  | 1.45                       |      |
| Dense dark grey very gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of granite and schist.  Strong to very strong grey speckled pink GRANITE. Discontinuities: 1) 20-30 degrees closely spaced planar rough clean. 2) 70-80 degrees medium spaced planar rough clean. 10-80 degrees undulating (8-22mm) from 4.55m to 4.70m recovered as non intact core (angular coarse gravel sized fragments)  from 5.68m to 5.89m recovered as non intact core (angular coarse gravel sized fragments)  5.95 6.65 92 100 93 17   | SAND. Gravel is subangular to subrounded fine to medium of mixed ingeous and metamorphic lithologies.  | *      | 1.90 -                          | -14.54 | B008 2.00-2.45                   |      |     |     |                 |                 |                  | 2.45 -<br>-<br>-<br>-<br>- |      |
| Dense dark grey very gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of granite and schist.  Strong to very strong grey speckled pink GRANITE.  Discontinuities: 1) 20-30 degrees closely spaced planar rough clean. from 4.20m to 4.52m 1 No pink and white quartzite vein 10-80 degrees undulating (8-22mm) from 4.65m to 4.70m recovered as non intact core (angular coarse gravel sized fragments)  From 5.68m to 5.89m recovered as non intact core (angular coarse gravel sized fragments)  SPTIC/SO/Omm 3.65 3.65 3.65 3.65 3.65 3.65 3.65 3.65  | ,  | ×      |                                 |        |                                  |      |     |     |                 |                 |                  | -                          |      |
| Dense dark grey very gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of granite and schist.  Strong to very strong grey speckled pink GRANITE.  Discontinuities: 1) 20-30 degrees closely spaced planar rough clean. 2) 70-80 degrees medium spaced planar rough clean. 10-80 degrees undulating (8-22mm) 10-90 degrees undulating (8-22mm) 10-80 degrees undul |  |        |                                 |        |                                  |      |     |     |                 |                 | SPT(C)34<br>3.00 | 3.45                       |      |
| Discontinuities: 1) 20-30 degrees closely spaced planar rough clean. 2) 70-80 degrees medium spaced planar rough clean. from 4.20m to 4.52m 1 No pink and white quartzite vein 10-80 degrees undulating (8-22mm) from 4.65m to 4.70m recovered as non intact core (angular coarse gravel sized fragments)  In the following spaced planar rough clean. Sign of the following spaced planar r |  | ++++   |                                 |        |                                  |      |     |     |                 |                 |                  |                            |      |
| from 5.68m to 5.89m recovered as non intact core (angular coarse gravel sized fragments)  4.85 5.95 92 100 81 31  4.85 5.95 92 100 81 31  5.95 6.65 92 100 93 17   | Discontinuities: 1) 20-30 degrees closely spaced planar rough clean. 2) 70-80 degrees medium spaced planar rough clean. from 4.20m to 4.52m 1 No pink and white quartzite vein 10-80 degrees undulating (8-22mm) from 4.65m to 4.70m recovered as non intact core (angular | *****  |                                 |        | 3.65 4.8!                        | 92   | 100 | 96  | 22              |                 |                  |                            |      |
| from 6.35m to 6.40m recovered as non intact core (angular  |  | *****  |                                 |        | 4.85 5.99                        | 92   | 100 | 81  | 31              | NI<br>75<br>200 |                  |                            |      |
| 6.65   -19.29  |  | *****  | 6.65                            | -19.29 | 5.95 6.69                        | 92   | 100 | 93  | 17              |                 |                  | -                          |      |
|  |  |        | -<br>-<br>-<br>-<br>-<br>-<br>- |        |                                  |      |     |     |                 |                 |                  | -<br>-<br>-<br>-<br>-<br>- |      |
|  |  |        | -<br>-<br>-<br>-<br>-           |        |                                  |      |     |     |                 |                 |                  | -<br>-<br>-<br>-           |      |
|  |  |        | -<br>-<br>-<br>-                |        |                                  |      |     |     |                 |                 |                  | -<br>-<br>-<br>-           |      |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:32:22

SOIL ENGINEERING Part of the Bachy Soletanche Group

| Projec               | t Nam            | ne Bay         | of Nigg            | Har          | rbour Dev                  | elop              | men             | t Groun           | d Inves         | tigati     | on          |  |                   | Evolo                               | ratory I                               | ا مام ا                | 00                |          | Ho                         | le ID.               |                            |
|----------------------|------------------|----------------|--------------------|--------------|----------------------------|-------------------|-----------------|-------------------|-----------------|------------|-------------|--|-------------------|-------------------------------------|--|------------------------|-------------------|----------|----------------------------|----------------------|----------------------------|
| Projec               |                  |                | 148                |              |                            |                   |                 |                   |                 |            |             |  |                   | Explo                               | iatory i                               | TOIR L                 | og                |          | F                          | 109                  |                            |
| Engine               |                  |                | h Hende            |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
| Emplo<br>Ground      |                  |                | erdeen H<br>23m CD | arbo         | our Board                  |                   |                 | Cor               | ordinates       |            | 3974        | 91 45 F  | 80450             | 00 34 N Na                          | ational Grid                           |                        |                   |          | H                          | eader                |                            |
| Date Sta             |                  |                | 07/2013            |              |                            |                   |                 |                   | te Compl        |            |             |  | 00 150            | 30.3 1 14 140                       | ational and                            | Inclina                | tion \            | /ertic   | cal                        |                      |                            |
| Тор                  | Base             | Туре           | Date Star          | ted          | Date Ende                  | d C               | rew             | Section<br>Logged | n Co<br>By Bar  | re<br>rel  | Core<br>Bit |  | Equip             | ment                                | She<br>Su                              | oring /<br>pport       |                   | R        | temarks                    |                      |                            |
| 0.00                 | 5.90             | СР             | 17/07/20           | 13           | 17/07/201                  | 3                 | TP              | DT                | , <u> </u>      |            | 5.0         | <del>                                       </del> | Dando             | 3000                                |  | pport                  |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    | PR           | ROGRESS                    |                   |                 |                   |                 |            |             |  |                   |                                     |  | VATER STR              | RIKES             |          |                            |                      |                            |
| Date                 | Т                | ime            | Hole<br>depth      | Cas<br>dep   | ing Wate                   | er<br>h           |                 | Rem               | arks            |            |             | Dat  | te                | Time                                | Strike at depth                        | Rise to depth          | Tin<br>tak        | ne<br>en | Cas<br>at strik            | sing der             | oth<br>o seal              |
| 17/07/2              | 013              | 2000           | 5.90               | 5.8          |                            |                   | d of Ho         | ole               |                 |            |             | <u> </u>   |                   |                                     | чери                                   | черин                  | tor               | ise      | time                       |                      | o seal<br>flow             |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                | CA                 | RIFF         | PERCUSSIO                  | N DET             | ΓΔΙΙς           |                   |                 |            |             |  |                   |                                     |  | SPT DETA               | II S              |          |                            |                      |                            |
| Haro                 | l Strata         | Depth          |                    | Chis         | elling                     |                   | narks           |                   |                 |            |             | Depth  | Туре              |                                     | nental blow                            | count /                | Hamr              |          | Energy                     | Casing               |                            |
| fron                 |                  | to             | Start ti<br>hhmi   | n            | Duration<br>hhmm           |                   |                 |                   |                 |            |             |  |                   |                                     | etration in I                          | mm                     | No                |          | ratio<br>%                 | depth                |                            |
| 5.80                 |                  | 5.90           | 1730               | )            | 0200                       | Chis              | elling          |                   |                 |            |             | 1.00<br>2.00<br>3.00                               | SPT<br>SPT<br>SPT | N=24 (2,2<br>N=32 (4,6              | 2,3,5,7,9)<br>5,7,8,8,9)<br>5,8,8,9,9) |                        | AR3<br>AR3<br>AR3 | 60       | 75<br>75<br>75<br>75<br>75 | 1.00<br>2.00<br>3.00 | -13.95<br>-13.15           |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             | 4.00<br>5.00                                       | SPT<br>SPT        | N=34 (4,6<br>N=34 (5,7<br>N=37 (6,8 | 7,7,9,9,9)<br>8,9,8,9,11)              |                        | AR3               | 60       | 75<br>75                   | 4.00<br>5.00         | -13.20<br>-12.20<br>-12.35 |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     | ,                                      |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    | OT A I       | DV ELLICIT E               | T A II            | <u> </u>        |                   |                 |            |             | -  |                   |                                     |  |                        |                   |          |                            |                      |                            |
| From                 |                  | То             |                    | OTAL         | RY FLUSH D                 | EIAIL             | F               | lush              |                 | ush        |             | 1  |                   |                                     |  |                        |                   |          |                            |                      |                            |
| dept                 | in               | depth          | !                  |              | type                       |                   | re              | eturn<br>%        | CO              | lour       |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
| НС                   | DLE DIA          | METER          | / CASING           |              |                            | DY                | NAMI            | C SAMPL           | ING             |            |             | 1  |                   |                                     |  |                        |                   |          |                            |                      |                            |
| Hole<br>diameter     |                  | n of Ca        |                    | th of<br>ing | Тор                        | Base              | Di              | ameter            | Time<br>hhmmss  | Reco       |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
| 200                  | 5.90             |                | 00 5.8             |              |                            |                   |                 |                   | 11111111133     | 70         |             | 1  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                | ATION DET          |              |                            |                   |                 | PIPE CON          |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
| Distance<br>from G.L |                  | 1              | ype                | Resp<br>To   | onse zone<br>p   Base      | ID                | Тор             | Pipe<br>  Base    | Dia.<br>of pipe | Type<br>pi | of<br>pe    |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    | D/           | ACKFILL DET                | LVII C            |                 |                   |                 |            |             |  |                   |                                     | * Seating bl                           | ows only.<br>iENERAL N | IOTES             |          |                            |                      |                            |
| Тор о                | of E             | Base of        | l N                | later        |                            | IAILS             |                 | Rem               | arks            |            |             |  |                   |                                     |  | IENERAL IV             | OTES              |          |                            |                      |                            |
| section<br>0.00      | n s              | ection<br>5.90 |                    | Grou         | ıt                         |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
|                      |                  |                |                    |              |                            |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   |          |                            |                      |                            |
| NOTES                | : All de<br>Wate | pths in        | metres, al         | l diar       | meters in m<br>nutes, hard | illime<br>I strat | tres.<br>a time | e in hhmr         | n               |            |             |  |                   |                                     |  |                        |                   |          | 4                          |                      |                            |
|                      | For d            | etails of      | abbreviat          | ions,        | , see key                  |                   |                 |                   |                 |            |             |  |                   |                                     |  |                        |                   | <b>~</b> |                            |                      | 0:55                       |
| 1                    |                  |                |                    | L            | Log Print Da               | ite An            | d Tim           | e: 23/12          | /2013 1         | 0:22:3     | 9           |  |                   |                                     |  |                        | S                 | UIL      | _ eng                      | mee                  | RING                       |

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

TA7148

Engineer

Employer

Arch Henderson LLP Aberdeen Harbour Board **Exploratory Hole Log** 

Hole ID.

E109 Sheet 1 of 1

Ground Level -12.23m CD Coordinates 397491.45 E, 804500.34 N National Grid

Hole Type Inclination

| Description of Strata   | Legend | Depth     | Datum<br>Level | Sampling                         |      | Blo<br>Sam | w Cou<br>ple Re | ınt An<br>ecover | d<br>ry  | In Situ<br>Deta |            | Insta |
|---|--------|-----------|----------------|----------------------------------|------|------------|-----------------|------------------|----------|-----------------|------------|-------|
|   |        |           | Level          | Details                          | Dia. | TCR        | SCR F           | RQD              |          | Deta            | IIS        | atio  |
| Grey slightly silty fine to coarse SAND.  | X      | 1 1 1 1 1 |                | B002 0.00-1.00<br>ES001 0.50     |      |            | ·               | •                |          |                 | 11.11.11.1 |       |
| Dense grey slightly silty very gravelly fine to coarse SAND. Gravel is angular to subrounded fine to medium of granite, schist and quartzite. | ×××    | 1.00      | -13.23         | D003 1.00-1.45<br>B004 1.00-1.45 |      |            |                 |                  |          | PT24<br>00      | 1.45 -     |       |
|   |        |           |                | ES005 1.50<br>B006 1.50-2.00     |      |            |                 |                  |          |                 |            |       |
|   |        |           |                | D007 2.00-2.45<br>B008 2.00-2.45 |      |            |                 |                  | 2.       | PT32<br>00      | 2.45 -     |       |
|   |        |           |                | ES009 2.50<br>B010 2.50-3.00     |      |            |                 |                  |          |                 | 11111      |       |
|   |        | 1111      |                | D011 3.00-3.45<br>B012 3.00-3.45 |      |            |                 |                  | SF<br>3. | PT34<br>00      | 3.45 -     |       |
|   |        |           |                | ES013 3.50<br>B014 3.50-4.00     |      |            |                 |                  |          |                 |            |       |
|   |        |           |                | D015 4.00-4.45<br>B016 4.00-4.45 |      |            |                 |                  |          | PT34<br>00      | 4.45 -     |       |
|   |        |           |                | ES017 4.50                       |      |            |                 |                  |          |                 | 11111      |       |
|   |        | 1         |                | D018 5.00-5.45<br>B019 5.00-5.45 |      |            |                 |                  | SF<br>5. | PT37<br>00      | 5.45       |       |
|   |        | 5.80      | -18.03         | ES020 5.50                       |      |            |                 |                  |          |                 | 111111     |       |
| No recovery. Possible rockhead. (Driller's description)   |        | 5.90      | -18.13         |                                  |      |            |                 |                  |          |                 | _          |       |
| Exploratory hole complete at 5.90 m.  |        | 2.30      | -18.13         |                                  |      |            |                 |                  |          |                 |            |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Form No. SIEXPHOLELOG

Log Print Date And Time: 23/12/2013 10:22:41

SOIL ENGINEERING Part of the Bachy Soletanche Group

|                       |                  | -              | •                   | g Hai           | rbour Dev             | /elop               | ment                   | : Ground        | d Inves              | tigatio       | n          |           |          | Evnlo        | ratory l                     | Hole Lo               | 20               | Нс               | ole ID.      | 1                |
|-----------------------|------------------|----------------|---------------------|-----------------|-----------------------|---------------------|------------------------|-----------------|----------------------|---------------|------------|-----------|----------|--------------|------------------------------|-----------------------|------------------|------------------|--------------|------------------|
| Project               |                  |                | 7148                |                 |                       |                     |                        |                 |                      |               |            |           |          | Lybici       | atory                        | IOIC L                | Jy               | Е                | 110          | ļ                |
| Engine                |                  |                | h Hend              |                 |                       | -                   |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
| Employ<br>Ground I    |                  |                | erdeen I<br>.73m CD |                 | our Board             |                     |                        |                 | rdinates             | - 30          | 7740       | 07 52 E ( | 20445    | 2 72 NI NIa  | tional Grid                  |                       |                  | н                | leader       |                  |
| Date Sta              |                  |                | .73m CD<br>07/2013  |                 |                       |                     |                        |                 | rdinates<br>e Comple |               |            | ,         | 80443    | 14./3 IV IVa | tionai Griu                  | Inclinat              | tion Verti       | cal              |              |                  |
| Тор                   | Base             |                | Date Sta            |                 | Date Ende             | ed (                | Crew                   | Section         | Cor                  |               | ore<br>Bit |           | Equipr   | ment         | Sho                          | oring /               |                  | Remarks          |              | -                |
| 0.00                  | 2.15             | СР             | 15/07/2             | 2013            | 15/07/201             | 3                   | TP                     | Logged By<br>DT |                      |               | iit        | [         | Dando    | 3000         | Su                           | pport                 |                  |                  |              |                  |
| 2.15                  | 5.85             | RC             | 15/07/2             | 2013            | 16/07/201             | 3                   | ww                     | DT              | T611                 | 16 Imp        | oreg       |           | Peltabas | se 515       |                              |                       |                  |                  |              | ļ                |
| .                     |                  |                |                     |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              | •                |
|                       |                  |                |                     |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              | ļ                |
|                       |                  | <u> </u>       |                     |                 |                       |                     |                        |                 |                      |               | _          | <u> </u>  |          |              |                              |                       |                  |                  |              |                  |
| Date                  |                  | ime            | Hole                | PR              | ROGRESS<br>sing Wate  |                     |                        | Rema            |                      |               | $\dashv$   | Date      | 2        | Time         | V<br>Strike at               | NATER STRI<br>Rise to | IKES<br>Time     | T Ca             | sing dep     | \+h              |
|                       |                  |                | depth               | dep             | pth dept              | th                  |                        |                 |                      |               |            | Date      |          |              | depth                        | depth                 | taken<br>to rise | at strik<br>time | ke i to      | o seal<br>flow   |
| 15/07/20<br>15/07/20  | 013 2            | 1200<br>2000   | 2.15<br>2.30        | 2.1<br>2.3      | 30 NR                 | En                  | nd of CP<br>nd of Shif | ift             |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
| 16/07/20<br>16/07/20  | 013 0            | 0730<br>2000   | 2.30<br>5.85        | 2.3             | 30 -18.15             | 5 Sta               | art of Sh<br>Id of Hol |                 |                      |               |            | 1         |          |              |                              |                       |                  |                  |              |                  |
| I                     |                  |                | I                   |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
| I                     |                  |                | I                   |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
|                       |                  |                | I                   |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              | •                |
| I                     |                  |                | I                   |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
| L                     |                  |                | I                   |                 |                       | $\perp$             |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
|                       |                  |                | C                   | ABLE F          | PERCUSSIO             | N DE                | TAILS                  |                 |                      |               |            |           |          |              |                              | SPT DETAI             |                  |                  |              |                  |
| Hard<br>from          | Strata           | Depth<br>to    | Start               | time            | selling<br>  Duration |                     | narks                  |                 |                      |               | _          | Depth     | Туре     |              | nental blow<br>etration in r |                       | Hammer<br>No.    | Energy<br>ratio  | Casing depth | Water<br>depth   |
| 2.10                  | -                | 2.15           | hhm<br>093          | mm              | hhmm<br>0200          |                     | selling                |                 |                      |               | $\dashv$   | 1.50      | SPT      | N=31 (3,4    | ,8,7,8,8)                    |                       | AR360            | %<br>75          | 1.50<br>2.15 | -13.80<br>-13.80 |
| I                     |                  |                |                     |                 |                       |                     |                        |                 |                      |               |            | 2.15      | SPT      | 50/0mm (     | (25/0,50/0)                  |                       | AR360            | 75               | 2.15         | -13.80           |
|                       |                  |                |                     |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
|                       |                  |                |                     |                 |                       |                     |                        |                 |                      |               |            | 1         |          |              |                              |                       |                  |                  |              |                  |
|                       |                  |                |                     | ROTA            | I<br>RY FLUSH D       | DETAI               | L.S                    |                 |                      |               | $\dashv$   | 1         |          |              |                              |                       |                  |                  |              |                  |
| From<br>dept          |                  | To<br>depth    |                     |                 | Flush<br>type         |                     | Flu                    | lush<br>turn    |                      | lush<br>olour | $\neg$     | 1         |          |              |                              |                       |                  |                  |              |                  |
| 2.15                  |                  | 2.30           | +                   |                 | Air/Mist              | !                   | 1                      | %<br>100        | Gı                   | arey          | $\dashv$   | 1         |          |              |                              |                       |                  |                  |              |                  |
| 2.30                  |                  | 5.85           |                     |                 | Air/Mist              | I                   |                        | 100             |                      | k/Grey        |            | 1         |          |              |                              |                       |                  |                  |              |                  |
|                       |                  |                |                     |                 |                       | I                   |                        |                 |                      |               |            | 1         |          |              |                              |                       |                  |                  |              |                  |
|                       |                  |                |                     |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
|                       |                  |                |                     |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
| НО                    | LE DIAI          | METER          | / CASINO            | G               |                       | DY                  | NAMI                   | C SAMPLII       | NG                   |               | $\neg$     | İ         |          |              |                              |                       |                  |                  |              |                  |
| Hole<br>diameter      | Depth            |                |                     | pth of<br>asing | Тор                   | Base                | Dia                    |                 | Time<br>hhmmss       | Recove        | ry         |           |          |              |                              |                       |                  |                  |              |                  |
| 200<br>139            | 2.15<br>2.30     | 5 20           | 200 2               | 2.15<br>2.30    |                       |                     |                        |                 |                      |               | $\dashv$   |           |          |              |                              |                       |                  |                  |              |                  |
| 116                   | 5.85             | 1              |                     | 50              |                       |                     |                        |                 | ļ                    |               |            |           |          |              |                              |                       |                  |                  |              |                  |
| l                     |                  |                |                     |                 |                       |                     |                        |                 | ļ                    |               |            |           |          |              |                              |                       |                  |                  |              |                  |
|                       |                  |                |                     |                 |                       |                     |                        |                 |                      |               |            | ĺ         |          |              |                              |                       |                  |                  |              |                  |
| <u> </u>              |                  |                | ATION DE            |                 |                       |                     |                        | IPE CONS        |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
| Distance<br>from G.L. |                  | , T            | ype                 | Respo           | onse zone<br>p   Base | ID                  | Top                    | Pipe<br>  Base  | Dia.<br>of pipe      | Type o        |            |           |          |              |                              |                       |                  |                  |              |                  |
|                       |                  | 1              |                     |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  | 1            |                  |
|                       |                  | 1              |                     |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  | 1            |                  |
|                       |                  | Щ_             |                     | Щ               |                       | <u> </u>            | <u> </u>               | <u> </u>        |                      | <u> </u>      | _          | <u> </u>  |          |              | * Seating bl                 |                       |                  |                  | <u></u>      |                  |
| Top of                | <del>-   -</del> | Base of        |                     | BA<br>Mater     | ACKFILL DET           | TAILS               |                        | Rema            |                      |               | $\dashv$   |           |          |              | G                            | ENERAL NO             | OTES             |                  |              |                  |
| section<br>0.00       | n se             | ection<br>5.85 | ــــــ              | Grou            |                       | ₩                   |                        |                 |                      |               | _          |           |          |              |                              |                       |                  |                  |              |                  |
| 0.00                  |                  | 5.05           |                     | Grou            |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
|                       |                  |                |                     |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
|                       |                  |                |                     |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
|                       |                  |                |                     |                 |                       |                     |                        |                 |                      |               |            |           |          |              |                              |                       |                  |                  |              |                  |
| NOTES:                | All de           | pths in        | metres.             | all dia         | meters in m           | nillim <sub>'</sub> | etres.                 |                 |                      | -             | _          |           |          |              |                              |                       |                  |                  |              |                  |
|                       | Water            | r strike ı     |                     | in mir          | nutes, hard           |                     |                        | in hhmm         | 1                    |               |            |           |          |              |                              |                       |                  | 1                |              |                  |
|                       |                  |                |                     |                 | Log Print Da          | ate Ar              | nd Time                | e: 23/12/       | /2013 1              | 0:32:27       |            |           |          |              |                              |                       | SOII             | L eng            | inee         | RING             |

Log Print Date And Time: 23/12/2013 10:32:27

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 E110 Engineer Arch Henderson LLP

Employer Aberdeen Harbour Board

Ground Level -14.73m CD Coordinates 397497.53 E, 804434.73 N National Grid

| Hole Type | CP+RC | Inclination | Vertical |  |
|-----------|-------|-------------|----------|--|
|-----------|-------|-------------|----------|--|

| Description of Strata   | Legend                                | Depth         | Datum            | Si                                    | ampling  |      |     |     | ount A<br>Recov |                  | In Situ Test           | Insta |
|---|---------------------------------------|---------------|------------------|---------------------------------------|--|------|-----|-----|-----------------|------------------|------------------------|-------|
| Description of Strata   | Legend                                | Берин         | Level            | De                                    | tails  | Dia. | TCR | SCR |                 | IF.              | Details                | ation |
| Medium dense dark grey slightly silty slightly gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of schist and granite. from 0.00m to 1.50m driller notes loose  |                                       |               |                  | ES002 1<br>D003 1<br>D004 1<br>B005 1 | 0.00-1.35<br>0.00-1.35<br>0.40<br>0.45<br>0.50-1.95<br>0.50-1.95 |      |     |     |                 |                  | SPT31<br>1.50 1.95     |       |
| No recovery. GRANITE. (Driller's description)   | ++++                                  | 2.15 <u> </u> | -16.88<br>-17.03 | B007 2                                | 2.00-2.10  |      |     |     |                 |                  | SPT50/0mm<br>2.15 2.15 |       |
| Strong to very strong grey and pink coarse crystalline GRANITE. Discontinuities: 1) 10-20 degrees closely to medium spaced planar rough clean. 2) 70-80 degrees medium spaced planar rough clean.                                 | *****                                 | 2.30          | -17.05           | 2.30                                  | 3.15   | 92   | 100 | 100 | 86              |                  | -                      |       |
|   | * * * * * * * * * * * * * * * * * * * |               |                  | 3.15                                  | 4.75   | 92   | 100 | 100 | 87              | 50<br>160<br>200 | -                      |       |
| from 5.22m to 5.30m recovered as non intact core (angular coarse gravel sized fragments) from 5.52m to 5.77m recovered as non intact core (angular medium to coarse gravel sized fragments)  Exploratory hole complete at 5.85 m. | *****                                 | 5.85          | -20.58           | 4.75                                  | 5.85   | 92   | 100 | 72  | 58              | NI<br>140<br>200 |                        |       |
| Exporatory note complete at 5.05 m.   |                                       |               |                  |                                       |  |      |     |     |                 |                  | -                      |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG

Issue Date 22/10/2012



Sheet 1 of 1

| -                      |              | _              |                    | g Harl       | bour Dev                   | elop      | men                  | Ground               | Inves           | tigatio     | n            |              |            | Fxnlor                              | ratory H                     | Hole Lo    | 00               | Но               | ole ID.      |                  |
|------------------------|--------------|----------------|--------------------|--------------|----------------------------|-----------|----------------------|----------------------|-----------------|-------------|--------------|--------------|------------|-------------------------------------|------------------------------|------------|------------------|------------------|--------------|------------------|
| Project                |              | TA7            |                    |              |                            |           |                      |                      |                 |             |              |              |            | -xpioi                              | acory i                      | 1010 20    | 79               | Ε                | 111          |                  |
| Engine                 |              |                | n Hende            |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
| Employ<br>Ground L     |              |                | rdeen F<br>72m CD  | larbo        | ur Board                   |           |                      | Coor                 | rdinates        | 31          | 9738         | R6 91 F 3    | 80439      | 1 24 N Na                           | tional Grid                  |            |                  | Н                | eader        |                  |
| Date Star              |              |                | 8/2013             |              |                            |           |                      |                      | Comple          |             |              |              | 00433      | 71.24 IV IVG                        | tional and                   | Inclinat   | ion Verti        | cal              |              |                  |
| Тор                    | Base         | Туре           | Date Sta           | rted         | Date Ende                  | d C       | Crew                 | Section<br>Logged By | Cor<br>y Barr   | e C         | ore<br>Bit   | E            | Equip      | ment                                | Sho                          | oring /    | F                | Remarks          |              |                  |
| 0.00                   | 3.50         | СР             | 12/08/2            | 013          | 12/08/201                  | 3         | TT                   | TW                   |                 |             |              |              | Dando      | 3000                                | Su                           | эрогс      |                  |                  |              |                  |
| 3.50<br>4.40           | 4.40<br>6.00 | RC<br>RC       | 12/08/2<br>13/08/2 |              | 12/08/201<br>13/08/201     |           | TT<br>WW             | TW<br>TW             | T61:            |             | preg<br>preg |              |            | se 515<br>se 515                    |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    | PRO          | OGRESS                     |           |                      |                      |                 |             |              |              |            |                                     |                              | VATER STRI | KES              |                  |              |                  |
| Date                   | Ti           | me             | Hole               | Casii        | no Wate                    | r         |                      | Rema                 | rks             |             |              | Date         | e          | Time                                | Strike at                    | Rise to    | Time             | Ca               | sing dep     | th               |
| 12/08/20:              | 13 1         | 710            | depth<br>3.30      | 3.30         | ) -14.90                   | ) En      | d of CP              | /Start of Ro         | tarv            |             |              |              |            |                                     | depth                        | depth      | taken<br>to rise | at stril<br>time | de lu        | seal<br>low      |
| 12/08/20:<br>13/08/20: | 13 1<br>13 0 | 900<br>700     | 4.40<br>4.40       | 4.00<br>4.40 | -20.10<br>-15.20           | En<br>Sta | d of Sh<br>art of Sh | ft<br>ift            | cury            |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
| 13/08/20               | 13 1         | 200            | 6.00               | 4.00         | -20.10                     | ) En      | d of Ho              | le                   |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                | C.A                | ABLE P       | ERCUSSIO                   | N DE1     | ΓAILS                |                      |                 |             |              |              |            |                                     | ı                            | SPT DETAI  | LS               | 1                | <u> </u>     |                  |
| Hard :                 | Strata       | Depth<br>to    | Start t            | Chise        | elling<br>Duration         | Ren       | narks                |                      |                 |             |              | Depth        | Туре       |                                     | nental blow<br>etration in r |            | Hammer<br>No.    | Energy<br>ratio  | Casing depth | Water<br>depth   |
| 110111                 |              | 10             | hhm                | ım           | hhmm                       |           |                      |                      |                 |             |              | 0.50         | SPT        |                                     |                              |            | AR360            | %                | N/A          | -13.40           |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              | 1.50<br>2.50 | SPT<br>SPT | N=28 (2,4<br>N=28 (3,4<br>N=36 (5,6 | ,5,6,6,11)<br>,6,8,9,13)     |            | AR360<br>AR360   | 75<br>75<br>75   | 1.50<br>2.50 | -13.80<br>-14.60 |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                | ,                  |              | Y FLUSH D                  | ETAIL     |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
| From<br>depth          |              | To<br>depth    |                    |              | Flush<br>type              |           |                      | ush<br>turn          |                 | ush<br>Iour |              |              |            |                                     |                              |            |                  |                  |              |                  |
| 3.30                   |              | 6.00           |                    | ١            | Water                      |           | :                    | %<br>L00             | Bro             | own         |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    | . 1          |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
| Hole                   |              | of Cas         | / CASING           | th of        | Тор                        | Base      |                      | C SAMPLII<br>ameter  | NG<br>Time      | Recove      | erv          |              |            |                                     |                              |            |                  |                  |              |                  |
| diameter<br>150        | hole<br>4.00 | dian           | neter ca           | sing<br>.00  | .,                         |           |                      |                      | hmmss           | %           | _            |              |            |                                     |                              |            |                  |                  |              |                  |
| 116                    | 6.00         |                |                    | .00          |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        | IN           | ISTALLA        | TION DE            | TAILS        |                            |           | Р                    | IPE CONS             | TRUCTIO         | ON          |              |              |            |                                     |                              |            |                  |                  |              |                  |
| Distance<br>from G.L.  | ID           | Ty             | /pe                | Respo        | onse zone<br>D   Base      | ID        | Тор                  | Pipe<br>  Base       | Dia.<br>of pipe | Type o      |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              | CI(E = :                   |           |                      |                      |                 |             | _            |              |            |                                     | * Seating blo                |            |                  |                  |              |                  |
| Top of                 | R            | ase of         | ı                  | BA<br>Materi | CKFILL DET                 | AILS      |                      | Rema                 | ırks            |             | $\dashv$     |              |            |                                     | G                            | ENERAL NO  | JIES             |                  |              |                  |
| section<br>0.00        | S            | ection<br>3.30 |                    | Arising      |                            |           |                      | Remo                 |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
| 3.30                   |              | 6.00           |                    | Grout        |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              |                  |
|                        |              |                |                    |              |                            |           |                      |                      |                 |             |              |              |            |                                     |                              |            | 1                |                  |              |                  |
|                        |              |                |                    |              | neters in m<br>lutes, hard |           |                      | in hhmm              |                 |             |              |              |            |                                     |                              |            |                  | A                |              |                  |
|                        | For de       |                | abbrevia           | tions,       | see key                    |           |                      |                      |                 |             |              |              |            |                                     |                              |            |                  |                  |              | 010-             |
| Unchecl                | ked          |                |                    | Lo           | og Print Da                | te An     | d Tim                | e: 23/12/            | 2013 10         | 0:32:34     |              | -            |            |                                     |                              |            | 501              | L eng            | ınee         | RING             |

Form No. SIEXPHOLEHDR

Issue.Revision No. 1.05

Project No. TA7148

Engineer

Employer

Arch Henderson LLP Aberdeen Harbour Board

## **Exploratory Hole Log**

Hole ID.

E111

Sheet 1 of 1

Ground Level -12.72m CD Coordinates 397386.91 E, 804391.24 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend | Depth                           | Datum            | Sa   | ampling              |      |     |     | ount A<br>Recov |                 |               | u Test | Ins |
|--|--------|---------------------------------|------------------|------|----------------------|------|-----|-----|-----------------|-----------------|---------------|--------|-----|
|  |        |                                 | Level            | De   | tails                | Dia. | TCR | SCR | RQD             | IF              | Det           | tails  | ati |
| Medium dense grey silty fine to coarse SAND. (Driller notes<br>boulders).  |        |                                 |                  |      | .50-0.95<br>.50-1.00 |      |     |     |                 |                 | SPT28<br>0.50 | 0.95   |     |
|  |        |                                 |                  |      | .50-1.95<br>.50-2.00 |      |     |     |                 |                 | SPT28<br>1.50 | 1.95 - |     |
| from 2.50m to 3.30m dense  |        |                                 |                  |      | .50-2.95<br>.50-3.00 |      |     |     |                 |                 | SPT36<br>2.50 | 2.95 - |     |
| Weak pink and grey coarse crystalline GRANITE. Discontinuities: 1) 0-10 degrees closely spaced planar rough stained reddish brown. from 3.30m to 3.60m stained reddish brown. Recovered as non intact core (angular to subangular fine to coarse gravel  |        | 3.30                            | -16.02<br>-16.72 | 3.30 | 4.00                 | 92   | 93  | 41  | 14              | NI<br>60<br>100 |               | -      |     |
| sized fragments) from 3.72m to 3.80m 1 No discontinuity 60 degrees planar  | *****  | =                               |                  | 4.00 | 4.40                 | 92   | 88  | 0   | 0               | NI              |               | -      |     |
| rough stained brown from 3.89m 1 No quartz vein stained reddish brown. Recovered as non intact core (angular coarse gravel sized fragments) from 3.95m to 4.00m assumed zone of no recovery  |        | 4.40 -<br>-<br>-<br>-<br>-<br>- | -17.12           | 4.40 | 5.15                 | 92   | 60  | 40  | 13              | NI<br>90<br>100 |               |        |     |
| Medium strong pink and grey coarse crystalline GRANITE stained<br>reddish brown. Recovered as non intact core (angular medium<br>to coarse gravel sized fragments).<br>from 4.35m to 4.40m assumed zone of no recovery   |        | 5.25 _<br>-<br>-<br>-           | -17.97           | 5.15 | 6.00                 | 92   | 100 | 12  | 12              | NI              |               | -      |     |
| Medium strong to strong pink and grey coarse crystalline GRANITE. Discontinuities: 1) 50-70 degrees closely spaced planar rough stained reddish brown.  from 4.50m to 4.71m recovered as non intact core (angular medium gravel sized fragments) from 4.77m to 4.90m 1 No discontinuity 90 degrees planar rough stained reddish brown from 5.00m to 5.15m assumed zone of no recovery  Medium strong to strong pink and grey coarse crystalline GRANITE stained reddish brown. Recovered as non intact core (angular to subangular fine to coarse gravel sized fragments).  Exploratory hole complete at 6.00 m. |        | 6.00                            | -18.72           |      |                      |      |     |     |                 |                 |               |        |     |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG Issue.Revision No. 1.05



| -                                |              | -                 |                      | ј На              | rbour Dev                           | elop    | men                           | t Groun             | d Inves         | tigation           |                      |                     | Fynlo                  | ratory                     | Hole L                  | 00                   |       | Hol                  | le ID.               |                            |
|----------------------------------|--------------|-------------------|----------------------|-------------------|-------------------------------------|---------|-------------------------------|---------------------|-----------------|--------------------|----------------------|---------------------|------------------------|----------------------------|-------------------------|----------------------|-------|----------------------|----------------------|----------------------------|
| Project                          |              |                   | 148                  |                   |                                     |         |                               |                     |                 |                    |                      |                     | LXPIO                  | ratory                     | I TOIC L                | og                   |       | E1                   | l12                  |                            |
| Engine<br>Employ                 |              |                   | h Hende              |                   | n LLP<br>our Board                  |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      | ader                 |                            |
| Ground                           |              |                   | 67m CD               | Iaib              | oui boaiu                           |         |                               | Coc                 | ordinates       | 397                | 398.02 E             | , 8044              | 37.20 N N              | ational Grid               |                         |                      |       |                      | auei                 |                            |
| Date Sta                         | ırted        | 09/0              | 7/2013               |                   |                                     |         |                               | Dat                 | e Compl         | eted 10/0          | 7/2013               |                     |                        |                            | Inclina                 | tion -               |       |                      |                      |                            |
| Тор                              | Base         | Туре              | Date Sta             | ırted             | Date Ende                           | d C     | rew                           | Section<br>Logged E | n Cor<br>By Bar | re Core<br>rel Bit | •                    | Equip               | ment                   | Sh<br>Su                   | oring /<br>ipport       |                      | Rema  | arks                 |                      |                            |
| 0.00<br>2.75                     | 2.75<br>6.05 | CP<br>RC          | 09/07/2<br>10/07/2   | 013<br>013        | 09/07/201<br>10/07/201              | 3 \     | TP<br>WW                      | DT<br>DT            | T61             | 16 Impre           | g                    | Dando<br>Deltaba    | 3000<br>ase 515        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
| Date                             | Ті           | me                | Hole                 |                   | ROGRESS<br>sing Wate                | ır İ    |                               | Rema                | arke            |                    | Da                   | ıta                 | Time                   | Strike at                  | NATER STR<br>Rise to    | RIKES<br>Tim         |       | Cas                  | ing dep              | th                         |
|                                  |              |                   | depth                | de                | pth dept                            | h       |                               |                     | ai K3           |                    |                      |                     | Time                   | depth                      | depth                   | take<br>to ris       | en at | t strike<br>time     | e to                 | seal<br>low                |
| 09/07/20<br>09/07/20<br>09/07/20 | 013   1      | 603<br>630<br>900 | 2.75<br>2.75<br>3.00 | 2.7<br>2.7<br>3.0 | 75 -16.20<br>70 -16.20<br>00 -15.30 | ) Sta   | d of CF<br>rt of R<br>d of Sh | otary               |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
| 10/07/20                         | 013 0        | 700<br>735        | 3.00<br>6.05         | 2.7               | 70 -13.50                           | ) Sta   | rt of Si                      | hift                |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  | ı            |                   | CA                   | BLE               | PERCUSSIO                           | N DET   | AILS                          |                     |                 |                    |                      |                     |                        |                            | SPT DETA                | ILS                  |       |                      |                      |                            |
| Hard<br>from                     | Strata       | Depth<br>to       | Start t              | ime               | selling<br>  Duration               | Rem     | arks                          |                     |                 |                    | Depth                | Туре                |                        | mental blow<br>etration in |                         | Hamm<br>No.          | . ra  | atio                 | Casing<br>depth      | Water<br>depth             |
| 2.70                             |              | 2.75              | hhm<br>133           |                   | 0200                                | Chise   | elling                        |                     |                 |                    | 1.00                 | SPT                 | N=2 (0,0,<br>N=6 (1,1, | 0,0,1,1)                   |                         | AR36                 | 0 7   | %<br>75              | 1.00                 | -14.20<br>-12.60           |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    | 1.50<br>2.50<br>2.75 | SPT<br>SPT<br>SPT(0 | 50/50mr                | n (5,20,50)<br>(25/0,50/0) |                         | AR36<br>AR36<br>AR36 | 0 7   | 75<br>75<br>75<br>75 | 1.50<br>2.50<br>2.75 | -12.60<br>-15.35<br>-16.20 |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      | '                   |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    | 4                    |                     |                        |                            |                         |                      |       |                      |                      |                            |
| Fror                             | n            | То                |                      | ROTA              | RY FLUSH D                          | ETAIL   |                               | lush                | FI              | ush                | 4                    |                     |                        |                            |                         |                      |       |                      |                      |                            |
| dept<br>2.75                     | h            | depth<br>6.05     |                      |                   | type<br>Air/Mist                    |         |                               | eturn<br>%<br>100   |                 | lour               |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
| 2.15                             |              | 6.05              |                      |                   | AIT/IVIISL                          |         |                               | 100                 | ۲               | Ink                |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  | ,            |                   | / CASING             |                   |                                     |         |                               | C SAMPL             |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
| Hole<br>diameter                 | hole         | dian              |                      | sing              | Тор                                 | Base    | Di                            | ameter              | Time<br>hhmmss  | Recovery<br>%      |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
| 200<br>116                       | 2.75<br>6.05 | 2                 | 00 2                 | .75               |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  | IN           | ISTALLA           | ATION DE             | TAILS             | 5                                   |         | F                             | PIPE CONS           | STRUCTION       | ON                 | 1                    |                     |                        |                            |                         |                      |       |                      |                      |                            |
| Distance<br>from G.L             |              | T                 | уре                  | Resp              | onse zone                           | ID      | Тор                           | Pipe<br>  Base      | Dia.<br>of pipe | Type of pipe       |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      | R                 | ACKFILL DE                          | TAILS   |                               |                     |                 |                    | +                    |                     |                        | * Seating b                | lows only.<br>SENERAL N | IOTES                |       |                      |                      |                            |
| Top o                            |              | ase of            |                      | Mate              |                                     | AILS    |                               | Rem                 | arks            |                    | 1                    |                     |                        |                            | ALIVEIVAL IV            | 0123                 |       |                      |                      |                            |
| sectio<br>0.00                   |              | ection<br>6.05    |                      | Grou              | ut                                  |         |                               |                     |                 |                    | _                    |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
|                                  |              |                   |                      |                   |                                     |         |                               |                     |                 |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
| NOTES                            | : All de     | oths in           | metres a             | ll dia            | meters in m                         | illime  | tres                          |                     |                 |                    |                      |                     |                        |                            |                         |                      |       | 10                   |                      |                            |
|                                  | Water        | strike            |                      | in mi             | nutes, hard                         |         |                               | e in hhmn           | n               |                    |                      |                     |                        |                            |                         |                      |       |                      |                      |                            |
| Unched                           |              |                   |                      |                   | Log Print Da                        | ite And | d Tim                         | e: 23/12            | /2013 1         | 0:32:43            |                      |                     |                        |                            |                         | S                    | JIL E | engi                 | nee                  | RING                       |

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Engineer

Ground Level

Arch Henderson LLP

# **Exploratory Hole Log**

Hole ID.

E112

Sheet 1 of 1

Employer

-12.67m CD

Aberdeen Harbour Board

Coordinates 397398.02 E, 804437.20 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  Very loose dark grey slightly silty slightly gravelly fine to medium SAND. Gravel is subangular to rouned fine to medium of mixed igneous and metamorpic litholgies, including granite, schist and gneiss.  | Legend | Depth  | Datum<br>Level | Sampling      |                   |      | Blow Count And<br>Sample Recovery |     |     |                  | In Situ Test<br>Details                              |        | Install<br>ation |
|--|--------|--------|----------------|---------------|-------------------|------|-----------------------------------|-----|-----|------------------|--|--------|------------------|
|  |        |        |                | [             | Details           | Dia. | TCR                               | SCR | RQD | IF               | D  | acion  |                  |
|  | X      |        |                | ES002         | 0.00-1.00<br>0.50 |      |                                   | •   |     |                  | SPT2   |        |                  |
| Medium dense dark grey slightly silty gravelly fine to coarse<br>SAND. Gravel is angular to subangular fine to medium of mixed<br>lithologies including granite, schist and quartzite.   |        | 1.50 - |                | D004<br>ES005 | 1.50-1.95         |      |                                   |     |     |                  | 1.00<br>SPT6<br>1.50                                 | 1.45 - |                  |
| Strong grey GRANITE. (Recovered as angular coarse gravel sized   | ****   | 2.70 - |                | D007<br>ES008 | 2.50-2.70<br>2.50 |      |                                   |     |     |                  | SPT50/50mm<br>2.50 2.70<br>SPT(C)50/0mm<br>2.75 2.75 |        |                  |
| fragments).  Strong to very strong grey speckled pink GRANITE.  Discontinuities: 1) 50-60 degrees closely spaced planar rough clean. 2) 70-80 degrees medium spaced planar rough clean. from 2.94m to 3.25m recovered as non intact core (angular coarse gravel sized fragments and angular cobble sized fragments)  from 4.00m to 4.08m recovered as non intact core (angular coarse gravel sized fragments and cobble sized fragments) from 4.17m to 4.35m recovered as non intact core (angular coarse gravel sized fragments and angular cobble sized fragments) |        |        |                | 2.7           | 5 3.25            | 92   | 100                               | 58  | 38  |                  | 2.75   | 2.75   |                  |
|  |        |        |                | 3.2           | 5 3.80            | 92   | 100                               | 100 | 82  | ,                |  | -      |                  |
|  | *****  |        |                | 3.8           | 0 5.10            | 92   | 100                               | 80  | 54  | NI<br>125<br>300 |  |        |                  |
|  |        | 6.05   |                | 5.1           | 0 6.05            | 92   | 100                               | 100 | 66  |                  |  | -      |                  |
| Exploratory hole complete at 6.06 m.   |        |        |                |               |                   |      |                                   |     |     |                  |  |        |                  |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG

Issue.Revision No. 1.05



| -                     |               | -              |                     | g Har            | rbour Dev                  | /elop              | ment                  | ւ Ground             | l Invest        | tigatio     | on          |              |               | Evnlo               | ratory l                     | ا مام                 | 00               | Но         | ole ID.     |                  |
|-----------------------|---------------|----------------|---------------------|------------------|----------------------------|--------------------|-----------------------|----------------------|-----------------|-------------|-------------|--------------|---------------|---------------------|------------------------------|-----------------------|------------------|------------|-------------|------------------|
| Project               |               |                | 7148                |                  | _                          |                    |                       |                      |                 |             |             |              |               | LAPIO               | atory                        | IOIC L                | Jy               | Е          | 115         | •                |
| Engine                |               |                | h Hende             |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             | ļ                |
| Employ<br>Ground I    |               |                | erdeen F<br>.67m CD | larbo            | our Board                  |                    | —                     | Coor                 | rdinates        |             | 2973(       | 00 79 F      | 20436         | 1 01 N N;           | ational Grid                 |                       |                  | н          | leader      |                  |
| Date Sta              |               |                | 08/2013             |                  |                            |                    |                       |                      | e Comple        |             |             |              | 00 102        | 1.01 1              | Ittoriai C                   | Inclinat              | tion Verti       | cal        |             | •                |
| Тор                   | Base          | Туре           | Date Sta            | arted            | Date Ende                  | d (                | Crew                  | Section<br>Logged By | Core            | re (        | Core<br>Bit | E            | Equipn        | nent                | She                          | oring /               | R                | Remarks    |             |                  |
| 0.00                  | 1.70          | СР             | 13/08/2             | 2013             | 13/08/201                  | .3                 | TP                    | TW                   |                 |             |             |              | Dando :       | 3000                | Ju                           | ррогс                 |                  |            |             |                  |
| 1.70                  | 5.70          | RC             | 14/08/2             | .013             | 14/08/201                  | 3                  | ww                    | TW                   | T611            | i6 in       | mpreg       | U            | Deltabas      | e 515               |                              |                       |                  |            |             | •                |
|                       |               |                |                     |                  |                            |                    |                       | i                    |                 |             |             |              |               |                     |                              |                       |                  |            |             | •                |
|                       |               |                |                     |                  |                            |                    |                       | i                    |                 |             |             |              |               |                     |                              |                       |                  |            |             | •                |
|                       |               |                |                     |                  | 202500                     |                    |                       |                      |                 |             | $\dashv$    |              |               |                     |                              | ED CTD                |                  |            |             |                  |
| Date                  | Ti            | ime            | Hole                | Casi             | ROGRESS<br>sing Wate       | er                 | —                     | Remar                | rks             | —           | $\dashv$    | Date         | e.            | Time                | Strike at                    | NATER STRI<br>Rise to | Time             | Ca         | sing dep    | oth              |
|                       |               |                | depth               | dep              | oth dept                   | :h                 |                       |                      |                 |             |             |              | $\perp$       |                     | depth                        | depth                 | taken<br>to rise | at stril   | ke i to     | o seal<br>flow   |
| 13/08/20<br>14/08/20  | 013 0         | 1815<br>0700   | 1.70<br>1.50        | 1.50<br>1.50     | 0 NR                       | Sta                | nd of CP<br>art of Ro | otary                |                 |             |             |              |               |                     |                              |                       |                  |            |             | •                |
| 14/08/20              | 13   1        | 1930           | 5.70                | 1.70             | 0 -14.10                   | )  En              | nd of Hol             | le                   |                 |             |             |              |               |                     |                              |                       |                  |            |             | ,                |
|                       |               |                | ,                   |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             | ,                |
|                       |               |                | ,                   |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             | ļ                |
| I                     |               |                | ,                   |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             | ļ                |
| I                     |               |                | ,                   |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             | ļ                |
| I                     |               |                | ,                   |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             | ,                |
|                       |               |                | C.F                 | ABLE F           | PERCUSSIO                  | N DE               | TAILS                 |                      |                 |             |             |              |               |                     |                              | SPT DETAI             | ILS              | -          |             |                  |
|                       | Strata I      | -              | Start t             |                  | elling<br>Duration         |                    | marks                 |                      |                 |             |             | Depth        | Туре          |                     | nental blow<br>etration in r |                       | Hammer<br>No.    | Energy     | Casing      | Water<br>depth   |
| from                  |               | to             | hhm                 | nm               | hhmm                       |                    |                       |                      |                 |             |             | 250          | COT           | · ·                 |                              | nm                    |                  | ratio<br>% | depth       |                  |
| 1.50                  |               | 1.70           | 160                 | 10               | 0200                       | Chis               | selling               |                      |                 |             |             | 0.50<br>1.70 | SPT<br>SPT(C) | N=22 (4,6<br>50/0mm | 5,5,4,6,7)<br>(25/0,50/0)    |                       | AR360<br>AR360   | 75<br>75   | N/A<br>1.50 | -12.90<br>-14.30 |
| I                     |               |                |                     |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       |               |                |                     |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
| <del></del>           |               |                |                     |                  |                            | <u> </u>           |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
| From                  | n             | То             | F                   | ROTAF            | RY FLUSH D<br>Flush        | ETAIL              |                       | lush                 | Fli             | ush         |             |              |               |                     |                              |                       |                  |            |             |                  |
| deptl                 |               | depth          | ı <u> </u>          |                  | type                       |                    | ret                   | turn<br>%            | col             | lour        |             |              |               |                     |                              |                       |                  |            |             |                  |
| 1.70                  |               | 5.70           |                     |                  | Water                      |                    |                       | 100                  | WI              | hite        |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       |               |                |                     |                  |                            | [                  |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       |               |                |                     |                  |                            | [                  |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       |               |                |                     |                  |                            | [                  |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       | $\perp$       |                |                     |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       |               |                | / CASING            |                  | <u> </u>                   |                    |                       | C SAMPLI             |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
| Hole<br>diameter      | Depth<br>hole |                |                     | pth of<br>asing  | Тор                        | Base               | ) Dia                 |                      | Time<br>nhmmss  | Recov<br>%  |             |              |               |                     |                              |                       |                  |            |             |                  |
| 150<br>116            | 1.70<br>5.70  | 1:             |                     | 1.70             |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
| _ '                   |               |                |                     |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       |               |                |                     |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       |               |                |                     |                  |                            |                    | $\perp$               |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       |               | JSTALL/        | ATION DE            | TAILS            |                            |                    | P                     | IPE CONS             | TRUCTIO         | ON.         |             |              |               |                     |                              |                       |                  |            |             |                  |
| Distance<br>from G.L. |               |                | уре                 | Respo            | onse zone<br>p   Base      | ID                 | Top                   | Pipe<br>  Base       | Dia.<br>of pipe | Type<br>pip |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       | + +           | <br>I          |                     |                  |                            | М                  | ,                     |                      | C. p.,          | <u> </u>    |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       |               | ı              |                     |                  |                            | '                  |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       |               |                |                     |                  |                            |                    |                       |                      |                 |             |             |              |               |                     | * Seating bl                 | ows only.             |                  |            |             |                  |
|                       |               |                |                     |                  | ACKFILL DET                | TAILS              |                       |                      |                 |             |             |              |               |                     | G                            | SENERAL NO            | OTES             |            |             |                  |
| Top of<br>section     | n se          | Base of ection |                     | Mater            |                            |                    |                       | Rema                 | ırks            |             |             |              |               |                     |                              |                       |                  |            |             |                  |
| 0.00<br>1.70          |               | 1.70<br>5.70   |                     | Arising<br>Grout | js<br>it                   |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       |               |                |                     |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
| I                     |               |                |                     |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
| I                     |               |                |                     |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
|                       |               |                |                     |                  |                            |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  |            |             |                  |
| NOTES:                | Water         | r strike ı     | rise time           | in mir           | meters in m<br>nutes, hard | ıillime<br>1 strat | etres.<br>ta time     | in hhmm              | 1               |             |             |              |               |                     |                              |                       |                  | 4          |             |                  |
|                       | For de        | tails of       | fabbrevia           | ations,          | , see key                  |                    |                       |                      |                 |             |             |              |               |                     |                              |                       |                  | 226        |             | -:06             |
| Unchec                | :ked          |                |                     | L                | Log Print Da               | ate Ar             | nd Time               | e: 23/12/            | 2013 10         | J:32:50     | )           |              |               |                     |                              |                       | SOIL             | L eng      | inee        | RING             |

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Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Ground Level

**Exploratory Hole Log** 

Hole ID.

E115

Sheet 1 of 1

Engineer Arch Henderson LLP

Employer Aberdeen Harbour Board -12.67m CD

Coordinates 397300.79 E, 804361.01 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend | Depth            | Datum  |      | Sampling                            |      |     |     | ount A<br>Recov |                 | In Situ Tes              | IIISI |
|--|--------|------------------|--------|------|-------------------------------------|------|-----|-----|-----------------|-----------------|--------------------------|-------|
| ·  |        | ·                | Level  | D    | etails                              | Dia. | TCR | SCR | RQD             | IF              | Details                  | atio  |
| Medium dense grey slightly gravelly silty fine to coarse SAND.<br>Gravel is subangular to subrounded fine to of schist and<br>gneiss.  | X<br>X |                  |        | D002 | 0.00-0.50<br>0.50-0.95<br>0.50-0.95 |      |     |     |                 |                 | SPT22<br>0.50 0.9        | 5 -   |
| No recovery. HARD strata. (Driller's description)  |        | 1.50 -<br>1.70 - | -14.17 |      |                                     |      |     |     |                 |                 | CDT/C\E0/0               |       |
| Medium strong grey GNEISS. Recovered as non intact core (angular fine to coarse gravel sized fragments).   |        |                  | -14.37 | 1.70 | 2.60                                | 92   | 100 | 5   | 0               |                 | SPT(C)50/0mm<br>1.70 1.7 |       |
| from 2.50m to 2.55m recovered as intact core. Discontinuities: 1) 10-20 degrees very closely spaced planar rough clean from 2.60m to 2.70m recovered as intact core. Discontinuities: 1) 10-20 degrees closely spaced planar rough clean   |        | -                |        | 2.60 | 3.40                                | 92   | 83  | 43  | 0               | NI<br>NI<br>100 |                          |       |
| from 2.96m to 3.15m recovered as intact core.  Discontinuities: 1) 10-20 degrees very closely spaced planar rough clean. 2) 20-30 degrees closely spaced planar  |        |                  |        | 3.40 | 3.75                                | 92   | 100 | 11  | 0               |                 |                          |       |
| rough clean from 3.25m to 3.40m assumed zone of no recovery from 3.71m to 3.75m recovered as intact core. Discontinuities: 1) 20-30 degrees very closely spaced planar rough stained brown on surface from 3.90m to 4.10m with schistose foliation (<1mm)  |        | 4.35             | -17.02 | 3.75 | 5 4.70                              | 92   | 86  | 36  | 0               |                 |                          |       |
| from 4.11m to 4.25m recovered as intact core. Discontinuities: 1) 30-40 degrees closely spaced planar rough clean. 2) 70-80 degrees closely spaced planar rough clean  Strong grey GNEISS. Discontinuities: 1) 30-40 degrees closely   |        | -                |        | 4.70 | 5.70                                | 92   | 100 | 80  | 29              | NI<br>65<br>150 |                          |       |
| spaced planar rough clean. 2) 70-80 degrees medium spaced planar rough clean locally stained yellow on surfaces.  from 4.55m to 4.70m assumed zone of no recovery from 5.10m to 5.40m dark grey with schistose foliation (<1mm) and yellow staining on surfaces from 5.25m to 5.45m recovered as non intact core (angular coarse gravel sized fragments)  Exploratory hole complete at 5.70 m. |        | 5.70             | -18.37 |      |                                     |      |     |     |                 |                 |                          |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Form No. SIEXPHOLELOG

Issue.Revision No. 1.05

Issue Date 22/10/2012



| -                    |                 | -                    |                        | ) Harl            | bour Dev                  | elopr             | ment             | Ground          | Inves         | tigat       | ion         |           |          | Fynlo      | ratory                    | Hole L                   | 00               | Н        | ole ID.      |                |
|----------------------|-----------------|----------------------|------------------------|-------------------|---------------------------|-------------------|------------------|-----------------|---------------|-------------|-------------|-----------|----------|------------|---------------------------|--------------------------|------------------|----------|--------------|----------------|
| Project              |                 | TA7                  |                        |                   |                           |                   |                  |                 |               |             |             |           |          | LXPIO      | iatory                    | I TOIC L                 | og               | F        | 116          |                |
| Engine               |                 |                      | n Hende                |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
| Employ<br>Ground     |                 |                      | rdeen F<br>81m CD      | larbo             | ur Board                  |                   |                  | Coor            | dinates       |             | 20720       | DE 02 E 0 | 90/20    | 0 20 N N   | ational Gri               |                          |                  | н        | eader        |                |
| Date Sta             |                 |                      | 7/2013                 |                   |                           |                   |                  |                 | Comple        |             |             |           | 00423    | 3.30 IN IN | ational Gir               | u<br>Inclina             | tion Vert        | ical     |              |                |
| Тор                  | Base            |                      | Date Sta               | rted              | Date Ende                 | d Cı              | rew              | Section         | Cor           | ·e          | Core<br>Bit |           | Equipn   | nent       | S                         | horing /<br>upport       |                  | Remarks  |              |                |
| 0.00                 | 1.10            | СР                   | 06/07/2                | 013               | 06/07/201                 | 3                 | TP               | Logged By<br>DT | Barr          | el          | Bit         | ı         | Dando    | 3000       | S                         | upport                   |                  |          |              |                |
| 1.10                 | 4.50            | RC                   | 08/07/2                | 013               | 08/07/201                 | 3 V               | vw               | DT              | T613          | 16          | PCD         | D         | eltabas  | se 515     |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
| Date                 | Т:              | me                   | Hole                   |                   | OGRESS<br>ng Wate         | _                 |                  | Remar           | ilio          |             |             | Date      |          | Time       | C+rileo o                 | WATER STR                | Time             | T C0     | sing dep     | +h             |
| Date                 | ''              | me                   | depth                  | Casir<br>dept     | th dept                   | 'n                |                  | Remai           | KS            |             |             | Date      | e        | Time       | Strike a<br>depth         | t Rise to<br>depth       | taken<br>to rise | at stril | ke i to      | seal<br>flow   |
| 06/07/20<br>08/07/20 | 13 0            | 630<br>930           | 1.10<br>1.10           | 1.10<br>1.10      | -12.20                    | ) Star            | of CP<br>t of Ro | tary            |               |             |             |           |          |            |                           |                          |                  |          |              |                |
| 08/07/20             | 13 1            | 600                  | 4.50                   | 1.10              |                           | ) End             | of Ho            | le ´            |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      | CA                     |                   | ERCUSSIO                  |                   |                  |                 |               |             |             |           |          |            |                           | SPT DETA                 | ILS              |          |              |                |
| Hard<br>from         | Strata          | Depth<br>to          | Start t                |                   | Duration                  | Rema              | arks             |                 |               |             |             | Depth     | Туре     |            | nental blo<br>etration ir |                          | Hammer<br>No.    | ratio    | Casing depth | Water<br>depth |
| 0.40                 |                 | 0.70                 | hhm                    | ım                | 0100                      | Chise             | lling            |                 |               |             |             | 1.00      | SPT      | 50/0mm     | (25/50,50/0               | ))                       | AR360            | 75       | 1.00         | -13.10         |
| 0.80<br>1.05<br>1.10 |                 | 1.00<br>1.10<br>1.10 |                        |                   | 0100<br>0100<br>0100      | Chise<br>Chise    | lling<br>lling   |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
| 1.10                 |                 | 1.10                 |                        |                   | 0100                      | Chise             | iling            |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      | F                      |                   | Y FLUSH D                 | ETAILS            |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
| Fron<br>dept         |                 | To<br>depth          |                        |                   | Flush<br>type             |                   | ret              | ush<br>turn     |               | ush<br>lour |             |           |          |            |                           |                          |                  |          |              |                |
| 1.00                 |                 | 4.50                 |                        | Ai                | ir/Mist                   |                   |                  | .00             | Grey          | //Pink      |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      | / CASING               |                   | ı                         |                   |                  | C SAMPLIN       |               |             |             |           |          |            |                           |                          |                  |          |              |                |
| Hole<br>diameter     | Depth<br>hole   |                      | neter ca               | oth of<br>sing    | Тор                       | Base              | Dia              |                 | Time<br>hmmss | Reco        | overy       |           |          |            |                           |                          |                  |          |              |                |
| 200<br>116           | 1.10<br>4.50    | 20                   | 00 1                   | .10               |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
| Distance             |                 |                      | TION DE                |                   | nse zone                  | ID                |                  | IPE CONST       | TRUCTION Dia. | ON<br>Type  | a of        |           |          |            |                           |                          |                  |          |              |                |
| from G.L             |                 | ('                   | урс                    | Тор               |                           | טו                | Тор              |                 | of pipe       |             | ipe         |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            | * C - +!                  |                          |                  |          |              |                |
|                      |                 |                      |                        | BAG               | CKFILL DET                | AILS              |                  | 1               |               | <u> </u>    |             |           | <u> </u> | <u> </u>   |                           | blows only.<br>GENERAL N | OTES             |          | <u> </u>     |                |
| Top of               |                 | ase of               | ı                      | Materia           |                           |                   |                  | Rema            | rks           |             |             |           |          |            |                           |                          |                  |          |              |                |
| section<br>0.00      |                 | <u>4.50</u>          |                        | Grout             |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
|                      |                 |                      |                        |                   |                           |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              |                |
| NOTES:               | All de<br>Water | oths in i            | metres, a<br>rise time | II diam<br>in min | neters in m<br>utes, hard | illimet<br>strata | res.<br>i time   | in hhmm         |               |             |             |           |          |            |                           |                          |                  | 4        |              |                |
|                      | For de          | tails of             | abbrevia               | tions, s          | see key                   |                   |                  |                 |               |             |             |           |          |            |                           |                          |                  |          |              | DID -          |
|                      |                 |                      |                        | Lo                | og Print Da               | te And            | d Time           | e: 23/12/2      | 2013 10       | 0:32:5      | 8           | -         |          |            |                           | -                        | SOI              | r end    | inee         | RING           |

Issue Date 22/10/2012

Issue.Revision No. 1.05

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project No. TA7148

Engineer

Arch Henderson LLP

Aberdeen Harbour Board

**Exploratory Hole Log** 

Hole ID.

E116

Sheet 1 of 1

Employer Ground Level -10.81m CD

Coordinates

397296.83 E, 804299.30 N National Grid

Hole Type CP+RC Inclination

|   | Level            | ۱ -          |  |   |           |  |           |                        | Details      |   |
|---|------------------|--------------|--|---|-----------|--|-----------|------------------------|--------------|---|
|   |                  | "            | etails   | Dia.  | TCR       | SCR  | RQD       | IF                     | 20145        | ation   |
| -   | 11.01            | B002<br>D003 | 0.50<br>0.50   |   |           |  |           |                        | COTTO (Amora |   |
| 1.00  | -11.81<br>-11.91 |              |  | 02  | 00        | F.   | 2/        | NI<br>65               | 1.00 1.05 -  |   |
| 1.50 -<br>-<br>-<br>-<br>-  | -12.31           | 1.10         | 1.60   | 92  | 80        | 54   | 24        | 100<br>NA              | -<br>-<br>-  |   |
| 2.30  | -13.11           | 1.60         | 2.90   | 92  | 46        | 15   | 0 .       |                        | -            |   |
| =   |                  | 2.90         | 3.40   | 92  | 100       | 30   | 0         |                        | -            |   |
| =   |                  |              |  |   |           |  |           | NI<br>40<br>85         | -            |   |
|   | -15.31           | 3.40         | 4.50   | 92  | 100       | 78   | 0         |                        | -            |   |
| -   |                  |              |  |   |           |  |           |                        |              |   |
| -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |                  |              |  |   |           |  |           |                        | -            | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |
| -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |                  |              |  |   |           |  |           |                        | -            |   |
|   | 2.30             | 1.10         | 1.0011.81 D004 1.1012.31  1.5012.31  2.3013.11  2.90 | 1.0011.81<br>1.1011.91<br>1.5012.31<br>2.3013.11<br>2.90 3.40 | 1.0011.81 | 1.0011.81<br>1.1012.31<br>1.5012.31<br>2.3013.11 1.60 2.90 92 46  2.90 3.40 92 100 | 1.0011.81 | 1.0011.81<br>1.1012.31 | 1.0011.81    | 1.0011.81<br>1.1012.31  |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:33:01



Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 **GS11** Engineer Arch Henderson LLP **Employer** Aberdeen Harbour Board Header Coordinates 396714.16 E, 804575.84 N National Grid Ground Level -1.42m CD 06/10/2013 Date Started Date Completed 08/10/2013 Inclination Vertical Section Logged By Date Started Date Ended Crew Equipment Shoring / Support Remarks Top Base Tvpe 2.00 3.30 19.00 06/10/2013 07/10/2013 08/10/2013 Dando 3000 Deltabase 520 Deltabase 520 0.00 06/10/2013 TP TT TT DT DT DT 2.00 3.30 RO RC 06/10/2013 07/10/2013 SWF Impre **PROGRESS** WATER STRIKES Time taken to rise Casing depth at strike to seal time flow Date Hole depth Water depth Date Time Strike at depth Rise to depth Time Casing depth Remarks 2300 0450 0700 End of CP/Start of RO End of RO/Start of RC End of Shift/Start of Shift 2.00 3.30 06/10/2013 2 00 \_4 RN 07/10/2013 07/10/2013 07/10/2013 3.00 3.70 -4.25 -4.30 4.10 9.20 16.00 07/10/2013 1900 4.20 -9.00 End of Shift/Start of Shift -8.00 -5.30 4.20 End of Shift/Start of Shift 08/10/2013 1330 19.00 4.20 End of Hole CABLE PERCUSSION DETAILS SPT DETAILS Chiselling me | Duration Hard Strata Depth Remarks Depth Туре Incremental blow count / Hammer Energy ratio Casing depth Water Start time penetration in mm No. depth from hhmm hhmm SPT(C) 50/0mm (25/0,50/0) SPT(C) 50/0mm (25/0,50/0) SPT(C) 50/85mm (25/77,50/85) SPT(C) 50/85mm (25/77,50/100) SPT(C) 50/100mm (25/76,50/95) SPT(C) 50/95mm (25/76,50/95) SPT(C) 50/10mm (25/10,50/10) SPT(C) 50/10mm (25/10,50/10) SPT(C) 50/200mm (7,12,15,18,17/50) SPT(C) 50/200mm (7,12,15,18,17/50) SPT(C) 50/200mm (7,18/20,50/20) SPT(C) 50/90mm (25/70,42,8/15) SPT(C) 50/10mm (25/10,50/10) SPT(C) 50/20mm (25/10,50/10) SPT(C) 50/20mm (6,10,12,12,16,10/70) -2.70 -2.80 -4.25 -9.00 -9.00 2100 0200 Chiselling 0.50 1.50 3.00 4.10 5.60 7.10 8.60 75 75 75 75 75 75 75 75 75 75 75 75 AR362 AR362 AR362 AR362 AR362 AR362 -9.00 -9.00 10.20 11.70 12.70 14.20 15.70 -8.00 -8.00 -8.00 -8.00 -8.00 AR362 AR362 AR362 AR362 AR362 AR362 **ROTARY FLUSH DETAILS** From Flush Flush Flush depth depth type return colour 3.30 4.10 4.10 16.00 50 100 Water Brown 16.00 19.00 Water Brown HOLE DIAMETER / CASING DYNAMIC SAMPLING Hole Depth of Casing Depth of Top Base Diameter Time Recovery diameter casing iametei hole hhmmss 200 4.20 INSTALLATION DETAILS PIPE CONSTRUCTION Dia. Distance ID Type Response zone Pipe Type of Base Top | Base from G.L. Top of pipe pipe \* Seating blows only BACKFILL DETAILS **GENERAL NOTES** Top of section Base of Material Remarks section 0.00 Arisings NOTES: All depths in metres, all diameters in millimetres. Water strike rise time in minutes, hard strata time in hhmm For details of abbreviations, see key

Log Print Date And Time: 23/12/2013 10:22:48

Issue Date 22/10/2012

Issue, Revision No. 1.05

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orm No. SIEXPHOLEHDR

SOIL ENGINEERING

Part of the Bachy Soletanche Group

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

**Exploratory Hole Log** 

Hole ID.

**GS11** 

Sheet 1 of 2

Ground Level -1.42m CD

Coordinates

396714.16 E, 804575.84 N National Grid

Hole Type CP+RC Inclination

| Description of Strata  | Legend | Depth  | Datum<br>Level | Sampli  | ng      |       |     | ount A<br>Recov |    | In Situ Test Details                | Inst |
|--|--------|--------|----------------|---------|---------|-------|-----|-----------------|----|-------------------------------------|------|
|  | -      |        | Level          | Details | Dia     | . TCR | SCR | RQD             | IF | Details                             | atio |
| No recovery. Granite BOULDERS sand and gravel. (Driller's<br>description)  |        |        |                |         |         |       |     |                 |    | SPT(C)50/0mm -<br>0.50 0.50 -       |      |
|  |        |        |                |         |         |       |     |                 |    | SPT(C)50/0mm -<br>1.50 1.50 -       |      |
| otary openhole drilling: Firm to stiff brown CLAY with ranite boulders. (Driller's description)  |        | 2.40 - | -3.82          |         |         |       |     |                 |    | SPT(C)50/85mm —<br>3.00 3.16 -      |      |
| tiff very high to extremely high strength brown slightly andy gravelly CLAY with low cobble content. Sand is fine to oarse. Gravel is subangular to subrounded fine to coarse of nixed igneous and metamorphic lithologies including granite, neiss, schist and quartz. Cobbles are subangular of granite nd gneiss. |        | 3.30 - | -4.72          | 3.30 4  | .10 10  | 7 100 | NA  | NA              |    | SPT(C)50/100mm -                    |      |
| iu gileiss.  |        |        |                | 4.10 5  | .60 107 | 7 100 | NA  | NA              |    | 4.10 4.28                           |      |
|  |        |        |                | 5.60 7  | .10 103 | 7 100 | NA  | NA              |    | SPT(c)50/95mm<br>5.60 5.77 -        |      |
|  |        |        |                | 7.10 8  | .60 103 | 7 100 | NA  | NA              |    | SPT(C)50/85mm 7.10 7.26 -           |      |
| from 9.00m to 9.20m assumed zone of no recovery  |        |        |                | 8.60 5  | .20 10  | 7 66  | NA  | NA              |    | SPT(C)50/10mm -<br>8.60 8.62 -<br>- |      |
|  |        |        |                | 9.20 10 | .20 10  | 7 100 | NA  | NA              |    | -                                   |      |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

### **Exploratory Hole Log**

Hole ID.

**GS11** 

Sheet 2 of 2

Ground Level -1.42m CD Coordinates 396714.16 E, 804575.84 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend                                | Depth                            | Datum  | Sam   | npling |      |     |     | ount A<br>Recov |    | In Situ Test                                     | Ins |
|---|---------------------------------------|----------------------------------|--------|-------|--------|------|-----|-----|-----------------|----|--|-----|
|   |                                       |                                  | Level  | Deta  | ils    | Dia. | TCR | SCR | RQD             | IF | Details  | ati |
| Stiff very high to extremely high strength brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss, schist and quartz. Cobbles are subangular of granite and gneiss. |                                       | 10.20 -                          | -11.62 |       |        |      |     |     |                 |    | SPT(C)50/15mm -<br>10.20 10.23 -<br>-            |     |
| Assumed zone of no recovery. Firm to stiff brown CLAY with granite boulders. (Driller's description)  | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | <u>-</u>                         |        | 10.20 | 11.70  | 107  | 66  | NA  | NA              | NA |  |     |
| Stiff extremely high strength brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss, schist and quartz. Cobbles are subangular of granite and gneiss.              |                                       |                                  |        | 11.70 | 12.70  | 107  | 100 | NA  | NA              | •  | SPT(C)50/200mm -<br>11.70 12.05 -<br>            |     |
|   |                                       |                                  |        | 12.70 | 14.20  | 107  | 100 | NA  | NA              | •  | SPT(C)50/260mm -<br>12.70 13.11 -<br>-<br>-<br>- |     |
| from 14.70m to 14.78m gneiss cobble   |                                       |                                  |        | 14.20 | 15.70  | 107  | 87  | NA  | NA              |    | SPT(C)50/20mm - 14.32                            |     |
| from 15.50m to 15.70m assumed zone of no recovery   |                                       |                                  |        | 15.70 | 16.00  | 107  | 73  | NA  | NA              |    | SPT(C)50/90mm -<br>15.70 15.86 -                 |     |
| from 15.92m to 16.00m assumed zone of no recovery   | 0 E                                   | _                                | -      | 16.00 | 16.10  | 107  | 100 | NA  | NA              |    | _  |     |
| Stiff brown slightly gravelly sandy CLAY with few cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. Cobbles are  |                                       | 16.85                            | -18.27 | 16.10 | 17.60  |      | 78  | NA  | NA              |    |  |     |
| subangular to subrounded of granite and gneiss.<br>from 17.27m to 17.60m assumed zone of no recovery  |                                       |                                  |        | 17.60 | 18.10  | 107  | 53  | NA  | NA              |    | SPT(C)50/10mm -<br>17.60 17.62 -<br>-            |     |
| Assumed zone of no recovery. Firm to stiff brown CLAY with granite boulders. (Driller's description)  |                                       | 18.34 _<br>-<br>-<br>-<br>-<br>- | -19.76 | 18.10 | 19.00  | 107  | 50  | NA  | NA              |    | -  |     |
|   |                                       | _                                |        |       |        |      | 1   |     | 1               | ı  | SPT(C)50/295mm                                   | 199 |

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NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 L01 Engineer Arch Henderson LLP Employer Aberdeen Harbour Board Header Coordinates 396570.35 E, 804915.78 N National Grid Ground Level 6.97m CD Date Started 28/10/2013 Date Completed 02/11/2013 Inclination Vertical Section Logged By Date Started Date Ended Crew Remarks Top Base Tvpe Equipment Shoring / Support 28/10/2013 28/10/2013 28/10/2013 28/10/2013 28/10/2013 30/10/2013 0.00 3.90 4.00 12.00 Dando 3000 RO RC 3.90 4.00 Deltabase 520 Deltabase 520 DT SWF WW/TT 12.00 14.00 16.60 20.30 14.00 16.60 20.30 RO RC RO 30/10/2013 30/10/2013 30/10/2013 30/10/2013 01/11/2013 WW/TT WW/TT DT DT DT Deltabase 520 Deltabase 520 Deltabase 520 SWF Impreg ODEX 30/10/2013 WW/TT 01/11/2013 02/11/2013 WW/TT DT T6116 Deltabase 520 Impre **PROGRESS** WATER STRIKES Casing depth at strike to seal time flow Date Hole depth Water depth Date Strike at depth Rise to depth Time Casing depth Remarks Time taken 3.90 3.90 10.70 End of CP End of Shift/Start of Shift End of Shift 1430 1900 0700 28/10/2013 3 90 28/10/2013 28/10/2013 29/10/2013 3.90 9.80 DRY 5.00 10.70 9.80 13.00 17.00 18.00 20.00 6.20 5.30 12.70 9.80 9.80 Start of Shift End of Shift/Start of Shift 29/10/2013 1900 30/10/2013 30/10/2013 0700 13.00 13.00 18.00 20.00 1900 0700 End of Shift/Start of Shift 4.15 DRY DRY 31/10/2013 End of Shift/Start of Shift 31/10/2013 01/11/2013 1900 0700 End of Shift/Start of Shift End of Shift 01/11/2013 1900 20.00 25.55 20.00 DRY Start of Shift 02/11/2013 CABLE PERCUSSION DETAILS SPT DETAILS Chiselling me | Duration Hard Strata Depth Remarks Depth Туре Incremental blow count / Hammer Energy ratio Casing depth Water Start time penetration in mm depth from hhmm hhmm N=18 (4,5,4,4,5,5) N=39 (5,7,9,9,11,10) 50/0mm (11,14,50/0) 50/5mm (25/0,50/0) 50/5mm (25/0,50/5) 50/0mm (25/0,50/0) 0200 Chiselling 1.50 2.50 3.50 3.90 4.00 DRY DRY 1200 75 75 75 75 75 75 75 75 75 75 75 2.50 AR362 3.50 3.90 3.90 AR362 DRY AR362 AR362 AR362 AR362 5.00 6.50 3.90 5.00 DRY DRY 8.00 9.50 13.00 15.00 17.00 50/01fm (25/10,50/0) N=58 (3,4,9,13,15,21) 50/170mm (6,10,18,21,11/20) 50/225mm (9,14,14,17,18,1/0) 50/5mm (25/5,50/5) 50/0mm (9,11,50/0) 8.00 9.50 13.00 17.00 AR362 DRY DRY 10.60 **ROTARY FLUSH DETAILS** 4.20 DRY From Flush Flush Flush AR362 depth depth type return colour 50/230mm (8,10,13,16,16,5/5) 18.50 10.70 12.00 3 00 Water Water 30 20 10.70 Brown 12.00 13.00 17.00 13.00 17.00 20.00 100 100 100 Brown Brown Air Water Air Brown 20.00 20.55 Water 100 Brown HOLE DIAMETER / CASING DYNAMIC SAMPLING Depth of Casing Depth of Top Base Diameter Time Recovery iametei hole diameter casing hhmmss 3.90 9.80 200 150 125 128 12.00 20.00 20.00 25.55 INSTALLATION DETAILS PIPE CONSTRUCTION Dia. Distance ID Type Response zone Pipe Type of Top | Base from G.L. Top of pipe pipe \* Seating blows only BACKFILL DETAILS GENERAL NOTES Top of section Base of Material Remarks section Arisings Grout 0.00 20.00 NOTES: All depths in metres, all diameters in millimetres. Water strike rise time in minutes, hard strata time in hhmm For details of abbreviations, see key

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orm No. SIEXPHOLEHDR

SOIL ENGINEERING

Part of the Bachy Soletanche Group

#### Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Exploratory Hole Log** Project No. TA7148 L01 Engineer Arch Henderson LLP

Aberdeen Harbour Board Employer

Ground Level 6.97m CD Coordinates 396570.35 E, 804915.78 N National Grid

| Hole Type | CP+RC | Inclination    | Vertical |
|-----------|-------|----------------|----------|
| поте туре | CP+RC | IIICIIIIatioii | vertical |

| Description of Strata  | Legend | Depth      | Datum<br>Level |      | Sampling     |      |     |     | ount A<br>Recov | ery | In Situ<br>Deta     |                  | Ins |
|--|--------|------------|----------------|------|--------------|------|-----|-----|-----------------|-----|---------------------|------------------|-----|
|  |        |            | LOVOI          | D    | etails       | Dia. | TCR | SCR | RQD             | IF  | Deta                |                  | uti |
| rown medium to coarse SAND.  |        | =          |                |      |              |      |     |     |                 |     |                     | 1                |     |
|  |        | -          |                | B001 | 0.50-1.00    |      |     |     |                 |     |                     | 1                |     |
|  |        | =          |                |      |              |      |     |     |                 |     |                     |                  |     |
|  |        | 1.00 -     | 5.97           | D002 | 1.00         |      |     |     |                 |     |                     | -                |     |
| ledium dense brown medium to coarse SAND.  |        | =          |                |      |              |      |     |     |                 |     |                     | 1                |     |
|  |        | =          |                | B003 | 1.50-2.00    |      |     |     |                 |     | SPT(C)18            | = =              |     |
|  |        | =          |                |      |              |      |     |     |                 |     | 1.50                | 1.95 -           |     |
|  |        | _          |                | D004 | 2.00         |      |     |     |                 |     |                     | ŝ                |     |
|  | 1      | 2.30       | 4.67           |      |              |      |     |     |                 |     |                     | 3                |     |
| ense greyish brown very gravelly fine to coarse SAND with<br>nedium cobble content. Gravel is angular to rounded fine to |        | =          |                | B005 | 2.50-3.00    |      |     |     |                 |     | SPT(C)39<br>2.50    | 2.95             |     |
| parse of mixed igneous and metamorphic lithologies including ranite, gneiss, schist and quartz. Cobbles are angular to   |        | -          |                |      |              |      |     |     |                 |     | 2.50                |                  |     |
| ounded of granite and gneiss.  | 1.0    | _          |                | D006 | 3.00         |      |     |     |                 |     |                     |                  |     |
|  |        | =          |                |      |              |      |     |     |                 |     |                     | -                |     |
| o recovery. COBBLES and BOULDERS. (Driller's description)  | 5,000  | 3.50 -     | 3.47           |      | 3.50<br>3.50 |      |     |     |                 |     | SPT(C)50/0r<br>3.50 | nm -<br>3.65 -   |     |
|  | 5000   | 3.90 -     | 3.07           |      |              |      |     |     |                 |     | SPT(C)50/0r         | nm -             |     |
| otary openhole drilling. Large BOULDERS. (Driller's escription)  | 0000   | 4.00       | 2.97           |      |              |      |     |     |                 |     | 3.90<br>SPT(C)50/5r | 3.90             |     |
| o recovery. Large BOULDERS. (Driller's description)  | 0000   | =          |                |      |              |      |     |     |                 |     | 4.00                | 12               |     |
|  | 0000   | } =        |                | 4.00 | 5.00         | 107  | 0   | NA  | NA              |     |                     | 1                |     |
|  | 0000   | <u> </u>   |                |      |              |      |     |     |                 |     | (-)                 | Í                |     |
|  | 0000   | ) <u> </u> |                |      |              |      |     |     |                 |     | SPT(C)50/0r<br>5.00 | 5.00 -           |     |
|  | 0 %    | ) =        |                | 5.00 | 5.70         | 107  | 0   | NA  | NA              |     |                     | 1                |     |
|  | 0000   | } [        |                |      |              |      |     |     |                 |     |                     | - 1              |     |
|  | 0 00   | ) <u> </u> |                |      |              |      |     |     |                 |     |                     | 1                |     |
|  | 0000   |            |                | 5.70 | 6.50         | 107  | 0   | NA  | NA              |     |                     | 1                |     |
|  | 0.0    | ` -        |                |      |              |      |     |     |                 |     | SPT(C)50/0r         | nm -             |     |
|  | 0,00   | 6.80       | 0.17           | 6.50 | 6.80         | 107  | 0   | NA  | NA              |     | 6.50                | 6.51 -           |     |
| o recovery. Coarse SAND and GRAVEL with boulders. (Driller's escription)   |        | -          | 0.17           |      |              |      |     |     |                 |     |                     | - 1              |     |
|  |        | 3          |                |      |              |      |     |     |                 |     |                     | 1                |     |
|  |        | -          |                | 6.80 | 8.00         | 107  | 0   | NA  | NA              |     |                     | 1                |     |
|  |        | =          |                |      |              |      |     |     |                 |     |                     | 3                |     |
|  |        | =          |                |      |              |      |     |     |                 | NA  | SPT(C)58<br>8.00    | 8.45             |     |
|  |        | -          |                | 8.00 | 8.70         | 107  | 0   | NA  | NA              |     | 0.00                |                  |     |
|  |        | ] =        |                | 3.50 | 50           |      |     |     |                 |     |                     | 1                |     |
|  |        | 9 =        |                |      |              |      |     |     |                 |     |                     | 2<br>2<br>3      |     |
|  |        | -          |                | 8.70 | 9.50         | 107  | 0   | NA  | NA              |     |                     | 1                |     |
|  |        | =          |                | 50   | 5.50         |      |     |     |                 |     |                     | 1                |     |
| rey subangular to rounded coarse GRAVEL and subangular to  |        | 9.50       | -2.53          |      |              |      |     |     |                 |     | SPT(C)50/17<br>9.50 | 70mm -<br>9.82 - |     |
| ounded cobbles of granite and schist.  | 314    | 9.90 -     | -2.93          |      |              |      |     |     |                 |     |                     | 1 2              |     |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Sheet 1 of 3

Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

### **Exploratory Hole Log**

Hole ID.

L01

Sheet 2 of 3

Ground Level 6.97m CD Coordinates 396570.35 E, 804915.78 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend   | Depth                                  | Datum<br>Level | Samp    | ling  |      |     |     | ount A<br>Recov |              | In Situ Test<br>Details                         | Insta |
|---|----------|--|----------------|---------|-------|------|-----|-----|-----------------|--------------|---|-------|
|   |          |  | Level          | Details | ;     | Dia. | TCR | SCR | RQD             | IF           | Details   | atioi |
| 9.50m - 9.90m : Remaining Detail : 9.80m - 9.90m : from 9.80m<br>to 9.90m strong grey boulder of granite  |          |  |                | 9.50    | 10.70 | 107  | 25  | NA  | NA              |              | :   |       |
| 9.90m - 10.70m : Assumed zone of no recovery. Coarse SAND and<br>GRAVEL with boulders. (Driller's description)  | 000      | 10.70                                  | -3.73          | 10.70   | 11.00 | 107  | 0   | NA  | NA              | <u> </u>     |   |       |
| No recovery. Large BOULDERS with sand and gravel. (Driller's description)   |          |  |                | 11.00   | 11.50 | 107  | 0   | NA  | NA              | _            |   |       |
|   | 0000     | 12.00                                  | F 02           | 11.50   | 12.00 | 107  | 0   | NA  | NA              |              | -   |       |
| Rotary openhole drilling. BOULDERS with sand and gravel.<br>(Driller's description)   | 0000     | 12.00                                  | -5.03          |         |       |      |     |     |                 |              |   |       |
| Rotary openhole drilling. Boulder CLAY. (Driller's description)   | 0,00     | 12.60 -                                | -5.63          |         |       |      |     |     |                 |              |   |       |
| Rotary openhole drilling. Very sandy CLAY with gravel and large boulders. (Driller's description)   |          | 13.00                                  | -6.03          |         |       |      |     |     |                 |              | SPT(C)50/225mm-<br>13.00 13.38 -<br>-<br>-<br>- |       |
| Soft brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, schist and quartz.   | 0.00     | 14.00                                  | -7.03<br>-7.48 | 14.00   | 15.00 | 90   | 45  | NA  | NA              |              |   |       |
| Assumed zone of no recovery. Very sandy CLAY with gravel and large boulders. (Driller's description)  | \$ 100 P | -                                      |                |         |       |      |     |     |                 |              |   |       |
| Stiff brown very sandy CLAY. Sand is fine to coarse. from 15.30m to 15.60m assumed zone of no recovery  | 0 0 0    | 15.00                                  | -8.03          | 15.00   | 15.60 | 90   | 50  | NA  | NA              | NA           | SPT(C)50/5mm —<br>15.00 15.01 ·                 |       |
| Soft brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed igneous and metamorphic lithologies including granite, gneiss and schist. from 15.60m to 15.80m gneiss boulder from 15.80m to 15.85m coarse gravel of schist, gneiss and granite |          | 15.60 -<br>-<br>15.85 -<br>-<br>-<br>- | -8.63<br>-8.88 | 15.60   | 16.60 | 90   | 25  | NA  | NA              | <del>.</del> | -<br>-<br>-                                     |       |
| Assumed zone of no recovery. Very sandy CLAY with gravel and large boulders. (Driller's description)  | P 8 6    | 16.60                                  | -9.63          |         |       |      |     |     |                 |              |   |       |
| Rotary openhole drilling. Firm greyish brown sandy boulder CLAY with cobbles and boulders. (Driller's description)  |          |  |                |         |       |      |     |     |                 |              | SPT(C)50/0mm — 17.00 17.15                      |       |
|   |          |  |                |         |       |      |     |     |                 |              | 18.50 18.88                                     |       |

NOTES: All depths in metres, all diameters in millimetres.

See header sheet for details of boring, progress and water. For details of abbreviations, see key

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Project No. TA7148

Engineer

Employer

Arch Henderson LLP

Aberdeen Harbour Board

**Exploratory Hole Log** 

Hole ID.

L01

Sheet 3 of 3

Ground Level 6.97m CD Coordinates 396570.35 E, 804915.78 N National Grid

Hole Type CP+RC Inclination

| Description of Strata   | Legend                                 | Depth        | Datum  | Sar   | npling |      |     |     | ount A<br>Recov |                   | In Situ Test<br>Details | Insta     |
|---|--|--------------|--------|-------|--------|------|-----|-----|-----------------|-------------------|-------------------------|-----------|
|   |  |              | Level  | Deta  | ails   | Dia. | TCR | SCR | RQD             | IF                | Derails                 | ation     |
| Rotary openhole drilling. Firm greyish brown sandy boulder<br>CLAY with cobbles and boulders. (Driller's description)   | 0 0 0                                  | 20.30 -      | -13.33 |       |        |      |     |     |                 |                   |                         |           |
| Strong dark grey GNEISS. Discontinuities: 1) 40-50 degrees very closely and closely spaced planar rough clean.  |  | 20.30        | 13.33  | 20.30 | 20.70  | 89   | 100 | 100 | 0               |                   | ·                       |           |
| from 20.70m to 20.79m recovered as non intact core (angular coarse gravel sized fragments)  |  |              |        |       |        |      |     |     |                 |                   | :<br>-                  |           |
| from 21.20m to 21.40m recovered as non intact core (angular coarse gravel sized fragments)  |  | -            |        | 20.70 | 21.75  | 89   | 100 | 72  | 0               |                   |                         |           |
| from 21.55m to 21.95m discontinuities: 1) 50-60 degrees   |  |              |        |       |        |      |     |     |                 | NI<br>50<br>130   |                         |           |
| from 21.95m to 22.10m recovered as non intact core (angular coarse gravel sized fragments)  |  |              |        | 21.75 | 22.95  | 89   | 100 | 79  | 29              |                   | -<br>:                  |           |
| from 22.60m to 22.70m recovered as non intact core (angular coarse gravel sized fragments)  |  |              |        |       |        |      |     |     |                 |                   | -<br>-                  |           |
| from 22.70m to 22.95m 1 No discontinuity 80-90 degrees smooth planar  Medium strong locally weak pinkish grey stained orange coarse   | -                                      | 23.17        | -16.20 |       |        |      |     |     |                 |                   | ( <del>.</del>          |           |
| (angular coarse gravel sized fragments).  |  | -            |        | 22.95 | 24.00  | 90   | 95  | 9   | 0               | NI<br>NI<br>NI    | :<br>:<br>:-            |           |
| from 23.95m to 24.00m assumed zone of no recovery   | ************************************** | 24.00        | -17.03 |       |        |      |     |     |                 |                   |                         |           |
| Very strong pinkish grey coarse crystalline GRANITIC GNEISS. Discontinuities: 1) 10-20 degrees closely spaced planar rough clean. from 24.00m to 24.23m 1 No discontinuity 80-90 degrees planar rough stained orange on surface |  |              |        | 24.00 | 25.55  | 90   | 100 | 100 | 100             | 140<br>200<br>300 | :<br>:<br>:             |           |
| Exploratory hole complete at 25.55 m.   |  | 25.55 _<br>- | -18.58 |       |        |      |     |     |                 |                   |                         | #1940 115 |
|   |  |              |        |       |        |      |     |     |                 |                   |                         |           |

NOTES: All depths in metres, all diameters in millimetres. See header sheet for details of boring, progress and water. For details of abbreviations, see key

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# SUPPORTING FACTUAL DATA

# **SECTION A**

Exploratory Hole Records and Field Data

**EXCAVATION RECORDS** 

Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Excavation Log** Project No. TA7148 **TP01** Engineer Arch Henderson LLP **Employer** Aberdeen Harbour Board Sheet 1 of 1 Ground Level 2.53m CD Coordinates 396830.40 E, 805054.60 N National Grid Hole Type Method and equipment 20T Tracked Excavator 26/09/2013 26/09/2013 Date Started **Date Completed** Logged by GD Datum Sample In Situ Test Install-Description of Strata Legend Depth Details Level Details ation Multicoloured subangular to rounded COBBLES of mixed igneous and metamorphic B 001 0.10 - 0.40 0.15 2.38 D 002 0.20 Greyish brown sandy subangular to subrounded fine to coarse GRAVEL of mixed B 003 0.50 - 0.80 0.55 1.98 igneous and metamorphic lithologies with high cobble content. Sand is fine to D 004 0.60 coarse. Cobbles are subangular to subrounded of mixed igneous and metamorphic 0.85 1.68 lithologies predominantly schist. B 005 1.00 Soft to firm reddish brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is D 006 1.20 subangular to subrounded fine to coarse of schist. Medium strong dark grey granitic SCHIST. 1.70 0.83 Excavation complete at 1.70 m. Excavation dimensions and orientation Stability All faces stable Length (sides A and C) 3.80m Shoring None used Width (sides B and D) 2.20m Depth 1.70m 1. Trial pit terminated at 1.70m due to bedrock. Remarks Bearing of side A WATER STRIKES Time taken Date Strike at Rise depth 0.95 to depth 0.50 to rise 26/09/2013 All depths in metres, all soil strengths are average in kPa All bearings given relate to magnetic North See legend sheet for key to symbols and abbreviations For in situ test results, see accompanying records SOIL ENGINEERING Log Print Date And Time: 23/12/2013 10:33:49 Form No. SI EXC LOG Issue.Revision No. 1.04 Issue Date 22/10/2012 Part of the Bachy Soletanche group

Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Excavation Log** Project No. TA7148 TP02 Engineer Arch Henderson LLP **Employer** Aberdeen Harbour Board Sheet 1 of 1 Ground Level 2.99m CD Coordinates 396752.70 E, 805060.10 N National Grid Hole Type Method and equipment 20T Tracked Excavator Date Started 26/09/2013 26/09/2013 **Date Completed** Logged by GD Datum Sample In Situ Test Install-Description of Strata Legend Depth Details Level Details ation B 001 0.00 - 0.40 Greyish brown sandy subangular to subrounded fine to coarse GRAVEL of mixed D 002 0.20 igneous and metamorphic lithologies with medium cobble content. Sand is fine to coarse. Cobbles are subangular to subrounded of mixed igneous and metamorphic 0.40 2.59 B 003 0.50 - 1.00 D 004 0.60 Firm reddish brown sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of schist. B 005 1.00 - 2.00 1.00-1.99  ${\color{red}\textbf{Cobbles are}} \, \underline{\textbf{subangular to subrounded of schist}}.$ D 006 1.20 Medium strong dark grey granitic SCHIST. 2.10 -0.89 Excavation complete at 2.10 m. Excavation dimensions and orientation Stability All faces stable Length (sides A and C) 3.80m Shoring None used Width (sides B and D) 1.70m Depth 2.10m Remarks 1. Trial pit terminated at 2.10m due to bedrock. Bearing of side A WATER STRIKES Time taken Date Strike at Rise depth 1.00 to depth 0.90 to rise 26/09/2013 All depths in metres, all soil strengths are average in kPa All bearings given relate to magnetic North See legend sheet for key to symbols and abbreviations For in situ test results, see accompanying records SOIL ENGINEERING Log Print Date And Time: 23/12/2013 10:33:52 Form No. SI EXC LOG Issue.Revision No. 1.04 Issue Date 22/10/2012 Part of the Bachy Soletanche group

Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Excavation Log** Project No. TA7148 **TP03** Engineer Arch Henderson LLP **Employer** Aberdeen Harbour Board Sheet 1 of 1 Ground Level 396723.00 E, 805002.10 N National Grid 1.71m CD Coordinates Hole Type Method and equipment 20T Tracked Excavator 26/09/2013 26/09/2013 Date Started **Date Completed** Logged by GD Datum Sample In Situ Test Install-**Description of Strata** Legend Depth Details Details ation Level B 001 0.00 - 0.40 Grey slightly gravelly fine to coarse SAND with high cobble content. Sand is fine D 002 0.20 to coarse. Gravel is subrounded of mixed igneous and metamorphic lithologies predominantly schist. Cobbles are subrounded of mixed igneous and metamorphic lithologies predominantly schist. 0.55 B 003 0.60 - 1.00 from 0.30m to 0.55m cobbles absent Firm reddish brown slightly gravelly sandy CLAY with low cobble content. Sand is D 004 1.00 fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies predominantly schist. Cobbles are subrounded of mixed igneous and metamorphic lithologies predominantly schist. B 005 1.50 - 2.00 from 1.50m to 2.40m very sandy clay with high cobble content D 006 2.00 2.40 -0.69 Medium strong dark grey granitic SCHIST. D 007 2.60 2.70 -0.99 Excavation complete at 2.70 m. Excavation dimensions and orientation Stability Trial pit spalling from 0.00m to 0.55m on all faces Length (sides A and C) 1.80m Shoring None used Width (sides B and D) 3.60m Depth 2.70m 1. Trial pit terminated at 2.70m due to b bedrock. Remarks Bearing of side A 45° WATER STRIKES Date Strike at Rise Time taken depth 1.00 to depth 0.35 to rise 26/09/2013 All depths in metres, all soil strengths are average in kPa All bearings given relate to magnetic North See legend sheet for key to symbols and abbreviations For in situ test results, see accompanying records SOIL ENGINEERING Log Print Date And Time: 23/12/2013 10:33:55 Form No. SI EXC LOG Issue.Revision No. 1.04 Issue Date 22/10/2012 Part of the Bachy Soletanche group

| Project Name         | Bay of Nigg Harbou  | r Development Ground Investig   | ation                                   |       |          |                |                                    |                 | Hole                   | ID.                   |
|----------------------|---|---|---|-------|----------|----------------|------------------------------------|-----------------|------------------------|-----------------------|
| Project No.          | TA7148  |   |   |       | Exc      | avatio         | on Log                             |                 | TP0                    | 4                     |
| Engineer             | Arch Henderson LLF  |   |   |       |          |                |                                    |                 | 110                    | ' -                   |
| Employer             | Aberdeen Harbour E  |   |   |       |          |                |                                    |                 | Sheet 1                | of 1                  |
| Ground Level         | 1.75m CD  | Coordinates   | 396656.00 E, 8049                       |       | N Nation | nal Grid       |                                    |                 |                        |                       |
| Hole Type            | TP  | Method and equipment  |   | ator  |          |                |                                    |                 |                        |                       |
| Date Started         | 27/09/2013  | Date Completed  | 27/09/2013                              |       |          | Logg           | ged by GD                          |                 |                        |                       |
|                      | Description of  | Strata  | Leg                                     | end   | Depth    | Datum<br>Level | Sample<br>Details                  | lı              | n Situ Test<br>Details | Install-<br>ation     |
| subrounded of mi     |   | h high cobble content. Gravel is<br>hic lithologies. Cobbles are subrounded | <b>▼</b>                                |       |          |                | B 001 0.00 - 0.7                   | 0 -             |                        |                       |
| Firm reddish brow    | n slightly gravelly sandy CL  | AY with low cobble content. Sand is nded fine to coarse of mixed            | p - p                                   |       | 0.60     | 1.15           | D 002 0.50                         | -               |                        |                       |
| igneous and meta     |   | s are subrounded of mixed igneous and                                       | P 0<br>P 0                              |       | ;<br>;   |                | B 003 1.00 - 1.5                   | · E             |                        |                       |
|                      |   |   | 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - |       |          |                | D 004 1.50                         | -<br> -<br> -   |                        |                       |
| from 1.80m           | to 3.30m with high cobble o   | content   | P - 0                                   |       |          |                | B 005 2.00 - 2.5                   |                 |                        |                       |
|                      |   |   | P - 2<br>P - 2                          | 6     | =        |                |                                    | -               |                        |                       |
|                      |   |   | P - 0                                   | 90,90 |          |                |                                    | E               |                        |                       |
| Excavation complet   | e at 3 30 m   |   | 4.0                                     | 0-    | 3.30     | -1.55          | D 006 3.20                         |                 |                        |                       |
|                      |   |   |   |       | -        |                |                                    | -               |                        |                       |
|                      |   |   |   |       |          |                |                                    | -               |                        |                       |
|                      |   |   |   |       | =        |                |                                    |                 |                        |                       |
|                      |   |   |   |       | ]        |                |                                    | -               |                        |                       |
|                      |   |   |   |       | -        |                |                                    | -               |                        |                       |
|                      |   |   |   |       | =        |                |                                    |                 |                        |                       |
|                      |   |   |   |       | -        |                |                                    |                 |                        |                       |
|                      |   |   |   |       | -        |                |                                    | -               |                        |                       |
|                      |   |   |   |       | -        |                |                                    | -               |                        |                       |
|                      |   |   |   |       |          | Fuerus         | *: di                              |                 | .:                     |                       |
| Stability            | Trial pit spalling from 0.  | 00m to 0.60m on all faces   |   |       |          |                | tion dimensions                    |                 | 3.90m                  |                       |
| Shoring              | None used   |   |   |       |          | _              | (sides A and C)<br>(sides B and D) |                 | 1.90m                  |                       |
|                      |   |   |   |       |          | Depth          | (Sides B and B)                    |                 | 3.30m                  |                       |
| Remarks              | surface water ingres  | at 3.30m due to constant collapse and ss.                                   |   |       |          | -              | g of side A                        |                 | 285°                   |                       |
|                      |   |   |   |       |          |                | WATER ST                           |                 |                        |                       |
|                      |   |   |   |       | Dat      |                | d                                  | rike at<br>epth | Rise<br>to depth       | Time taken<br>to rise |
|                      |   |   |   |       | 27/09    | /2013          |                                    | 0.00            | 0.00                   | 0                     |
|                      |   |   |   |       |          |                |                                    |                 |                        |                       |
| All bear<br>See lege | hs in metres, all soil strer<br>ings given relate to magne<br>end sheet for key to symb<br>tu test results, see accom | etic North<br>ols and abbreviations   |   | ı     |          |                |                                    |                 |                        |                       |
| 1 01 111 31          |   | Print Date And Time: 23/12/2013 10:   | :33:57                                  |       |          |                |                                    | SOIL            | engin                  | eering                |
| Form No. SI EXC LOG  | Issue   | Revision No. 1.04 Issue Date 22/10/2  | 012                                     |       |          |                |                                    | Part of         | the Bachy Solet        | tanche group          |

|                     |   |                                       |                  |            |   |                |                   | ,             |                        |                   |
|---------------------|---|---------------------------------------|------------------|------------|---|----------------|-------------------|---------------|------------------------|-------------------|
|                     | Bay of Nigg Harbour Devel   | opment Ground Investig                | jation           |            |   | _              | _                 |               | Hole I                 | D.                |
| Project No.         | TA7148  |                                       |                  |            | Exc                                     | avatio         | on Log            |               | TDO                    | _                 |
| Engineer            | Arch Henderson LLP  |                                       |                  |            |   |                |                   |               | TP0                    | 5                 |
| Employer            | Aberdeen Harbour Board  |                                       |                  |            |   |                |                   |               | Sheet 1                | of 1              |
| Ground Level        | 2.77m CD  | Coordinates                           | 396595.70 E, 80  | 4882.30    | N Nation                                | nal Grid       |                   |               |                        |                   |
| Hole Type           | TP  | Method and equipment                  | 20T Tracked Exc  | avator     |   |                |                   |               |                        |                   |
| Date Started        | 26/09/2013  | Date Completed                        | 26/09/2013       |            |   | Logo           | ged by GD         |               |                        |                   |
| Duto 4              | 20, 00, 2010  | 2000 C                                | 20,00            |            |   |                |                   |               |                        |                   |
|                     | Description of Strata   |                                       | L                | egend.     | Depth                                   | Datum<br>Level | Sample<br>Details | I             | n Situ Test<br>Details | Install-<br>ation |
| Multicoloured slig  | ghtly sandy subangular to subrounded  | d fine to coarse GRAVEL of            | .*.              | :          | _                                       |                | B 001 0.00 - 0.5  | 0             |                        |                   |
| mixed igneous and   | d metamorphic lithologies with high   | cobble content and high               |                  |            | =                                       |                |                   | þ             |                        |                   |
|                     | Sand is fine to coarse. Cobbles are sul<br>ded of mixed igneous and metamorpl |                                       | (5)              |            | 1                                       |                | D 002 0.50        | F             |                        |                   |
| to 1.00m x 0.60m    | x 0.60m) are of mixed igneous and n   |                                       | , 🗹              |            |   |                | B 003 0.50 - 1.0  | ° E           |                        |                   |
| predominantly gra   | anite.  |                                       | _ ▼              |            | -                                       |                | D 004 1.00        | L             |                        |                   |
|                     |   |                                       | , ,              |            | -                                       |                | D 00              | þ             |                        |                   |
|                     | y slightly gravelly sandy CLAY with lo  |                                       | p. 4             | o          | 1.30 -                                  | 1.47           | 4 50 20           | . <b>F</b>    |                        |                   |
|                     | avel is subrounded fine to coarse of gree subrounded of granite and predomi   |                                       | 0-               | 0-0-       | 3                                       |                | B 005 1.50 - 2.0  | °E            |                        |                   |
| Someti Connection   | s subjourned of granice and piece.  | manny dank groy some                  | p.               | 0 0        | -                                       |                |                   | F             |                        |                   |
|                     |   |                                       | p                | , p        | -                                       |                | D 006 2.00        | _             |                        |                   |
|                     |   |                                       | p.4              | P 6        | =                                       |                |                   | F             |                        |                   |
|                     |   |                                       | 9.5<br>4.        | 0 0        | 3                                       |                |                   | F             |                        |                   |
|                     |   |                                       | 0.               | \$ = = = · |   |                |                   | E             |                        |                   |
|                     |   |                                       | 0.               | 0 p        | _                                       |                |                   | E             |                        |                   |
|                     |   |                                       | 13°              | à          | 3.20 <del>-</del>                       | -0.43          |                   | F             |                        |                   |
| Excavation complete | e at 3.20 m.  |                                       |                  |            | ======================================= |                |                   | þ             |                        | 100 100 10        |
|                     |   |                                       |                  |            | -                                       |                |                   | F             |                        |                   |
|                     |   |                                       |                  |            | ]                                       |                |                   | F             |                        |                   |
|                     |   |                                       |                  |            | -                                       |                |                   | E             |                        |                   |
|                     |   |                                       |                  |            | =                                       |                |                   | E             |                        |                   |
|                     |   |                                       |                  |            | -                                       |                |                   |               |                        |                   |
|                     |   |                                       |                  |            | =                                       |                |                   | F             |                        |                   |
|                     |   |                                       |                  |            |   |                |                   | þ             |                        |                   |
|                     |   |                                       |                  |            | -                                       |                |                   | -             |                        |                   |
|                     |   |                                       |                  |            | =                                       |                |                   | F             |                        |                   |
|                     |   |                                       |                  |            | ]                                       |                |                   | E             |                        |                   |
|                     |   |                                       |                  |            | _                                       |                |                   | F             |                        |                   |
|                     |   |                                       |                  |            | =                                       |                |                   | L             |                        |                   |
|                     |   |                                       |                  |            | -                                       |                |                   | F             |                        |                   |
|                     |   |                                       |                  |            | 3                                       |                |                   | E             |                        |                   |
|                     |   |                                       |                  |            | ]                                       |                |                   | E             |                        |                   |
|                     |   |                                       |                  |            | -                                       |                |                   | F             |                        |                   |
|                     |   |                                       |                  |            | -                                       |                |                   | <u> </u>      |                        |                   |
|                     |   |                                       |                  |            | -                                       |                |                   | þ             |                        |                   |
|                     |   |                                       |                  |            |   |                |                   |               |                        |                   |
|                     |   |                                       |                  |            |   | Excava         | tion dimensions   | s and or      | rientation             |                   |
| Stability           | Collapse from 0.00m to 1.30m or   | ı all faces                           |                  |            |   | Lenath         | (sides A and C)   |               | 3.80m                  |                   |
| Shoring             | None used   |                                       |                  |            |   | _              | (sides R and D)   |               | 3.80m                  |                   |
| _                   |   |                                       |                  |            |   |                | (Sides Dana D,    |               |                        |                   |
| Remarks             | 1. Trial pit terminated at 3.20m  | due to constant collapse.             |                  |            |   | Depth          |                   |               | 3.20m                  |                   |
|                     |   |                                       |                  |            |   | Bearing        | g of side A       |               | 330°                   |                   |
|                     |   |                                       |                  |            |   |                | WATER ST          | RIKES         |                        |                   |
|                     |   |                                       |                  |            | Dat                                     | te             |                   | rike at       | 1                      | Γime taken        |
|                     |   |                                       |                  |            | 26/09                                   | /2013          |                   | lepth<br>1.00 | to depth<br>0.80       | to rise           |
|                     |   |                                       |                  |            |   |                |                   |               |                        |                   |
|                     |   |                                       |                  |            |   |                |                   |               |                        |                   |
|                     |   |                                       |                  |            |   |                |                   |               |                        |                   |
|                     |   |                                       |                  |            |   |                |                   |               |                        |                   |
| Notes: All depti    | hs in metres, all soil strengths are ings given relate to magnetic North      | average in kPa                        |                  |            |   |                |                   |               | IA                     |                   |
| See leae            | end sheet for key to symbols and a  | bbreviations                          |                  |            |   |                |                   |               |                        |                   |
| For in si           | itu test results, see accompanying I  | records<br>te And Time: 23/12/2013 10 | )·3 <b>₹·</b> UU |            |   |                |                   | SOIL          | engine                 | eering            |
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|  |   |   |                 | $\overline{}$ |          |                |  |            |                        | $\overline{}$     |
|--|---|---|-----------------|---------------|----------|----------------|--|------------|------------------------|-------------------|
|  | Bay of Nigg Harbour Develop   | oment Ground Investig                                 | ation           |               |          | ••             |  |            | Hole I                 | D.                |
| Project No.  | TA7148  |   |                 |               | EXC      | avatic         | on Log   |            | TP0                    | 6                 |
| Engineer   | Arch Henderson LLP Aberdeen Harbour Board   |   |                 |               |          |                |  |            |                        |                   |
| Employer Ground Level  | 7.06m CD  | Coordinates   | 396523.30 E, 80 | )4863.20      | N Natior | nal Grid       |  |            | Sheet 1                | of 1              |
|  | TP  | Method and equipment                                  |                 |               | / 14 14  | idi C          |  |            |                        |                   |
|  | 25/09/2013  | Date Completed  | 25/09/2013      | 4.4           |          | Logo           | ged by GD  |            |                        |                   |
| Date 5tm   | 23/ 03/ 2010  |   |                 |               |          | 55             |  |            |                        |                   |
|  | Description of Strata   |   | L               | Legend        | Depth    | Datum<br>Level | Sample<br>Details  |            | n Situ Test<br>Details | Install-<br>ation |
| metamorphic litho<br>is coarse. Cobbles<br>metamorphic litho | angular to subrounded fine to coarse GR<br>blogies with high cobble content and hi<br>are subangular to rounded fine to coar<br>blogies. Boulders are (up to 500mm x 40<br>morphic lithologies. | igh boulder content. Sand<br>rse of mixed igneous and |                 |               | 3.00     | 4.06           | D 001 0.50<br>D 002 0.50 -<br>D 003 1.50<br>B 004 1.50 -<br>D 005 2.50<br>B 006 2.50 - | - 2.00     |                        |                   |
|  |   |   |                 |               |          |                |  |            |                        |                   |
| Or 1.784   | 5 "   |   |                 |               |          | Excavat        | tion dimensi   | ons and or | rientation             |                   |
| Stability<br>Shoring   | Collapse from 0.00m to 3.00m on a   | il faces  |                 |               |          | _              | (sides A and   | -          | 4.20m<br>3.30m         |                   |
| Remarks  | Trial pit terminated at 3.00m du  | ue to constant collapse.                              |                 |               |          | Depth          |  | :          | 3.00m                  |                   |
|  | ** ***********************************  | 10 10 101111111111111111111111111111111               |                 |               |          | Bearing        | g of side A  | :          | 300°                   |                   |
|  |   |   |                 | t             |          |                | WATER  | STRIKES    |                        |                   |
|  |   |   |                 | }             | Dat      | te             | Time   | Strike at  |                        | Time taken        |
|  |   |   |                 | _             |          |                |  | depth      | to depth               | to rise           |
|  |   |   |                 |               |          |                |  |            |                        |                   |
| See lege   | hs in metres, all soil strengths are avings given relate to magnetic North end sheet for key to symbols and abbut tu test results, see accompanying rec   | breviations   |                 |               |          |                |  | SOIL       | engine                 | eering            |

|  | Bay of Nigg Harbour Develop  | oment Ground Investig                        | ation          |         |               |                |                          |   | Hole                   | ID.               |
|--|--|--|----------------|---------|---------------|----------------|--------------------------|---|------------------------|-------------------|
| Project No.  | TA7148   |  |                |         | Exc           | avatio         | on Log                   |   | TP0                    | 7                 |
| Engineer   | Arch Henderson LLP   |  |                |         |               |                |                          |   | 170                    | 1                 |
| Employer   | Aberdeen Harbour Board   |  |                |         |               |                |                          |   | Sheet 1                | of 1              |
| Ground Level   | 3.89m CD   | Coordinates                                  | 396566.10 E, 8 | 804828  | 3.70 N Nation | nal Grid       |                          |   |                        |                   |
| Hole Type  | TP   | Method and equipment                         | 20T Tracked E  | xcavato | or            |                |                          |   |                        |                   |
| Date Started   | 25/09/2013   | Date Completed                               | 25/09/2013     |         |               | Log            | ged by GD                |   |                        |                   |
|  |  |  |                |         |               |                |                          |   |                        |                   |
|  | Description of Strata  |  |                | Legen   | nd Depth      | Datum<br>Level | Sample<br>Details        | lı                                      | n Situ Test<br>Details | Install-<br>ation |
| metamorphic litho<br>is fine to coarse. O<br>metamorphic litho | angular to subrounded fine to coarse GR ologies with high cobble content and his Cobbles are subangular to rounded of m ologies. Boulders are (up to 350mm x 35 morphic lithologies. | gh boulder content. Sand<br>ixed igneous and |                |         | 2.00          | 1.89           | D 001 1.00<br>B 002 1.00 |   |                        |                   |
|  |  |  |                |         |               | Excava         | tion dimensi             | ons and or                              | ientation              |                   |
| Stability  | Collapse from 0.00m to 2.00m on a  | II faces                                     |                |         |               | Length         | ı (sides A and           | I C) 2                                  | 2.20m                  |                   |
| Shoring  | None used  |  |                |         |               | Width          | (sides B and             | D) 2                                    | 2.20m                  |                   |
| Remarks  | Trial pit terminated at 2.00m du   | ie to constant collanse                      |                |         |               | Depth          |                          | 2                                       | 2.00m                  |                   |
| Acmains  | 2. That pic terminated at 2.00111 dt   | ac to constant collapse.                     |                |         |               |                | g of side A              | 1                                       | 160°                   |                   |
|  |  |  |                |         |               |                |                          | STRIKES                                 |                        |                   |
|  |  |  |                |         | Dat           | te             | Time                     | Strike at                               | Rise                   | Time taken        |
|  |  |  |                |         |               |                |                          | depth                                   | to depth               | to rise           |
|  |  |  |                |         | 25/09         | / 2013         |                          | 0.40                                    | 0.40                   | 1                 |
| No.  | the transfer of the state of   | and the LP                                   |                |         |               |                |                          |   |                        |                   |
| All bear   | hs in metres, all soil strengths are avings given relate to magnetic North   |  |                |         |               |                |                          |   | 4                      |                   |
| See lege<br>For in si  | end sheet for key to symbols and abb<br>itu test results, see accompanying rec   | cords  |                |         |               |                |                          |   |                        |                   |
|  | •  | And Time: 23/12/2013 10                      |                |         |               |                |                          | 100000000000000000000000000000000000000 |                        | eering            |
| Form No. SI EXC LOG  | Issue.Revision No. 1.0   | 94 Issue Date 22/10/2                        | 2012           |         |               |                |                          | Part of                                 | the Bachy Solet        | anche group       |

| -  | Bay of Nigg Harbour Devel  | opment Ground Investig  | jation                              |          | _      |                | _  |                    | Hole I                  | D.                    |
|--|--|---|-------------------------------------|----------|--------|----------------|--|--------------------|-------------------------|-----------------------|
| Project No.  | TA7148   |   |                                     |          | Exc    | avatio         | on Log   |                    | TP08                    | R                     |
| Engineer   | Arch Henderson LLP   |   |                                     |          |        |                |  |                    | 1. 0.                   | ı l                   |
| Employer   | Aberdeen Harbour Board   |   |                                     |          |        |                |  |                    | Sheet 1 c               | of 1                  |
| Ground Level   | 6.65m CD   | Coordinates   | 396506.00 E, 8                      |          |        | nal Grid       |  |                    |                         |                       |
| Hole Type  | TP   | Method and equipment  |                                     | xcavator |        |                |  |                    |                         |                       |
| Date Started   | 25/09/2013   | Date Completed  | 25/09/2013                          |          |        | Log            | ged by GD  |                    |                         |                       |
|  | Description of Strata  |   |                                     | Legend   | Depth  | Datum<br>Level | Sample<br>Details  |                    | In Situ Test<br>Details | Install-<br>ation     |
| MADE GROUND: 1   | <br>Горsoil.   |   |                                     | XXXX     | =      |                |  |                    |                         |                       |
| and subangular to<br>mixed igneous and<br>fragments, occasion<br>occasional ceramion<br>sized fragments and<br>metamorphic litho | Brown subangular to rounded fine to be rounded boulder sized fragments (up the model of the mode | up to 500mm x 400mm x 400m) th sandy gravel sized tic packaging fragments and ure fine to coarse. Gravel rse of mixed igneous and |                                     |          | 0.30   | 6.35           | B 001 0.50 -<br>D 002 0.50<br>B 003 1.50 -<br>D 004 1.50 | -                  |                         |                       |
| Sand is fine to coa igneous and meta   | andy GRAVEL with high cobble conte<br>arse. Gravel is subangular to rounded<br>amorphic lithologies. Cobbles are sub<br>amorphic lithologies. Boulders (up to !  | I fine to coarse of mixed<br>pangular to rounded of mixed   | re [\frac{\frac{\frac{1}{2}}{2}}{2} |          | 2.50   | 4.15           | B 005 2.50 -<br>D 006 2.50                               | 3.00               |                         |                       |
| of mixed igneous   | and metamorphic lithologies. `   | 500mm x 500mm x 4001111111 an   | e L¥                                |          | 3.80   | 2.85           | B 007 3.50 -<br>D 008 3.50                               | 4.00               |                         |                       |
| Excavation complete  |  |   |                                     |          |        | Excava         | tion dimensi   | ons and c          | prientation             |                       |
| Stability  | Collapse from 0.30m to 3.80m or  | n all faces   |                                     |          |        |                | (sides A and   |                    | 1.90m                   |                       |
| Shoring  | None used  |   |                                     |          |        | _              | (sides B and   | •                  | 4.00m                   |                       |
| 5t   | T 1 1 12 12 12 12 12 12 12 12 12 12 12 12  | · · · · · · · · · · · · · · · · · · ·   |                                     |          |        | Depth          | (0.002 =   | -                  | 3.80m                   |                       |
| Remarks  | Trial pit terminated at 3.80m  | due to constant collapse.   |                                     |          |        |                | g of side A  |                    | 320°                    |                       |
|  |  |   |                                     |          |        | Doc            | _  |                    |                         |                       |
|  |  |   |                                     |          | Det    | -              |  | STRIKES            | h                       |                       |
|  |  |   |                                     |          | Dat    |                | Time   | Strike at<br>depth | to depth                | Time taken<br>to rise |
|  |  |   |                                     |          | 25/09. | /2013          |  | 3.10               | 3.00                    | 5                     |
| All beari<br>See lege  | ths in metres, all soil strengths are<br>rings given relate to magnetic Nortl<br>end sheet for key to symbols and a<br>itu test results, see accompanying i<br>Log Print Dat   | h<br>abbreviations  | 0:34:08                             |          |        |                |  | SOIL               | engine                  | eering                |
| Form No. SLEXC LOG   | Issue Revision No.   |   |                                     |          |        | <del> </del>   |  | Part of            | f the Bachy Soleta      | anche group           |

|                                      |   |   |                  | -        |            |                |                                 | 1            |                        | <del></del>       |
|--------------------------------------|---|---|------------------|----------|------------|----------------|---------------------------------|--------------|------------------------|-------------------|
|                                      |   | Development Ground Investig   | ation            |          | _          | . •            | -                               |              | Hole I                 | D.                |
| Project No.                          | TA7148  |   |                  |          | Exc        | avatı          | on Log                          |              | TP0                    | q                 |
| Engineer                             | Arch Henderson LLP  |   |                  |          |            |                |                                 |              | 11 🐱                   | _                 |
| Employer                             | Aberdeen Harbour Bo   |   |                  |          |            |                |                                 |              | Sheet 1                | of 1              |
| Ground Level                         | 3.32m CD  | Coordinates   | 396563.70 E, 804 |          | ) N Natior | nal Grid       |                                 |              |                        |                   |
| Hole Type                            | TP  | Method and equipment  | 20T Tracked Exca | avator   |            |                |                                 |              |                        |                   |
| Date Started                         | 25/09/2013  | Date Completed  | 25/09/2013       |          |            | Log            | ged by GD                       |              |                        |                   |
|                                      |   |   |                  |          |            |                |                                 |              |                        |                   |
|                                      | Description of S  | Strata  | Le               | egend    | Depth      | Datum<br>Level | Sample<br>Details               | lı           | n Situ Test<br>Details | Install-<br>ation |
| subrounded BOUL<br>metamorphic litho | LDERS (up to 500mm x 500m ologies with much slightly sa                                     | to coarse COBBLES and subangular to<br>mm x 400mm) of mixed igneous and<br>andy gravel. Sand is fine to coarse. | 9                | 00000    |            |                | B 001 0.40 - 0.60               |              |                        |                   |
| metamorphic litho                    | ılar to subrounded fine to coa<br>ologies.  | rse or mixed igneous and  | - 🔻 🖔            | 0000     |            |                | D 002 0.40<br>B 003 0.60 - 1.00 | b  -         |                        |                   |
|                                      |   |   | 0                | 0000     | 3 -        |                | D 004 1.00                      | -            |                        |                   |
|                                      |   |   | þ                | 0000     | =          |                | B 005 1.20 - 2.00               | P            |                        |                   |
|                                      |   |   | Ş                | 0000     | =          |                | D 006 1.50                      | E            |                        |                   |
|                                      |   |   | 8                | 0300     | <u> </u>   |                |                                 | -            |                        |                   |
|                                      |   |   | 8                | 0300     | 6 -        |                |                                 |              |                        |                   |
|                                      |   |   | 8                | 0000     | -          |                |                                 | -            |                        |                   |
| is fine to coarse. G                 | Gravel is subangular to subrou  | with medium cobble content. Sand unded fine to coarse of mixed are subangular to subrounded                     | Ø. –             |          | 2.40       | 0.92           | B 007 2.50 - 3.00<br>D 008 2.50 |              |                        |                   |
|                                      | ded of mixed igneous and me   |   | 0-               | 0 0      |            |                | B 009 3.00 - 3.50               |              |                        |                   |
|                                      |   |   | 0                | <u> </u> | _          |                |                                 | -            |                        |                   |
|                                      |   |   | 0 -              | 0 0      | 3          |                |                                 | Ė            |                        |                   |
| Excavation complet                   | te at 3.80 m.   |   |                  | 0        | 3.80 -     | -0.48          |                                 | -            |                        |                   |
|                                      |   |   |                  |          | =          |                |                                 | -            |                        |                   |
|                                      |   |   |                  |          | -          |                |                                 | E            |                        |                   |
|                                      |   |   |                  |          | -          |                |                                 | -            |                        |                   |
|                                      |   |   |                  |          | =          |                |                                 | Ė            |                        |                   |
|                                      |   |   |                  |          | -          |                |                                 | -            |                        |                   |
|                                      |   |   |                  |          | -          |                |                                 | F            |                        |                   |
|                                      |   |   |                  |          |            |                |                                 | Ė            |                        |                   |
|                                      |   |   |                  |          | -          |                |                                 | -            |                        |                   |
|                                      |   |   |                  |          | _          |                |                                 | F            |                        |                   |
|                                      |   |   |                  |          | =          |                |                                 | E            |                        |                   |
|                                      |   |   |                  |          | -          |                |                                 | -            |                        |                   |
|                                      |   |   |                  |          | -          |                |                                 | Ė            |                        |                   |
|                                      |   |   |                  |          | _          |                |                                 | F            |                        |                   |
|                                      |   |   |                  |          | =          |                |                                 | Ė            |                        |                   |
|                                      |   |   |                  |          | -          |                |                                 | -            |                        |                   |
| Stability                            | Collapse from 0.80m to 2  | .80m on all faces   |                  |          |            |                | tion dimensions                 |              |                        |                   |
| Charina                              | None used   |   |                  |          |            | _              | (sides A and C)                 |              | 1.80m                  |                   |
| Shoring                              | None useu   |   |                  |          |            |                | (sides B and D)                 |              | 4.00m                  |                   |
| Remarks                              | 1. Trial pit terminated a   | t 3.80m due to constant collapse.   |                  |          |            | Depth          |                                 |              | 3.80m                  |                   |
|                                      |   |   |                  |          |            | Bearin         | g of side A                     |              | 250°                   |                   |
|                                      |   |   |                  |          |            |                | WATER STI                       | RIKES        |                        |                   |
|                                      |   |   |                  |          | Dat        | te             |                                 | rike at      | 1                      | Time taken        |
|                                      |   |   |                  |          | 25/09      | /2013          |                                 | epth<br>0.80 | to depth<br>0.80       | to rise           |
|                                      |   |   |                  |          |            |                |                                 |              |                        | ı                 |
|                                      |   |   |                  |          |            |                |                                 |              |                        | ı                 |
|                                      |   |   |                  |          |            |                |                                 |              |                        | ı                 |
| Notes: All dept                      | ths in metres, all soil streng  | oths are average in kPa   |                  |          |            |                |                                 |              |                        |                   |
| All bear<br>See lege                 | rings given relate to magnet<br>end sheet for key to symbol<br>itu test results, see accomp | tic North<br>Is and abbreviations   |                  |          |            |                |                                 |              |                        |                   |
| 10111101                             |   | Print Date And Time: 23/12/2013 10:   | :34:11           |          |            |                |                                 | SOIL         | engine                 | eering            |
| Form No. SI EXC LOG                  | Issue.F   | Revision No. 1.04 Issue Date 22/10/2  | 2012             |          |            | •              |                                 | Part of      | the Bachy Soleta       | anche group       |

| Project Name  | Bay of Nigg Harbo  | our Development Ground Investig   | ation   |           |  |                |  |                   | Hole                   | ID.                   |
|---|--|---|---|-----------|--|----------------|--|-------------------|------------------------|-----------------------|
| Project No.   | TA7148   |   |   |           | Exc  | avatio         | on Log   |                   | TP1                    | 0                     |
| Engineer  | Arch Henderson L   | LP  |   |           |  |                |  |                   | 117                    | .0                    |
| Employer  | Aberdeen Harbou  | r Board   |   |           |  |                |  |                   | Sheet 1                | of 1                  |
| Ground Level  | 6.49m CD   | Coordinates   | 396524.50 E, 8046                               | 51.50 N   | l Nation   | al Grid        |  |                   |                        |                       |
| Hole Type   | TP   | Method and equipment  | 20T Tracked Excava                              | ator      |  |                |  |                   |                        |                       |
| Date Started  | 25/09/2013   | Date Completed  | 25/09/2013                                      |           |  | Logg           | ged by GD  |                   |                        |                       |
|   |  |   |   |           |  | _              |  |                   |                        | 1                     |
|   | Description  | of Strata   | Leg   | end I     | Depth  | Datum<br>Level | Sample<br>Details  |                   | n Situ Test<br>Details | Install-<br>ation     |
| MADE GROUND: 1  | Topsoil.   |   | $\otimes$                                       | <b>XX</b> | 0.20 -   | 6.29           |  |                   |                        |                       |
| content and high l<br>sized fragments al<br>metamorphic litho<br>subangular to sub<br>and tarmacadam. | boulder content. Sand siz<br>re angular to subrounded<br>ologies, brick and tarmaca<br>rounded of mixed igneou | gravel sized fragments with high cobble ed fragments are fine to coarse. Gravel fine to coarse of mixed igneous and adam. Cobble sized fragments are s and metamorphic lithologies, red brick are of reinforced concrete and granite. some electrical cable |   |           | 0.20<br><br><br><br><br><br><br><br><br><br><br><br><br> | 0.23           | B 001 0.50 - 1.0<br>D 002 0.50<br>B 003 1.50 - 2.0<br>D 004 1.50 |                   |                        |                       |
|   |  |   |   |           |  |                | B 005 2.00 - 3.0   | 00                |                        |                       |
| to rounded fine to  |  | w cobble content. Gravel is subangular<br>and metamorphic lithologies. Cobbles<br>t and gneiss.   | 9 - 0<br>- 0<br>- 0<br>- 0<br>- 0<br>- 0<br>- 0 |           | 2.40 -   | 4.09           | D 006 2.50   |                   |                        |                       |
| from 3.00m t  | to 3.20m dark brown/blad   | ck staining   |   | 0         | -  |                |  |                   |                        |                       |
| Firm to stiff orangi<br>content. Sand is fi   | ish brown slightly sandy one to coarse. Gravel is su   | gravelly CLAY with low cobble<br>bangular to rounded medium to coarse   | ρ ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο         |           | 3.20 -   | 3.29           | B 007 3.50 - 4.0   | 00                |                        |                       |
| and predominantly   |  | gies. Cobbles are subrounded of granite   | 0 - 6   |           | -  |                | D 008 3.50   | -                 |                        |                       |
|   |  |   | P : 0   |           | -  |                | B 009 4.00 - 4.4   | 40 -              |                        |                       |
| Excavation complete   | e at 4.40 m.   |   | <u>ρ</u>  |           | 4.40   | 2.09           | D 010 4.40   |                   |                        |                       |
|   |  |   |   |           |  |                |  |                   |                        |                       |
| Stability   | All faces stable   |   |   |           |  |                | tion dimension   |                   |                        |                       |
| Shoring   | None used  |   |   |           |  | •              | (sides A and C   | •                 | 1.80m<br>3.90m         |                       |
| _   |  |   |   |           |  |                | (sides B and D)  |                   | 3.90m<br>4.40m         |                       |
| Remarks   |  |   |   |           |  | Depth          | a of side ^  |                   | 4.40m<br>350°          |                       |
|   |  |   |   |           |  | Bearing        | g of side A  |                   | 330                    |                       |
|   |  |   |   |           |  |                | WATER ST   |                   | T 5:                   | hrim to t             |
|   |  |   |   |           | Dat  |                |  | trike at<br>depth | Rise<br>to depth       | Time taken<br>to rise |
|   |  |   |   |           | 25/09/   | /2013          |  | 3.10              | 3.00                   | 5                     |
| All beari<br>See lege   | ings given relate to mag   | bols and abbreviations  |   |           |  |                |  | 2,17              |                        |                       |
|   |  | og Print Date And Time: 23/12/2013 10   |   |           |  |                |  | 23.3              | Ser server             | eering                |
| Form No. SI EXC LOG   | Is   | sue.Revision No. 1.04 Issue Date 22/10/2  | 012   |           |  |                |  | Part of           | the Bachy Sole         | tanche group          |

Project Name Bay of Nigg Harbour Development Ground Investigation Hole ID. **Excavation Log** Project No. TA7148 **TP11** Engineer Arch Henderson LLP **Employer** Aberdeen Harbour Board Sheet 1 of 1 Ground Level 396574.90 E, 804657.90 N National Grid 2.64m CD Coordinates Hole Type Method and equipment 20T Tracked Excavator 24/09/2013 Date Started **Date Completed** 24/09/2013 Logged by GD Datum Sample In Situ Test Install-Description of Strata Legend Depth Details Details ation Level MADE GROUND: Multicoloured subangular to subrounded cobbles and boulder sized fragments (up to 400mm x 400mm x 400mm) of mixed igneous and metamorphic lithologies and occasional concrete with much slightly sandy gravel. Sand sized B 001 0.50 - 1.00 fragments are fine to coarse. Gravel sized fragments are subangular to subrounded D 002 0.50 fine to coarse of mixed igneous and metamorphic lithologies. B 003 1.50 - 2.00 D 004 1.50 2.30 0.34 Firm to stiff brown slightly sandy gravelly CLAY with low cobble content. Sand is B 005 2.50 - 2.80 D 006 2.50 fine to coarse. Gravel is subangular to rounded medium to coarse of mixed igneous and metamorphic lithologies. Cobbles are subrounded of granite and B 007 2.80 - 3.10 D 008 2.80 predominantly schist. -0.46 Excavation complete at 3.10 m. Excavation dimensions and orientation Stability Collapse from 1.40m to 2.30m on all faces Length (sides A and C) 1.80m Shoring None used Width (sides B and D) 3.60m Depth 3.10m 1. Trial pit terminated at 3.10m due to groundwater inflow and Remarks constant collapse. Bearing of side A WATER STRIKES Date Strike at Rise Time taken depth 1.40 to depth 1.00 to rise 24/09/2013 All depths in metres, all soil strengths are average in kPa All bearings given relate to magnetic North See legend sheet for key to symbols and abbreviations For in situ test results, see accompanying records SOIL ENGINEERING Log Print Date And Time: 23/12/2013 10:34:17 Form No. SI EXC LOG Issue.Revision No. 1.04 Issue Date 22/10/2012 Part of the Bachy Soletanche group

| · ·   | Bay of Nigg Harbour Dev  | elopment Ground Investig   | ation           |         | _          | . •            | -  |           | Hole I                 | D.                |
|---|--|--|-----------------|---------|------------|----------------|--|-----------|------------------------|-------------------|
| Project No.   | TA7148   |  |                 |         | Exc        | avatio         | on Log   |           | TP1                    | 2                 |
| Engineer  | Arch Henderson LLP   |  |                 |         |            |                |  |           |                        |                   |
| Employer  | Aberdeen Harbour Board   | C 45   | 222227 00 F 00  | :500 // | - NI NI-4: | 10             |  |           | Sheet 1                | of 1              |
| Ground Level  | 8.62m CD   | Coordinates  Mathed and aguinment  | 396537.00 E, 80 |         | ) N Natior | nal Grid       |  |           |                        |                   |
| Hole Type   | TP   | Method and equipment   |                 | avator  |            |                | CD   |           |                        |                   |
| Date Started  | 24/09/2013   | Date Completed   | 24/09/2013      |         |            | Logo           | ged by GD  |           |                        |                   |
|   | Description of Strata  |  | L               | egend   | Depth      | Datum<br>Level | Sample<br>Details  | ı         | n Situ Test<br>Details | Install-<br>ation |
| MADE GROUND: 1  | Горsoil.   |  | X               | ****    | 1          |                |  |           |                        |                   |
| content, high boul<br>occasional polysty<br>occasional coal fra<br>fragments are sub<br>metamorphic litho<br>mixed igneous an<br>fragments are of g | Dark greyish brown gravelly sand sider content, occasional plastic borene fragments, occasional plastic borene fragments, occasional cast in gments. Sand sized fragments are langular to subrounded fine to coalogies. Cobble sized fragments and metamorphic lithologies, tarmacyranite (up to 1000mm x 300mm x up to 2000mm x 600mm x 400mm | ttles and plastic packaging,<br>on pipe fragments and<br>ifine to coarse. Gravel sized<br>rse of mixed igneous and<br>e subangular to subrounded of<br>adam and brick. Boulder sized<br>200mm) and reinforced concrete |                 |         | 0.30 -     | 8.32           | D 001 0.50<br>B 002 0.50 - 1<br>D 003 1.20<br>B 004 1.50 - 2<br>D 005 2.20<br>B 006 2.50 - 3 | .00       |                        |                   |
|   |  |  | 8               |         |            |                | D 007 3.20   | -         |                        |                   |
| Excavation complet  | e at 3.70 m.   |  |                 | ****    | 3.70       | 4.92           |  |           |                        |                   |
|   |  |  |                 |         |            |                |  |           |                        |                   |
| Stability   | Collapse from 0.30m to 3.70m   | on all faces   |                 |         |            | Excava         | tion dimensio  | ns and or | rientation             |                   |
| - C. C. C. C. C. C. C. C. C. C. C. C. C.  |  | S. S. S. S. S. S. S. S. S. S. S. S. S. S   |                 |         |            | Length         | (sides A and 0   | C) 4      | 4.40m                  |                   |
| Shoring   | None used  |  |                 |         |            | Width          | (sides B and D   | )) :      | 1.40m                  |                   |
| Remarks   | 1. Trial pit terminated at 3.70  | m due to constant collapse.  |                 |         |            | Depth          |  | :         | 3.70m                  |                   |
|   |  |  |                 |         |            | Bearing        | g of side A  |           | 170°                   |                   |
|   |  |  |                 |         |            |                | WATER S  | TRIKES    |                        |                   |
|   |  |  |                 |         | Da         | te             | Time S   | Strike at | Rise                   | Time taken        |
|   |  |  |                 | ·       |            |                |  | depth     | to depth               | to rise           |
| Notes: All dept   | hs in metres, all soil strengths a   | re average in kPa  |                 |         |            |                |  |           |                        |                   |
| All bear<br>See lege  | ings given relate to magnetic No<br>end sheet for key to symbols and<br>tu test results, see accompanyir   | orth<br>Labbreviations   | :34:19          |         |            |                |  | SOIL      | engine                 | eering            |
| Form No. SLEVC LOG  | I Desiries   | N- 10/   |                 |         |            |                |  |           |                        |                   |

|   | Bay of Nigg Harbour Develo   | pment Ground Investig   | ation            |        | _            |                |  |                   | Hole I                 | D.                |
|---|--|---|------------------|--------|--------------|----------------|--|-------------------|------------------------|-------------------|
| Project No.   | TA7148   |   |                  |        | Exc          | avatio         | on Log   |                   | TP13                   | 3                 |
| Engineer  | Arch Henderson LLP   |   |                  |        |              |                |  |                   |                        |                   |
| Employer  | Aberdeen Harbour Board   | Casudinatas   | 20050250500      | F0C 90 | O NI NIation | ما د انا       |  |                   | Sheet 1 o              | of 1              |
| Ground Level  | 3.26m CD   | Coordinates   | 396583.50 E, 804 |        | J IN INATIOR | iai Grid       |  |                   |                        |                   |
| Hole Type   | TP   | Method and equipment  |                  | vator  |              |                |  |                   |                        |                   |
| Date Started  | 24/09/2013   | Date Completed  | 24/09/2013       |        |              | Logo           | ged by GD  |                   |                        |                   |
|   | Description of Strata  |   | Le               | gend   | Depth        | Datum<br>Level | Sample<br>Details  | ı                 | n Situ Test<br>Details | Install-<br>ation |
| occasional plastic<br>Gravel sized fragn<br>igneous and meta<br>are subangular to<br>and concrete. Bou<br>reinforced concre | ish grey sandy gravelly CLAY with me<br>Gravel is fine to medium occasionally o<br>lithologies. Cobbles are subangular to                          | d occasional metal strip. ne to coarse of mixed ick. Cobble sized fragments etamorphic lithologies, brick x 300mm x 300mm) are of | - V              |        | 2.50         | 0.76           | B 001 0.50 - 1.0 D 002 0.50  D 004 1.20 B 003 1.50 - 2.0 D 006 2.00 - 2.5 D 006 2.00  B 007 2.50 - 3.0 | 0 -               |                        |                   |
|   |  |   |                  |        |              |                |  |                   |                        |                   |
|   |  |   |                  |        |              | Excava         | tion dimension   | s and o           | rientation             |                   |
| Stability   | Collapse from 0.00m to 2.50m on  | all Taces   |                  |        |              | Length         | (sides A and C   | ) :               | 1.90m                  |                   |
| Shoring   | None used  |   |                  |        |              | Width          | (sides B and D)  |                   | 4.00m                  |                   |
| Remarks   | Trial pit terminated at 3.50m  | due to constant collanse  |                  |        |              | Depth          |  | :                 | 3.50m                  |                   |
| Kemarks   | 1. That pit terminated at 3.30m  | ade to constant conapse.  |                  |        |              | Bearing        | g of side A  | :                 | 200°                   |                   |
|   |  |   |                  |        |              |                | WATER ST   | DIKES             |                        |                   |
|   |  |   |                  |        | Dat          | e e            |  | rike at           | Rise                   | ime taken         |
|   |  |   |                  |        | 24/09/       |                |  | depth<br>1.40     | to depth               | to rise           |
|   |  |   |                  |        | Z4/U9.       | . 2013         |  | 1. <del>4</del> U | 1.40                   | 3                 |
| All bear<br>See leg   | ths in metres, all soil strengths are ings given relate to magnetic North end sheet for key to symbols and a litu test results, see accompanying r | breviations   | 134:22           |        |              |                |  | SOIL              | engine                 | eering            |
| Form No. SLEXC LOG  | Log Print Dat  | 7:3 <b>4</b> :22  |                  |        |              |                |  | the Bachy Soleta  |                        |                   |

|  |   |   |                               | -       |                  |                |  | -                |                        |                   |
|--|---|---|-------------------------------|---------|------------------|----------------|--|------------------|------------------------|-------------------|
|  |   | our Development Ground Investig   | ation                         |         | _                |                |  |                  | Hole I                 | D.                |
| Project No.  | TA7148  |   |                               |         | Exc              | avatio         | on Log                                     |                  | TP1                    | 4                 |
| Engineer   | Arch Henderson I  |   |                               |         |                  |                |  |                  |                        |                   |
| Employer   | Aberdeen Harbou   |   | 396585.00 E, 80               | 1//2 2/ | ^ NI NIntion     | 1 0 4          |  |                  | Sheet 1                | of 1              |
| Ground Level   | 9.66m CD<br>TP  | Coordinates  Method and equipment   |                               |         | O IN Mation      | nai Griu       |  |                  |                        |                   |
| Hole Type  |   | Method and equipment  | 201 Tracked Exc<br>24/09/2013 | Cavatoi |                  | 1000           | ged by GD                                  |                  |                        |                   |
| Date Started   | 24/09/2013  | Date Completed  | 24/09/2013                    |         |                  | Logo           | ged by GD                                  |                  |                        |                   |
|  | Description   | of Strata   |                               | Legend  | Depth            | Datum<br>Level | Sample<br>Details                          | ı                | n Situ Test<br>Details | Install-<br>ation |
| MADE GROUND: 1   | Горsoil.  |   | ×                             | ***     | 0.20             | 0.46           |  | E                |                        |                   |
| cobble content, hi<br>glass fragments, o<br>paving slabs. Sand<br>are subangular to<br>lithologies. Cobble | gh boulder content, occoccasional plastic packag<br>I sized fragments are fin-<br>subrounded fine to coal<br>e sized fragments are an | gravelly sand sized fragments with high casional ceramic fragments, occasional ping fragments and occasional concrete e to coarse. Gravel sized fragments rise of mixed igneous and metamorphic gular to subrounded of concrete, mixed I brick and tarmacadam. Boulders are (up |                               |         | 0.20 -           | 9.46           | D 001 0.50<br>B 002 0.50 - 1<br>D 003 1.20 | .00              |                        |                   |
|  |   | e and reinforced concrete.  | 8                             |         | 1                |                |  | F                |                        |                   |
|  |   |   | 8                             |         | =                |                | B 004 1.50 - 2                             | .00              |                        |                   |
| from 1.80m t<br>gravelly clay  | to 3.00m with some cob  | ble sized fragments of orange brown sandy   |                               |         |                  |                |  |                  |                        |                   |
|  | to 2.60m 1 No large bou   | lder of reinforced concrete (2.80m x 0.60m  | 8                             | ****    |                  |                | D 005 2.20                                 | _                |                        |                   |
| x 0.40m)   |   |   | 8                             | ***     | -                |                | B 006 2.50 - 3                             | .00              |                        |                   |
|  |   |   | 8                             |         |                  |                |  |                  |                        |                   |
| from 3.00m t   | to 3.50m greyish brown  | with sand and gravel sized fragments of   | Š                             | ****    | -                |                | B 008 3.00 - 3                             | .50 —            |                        |                   |
| cement   |   | -   | 8                             |         |                  |                | D 007 3.20                                 | Ė                |                        |                   |
| Excavation complete  | e at 3.50 m.  |   |                               | XXXX    | 3.50 -           | 6.16           |  | -                |                        |                   |
|  |   |   |                               |         | -                |                |  |                  |                        |                   |
|  |   |   |                               |         | -<br>-<br>-<br>- |                |  | -                |                        |                   |
|  |   |   |                               |         | -                |                |  | -<br>-<br>-<br>- |                        |                   |
|  |   |   |                               |         | -                |                |  | -                |                        |                   |
|  |   |   |                               |         | -                |                |  | F                |                        |                   |
|  |   |   |                               |         | -                |                |  |                  |                        |                   |
|  |   |   |                               |         | -                |                |  | -                |                        |                   |
|  |   |   |                               |         | -                |                |  | F                |                        |                   |
|  |   |   |                               |         | -                |                |  |                  |                        |                   |
| Stability  | Collapse from 1.00m   | to 3.50m of faces C and D   |                               |         |                  |                | tion dimension                             |                  |                        |                   |
| Shoring  | None used   |   |                               |         |                  | _              | (sides A and 0<br>(sides B and D           | -                | 1.80m<br>5.10m         |                   |
| _  |   |   |                               |         |                  | Depth          | (sides b and b                             | -                | 3.50m                  |                   |
| Remarks  | Trial pit terminate   | ed at 3.50m due to constant collapse.   |                               |         |                  | -              | g of side A                                |                  | 3.50111<br>340°        |                   |
|  |   |   |                               |         |                  | Dearing        |  |                  |                        |                   |
|  |   |   |                               |         | Dat              | to.            | WATER S                                    | Strike at        | Rise                   | Time taken        |
|  |   |   |                               |         |                  |                | Time                                       | depth            | to depth               | to rise           |
|  |   |   |                               |         |                  |                |  |                  |                        |                   |
| Notes: All dept  | hs in metres, all soil st   | trengths are average in kPa   |                               |         | I                |                |  |                  |                        | 7                 |
| All beari<br>See lege  | ings given relate to ma<br>end sheet for key to syr<br>tu test results, see acc   | gnetic North<br>mbols and abbreviations<br>ompanying records  | 27.25                         |         |                  |                |  | SOII             | engine.                | eering            |
| Form No. SLEVC LOG   | <u>l</u>  | Log Print Date And Time: 23/12/2013 10:   |                               |         |                  |                |  | JUIL             | CHIGHIE                | CKIIIG            |

|   |   |  |                | -           |            |                  |  | ı                               |                        |                   |
|---|---|--|----------------|-------------|------------|------------------|--|---------------------------------|------------------------|-------------------|
|   | Bay of Nigg Harbour Develop   | oment Ground Investig  | ation          |             | _          | . •              | -                                      |                                 | Hole I                 | D.                |
| Project No.   | TA7148  |  |                |             | Exc        | avatio           | on Log                                 |                                 | TP1                    | 5                 |
| Engineer  | Arch Henderson LLP  |  |                |             |            |                  |  |                                 |                        | , I               |
| Employer  | Aberdeen Harbour Board  |  |                |             |            |                  |  |                                 | Sheet 1                | of 1              |
| Ground Level  | 2.47 m CD   | Coordinates  | 396667.20 E, 8 |             | 0 N Natior | nal Grid         |  |                                 |                        |                   |
| Hole Type   | TP  | Method and equipment   | 20T Tracked Ex | cavator     |            |                  |  |                                 |                        |                   |
| Date Started  | 24/09/2013  | Date Completed   | 24/09/2013     |             |            | Logg             | ged by GD                              | 1                               |                        |                   |
|   |   |  |                |             |            |                  |  |                                 |                        |                   |
|   | Description of Strata   |  |                | Legend      | Depth      | Datum<br>Level   | Sample<br>Details                      |                                 | n Situ Test<br>Details | Install-<br>ation |
| boulder content an<br>Gravel sized fragm<br>and metamorphic<br>igneous and meta<br>x 400mm) are sub | Brown sandy gravel sized fragments wit<br>nd plastic packaging. Sand sized fragm<br>nents are subangular to rounded fine to<br>lithologies. Cobble sized fragments are<br>morphic lithologies. Boulder sized fragi<br>rounded of granite and schist.<br>to 0.60m plastic packaging absent | ents are medium to coarse.<br>coarse of mixed igneous<br>subrounded of mixed | n              |             | 0.60       | 1.87             | B 001 0.50<br>D 002 0.50               | - 1.00                          |                        |                   |
| metamorphic litho<br>is coarse. Cobbles   | ingular to rounded fine to coarse GRAVI<br>ologies with high cobble content and hi<br>are subrounded of mixed igneous and<br>i0mm x 400mm x 400mm) are of granit  | gh boulder content. Sand<br>metamorphic lithologies.                         |                |             |            |                  | B 003 1.80<br>D 004 1.80<br>B 005 2.80 | -<br>-<br>-<br>-<br>-<br>-<br>- |                        |                   |
| Excavation complete   | e at 2.90 m.  |  |                | a desired a | 2.90 -     | -0.43            | D 006 2.80                             |                                 |                        |                   |
|   |   |  |                |             |            |                  | ü                                      |                                 |                        |                   |
| Stability   | Collapse from 0.60m to 2.90m on a   | II faces   |                |             |            | Excava           | tion dimens                            | ions and o                      | rientation             |                   |
| Shoring   | None used   |  |                |             |            | Width            | (sides A and                           | I D)                            | 1.90m<br>3.80m         |                   |
| Remarks   | 1. Trial pit terminated at 2.90m du   | ue to constant collapse.   |                |             |            | Depth<br>Bearing | g of side A                            |                                 | 2.90m<br>330°          |                   |
|   |   |  |                |             |            |                  | WATER                                  | STRIKES                         |                        |                   |
|   |   |  |                |             | Dat        | te               | Time                                   | Strike at                       | Rise                   | Time taken        |
|   |   |  |                |             |            |                  |  | depth                           | to depth               | to rise           |
|   |   |  |                |             |            |                  |  |                                 |                        |                   |
| Notes: All dept   | hs in metres, all soil strengths are av   | verage in kPa  |                |             | <u> </u>   |                  |  |                                 |                        |                   |
| All beari<br>See lege   | ings given relate to magnetic North<br>end sheet for key to symbols and abb<br>tu test results, see accompanying red  | previations  | 34.27          |             |            |                  |  | SOII                            | engine                 | eering            |
| Form No. SI EXC LOG   | Log Print Date  Issue.Revision No. 1.0  |  |                |             |            |                  |  |                                 | the Bachy Soleta       |                   |

|  |  |  |  | ,         |          |                |                            | 1                                    |                        |                   |
|--|--|--|--|-----------|----------|----------------|----------------------------|--------------------------------------|------------------------|-------------------|
| Project Name   | Bay of Nigg Harbo  | our Development Ground Investig  | ation                                  |           |          |                |                            |                                      | Hole I                 | D.                |
| Project No.  | TA7148   |  |  |           | Exc      | avatio         | on Log                     |                                      | TP1                    | <b>c</b>          |
| Engineer   | Arch Henderson L   | LP   |  |           |          |                |                            |                                      | 11 1                   | 6                 |
| Employer   | Aberdeen Harbou  | r Board  |  |           |          |                |                            |                                      | Sheet 1                | of 1              |
| Ground Level   | 2.11m CD   | Coordinates  | 396704.70 E, 8050                      | 25.70     | N Nation | nal Grid       |                            |                                      |                        |                   |
| Hole Type  | TP   | Method and equipment   | 20T Tracked Excav                      | ator      |          |                |                            |                                      |                        |                   |
| Date Started   | 27/09/2013   | Date Completed   | 27/09/2013                             |           |          | Logg           | ged by GD                  |                                      |                        |                   |
|  |  |  |  |           | 1        |                |                            |                                      |                        |                   |
|  | Description  | of Strata  | Leg                                    | gend      | Depth    | Datum<br>Level | Sample<br>Details          | 1                                    | n Situ Test<br>Details | Install-<br>ation |
|  |  | o coarse GRAVEL and subangular to<br>d metamorphic lithologies.  | 0 - 9                                  | 100       | 0.10 -   | 2.01           | B 001 0.00 -<br>D 002 0.20 | 0.50                                 | •                      |                   |
| fine to coarse. Gra<br>igneous and meta                    | ivel is subangular to subro<br>imorphic lithologies predo  | CLAY with low cobble content. Sand is<br>ounded fine to coarse of mixed<br>ominantly schist. Cobbles are subangular<br>morphic lithologies predominantly schist.                         | 2                                      |           | 0.60     | 1.51           | B 003 1.00 -               | 150                                  |                        |                   |
| boulder content. O<br>igneous and meta<br>to subrounded of | Gravel is subangular to su<br>morphic lithologies predo  | th high cobble content and high<br>brounded fine to coarse of mixed<br>ominantly schist. Cobbles are subangular<br>morphic lithologies predominantly schist.<br>e of granite and schist. |  |           |          |                | B 005 2.00 -<br>D 006 2.20 | -<br>-<br>-<br>-<br>-<br>-<br>-<br>- |                        |                   |
|  |  |  |  |           | 2.50     | -0.40          |                            | E                                    |                        |                   |
| Medium strong da   | ark grey granitic SCHIST.  |  | ************************************** | $\approx$ | =        |                | D 007 2.60                 | -                                    |                        |                   |
| Excavation complet   | e at 2.80 m.   |  |  | ~~        | 2.80 -   | -0.70          |                            | E                                    |                        |                   |
|  |  |  |  |           |          | Excava         | tion dimens                | ons and ol                           | rientation             |                   |
| Stability  | Spalling from 0.00m to   | o 2.50m on faces B and D   |  |           |          |                |                            |                                      |                        |                   |
| Shoring  | None used  |  |  |           |          | _              | (sides A and               | -                                    | 3.20m                  |                   |
| Shoring  | World used   |  |  |           |          |                | (sides B and               | •                                    | 1.20m                  |                   |
| Remarks  | 1. Trial pit terminate   | d at 2.80m due to bedrock.   |  |           |          | Depth          |                            | :                                    | 2.80m                  |                   |
|  |  |  |  |           |          | Bearing        | g of side A                | ;                                    | 210°                   |                   |
|  |  |  |  | Ī         |          |                | WATER                      | STRIKES                              |                        |                   |
|  |  |  |  | Ī         | Dat      | te             | Time                       | Strike at                            | Rise                   | Time taken        |
|  |  |  |  | ŀ         |          |                |                            | depth                                | to depth               | to rise           |
|  |  |  |  |           |          |                |                            |                                      |                        |                   |
| All bear   | ings given relate to mag   | rengths are average in kPa<br>Inetic North   |  |           |          |                |                            |                                      |                        |                   |
| See lead   | end sheet for key to syn<br>itu test results, see acco   | nbols and abbreviations ompanying records  | ·34·30                                 |           |          |                |                            | SOIL                                 | engine                 | eering            |
| Form No. SI EXC LOG  | For in situ test results, see accompanying records  Log Print Date And Time: 23/12/2013 10:34:30  No. SI EXC LOG Issue Revision No. 1.04 Issue Date 22/10/2012 |  |  |           |          |                |                            | 1000                                 | the Bachy Soleta       |                   |

|                     |   |                              |                       | <del></del> |            |                |                                       |                 |                         |                       |
|---------------------|---|------------------------------|-----------------------|-------------|------------|----------------|---------------------------------------|-----------------|-------------------------|-----------------------|
|                     | Bay of Nigg Harbour Deve  | elopment Ground Investig     | gation                |             |            |                |                                       |                 | Hole I                  | D.                    |
| Project No.         | TA7148  |                              |                       |             | Exc        | avatic         | on Log                                |                 | TD1                     | _                     |
| Engineer            | Arch Henderson LLP  |                              |                       |             |            |                |                                       |                 | TP1                     | ′                     |
| Employer            | Aberdeen Harbour Board  |                              |                       |             |            |                |                                       |                 | Sheet 1 c               | of 1                  |
|                     | 1.64m CD  | Coordinates                  | 396634.80 E, 8049     | ¥950.10     | ) N Nation | nal Grid       |                                       |                 |                         |                       |
| Hole Type           | TP  | Method and equipment         | 20T Tracked Exca      | avator      |            |                |                                       |                 |                         | ļ                     |
| Date Started        | 27/09/2013  | Date Completed               | 27/09/2013            |             |            | Logç           | ged by GD                             |                 |                         | ,                     |
|                     |   | ·                            |                       | <del></del> |            | -              | · · · · · · · · · · · · · · · · · · · |                 |                         |                       |
|                     | Description of Strata   |                              | Le                    | egend       | Depth      | Datum<br>Level | Sample<br>Details                     |                 | In Situ Test<br>Details | Install-<br>ation     |
| subangular to subi  | Ily fine to coarse SAND with low cob<br>prounded fine to coarse of mixed ign<br>es are subangular to subrounded fin | neous and metamorphic        |                       |             |            |                |                                       |                 |                         |                       |
| and metamorphic     |   | 16 to coalse of things 19    |                       | 10 m        | 1 200      | 0.84           | D 001 0.50                            | -<br>-<br>-     |                         |                       |
|                     | vn sandy slightly gravelly CLAY with  |                              | 0.0                   | P - 5       | 0.80 -     | 0.67           | B 002 1.00 - 1.                       | 150             |                         |                       |
| igneous and metai   | avel is subangular to subrounded fin<br>amorphic lithologies. Cobbles are su  |                              | 0                     | 0 0         | 1          | 4              | D 003 1.20                            | <u></u>         |                         |                       |
|                     | nd metamorphic lithologies.   | •                            | P                     | 0 0         | . 3        | 1              | 1                                     | Ė               |                         |                       |
|                     |   |                              | p                     | 200         |            | <sub>1</sub>   | 1                                     | Ē               |                         |                       |
|                     |   |                              | P                     | 0 0         | 1          | 4              | 1                                     | F               |                         |                       |
|                     | elly clayey fine to medium SAND. Gr   | ravel is subangular to       |                       |             | 2.00       | -0.36          |                                       | .50             |                         |                       |
|                     | to coarse of dark grey schist.  |                              |                       |             | ]          | 1              | D 005 2.20                            | Ė               |                         |                       |
|                     |   |                              |                       |             | 4          | 1              | 1                                     | F               |                         |                       |
|                     |   |                              | 77                    | 7           | 4          | 4 1            | 1                                     | F               |                         |                       |
| - 0.00m             |   |                              | 73                    |             | 1 4        | 4              | B 006 3.00 - 3.                       | 3.50            |                         |                       |
|                     | to 4.40m medium cobble content. C of mixed lithologies predominantly  |                              | 7                     | X. T        | . J        | 1              | 1                                     | Ė               |                         |                       |
| Junica              | JI IIIIAGU IIUIOIOGIOO F  | / SCHIST                     | TO THE REAL PROPERTY. | Na VVI      | ]          | 1              | 2 227 3 50                            | Ė               |                         |                       |
|                     |   |                              |                       | 5.77        | į          | 1              | D 007 3.50                            | E               |                         |                       |
|                     |   |                              |                       |             | <u> </u>   | 1              | 1                                     | E               |                         |                       |
|                     |   |                              | <u>₹</u>              |             | 1          | 4 1            | 1                                     | -               |                         |                       |
|                     |   |                              | 4.                    | 5.70        | 4          | , <u> </u>     | 1                                     | þ               |                         |                       |
| Excavation complete | :e at 4.40 m.   |                              |                       |             | 4.40 -     | -2.76          | 1                                     | Ė               |                         |                       |
| ı                   |   |                              |                       |             | . ]        | 1              | 1                                     | E               |                         |                       |
| ı                   |   |                              |                       |             | <u>.</u> _ | <sub>1</sub> 1 | 1                                     | E               |                         |                       |
| ı                   |   |                              |                       |             | ,          | 1              | 1                                     | F               |                         |                       |
| ı                   |   |                              |                       |             | , ‡        | ]              | 1                                     | F               |                         |                       |
|                     |   |                              |                       |             | , ‡        | <sub>4</sub> 1 | 1                                     | þ               |                         |                       |
|                     |   |                              |                       |             | , 4        | 1              | 1                                     | F               |                         |                       |
|                     |   |                              |                       |             | , <u> </u> | 1              | 1                                     | E               |                         |                       |
| ı                   |   |                              |                       |             | <u>,</u>   | 1              | 1                                     | E               |                         |                       |
| ı                   |   |                              |                       |             | , ‡        | , 1            | 1                                     | þ               |                         |                       |
| ı                   |   |                              |                       |             | , ‡        | 4 1            | 1                                     | þ               |                         |                       |
| ı                   |   |                              |                       |             | ,          | 1              | 1                                     | Ė.              |                         |                       |
| ı                   |   |                              |                       |             | , <u> </u> | 1              | 1                                     | E               |                         |                       |
| ı                   |   |                              |                       |             | , ‡        | 1              | 1                                     | E               |                         | !                     |
| v usa.,             | - " C 2 00m to 4 40m/   |                              | 1                     |             |            | Excava         | tion dimension                        | ns and o        | rientation              |                       |
| Stability           | Spalling from 2.00m to 4.40m o  | in all faces                 |                       |             | i          | Length         | n (sides A and 0                      | C)              | 3.80m                   | ļ                     |
| Shoring             | None used   |                              |                       |             | i          | _              | (sides B and D                        | -               | 1.90m                   | ļ                     |
| _                   |   |                              |                       |             | i          | Depth          |                                       | -               | 4.40m                   | ļ                     |
| Remarks             | 1. Trial pit terminated at 4.40n  | m due maximum depth reached  | d.                    |             | i          | •              |                                       |                 |                         | !                     |
|                     |   |                              |                       |             |            | Веатту         | g of side A                           |                 | 180°                    |                       |
|                     |   |                              |                       |             |            |                | WATER S                               |                 |                         |                       |
|                     |   |                              |                       |             | Dat        | īe             |                                       | Strike at depth | Rise 1                  | Time taken<br>to rise |
|                     |   |                              |                       | ļ           |            |                |                                       | исра.           | 10 405                  | 10 1100               |
|                     |   |                              |                       |             | i          | ļ              | 1                                     |                 |                         |                       |
|                     |   |                              |                       |             | i          | ļ              | 1                                     |                 |                         | <br>                  |
|                     |   |                              |                       |             | i          | ļ              | 1                                     |                 |                         |                       |
| All dant            | " " " " - " - +vonatho a  | . (5.                        |                       |             |            |                | <u> </u>                              |                 |                         |                       |
| All beari           | ths in metres, all soil strengths ar<br>rings given relate to magnetic Nor  | orth                         |                       |             |            |                |                                       |                 |                         |                       |
| See leae            | end sheet for key to symbols and<br>itu test results, see accompanying  | abbreviations                |                       |             |            |                |                                       |                 |                         |                       |
|                     |   | Date And Time: 23/12/2013 10 | 0:34:32               |             |            | -              |                                       | SOIL            | engine                  | eering                |
| Form No. SLEXC LOG  | Issue Revision N  | No. 1.04 Issue Date 22/10/   | (2012                 |             |            |                |                                       | Part of         | f the Bachy Soleta      | anche group           |

| -   | Bay of Nigg Harbour Develo  | pment Ground Investig  | ation           |         | _      | _              |                               |                      | Hole                   | ID.               |
|---|---|--|-----------------|---------|--------|----------------|-------------------------------|----------------------|------------------------|-------------------|
| Project No.   | TA7148  |  |                 |         | Exc    | avatio         | on Log                        |                      | TP1                    | 8                 |
| Engineer  | Arch Henderson LLP  |  |                 |         |        |                |                               |                      |                        | J                 |
| Employer  | Aberdeen Harbour Board  |  |                 |         |        |                |                               |                      | Sheet 1                | of 1              |
| Ground Level  | 2.93 m CD   | Coordinates  | 396607.30 E, 80 |         |        | ial Grid       |                               |                      |                        |                   |
| ,,  | TP  | Method and equipment   |                 | cavator |        |                |                               |                      |                        |                   |
| Date Started  | 27/09/2013  | Date Completed   | 27/09/2013      |         |        | Log            | ged by GD                     |                      |                        |                   |
|   | Description of Strata   |  | 1               | Legend  | Depth  | Datum<br>Level | Sample<br>Details             | ı                    | n Situ Test<br>Details | Install-<br>ation |
| metamorphic litho<br>Cobbles are suban<br>lithologies. Boulde | pangular to subrounded fine to coarse (oblogies with high cobble content and higular to subrounded of mixed igneous ers (up to 0.80m x 0.60m x 0.50m) are smorphic lithologies predominantly grains | igh boulder content.<br>and metamorphic<br>subangular of mixed |                 |         |        |                | B 001 0.50 - 1                | .00                  | 1                      |                   |
| fine to coarse. Gra   | y slightly gravelly sandy CLAY with low<br>vel is subrounded fine to coarse of gran<br>unded of granite and predominantly da  | nite and schist.   | - ¥ ,,          | 0 0     | 1.10 - | 1.83           | D 002 1.00  B 003 1.50 - 2    | .00                  |                        |                   |
|   |   |  | ρ<br>ρ          | 0 0     | 2.00   | 0.93           | D 004 2.00                    | -                    |                        |                   |
| Excavation complete   | e at 2.00 m.  |  |                 |         | 2.00   |                |                               |                      |                        |                   |
| Stability   | Collapse from 0.00m to 1.30m on a   | ıll faces  |                 |         |        |                | tion dimension (sides A and e |                      | rientation<br>3.90m    |                   |
| Shoring   | None used   |  |                 |         |        | Width          | (sides B and D                | ))                   | 3.60m                  |                   |
| Remarks   | Trial pit terminated at 2.00m d   | ue to constant collapse.                                       |                 |         |        | Depth          |                               |                      | 2.00m                  |                   |
|   |   | •  |                 |         |        | Bearin         | g of side A                   |                      | 330°                   |                   |
|   |   |  |                 |         |        |                | WATER S                       | TRIKES               |                        |                   |
|   |   |  |                 |         | Dat    | te             | Time                          | Strike at            | Rise                   | Time taken        |
|   |   |  |                 |         | 27/09/ | /2013          |                               | <u>depth</u><br>1.00 | to depth<br>1.00       | to rise<br>0      |
| All beari<br>See lege   | hs in metres, all soil strengths are a<br>ings given relate to magnetic North<br>end sheet for key to symbols and abl<br>tu test results, see accompanying re<br>Log Print Date                     | oreviations<br>cords<br>And Time: 23/12/2013 10                |                 |         |        |                |                               |                      | engin                  | <b>eering</b>     |



# SUPPORTING FACTUAL DATA

# **SECTION A**

Exploratory Hole Records and Field Data

**GROUNDWATER / GAS MONITORING RESULTS** 

| Project Name Bay of Nigg Harbour Development Ground<br>Investigation<br>Project No. TA7148 |               |           |                 | Groundwater Inflows |                          |                            |                                 |       |          |                                    |
|--|---------------|-----------|-----------------|---------------------|--------------------------|----------------------------|---------------------------------|-------|----------|------------------------------------|
|  |               |           |                 | Recorded in         |                          |                            |                                 |       |          |                                    |
| Engineer   | Arch Henderso | on LLP    |                 |                     | Exp                      | lorator                    | y Hole                          | S     |          | Table No.                          |
| Employer   | Aberdeen Harl | bour Boar | d               |                     |                          |                            |                                 |       |          | 25                                 |
| , ,  |               |           |                 |                     |                          | Casing                     |                                 |       |          |                                    |
| Hole ID  | Date          | Time      | Strike at depth | Rise to<br>depth    | Time<br>taken to<br>rise | depth at<br>strike<br>time | Casing<br>depth to<br>seal flow |       | ratum    | Flow rate remarks                  |
|  | dd/mm/yyyy    | hhmm      | m               | m                   | mins                     | m                          | m                               |       |          |                                    |
| TP01   | 26/09/2013    | NR        | 0.95            | 0.50                | 2                        |                            |                                 | S     | CHIST    |                                    |
| TP02   | 26/09/2013    | NR        | 1.00            | 0.90                | 5                        |                            |                                 | S     | CHIST    |                                    |
| TP03   | 26/09/2013    | NR        | 1.00            | 0.35                | 5                        |                            |                                 |       | CLAY     |                                    |
| TP04   | 27/09/2013    | NR        | 0.00            | 0.00                | 0                        |                            |                                 |       | SAND     |                                    |
| TP05   | 26/09/2013    | NR        | 1.00            | 0.80                | 2                        |                            |                                 | G     | RAVEL    |                                    |
| TP07   | 25/09/2013    | NR        | 0.40            | 0.40                | 1                        |                            |                                 | G     | RAVEL    |                                    |
| TP08   | 25/09/2013    | NR        | 3.10            | 3.00                | 5                        |                            |                                 | G     | RAVEL    |                                    |
| TP09   | 25/09/2013    | NR        | 0.80            | 0.80                | 1                        |                            |                                 | CC    | OBBLES   |                                    |
| TP10   | 25/09/2013    | NR        | 3.10            | 3.00                | 5                        |                            |                                 |       | CLAY     |                                    |
| TP11   | 24/09/2013    | NR        | 1.40            | 1.00                | 2                        |                            |                                 | MADI  | E GROUND |                                    |
| TP13   | 24/09/2013    | NR        | 1.40            | 1.40                | 3                        |                            |                                 | MADI  | E GROUND |                                    |
| TP18   | 27/09/2013    | NR        | 1.00            | 1.00                | 0                        |                            |                                 | G     | RAVEL    |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
|  |               |           |                 |                     |                          |                            |                                 |       |          |                                    |
| Recorded By:   | Thomas.Walto  | n Che     | cked By:        | Thomas.\            | Nalton                   | Approved                   | By: Thor                        | mas.V | Valton   | <u> </u>                           |
| Date:  | 06/11/2013    | Date      |                 | 06/11/20            |                          | Date:                      |                                 | 11/20 |          | SOIL ENGINEERING                   |
| Form No. SE-PGR-F-007  |               | Issue     | No.RevisionI    | No 3.04             |                          | Issue Date                 | 26/07/20                        | 013   |          | Part of the Bachy Soletanche Group |



# SUPPORTING FACTUAL DATA

# **SECTION B**

**Laboratory Testing** 

**KEY TO LABORATORY TEST RESULTS AND SUMMARY SHEETS** 

### SECTION B: KEY TO LABORATORY TEST RESULTS AND SUMMARY SHEETS

#### FIELD IDENTIFICATION

| Sample Type | U<br>UT<br>P<br>TW<br>L | Undisturbed sample Thin wall open drive tube sample Piston sample Thin walled sample Liner sample | D<br>B<br>AMAL<br>BLK<br>C | Small disturbed sample Bulk disturbed sample Amalgamated sample Block sample Core sample |
|-------------|-------------------------|---|----------------------------|--|
| Test status |                         | esult in italics indicates a test that is not s laboratory.                                       | within the s               | scope of the UKAS accreditation  |

### SUMMARY OF LABORATORY SOIL TESTS: INDEX / CLASSIFICATION TESTS

| Particle density      | р | Small pyknometer method   | 9 | Gas jar method |  |
|-----------------------|---|---|---|----------------|--|
| Plastic index N/P     |   | Non plastic, although liquid limit will have been determined if requested                                     |   |                |  |
| Particle size (PSD) 1 |   | Following value in silt column denotes following value in clay column denotes sedimentation is by hydrometer. |   |                |  |

#### SUMMARY OF LABORATORY SOIL TESTS: STRENGTH AND PERMEABILITY TESTS

| Triaxial      | UU UUM UU3 CU CUM CU3 CD CDM CD3 | Single stage unconsolidated quick undrained Multi stage unconsolidated quick undrained Set of 3 unconsolidated quick undrained Single stage consolidated undrained Multi stage consolidated undrained Set of 3 consolidated undrained Single stage consolidated drained Multi stage consolidated drained Multi stage consolidated drained Set of 3 consolidated drained Note that single stage tests are reported assuming phi = 0 for total stress |
|---------------|----------------------------------|---|
| Consolidation | Oed<br>mv                        | One-dimensional oedometer<br>Coefficient of compressibility quoted for range p0 to p0 + 100kPa, where determined  |
| Permeability  | С                                | Constant head permeability  |
| Shearbox      | SSB<br>LSB<br>p<br>r<br>RS       | Small shear box Large shear box Peak value Residual shear strength Ring shear   |



### SECTION B: KEY TO LABORATORY TEST RESULTS AND SUMMARY SHEETS

### SUMMARY OF LABORATORY SOIL RE-USE TESTS

| MCV | S   | MCV value at natural or specified moisture content |
|-----|-----|--|
|     | int | Intercept of calibration line in MCV calibration   |

### SUMMARY OF LABORATORY ROCK STRENGTH TESTS

| Point | Туре         | D | Diametral   | Α | Axial |  |  |
|-------|--------------|---|---|---|-------|--|--|
| Load  | (combination | 1 | Irregular lump  | В | Block |  |  |
|       | of)          | L | Test performed parallel to planes of weakness                                 |   |       |  |  |
|       |              | Р | Test performed perpendicular to planes of weakness                            |   |       |  |  |
|       |              | Χ | Invalid failure of point load (not broken between points of load application) |   |       |  |  |

#### SUMMARY OF LABORATORY ROCK MATERIALS TESTS

| Ten% fines w Soaked test | d Dry test |
|--------------------------|------------|
|--------------------------|------------|

#### Important note:

Summary sheets are provided for convenience and in no way replace individual test result sheets which shall, without exception, be regarded as the definitive result.

#### POINT LOAD INDEX RESULT

| Point      | Туре         | D        | Diametral  | Α  | Axial                         |  |  |  |  |
|------------|--------------|----------|--|--|-------------------------------|--|--|--|--|
| Load       | (combination | 1        | Irregular lump   | В  | Block                         |  |  |  |  |
|            | of)          | L        | Test performed parallel to planes of weakness  |  |                               |  |  |  |  |
|            |              | Р        | Test performed perpendicular to pla  | Test performed perpendicular to planes of weakness |                               |  |  |  |  |
|            |              | Χ        | Invalid failure of point load (not broken  | ken betweer  | n points of load application) |  |  |  |  |
| Dimensions |              | W        | Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump                     |  |                               |  |  |  |  |
| D          |              | D        | Distance between platens when just in contact with specimen  |  |                               |  |  |  |  |
|            |              | D'       | Distance between platens at point of   | of failure   |                               |  |  |  |  |
|            |              | De       | Equivalent core diameter   | ls   | P/De <sup>2</sup>             |  |  |  |  |
|            |              | Is(50)   | FxIs   | F  | (De/50) <sup>0.45</sup>       |  |  |  |  |
|            |              | For Axia | point load strength index corrected for al/Lump tests $De^2 = (4/Pi) \times (W \times D')$ metral tests $De^2 = D \times D'$ | a diametra   | I test of core diameter 50mm  |  |  |  |  |



# SUPPORTING FACTUAL DATA

# **SECTION B**

**Laboratory Testing** 

LABORATORY SOIL TEST SUMMARY SHEETS

| Project Name<br>Project No. | Bay of Nig<br>Investigat<br>TA7148      |            | rbour       | Developm         | nent (       | Groun              | d            | C           | las              |                | cation<br>mm    | on 1<br>ary     | est             | S                  |          |                |        |        |         |   |
|-----------------------------|---|------------|-------------|------------------|--------------|--------------------|--------------|-------------|------------------|----------------|-----------------|-----------------|-----------------|--------------------|----------|----------------|--------|--------|---------|---|
| Engineer                    | Arch Hend                               | derso      | n LLP       |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |          |                |        |        |         |   |
| Employer                    | Aberdeen                                | Harb       | our B       | oard             |              |                    |              |             |                  |                |                 |                 |                 |                    |          |                |        |        |         |   |
|                             |   |            |             | μ                |              | tent               |              |             | ty               |                |                 |                 | ٤               | əbı                |          | Par            | ticle  | size   |         |   |
| Hole ID                     | Sample depth m                          | Sample no. | Sample type | Specimen depth m | Specimen no. | % Moisture Content | Bulk Density | Dry Density | Particle Density | % Liquid Limit | % Plastic Limit | % Plastic Index | % Passing 425µm | % Linear Shrinkage | % Clay   | Silt           | % Sand | Gravel | Cobbles |   |
| 立<br>D101                   | 1.50                                    | 004        | SS<br>B     | 1.50             | 01           | %                  |              | Vlg/m       | •                | %              | %               | %               | %               | %                  | %        | %<br>8¹        | 80     | 12     | 0       |   |
|                             | 1.50                                    | 004        | В           | 1.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          |                | 80     | 12     | U       |   |
| D101                        | 3.50                                    | 800        | В           | 3.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          | 6 <sup>1</sup> | 71     | 24     | 0       |   |
| L01                         | 0.50                                    | 001        | В           | 0.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          | 7 <sup>1</sup> | 85     | 8      | 0       |   |
| L01                         | 2.50                                    | 005        | В           | 2.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          | 4 <sup>1</sup> | 52     | 30     | 14      |   |
| A05                         | 1.40                                    | 001        | В           | 1.40             | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 9        | 18             | 43     | 30     | 0       |   |
| A05                         | 5.98                                    |            | С           | 5.98             | 02           | 11                 |              |             |                  | 29             | 15              | 14              | 66              |                    |          |                |        |        |         |   |
| A05                         | 5.98                                    |            | С           | 5.98             | 03           |                    |              |             |                  |                |                 |                 |                 |                    | 12       | 19             | 38     | 31     | 0       |   |
| A05                         | 19.64                                   |            | С           | 19.64            | 01           | 8.6                |              |             |                  |                |                 |                 |                 |                    |          |                |        |        |         |   |
| A05                         | 22.10                                   |            | С           | 22.10            | 01           | 7.4                |              |             |                  | 22             | 14              | 8               | 61              |                    |          |                |        |        |         |   |
| A08                         | 0.50                                    | 001        | В           | 0.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 5        | 13             | 27     | 55     | 0       |   |
| A08                         | 7.73                                    |            | С           | 7.73             | 02           | 8.7                |              |             |                  | 27             | 15              | 12              | 65              |                    |          |                |        |        |         |   |
| A08                         | 7.73                                    |            | С           | 7.73             | 03           |                    |              |             |                  |                |                 |                 |                 |                    | 12       | 19             | 37     | 32     | 0       |   |
| A08                         | 17.60                                   |            | С           | 17.60            | 02           | 8.6                |              |             |                  | 26             | 13              | 13              | 66              |                    |          |                |        |        |         |   |
| A08                         | 29.10                                   |            | С           | 29.10            | 01           | 8.5                |              |             |                  |                |                 |                 |                 |                    |          |                |        |        |         |   |
| A11                         | 0.00                                    | 002        | В           | 0.00             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          | 4 <sup>1</sup> | 95     | 1      | 0       |   |
| A11                         | 8.58                                    |            | С           | 8.58             | 01           | 7.3                |              |             |                  | 31             | 16              | 15              | 67              |                    |          |                |        |        |         |   |
| A11                         | 8.58                                    |            | С           | 8.58             | 02           |                    |              |             |                  |                |                 |                 |                 |                    | 9        | 22             | 35     | 33     | 1       |   |
| A11                         | 12.78                                   |            | С           | 12.78            | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 22       | 37             | 21     | 21     | 0       |   |
| A11                         | 25.28                                   |            | С           | 25.28            | 01           | 7.3                |              |             |                  |                |                 |                 |                 |                    |          |                |        |        |         |   |
| A11                         | 25.28                                   |            | С           | 25.28            | 02           |                    |              |             |                  |                |                 |                 |                 |                    | 8        | 19             | 40     | 31     | 2       |   |
|                             |   |            |             |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |          |                |        |        |         |   |
| Approved by:                |   | <u> </u>   | Leed        | s Laborato       | rv           |                    |              |             |                  |                |                 |                 |                 |                    |          | <u> </u>       |        |        |         | L |
| Sushil Sharda               |   |            |             |                  |              |                    |              |             |                  |                | so              |                 | <b>S</b>        |                    | ng       |                |        |        |         |   |
|                             | Revision No. 2.03 Issue Date 20/11/2012 |            |             |                  |              |                    |              |             |                  |                |                 |                 | Part o          | of the Ba          | chy Sole | tanche         | Group  |        |         |   |

| Project Name<br>Project No. | Investigation  |                                   |                |                  |              |                    |              |             |                  |                | cation<br>mm    |                 | est             | S                  |        |                                 |           |          |           |          |
|-----------------------------|----------------|-----------------------------------|----------------|------------------|--------------|--------------------|--------------|-------------|------------------|----------------|-----------------|-----------------|-----------------|--------------------|--------|---------------------------------|-----------|----------|-----------|----------|
| Engineer                    | Arch Hend      | derso                             | n LLP          |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |        |                                 |           |          |           |          |
| Employer                    | Aberdeen       | Harb                              | our B          | oard             |              |                    |              |             |                  |                |                 |                 |                 |                    |        |                                 |           |          |           |          |
|                             |                |                                   |                | Ε                |              | tent               |              |             | ity              |                |                 |                 | ٤               | age                |        | Par                             | ticle     | size     |           |          |
| Hole ID                     | Sample depth m | Sample no.                        | Sample type    | Specimen depth m | Specimen no. | % Moisture Content | Bulk Density | Dry Density | Particle Density | % Liquid Limit | % Plastic Limit | % Plastic Index | % Passing 425µm | % Linear Shrinkage | % Clay | % Silt                          | % Sand    | % Gravel | % Cobbles |          |
| Д<br>А29                    | 0.50           | 003                               | B              | 0.50             | 01           | 70                 |              | Vlg/m       |                  | 70             | 70              | 70              | 70              | 70                 | 70     | <sup>90</sup><br>2 <sup>1</sup> | 95        | 3        | 0         |          |
|                             |                |                                   |                |                  |              |                    |              |             |                  |                |                 |                 |                 |                    | 42     |                                 |           |          |           |          |
| A29                         | 4.70           | 010                               | С              | 4.70             | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 13     | 22                              | 39        | 25       | 2         |          |
| A29                         | 10.80          | 011                               | С              | 10.80            | 03           | 8.1                |              |             |                  | 31             | 17              | 14              | 59              |                    |        |                                 |           |          |           |          |
| A29                         | 15.25          | 012                               | С              | 15.25            | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 9      | 21                              | 33        | 37       | 0         |          |
| A29                         | 21.50          | 014                               | С              | 21.71            | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 26     | 36                              | 24        | 14       | 0         |          |
| A31                         | 0.50           | 002                               | В              | 0.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 5 <sup>1</sup>                  | 93        | 2        | 0         |          |
| A31                         | 4.80           | 005                               | С              | 4.80             | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 11     | 21                              | 36        | 32       | 0         |          |
| A31                         | 15.76          | 5.76 008 C 15.76 02 11 31 16 15 6 |                |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |        |                                 |           |          |           |          |
| A31                         | 19.30          | 009                               | 009 C 19.52 01 |                  |              |                    |              |             |                  |                |                 |                 |                 |                    | 59     | 36                              | 4         | 0        | 0         |          |
| A34                         | 0.50           | 002                               | 009 C 19.52 01 |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |        | 6¹                              | 94        | 0        | 0         |          |
| A34                         | 1.00           | 004                               | D              | 1.00             | 01           |                    |              |             | 2.67<br>p        |                |                 |                 |                 |                    |        |                                 |           |          |           |          |
| A34                         | 1.50           | 006                               | В              | 1.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 4 <sup>1</sup>                  | 95        | 1        | 0         |          |
| A34                         | 4.75           |                                   | С              | 4.75             | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 11     | 23                              | 37        | 29       | 0         |          |
| A34                         | 6.25           |                                   | С              | 6.25             | 02           | 12                 |              |             |                  | 29             | 16              | 13              | 64              |                    |        |                                 |           |          |           |          |
| A51                         | 0.50           | 003                               | В              | 0.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 8 <sup>1</sup>                  | 92        | 1        | 0         |          |
| A54                         | 1.50           | 006                               | В              | 1.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 4 <sup>1</sup>                  | 94        | 3        | 0         |          |
| A54                         | 6.00           | 014                               | С              | 6.16             | 01           | 7.1                | 2.21         | 2.07        |                  |                |                 |                 |                 |                    |        |                                 |           |          |           |          |
| A54                         | 6.00           | 014                               | С              | 6.00             | 02           |                    |              |             |                  |                |                 |                 |                 |                    | 11     | 22                              | 37        | 30       | 0         |          |
| A54                         | 8.00           | 015                               | С              | 8.24             | 02           | 11                 |              |             |                  | 36             | 19              | 17              | 68              |                    |        |                                 |           |          |           |          |
| A54                         | 10.15          | 016                               | С              | 10.15            | 01           | 14                 | 2.16         | 1.90        |                  |                |                 |                 |                 |                    |        |                                 |           |          |           |          |
| Approved by:                | 1              | <u> </u>                          | Leed           | s Laborato       | ry           |                    |              |             |                  |                |                 |                 |                 |                    |        |                                 |           |          |           | <u> </u> |
| Sushil Sharda               |                |                                   |                |                  | -            |                    |              |             |                  | Print da       | te              | 28/11/2         | 2013            |                    |        | so                              | oir ei    | ngin     | eerii     | ng       |
|                             |                |                                   | Revisi         | on No.           | 2.03         |                    |              | Issue       | Date             | 20             | /11/20          | 012             |                 |                    |        | Part o                          | of the Ba | chy Sole | tanche    | Group    |

| Project Name<br>Project No. | Investigation                    |                              |              |                  |              |                    |              |             |                  | ation          |                 | est             | S               |                    |        |                 |          |           |           |       |
|-----------------------------|----------------------------------|------------------------------|--------------|------------------|--------------|--------------------|--------------|-------------|------------------|----------------|-----------------|-----------------|-----------------|--------------------|--------|-----------------|----------|-----------|-----------|-------|
| Engineer                    | Arch Hend                        | derso                        | n LLP        |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |        |                 |          |           |           |       |
| Employer                    | Aberdeen                         | Harb                         | our B        | oard             |              |                    |              |             |                  |                |                 |                 |                 |                    |        |                 |          |           |           |       |
|                             |                                  |                              |              | Ε                |              | tent               |              |             | ity              |                |                 |                 | E               | age                |        | Par             | ticle    | size      |           |       |
| Hole ID                     | Sample depth m                   | Sample no.                   | Sample type  | Specimen depth m | Specimen no. | % Moisture Content | Bulk Density | Dry Density | Particle Density | % Liquid Limit | % Plastic Limit | % Plastic Index | % Passing 425µm | % Linear Shrinkage | % Clay | % Silt          | % Sand   | % Gravel  | % Cobbles |       |
| Т<br>А54                    | 10.15                            | 016                          | C            | 10.15            | 02           | 70                 |              | Vlg/m       |                  | 70             | 70              | 70              | 70              | 70                 | 20     | 23              | 33       | 24        | 0         |       |
| A57                         | 0.50                             | 003                          | В            | 0.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 10¹             | 84       | 6         | 0         |       |
| A57                         | 1.50                             | 006                          | В            | 1.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 10¹             | 84       | 5         | 0         |       |
| A57                         | 4.50                             | 015                          | В            | 4.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 11 <sup>1</sup> | 87       | 2         | 0         |       |
| A57                         | 7.00                             | 019                          | D            | 7.00             | 01           | 10                 |              |             |                  | 31             | 17              | 14              | 40              |                    |        |                 |          |           |           |       |
| A57                         | 9.20                             | 022                          | С            | 9.20             | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 10     | 20              | 34       | 32        | 4         |       |
| A57                         | 17.30                            | 025 C 17.30 01 006 B 1.50 01 |              |                  |              |                    |              |             |                  |                |                 |                 |                 |                    | 11     | 19              | 35       | 35        | 0         |       |
| A59                         | 1.50                             | 50 006 B 1.50 01             |              |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |        | 9 <sup>1</sup>  | 90       | 1         | 0         |       |
| A59                         | 5.50                             | 016                          | 06 B 1.50 01 |                  |              |                    |              |             |                  |                |                 |                 |                 |                    | 6      | 15              | 31       | 21        | 27        |       |
| A59                         | 7.50                             | 020                          | 16 B 5.50 01 |                  |              |                    |              |             |                  |                |                 |                 | 67              |                    |        |                 |          |           |           |       |
| A59                         | 10.45                            | 024                          | С            | 10.72            | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 14     | 23              | 40       | 23        | 0         |       |
| A59                         | 21.20                            | 027                          | С            | 21.43            | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 9      | 17              | 39       | 32        | 2         |       |
| A59                         | 26.60                            | 028                          | С            | 26.60            | 01           | 5.8                |              |             |                  | 30             |                 |                 | 62              |                    |        |                 |          |           |           |       |
| A63                         | 1.00                             | 006                          | В            | 1.00             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 6¹              | 92       | 1         | 0         |       |
| A63                         | 2.00                             | 010                          | В            | 2.00             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 7 <sup>1</sup>  | 91       | 2         | 0         |       |
| A63                         | 3.00                             | 014                          | В            | 3.00             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 8 <sup>1</sup>  | 89       | 4         | 0         |       |
| A63                         |                                  |                              |              |                  |              |                    |              |             |                  |                | 13              | 66              |                 |                    |        |                 |          |           |           |       |
| A63                         | 7.50 024 B 7.50 01               |                              |              |                  |              |                    |              |             |                  |                |                 |                 | 9               | 18                 | 34     | 40              | 0        |           |           |       |
| B61                         | 1.50                             | 007                          | В            | 1.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 6 <sup>1</sup>  | 89       | 5         | 0         |       |
| B61                         | 2.00 008 D 2.00 01 2.67 p        |                              |              |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |        |                 |          |           |           |       |
|                             |                                  |                              |              |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |        |                 |          |           |           |       |
| Approved by:                |                                  |                              | Leed         | s Laborato       | ry           |                    |              |             |                  | I              |                 |                 |                 |                    |        |                 |          |           |           |       |
| Sushil Sharda               |                                  |                              | Revisi       | on No            | 3 U3         |                    |              | Issue       |                  |                | te<br>/11/20    | 28/11/2         | 013             |                    |        |                 |          | nGIN      |           |       |
|                             | Revision No. 2.03 Issue Date 20/ |                              |              |                  |              |                    |              |             |                  |                | / 11/2(         | 112             |                 |                    |        | rart c          | и пие ва | city 5016 | tancne    | uroup |

| Project Name<br>Project No. |   | Bay of Nigg Harbour Development Ground Investigation TA7148  Classification T Summary  Arch Henderson LLP  Aberdeen Harbour Board |                |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |                |                |       |        |         |  |
|-----------------------------|---|---|----------------|------------------|--------------|--------------------|--------------|-------------|------------------|----------------|-----------------|-----------------|-----------------|--------------------|----------------|----------------|-------|--------|---------|--|
| Engineer                    | Arch Hen                                | derso   | n LLP          |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |                |                |       |        |         |  |
| Employer                    | Aberdeen                                | Harb  | our B          | oard             |              |                    |              |             |                  |                |                 |                 |                 |                    |                |                |       |        |         |  |
|                             |   |   |                | ٤                |              | tent               |              |             | ty               |                |                 |                 | Е               | agı                |                | Par            | ticle | size   |         |  |
| Ное ID                      | Sample depth m                          | Sample no.  | Sample type    | Specimen depth m | Specimen no. | % Moisture Content | Bulk Density | Dry Density | Particle Density | % Liquid Limit | % Plastic Limit | % Plastic Index | % Passing 425µm | % Linear Shrinkage | % Clay         | Silt           | Sand  | Gravel | Cobbles |  |
| 五<br>B61                    | 3.50                                    | 015   | ß              | 3.50             | 01           | %                  | '            | Vlg/m       |                  | %              | %               | %               | %               | %                  | %              | %<br>3¹        | 93    | 4      | 0       |  |
|                             | 3.30                                    |   |                |                  | 01           |                    |              |             |                  |                |                 |                 |                 |                    |                | 3              | 33    | 4      | 0       |  |
| B61                         | 28.05                                   | 020   | С              | 28.07            | 01           | 3.6                | 2.07         | 1.99        |                  |                |                 |                 |                 |                    |                |                |       |        |         |  |
| B61                         | 28.05                                   | 020   | С              | 28.10            | 02           |                    |              |             |                  |                |                 |                 |                 |                    | 9              | 20             | 36    | 35     | 0       |  |
| B61                         | 30.30                                   | 021   | С              | 30.35            | 01           | 7.2                | 2.16         | 2.02        |                  |                |                 |                 |                 |                    |                |                |       |        |         |  |
| B61                         | 30.30                                   | 021   | С              | 30.30            | 02           |                    |              |             |                  |                |                 |                 |                 |                    | 10             | 19             | 34    | 36     | 0       |  |
| B61                         | 30.30                                   | 021   | С              | 30.30            | 03           | 7.2                |              |             |                  | 34             | 20              | 14              | 62              |                    |                |                |       |        |         |  |
| B61                         | 30.80                                   | 022   | С              | 30.85            | 01           | 6.5                | 2.19         | 2.05        |                  |                |                 |                 |                 |                    |                |                |       |        |         |  |
| B61                         | 30.80                                   | 022   | 022 C 30.80 02 |                  |              |                    |              |             |                  |                |                 |                 |                 | 9                  | 20             | 35             | 35    | 0      |         |  |
| C79                         | 0.50                                    | 002   | 002 B 0.50 01  |                  |              |                    |              |             |                  |                |                 |                 |                 |                    | 5 <sup>1</sup> | 55             | 40    | 0      |         |  |
| C81                         | 0.50                                    | 002   | В              | 0.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |                | 6¹             | 53    | 41     | 0       |  |
| C81                         | 1.50                                    | 004   | В              | 1.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |                | 7 <sup>1</sup> | 77    | 16     | 0       |  |
| C81                         | 4.40                                    |   | С              | 4.40             | 01           | 9.5                |              |             |                  | 30             | 17              | 13              | 60              |                    |                |                |       |        |         |  |
| C81                         | 6.30                                    |   | С              | 6.30             | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 10             | 25             | 40    | 25     | 0       |  |
| C83                         | 0.00                                    | 002   | В              | 0.00             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |                | 2 <sup>1</sup> | 72    | 27     | 0       |  |
| C83                         | 1.00                                    | 003   | D              | 1.00             | 01           |                    |              |             | 2.66<br>p        |                |                 |                 |                 |                    |                |                |       |        |         |  |
| C83                         | 2.75                                    | 008   | С              | 2.90             | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 14             | 22             | 37    | 27     | 0       |  |
| C83                         | 2.75                                    | 008   | С              | 2.75             | 03           | 12                 |              |             |                  | 32             | 15              | 17              | 56              |                    |                |                |       |        |         |  |
| C83                         | 9.05                                    | 010   | С              | 9.05             | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 13             | 19             | 40    | 28     | 0       |  |
| C83                         | 9.05                                    | 010   | С              | 9.05             | 02           | 8.4                |              |             |                  |                |                 |                 |                 |                    |                |                |       |        |         |  |
| C84                         | 0.30                                    | 002   | В              | 0.30             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |                | 2 <sup>1</sup> | 56    | 42     | 0       |  |
|                             |   |   |                |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |                |                |       |        |         |  |
| Approved by:                |   |   | Leed           | s Laborato       | ry           |                    |              |             |                  |                |                 |                 |                 |                    |                |                |       |        |         |  |
| Sushil Sharda               |   |   | Destin         | on N-            | 2.02         |                    |              | la ·        |                  |                |                 |                 | 013             |                    |                |                | IL e  | ngin   | eerii   |  |
|                             | Revision No. 2.03 Issue Date 20/11/2012 |   |                |                  |              |                    |              |             |                  |                |                 |                 | Part o          | of the Ba          | chy Sole       | tanche         | Group |        |         |  |

| Project Name<br>Project No. | Bay of Nig<br>Investigat<br>TA7148 | -          | rbour         | Developm         | Groun        | d                  | C            | las         |                  | ation          | on 1<br>ary     | est             | S               |                    |        |                |          |          |           |       |
|-----------------------------|------------------------------------|------------|---------------|------------------|--------------|--------------------|--------------|-------------|------------------|----------------|-----------------|-----------------|-----------------|--------------------|--------|----------------|----------|----------|-----------|-------|
| Engineer                    | Arch Hend                          | derso      | n LLP         |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |        |                |          |          |           |       |
| Employer                    | Aberdeen                           | Harb       | our B         | oard             |              |                    |              |             |                  |                |                 |                 |                 |                    |        |                |          |          |           |       |
|                             |                                    |            |               | Е                |              | itent              |              |             | ity              |                |                 |                 | ٤               | age                |        | Par            | ticle    | size     |           |       |
| Hole ID                     | Sample depth m                     | Sample no. | Sample type   | Specimen depth m | Specimen no. | % Moisture Content | Bulk Density | Dry Density | Particle Density | % Liquid Limit | % Plastic Limit | % Plastic Index | % Passing 425µm | % Linear Shrinkage | % Clay | % Silt         | % Sand   | % Gravel | % Cobbles |       |
| Т<br>С84                    | 3.60                               | 006        | C             | 3.75             | 01           | 70                 |              | Vlg/m       |                  | 70             | 70              | 70              | 70              | 70                 | 7      | 12             | 24       | 18       | 38        |       |
|                             |                                    |            |               |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |        |                |          |          |           |       |
| C84                         | 5.50                               | 007        | С             | 5.50             | 02           | 9.4                |              |             |                  | 33             | 17              | 16              | 54              |                    |        |                |          |          |           |       |
| C84                         | 7.10                               | 800        | С             | 7.10             | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 10     | 16             | 29       | 42       | 3         |       |
| C84                         | 7.10                               | 800        | С             | 7.10             | 02           | 10.0               |              |             |                  | 30             | 15              | 15              | 68              |                    |        |                |          |          |           |       |
| C87                         | 0.00                               | 002        | В             | 0.00             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 4 <sup>1</sup> | 90       | 6        | 0         |       |
| C87                         | 2.40                               | 004        | С             | 2.40             | 01           | 8.3                |              |             |                  |                |                 |                 |                 |                    |        |                |          |          |           |       |
| C87                         | 4.15                               | 005        | 002 B 0.00 01 |                  |              |                    |              |             |                  |                |                 |                 |                 |                    | 13     | 20             | 39       | 27       | 2         |       |
| C88                         | 0.00                               | 002        | 02 B 0.00 01  |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |        | 2 <sup>1</sup> | 56       | 32       | 10        |       |
| C88                         | 2.05                               | 005        | 5 C 2.05 01   |                  |              |                    |              |             |                  |                |                 |                 |                 | 10                 | 16     | 31             | 29       | 14       |           |       |
| C88                         | 4.30                               | 006        | 95 C 2.05 01  |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |        |                |          |          |           |       |
| C88                         | 6.20                               | 007        | С             | 6.20             | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 13     | 20             | 38       | 28       | 0         |       |
| C88                         | 6.20                               | 007        | С             | 6.20             | 02           | 29                 |              |             |                  |                |                 |                 |                 |                    |        |                |          |          |           |       |
| C96                         | 0.50                               | 003        | В             | 0.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 4 <sup>1</sup> | 85       | 11       | 0         |       |
| C96                         | 3.50                               | 012        | В             | 3.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 9 <sup>1</sup> | 83       | 8        | 0         |       |
| D98                         | 0.00                               | 001        | В             | 0.00             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 8 <sup>1</sup> | 92       | 0        | 0         |       |
| D98                         | 1.50                               | 006        | В             | 1.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |        | 11¹            | 89       | 0        | 0         |       |
| D99                         | 0.50 003 B 0.50 01                 |            |               |                  |              |                    |              |             |                  |                |                 |                 | 5 <sup>1</sup>  | 86                 | 9      | 0              |          |          |           |       |
| D99                         | 1.50 006 B 1.50 01                 |            |               |                  |              |                    |              |             |                  |                |                 |                 | 7 <sup>1</sup>  | 88                 | 6      | 0              |          |          |           |       |
| D99                         | 6.00                               |            | С             | 6.00             | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 11     | 21             | 36       | 32       | 0         |       |
| D100                        | 0.50 003 B 0.50 01                 |            |               |                  |              |                    |              |             |                  |                |                 |                 |                 | 7 <sup>1</sup>     | 92     | 1              | 0        |          |           |       |
|                             |                                    |            |               |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |        |                |          |          |           |       |
| Approved by:                |                                    | •          | Leed          | s Laborato       | ry           |                    |              |             |                  |                |                 |                 |                 |                    |        |                | •        |          |           |       |
| Sushil Sharda               |                                    |            |               |                  |              |                    |              |             |                  | Print da       |                 | 28/11/2         | 013             |                    |        |                |          | ngin     |           |       |
|                             |                                    |            | Revisi        | ion No.          | 2.03         |                    |              | Issue       | Date             | 20             | /11/20          | )12             |                 |                    |        | Part o         | f the Ba | chy Sole | tanche    | Group |

| Project Name<br>Project No.         | Bay of Nig<br>Investigat<br>TA7148      |            | rbour       | Developm         | nent (       | Groun              | d            | C              | las              |                | cation<br>mm    | on 1<br>ary     | est             | S                  |          |                |        |          |           |  |
|-------------------------------------|---|------------|-------------|------------------|--------------|--------------------|--------------|----------------|------------------|----------------|-----------------|-----------------|-----------------|--------------------|----------|----------------|--------|----------|-----------|--|
| Engineer                            | Arch Hend                               | derso      | n LLP       |                  |              |                    |              |                |                  |                |                 |                 |                 |                    |          |                |        |          |           |  |
| Employer                            | Aberdeen                                | Harb       | our B       | oard             |              |                    |              |                |                  |                |                 |                 |                 |                    |          |                |        |          |           |  |
|                                     |   |            |             | ٤                |              | tent               |              |                | ty               |                |                 |                 | ۲               | ge                 |          | Par            | ticle  | size     |           |  |
| Hole ID                             | Sample depth m                          | Sample no. | Sample type | Specimen depth m | Specimen no. | % Moisture Content | Bulk Density | Je Dry Density | Particle Density | % Liquid Limit | % Plastic Limit | % Plastic Index | % Passing 425µm | % Linear Shrinkage | % Clay   | % Silt         | % Sand | % Gravel | % Cobbles |  |
| D100                                | 1.50                                    | 006        | B           | 1.50             | 01           | 24                 |              | vig/iii        |                  | 26             | NP              | NP              | 100             | 70                 | 70       | 70             | 70     | 70       | 70        |  |
| D100                                | 2.50                                    | 009        | В           | 2.50             | 01           |                    |              |                |                  |                |                 |                 |                 |                    |          | 5 <sup>1</sup> | 95     | 1        | 0         |  |
|                                     |   |            |             |                  |              |                    |              |                |                  |                |                 |                 |                 |                    |          |                |        |          |           |  |
| D102                                | 0.50                                    | 003        | В           | 0.50             | 01           |                    |              |                | 2.00             |                |                 |                 |                 |                    |          | 6 <sup>1</sup> | 92     | 2        | 0         |  |
| D102                                | 1.50                                    | 006        | В           | 1.50             | 02           |                    |              |                | 2.68<br>p        |                |                 |                 |                 |                    |          |                |        |          |           |  |
| D102                                | 2.50                                    | 009        | В           | 2.50             | 01           |                    |              |                |                  |                |                 |                 |                 |                    |          | 4 <sup>1</sup> | 95     | 1        | 0         |  |
| D104                                | 1.50                                    | 004        | В           | 1.50             | 01           |                    |              |                |                  |                |                 |                 |                 |                    |          | 4 <sup>1</sup> | 50     | 46       | 0         |  |
| D104                                | 5.50                                    | 012        | В           | 5.50             | 01           |                    |              |                |                  |                |                 |                 |                 |                    |          | 7 <sup>1</sup> | 85     | 8        | 0         |  |
| E65                                 | 0.50                                    | 003        | В           | 0.50             | 01           |                    |              |                |                  |                |                 |                 |                 |                    |          | 10¹            | 83     | 7        | 0         |  |
| E65                                 | 1.50                                    | 005        | D           | 1.50             | 01           |                    |              |                | 2.67<br>p        |                |                 |                 |                 |                    |          |                |        |          |           |  |
| E65                                 | 2.50                                    | 009        | В           | 2.50             | 01           |                    |              |                |                  |                |                 |                 |                 |                    |          | 10¹            | 83     | 8        | 0         |  |
| E65                                 | 4.50                                    | 015        | В           | 4.50             | 01           |                    |              |                |                  |                |                 |                 |                 |                    |          | 3 <sup>1</sup> | 63     | 34       | 0         |  |
| E65                                 | 8.00                                    |            | С           | 8.24             | 01           |                    |              |                |                  |                |                 |                 |                 |                    | 10       | 22             | 33     | 36       | 0         |  |
| E65                                 | 9.80                                    |            | С           | 9.80             | 01           | 9.6                |              |                |                  | 31             | 19              | 12              | 55              |                    |          |                |        |          |           |  |
| E66                                 | 1.50                                    | 004        | В           | 1.50             | 01           |                    |              |                |                  |                |                 |                 |                 |                    |          | 5 <sup>1</sup> | 87     | 8        | 0         |  |
| E66                                 | 3.50                                    | 800        | В           | 3.50             | 01           |                    |              |                |                  |                |                 |                 |                 |                    |          | 6 <sup>1</sup> | 89     | 4        | 0         |  |
| E66                                 | 6.50                                    | 014        | В           | 6.50             | 01           |                    |              |                |                  |                |                 |                 |                 |                    |          | 7 <sup>1</sup> | 84     | 9        | 0         |  |
| E66                                 | 11.60                                   |            | С           | 11.60            | 01           |                    |              |                |                  |                |                 |                 |                 |                    | 11       | 19             | 34     | 36       | 0         |  |
| E66                                 | 12.80                                   |            | С           | 12.80            | 02           | 11                 |              |                |                  | 31             | 16              | 15              | 55              |                    |          |                |        |          |           |  |
| E69                                 | 1.50                                    | 004        | В           | 1.50             | 01           |                    |              |                |                  |                |                 |                 |                 |                    |          | 11¹            | 87     | 3        | 0         |  |
| E69                                 | 3.50                                    | 008        | В           | 3.50             | 01           |                    |              |                |                  |                |                 |                 |                 |                    |          | 8 <sup>1</sup> | 83     | 10       | 0         |  |
|                                     |   |            |             |                  |              |                    |              |                |                  |                |                 |                 |                 |                    |          |                |        |          |           |  |
| Approved by:                        | <u> </u>                                | <u> </u>   | Leed        | s Laborato       | rv           | <u> </u>           |              |                |                  |                | <u> </u>        | <u> </u>        | ]               |                    | <u> </u> |                | ]      |          |           |  |
| Sushil Sharda Print date 28/11/2013 |   |            |             |                  |              |                    |              |                |                  |                | so              |                 | ngine           | eerii              | ng       |                |        |          |           |  |
|                                     | Revision No. 2.03 Issue Date 20/11/2012 |            |             |                  |              |                    |              |                |                  |                |                 |                 | Part o          | of the Ba          | chy Sole | etanche        | Group  |          |           |  |

| Project Name<br>Project No. | Bay of Nigg Harbour Development Ground Investigation TA7148  Arch Henderson LLP  Classification Test Summary |            |             |                  |              |                    |              |             |                  |                |                 |                        |                 | S                  |          |                |          |          |           |   |
|-----------------------------|--|------------|-------------|------------------|--------------|--------------------|--------------|-------------|------------------|----------------|-----------------|------------------------|-----------------|--------------------|----------|----------------|----------|----------|-----------|---|
| Engineer                    | Arch Hen   | derso      | n LLP       |                  |              |                    |              |             |                  |                |                 |                        |                 |                    |          |                |          |          |           |   |
| Employer                    | Aberdeen   | Harb       | our B       | oard             |              |                    |              |             |                  |                |                 |                        |                 |                    |          |                |          |          |           |   |
|                             |  |            |             | π                |              | tent               |              |             | ty               |                |                 |                        | E               | agi                |          | Par            | ticle    | size     |           |   |
| Hole ID                     | Sample depth m   | Sample no. | Sample type | Specimen depth m | Specimen no. | % Moisture Content | Bulk Density | Jey Density | Particle Density | % Liquid Limit | % Plastic Limit | % Plastic Index        | % Passing 425µm | % Linear Shrinkage | % Clay   | % Silt         | % Sand   | % Gravel | % Cobbles |   |
| E69                         | 8.10   | .,         | С           | 8.10             | 01           |                    |              |             |                  |                |                 |                        |                 |                    | 10       | 21             | 32       | 38       | 0         |   |
| E69                         | 8.80   |            | С           | 8.80             | 01           | 8.0                |              |             |                  | 27             | 20              | 7                      | 60              |                    |          |                |          |          |           |   |
| E71                         | 1.50   | 004        | В           | 1.50             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 8 <sup>1</sup> | 86       | 6        | 0         |   |
| E71                         | 2.00   | 005        | D           | 2.00             | 01           |                    |              |             | 2.66<br>p        |                |                 |                        |                 |                    |          |                |          |          |           |   |
| E71                         | 4.50   | 010        | В           | 4.50             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 8 <sup>1</sup> | 84       | 8        | 0         |   |
| E71                         | 9.00   | 016        | В           | 9.00             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 8 <sup>1</sup> | 85       | 7        | 0         |   |
| E71                         | 10.30  |            | С           | 10.30            | 01           | 10                 |              |             |                  | 31             | 17              | 14                     | 56              |                    |          |                |          |          |           |   |
| E72                         | 1.50   | 004        | В           | 1.50 O1 3.50 O1  |              |                    |              |             |                  |                |                 |                        |                 |                    | 11¹      | 84             | 5        | 0        |           |   |
| E72                         | 3.50   | 008        | В           | 3.50             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 9 <sup>1</sup> | 86       | 6        | 0         |   |
| E75                         | 0.50   | 002        | В           | 0.50             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 3 <sup>1</sup> | 33       | 63       | 0         |   |
| E75                         | 2.50   | 006        | В           | 2.50             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 4 <sup>1</sup> | 43       | 53       | 0         |   |
| E105                        | 0.00   | 002        | В           | 0.00             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 2 <sup>1</sup> | 83       | 15       | 0         |   |
| E105                        | 1.50   | 006        | В           | 1.50             | 01           |                    |              |             | 2.68<br>p        |                |                 |                        |                 |                    |          |                |          |          |           |   |
| E105                        | 3.50   | 014        | В           | 3.50             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 2 <sup>1</sup> | 88       | 10       | 0         |   |
| E105                        | 5.50   | 022        | В           | 5.50             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 1¹             | 73       | 26       | 0         |   |
| E106                        | 0.00   | 002        | В           | 0.00             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 2 <sup>1</sup> | 92       | 6        | 0         |   |
| E106                        | 2.50   | 010        | В           | 2.50             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 2 <sup>1</sup> | 87       | 11       | 0         |   |
| E106                        | 4.50   | 018        | В           | 4.50             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 2 <sup>1</sup> | 93       | 5        | 0         |   |
| E107                        | 0.50   | 003        | В           | 0.50             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 3 <sup>1</sup> | 93       | 5        | 0         |   |
| E107                        | 4.50   | 011        | В           | 4.50             | 01           |                    |              |             |                  |                |                 |                        |                 |                    |          | 8 <sup>1</sup> | 90       | 3        | 0         |   |
|                             |  |            |             |                  |              |                    |              |             |                  |                |                 |                        |                 |                    |          |                |          |          |           |   |
| Approved by:                | 1  |            | l eed       | s Laborato       | rv           | <u> </u>           | <u> </u>     |             |                  |                | <u> </u>        | <u> </u>               | <u> </u>        | <u> </u>           | <u> </u> | <u> </u>       | <u> </u> |          |           | L |
| Sushil Sharda               |  |            |             |                  | -,           |                    |              | ]           |                  |                |                 |                        |                 |                    |          |                |          |          |           |   |
| Justin Stiatua              |  |            | Revisi      | on No.           | 2.03         |                    |              | Issue       |                  | Print da       | te<br>/11/20    | 28/11/2<br>0 <b>12</b> | 2013            |                    |          | _              |          | chy Sole |           | - |

| Project Name<br>Project No. | Bay of Nigg Harbour Development Ground Investigation TA7148  Classification Tes Summary  Arch Henderson LLP |            |             |                  |              |                    |              |                |                       |                |                 |                 |                 | S                  |          |                |          |          |           |   |
|-----------------------------|---|------------|-------------|------------------|--------------|--------------------|--------------|----------------|-----------------------|----------------|-----------------|-----------------|-----------------|--------------------|----------|----------------|----------|----------|-----------|---|
| Engineer                    | Arch Hen  | derso      | n LLP       |                  |              |                    |              |                |                       |                |                 |                 |                 |                    |          |                |          |          |           |   |
| Employer                    | Aberdeen  | Harb       | our B       | oard             |              |                    |              |                |                       |                |                 |                 |                 |                    |          |                |          |          |           |   |
|                             |   |            |             | c                |              | ent                |              |                | <u>ج</u>              |                |                 |                 | ے               | ge                 |          | Par            | ticle    | size     |           |   |
| Hole ID                     | Sample depth m  | Sample no. | Sample type | Specimen depth m | Specimen no. | % Moisture Content | Bulk Density | de Dry Density | "<br>Particle Density | % Liquid Limit | % Plastic Limit | % Plastic Index | % Passing 425µm | % Linear Shrinkage | % Clay   | % Silt         | % Sand   | % Gravel | % Cobbles |   |
| E107                        | 5.00  | 012        | D           | 5.00             | 01           |                    |              | 1              | 2.68                  |                |                 |                 |                 |                    |          |                |          |          |           |   |
| E108                        | 0.00  | 001        | В           | 0.00             | 01           |                    |              |                | р                     |                |                 |                 |                 |                    |          | 2 <sup>1</sup> | 75       | 22       | 0         |   |
| E108                        | 2.00  | 008        | В           | 2.00             | 01           |                    |              |                |                       |                |                 |                 |                 |                    |          | 11¹            | 63       | 26       | 0         |   |
| E108                        | 3.00  | 011        | В           | 3.00             | 01           |                    |              |                |                       |                |                 |                 |                 |                    |          | 4 <sup>1</sup> | 60       | 36       | 0         |   |
| E109                        | 0.00  | 002        | В           | 0.00             | 01           |                    |              |                |                       |                |                 |                 |                 |                    |          | 4 <sup>1</sup> | 95       | 1        | 0         |   |
| E109                        | 2.00  | 008        | В           | 2.00             | 01           |                    |              |                | 2.67<br>p             |                |                 |                 |                 |                    |          |                |          |          |           |   |
| E109                        | 2.50  | 010        | В           | 2.50             | 01           |                    |              |                |                       |                |                 |                 |                 |                    |          | 1¹             | 61       | 38       | 0         |   |
| E109                        | 5.00  | 019        | В           | 5.00             | 01           |                    |              |                |                       |                |                 |                 |                 |                    |          | 4 <sup>1</sup> | 75       | 21       | 0         |   |
| E110                        | 1.50  | 005        | В           | 1.50             | 01           |                    |              |                |                       |                |                 |                 |                 |                    |          | 2 <sup>1</sup> | 67       | 31       | 0         |   |
| E111                        | 0.50  | 003        | В           | 0.50             | 01           |                    |              |                |                       |                |                 |                 |                 |                    |          | 6 <sup>1</sup> | 87       | 7        | 0         |   |
| E111                        | 2.50  | 009        | В           | 2.50             | 01           |                    |              |                |                       |                |                 |                 |                 |                    |          | 5 <sup>1</sup> | 94       | 0        | 0         |   |
| E112                        | 0.00  | 001        | В           | 0.00             | 01           |                    |              |                |                       |                |                 |                 |                 |                    |          | 5 <sup>1</sup> | 65       | 30       | 0         |   |
| E112                        | 2.00  | 006        | В           | 2.00             | 01           |                    |              |                |                       |                |                 |                 |                 |                    |          | 4 <sup>1</sup> | 96       | 0        | 0         |   |
| E112                        | 2.00  | 006        | В           | 2.00             | 02           |                    |              |                | 2.67<br>p             |                |                 |                 |                 |                    |          |                |          |          |           |   |
| E115                        | 0.50  | 003        | В           | 0.50             | 01           |                    |              |                |                       |                |                 |                 |                 |                    |          | 5 <sup>1</sup> | 74       | 21       | 0         |   |
| E116                        | 0.50  | 002        | В           | 0.50             | 01           |                    |              |                |                       |                |                 |                 |                 |                    |          | 7 <sup>1</sup> | 58       | 27       | 8         |   |
| GS11                        | 6.80  |            | С           | 6.80             | 01           | 8.0                |              |                |                       | 52             | 21              | 31              | 63              |                    |          |                |          |          |           |   |
| GS11                        | 6.80  |            | С           | 6.80             | 02           |                    |              |                |                       |                |                 |                 |                 |                    | 10       | 23             | 40       | 27       | 0         |   |
| TP01                        | 0.10  | 001        | В           | 0.10             | 01           |                    |              |                |                       |                |                 |                 |                 |                    |          | 2 <sup>1</sup> | 11       | 67       | 20        |   |
| TP01                        | 0.50  | 003        | В           | 0.50             | 01           | 9.4                |              |                |                       | 36             | 21              | 15              | 49              |                    |          |                |          |          |           |   |
|                             |   |            |             |                  |              |                    |              |                |                       |                |                 |                 |                 |                    |          |                |          |          |           |   |
| Approved by:                | 1   |            | امما        | s Laborato       | rv           | <u> </u>           | <u> </u>     |                | <u> </u>              |                | <u> </u>        |                 | <u> </u>        | <u> </u>           | <u> </u> | <u> </u>       | <u> </u> |          |           | L |
| Sushil Sharda               |   |            | Locu        | Laborato         | · · y        |                    |              |                |                       |                |                 |                 |                 |                    |          |                |          |          |           |   |
| Sustill Stiarda             | Pfill date 26/11/2013   |            |             |                  |              |                    |              |                |                       |                | _               |                 | nGIN(           |                    | -        |                |          |          |           |   |
|                             | Revision No. 2.03 Issue Date 20/11/2012   |            |             |                  |              |                    |              |                |                       |                |                 |                 | Part c          | n rue Ra           | chy Sole | canche         | aroup    |          |           |   |

| Project Name<br>Project No. | Bay of Nigg Harbour Development Ground Investigation TA7148  Arch Henderson LLP  Aberdeen Harbour Board  Classification 1 Summary |            |               |                  |              |                    |              |             |                  |                |                 |                 |                 | S                  |          |                 |        |          |           |  |
|-----------------------------|---|------------|---------------|------------------|--------------|--------------------|--------------|-------------|------------------|----------------|-----------------|-----------------|-----------------|--------------------|----------|-----------------|--------|----------|-----------|--|
| Engineer                    | Arch Hend   | derso      | n LLP         |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |          |                 |        |          |           |  |
| Employer                    | Aberdeen  | Harb       | our B         | oard             |              |                    |              |             |                  |                |                 |                 |                 |                    |          |                 |        |          |           |  |
|                             |   |            |               | Ε                |              | tent               |              |             | ity              |                |                 |                 | E               | age                |          | Par             | ticle  | size     |           |  |
| Hole ID                     | Sample depth m  | Sample no. | Sample type   | Specimen depth m | Specimen no. | % Moisture Content | Bulk Density | Dry Density | Particle Density | % Liquid Limit | % Plastic Limit | % Plastic Index | % Passing 425µm | % Linear Shrinkage | % Clay   | % Silt          | % Sand | % Gravel | % Cobbles |  |
| Т<br>ТР02                   | ن<br>0.50   | 003        | B             | 0.50             | 01           | %                  |              | Vlg/m       |                  | %              | %               | %               | %               | %                  | 6        | 18              | 35     | 40       | 0         |  |
|                             |   |            |               |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |          |                 |        |          |           |  |
| TP03                        | 0.00  | 001        | В             | 0.00             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          | 12 <sup>1</sup> | 61     | 16       | 11        |  |
| TP03                        | 1.50  | 005        | В             | 1.50             | 01           | 14                 |              |             |                  | 30             | 18              | 12              | 63              |                    |          |                 |        |          |           |  |
| TP04                        | 2.00  | 005        | В             | 2.00             | 01           |                    |              |             |                  |                |                 |                 |                 |                    | 7        | 21              | 43     | 29       | 0         |  |
| TP05                        | 0.50  | 003        | В             | 0.50             | 01           |                    |              |             | 2.67<br>g        |                |                 |                 |                 |                    |          |                 |        |          |           |  |
| TP05                        | 0.50  | 003        | В             | 0.50             | 02           |                    |              |             |                  |                |                 |                 |                 |                    |          | O <sup>1</sup>  | 6      | 65       | 29        |  |
| TP05                        | 1.50  | 005        | В             | 1.50             | 01           | 12                 |              |             |                  | 26             | 14              | 12              | 56              |                    |          |                 |        |          |           |  |
| TP06                        | 2.50  | 006        | 006 B 2.50 01 |                  |              |                    |              |             |                  |                |                 |                 |                 |                    | 1¹       | 26              | 49     | 24       |           |  |
| TP07                        | 1.00  | 002        | В             | 1.00             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          | 1¹              | 15     | 82       | 2         |  |
| TP08                        | 1.50  | 003        | В             | 1.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          | 3 <sup>1</sup>  | 18     | 58       | 21        |  |
| TP09                        | 0.60  | 003        | В             | 0.60             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          | 3 <sup>1</sup>  | 21     | 66       | 11        |  |
| TP09                        | 2.50  | 008        | D             | 2.50             | 01           | 15                 |              |             |                  | 20             | NP              | NP              | 66              |                    |          |                 |        |          |           |  |
| TP10                        | 0.50  | 001        | В             | 0.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          | 2 <sup>1</sup>  | 26     | 62       | 10        |  |
| TP11                        | 1.50  | 003        | В             | 1.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          | 1¹              | 27     | 57       | 15        |  |
| TP11                        | 2.80  | 007        | В             | 2.80             | 01           | 5.9                |              |             |                  | 29             | 19              | 10              | 56              |                    |          |                 |        |          |           |  |
| TP11                        | 2.80  | 007        | В             | 2.80             | 02           |                    |              |             |                  |                |                 |                 |                 |                    | 3        | 21              | 38     | 37       | 0         |  |
| TP12                        | 1.50  | 004        | В             | 1.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          | 11¹             | 44     | 44       | 1         |  |
| TP13                        | 1.50  | 003        | В             | 1.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          | 3 <sup>1</sup>  | 36     | 56       | 6         |  |
| TP13                        | 3.50  | 800        | D             | 3.50             | 01           | 7.0                |              |             |                  | 27             | 15              | 12              | 63              |                    |          |                 |        |          |           |  |
| TP14                        | 0.50  | 002        | В             | 0.50             | 01           |                    |              |             |                  |                |                 |                 |                 |                    |          | 11¹             | 37     | 48       | 4         |  |
|                             |   |            |               |                  |              |                    |              |             |                  |                |                 |                 |                 |                    |          |                 |        |          |           |  |
| Approved by:                | by: Leeds Laboratory  |            |               |                  |              |                    |              |             |                  |                |                 |                 |                 | -                  |          |                 |        |          |           |  |
| Sushil Sharda               | Pfilit date 26/11/2015  |            |               |                  |              |                    |              |             |                  |                |                 |                 |                 |                    | ngin     |                 | -      |          |           |  |
|                             | Print date 28/11/2013   Revision No. 2.03   Issue Date 20/11/2012   |            |               |                  |              |                    |              |             |                  |                |                 |                 | Part o          | of the Ba          | chy Sole | tanche          | Group  |          |           |  |

| Project Name<br>Project No. | Bay of Nig<br>Investigat<br>TA7148 |            | rbour           | Developn         | nent (       | Grour              | nd           | C             | las              |                |                         | on T<br>ary           |                 | S                  |        |                |        |          |           |   |
|-----------------------------|------------------------------------|------------|-----------------|------------------|--------------|--------------------|--------------|---------------|------------------|----------------|-------------------------|-----------------------|-----------------|--------------------|--------|----------------|--------|----------|-----------|---|
| Engineer                    | Arch Hen                           | derso      | n LLP           |                  |              |                    |              |               |                  |                |                         |                       |                 |                    |        |                |        |          |           |   |
| Employer                    | Aberdeen                           | Harb       | our B           | oard             |              |                    |              |               |                  |                |                         |                       |                 |                    |        |                |        |          |           |   |
|                             |                                    |            |                 | ٤                |              | tent               |              |               | ΓŹ               |                |                         |                       | ۴               | ge                 |        | Par            | ticle  | size     |           |   |
| Hole ID                     | Sample depth m                     | Sample no. | Sample type     | Specimen depth m | Specimen no. | % Moisture Content | Bulk Density | 6 Dry Density | Particle Density | % Liquid Limit | % Plastic Limit         | % Plastic Index       | % Passing 425µm | % Linear Shrinkage | % Clay | % Silt         | % Sand | % Gravel | % Cobbles |   |
| TP14                        | 1.20                               | 003        | D               | 1.20             | 01           |                    |              |               | 2.61<br>p        |                |                         |                       |                 |                    |        |                |        |          |           |   |
| TP15                        | 1.80                               | 003        | В               | 1.80             | 01           |                    |              |               | ۲                |                |                         |                       |                 |                    |        | 3 <sup>1</sup> | 22     | 64       | 11        |   |
| TP16                        | 0.00                               | 001        | В               | 0.00             | 01           |                    |              |               |                  |                |                         |                       |                 |                    | 6      | 19             | 39     | 32       | 4         |   |
| TP17                        | 1.20                               | 003        | D               | 1.20             | 01           | 25                 |              |               |                  | 22             | NP                      | NP                    | 100             |                    |        |                |        |          |           |   |
| TP17                        | 3.00                               | 006        | В               | 3.00             | 01           |                    |              |               |                  |                |                         |                       |                 |                    |        | 10¹            | 46     | 11       | 33        |   |
| TP18                        | 0.50                               | 001        | 1 B 0.50 01 End |                  |              |                    |              |               |                  |                |                         |                       |                 |                    | 2      | 19             | 25     | 52       | 1         |   |
|                             |                                    |            |                 |                  |              |                    |              |               |                  |                |                         |                       |                 |                    |        |                |        |          |           |   |
| Approved by:                |                                    |            | Leed            | s Laborato       | ry           |                    |              |               |                  |                |                         |                       |                 |                    |        |                |        |          |           |   |
| Sushil Sharda               |                                    |            | Revisi          | on No.           | 2.03         |                    |              | Issue         | Date             | Print da       | <sub>te</sub><br>/11/20 | 28/11/2<br><b>)12</b> | 2013            |                    |        |                | oir ei | nGIN     | eerii     | _ |

|                               | Investiga  |            | arbour      | Developr         | ory          |                  |              |          |                 |           |          |           |                          |        |
|-------------------------------|--|------------|-------------|------------------|--------------|------------------|--------------|----------|-----------------|-----------|----------|-----------|--------------------------|--------|
| Project No.                   | TA7148   |            |             |                  |              |                  |              | JUII K   | le-Use          | 16212     |          |           |                          |        |
| Engineer                      | Arch Her   | nderso     | on LLP      |                  |              |                  |              |          |                 |           |          |           |                          |        |
| Employer                      | Aberdeer   | n Harl     | oour B      | oard             |              |                  |              |          |                 |           |          |           |                          |        |
|                               | ε  |            |             | :h m             |              |                  | ry.          | Comp     | paction         | MCV       | CI       | BR        | sion                     |        |
| Hole ID                       | Sample depth m   | Sample no. | Sample type | Specimen depth m | Specimen no. | Moisture Content | Bulk Density | OMC<br>% | Max DD<br>Mg/m³ |           | Top<br>% | Base<br>% | Pinhole Dispersion       |        |
| TP17                          | 1.00   | 002        | В           | 1.00             | 01           | 16               | 2.20         |          |                 |           | 0.49     | 0.65      |                          |        |
| TP18                          | 1.50   | 003        | В           | 1.50             | 01           | 14               | 2.24         |          |                 |           | 0.31     | 0.45      |                          |        |
| Approved by:                  |  |            | Leeds       | Laborato         | ry           |                  |              | End      |                 |           |          |           |                          |        |
| Approved by:<br>Sushil Sharda |  |            | Leeas       | ranoiato         | У            |                  |              |          |                 | 00.111.77 |          | 56"       |                          | NDISC. |
|                               | Sharda         Print date         28/11/2013           Revision No.         2.03         Issue Date         09/01/2013 |            |             |                  |              |                  |              |          |                 |           |          |           | enginee<br>Bachy Soletar |        |

| Project Name<br>Project No. |  | _  |         | evelopment     |   | Pe   |                | reng<br>abilit |            |      | ary       |      |       |          |     |           |     |
|-----------------------------|--|--|---------|----------------|---|------|----------------|----------------|------------|------|-----------|------|-------|----------|-----|-----------|-----|
| Engineer                    | Arch Hend  | erson l  | _LP     |                |   |      |                |                |            |      |           |      |       |          |     |           |     |
| Employer                    | Aberdeen l   | Harbou   | ır Boar | <sup>-</sup> d |   |      |                |                |            |      |           |      |       |          |     |           |     |
|                             |  |  |         |                |   |      |                |                | Triaxial   |      | Со        | nsol | Perme | eability | :   | Shearbo   | x   |
| Ное ID                      | Sample depth m                                       | Permeability Summary   Permeability Summary |         |                |   |      | m <sub>v</sub> | Туре           | K<br>m/s   | Туре | c<br>kPa  | Ø    |       |          |     |           |     |
| A05                         | 5.00   | 0,   |         |                |   | 9.2  |                |                | 254        | 0    |           |      |       |          |     |           |     |
| A05                         | 7.95   |  | С       | 7.98           | 1 | 10   | 2.27           | uu             | 135        | 0    |           |      |       |          |     |           |     |
| A05                         | 21.20  |  | С       | 21.21          | 1 | 8.5  | 2.36           | uu             | 391        | 0    |           |      |       |          |     |           |     |
| A08                         | 4.63   |  | С       | 4.63           | 1 | 9.5  | 2.34           | uu             | 187        | 0    |           |      |       |          |     |           |     |
| A08                         | 12.23  |  | С       | 12.25          | 1 | 6.4  | 2.16           | uu             | 351        | 0    |           |      |       |          |     |           |     |
| A08                         | 20.95  | 63 C 7.64 1 9 2.25 CUM 18 29.5   |         |                |   |      |                |                |            |      |           |      |       |          |     |           |     |
| A11                         | 7.63   | 7.63 C 7.64 1 9 2.25 CUM 18 29.5   |         |                |   |      |                |                |            |      |           |      |       |          |     |           |     |
| A11                         | 9.81   | 9.81 C 9.99 1 7.0 2.37 UU 488 0  |         |                |   |      |                |                |            |      |           |      |       |          |     |           |     |
| A11                         | 11.64  | C 9.99 1 7.0 2.37 UU 488 0   |         |                |   |      |                |                |            |      |           |      |       |          |     |           |     |
| A11                         | 21.75  |  | С       | 21.77          | 1 | 8.8  | 2.22           | uu             | 388        | 0    |           |      |       |          |     |           |     |
| A29                         | 4.70   | 010  | С       | 4.92           | 2 | 8.2  | 2.34           | uu             | 458        | 0    |           |      |       |          |     |           |     |
| A29                         | 10.80  | 011  | С       | 10.81          | 1 | 10.0 | 2.27           | uu             | 355        | 0    |           |      |       |          |     |           |     |
| A29                         | 21.50  | 014  | С       | 21.53          | 2 | 18   | 2.11           | uu             | 114        | 0    |           |      |       |          |     |           |     |
| A31                         | 9.70   | 006  | С       | 9.72           | 1 | 8.1  | 2.31           | uu             | 393        | 0    |           |      |       |          |     |           |     |
| A31                         | 13.00  |  | С       | 13.04          | 1 | 10   | 2.24           | uu             | 166        | 0    |           |      |       |          |     |           |     |
| A31                         | 19.30  | 009  | С       | 19.32          | 2 | 32   | 1.96           | uu             | 58         | 0    |           |      |       |          |     |           |     |
| A34                         | 4.75   |  | С       | 4.88           | 2 | 7.7  | 2.33           | uu             | 448        | 0    |           |      |       |          |     |           |     |
| A34                         | 8.50   |  | С       | 8.50           | 1 | 8.6  | 2.27           | uu             | 313        | 0    |           |      |       |          |     |           |     |
| A54                         | 2.50   | 009  | В       | 2.50           | 1 |      |                |                |            |      |           |      |       |          | SSB | p7.5      | p40 |
| A54                         |  |  |         |                |   |      |                |                |            |      |           |      |       |          |     |           |     |
|                             |  |  |         |                |   |      |                |                |            |      |           |      |       |          |     |           |     |
| Approved by:                |  | <u> </u>   | Leeds   | Laboratory     |   |      |                |                |            |      |           |      |       |          |     |           |     |
| Sushil Sharda               |  |  |         |                |   |      |                |                | Print data | 25   | 8/11/2013 |      |       | SOI      |     | Ineer     | ıng |
|                             | rda Print date  Revision No. 3.03 Issue Date 23/11/2 |  |         |                |   |      |                |                |            |      |           |      |       |          |     | Soletanch |     |

| Project Name<br>Project No. | Bay of Nig<br>Ground Inv<br>TA7148 | -          |             | evelopment       |              | Pe                 | St<br>rmea      |      | th a       |       | ary       |                |       |          |           |              |       |
|-----------------------------|------------------------------------|------------|-------------|------------------|--------------|--------------------|-----------------|------|------------|-------|-----------|----------------|-------|----------|-----------|--------------|-------|
| Engineer                    | Arch Hend                          | erson l    | LP.         |                  |              |                    |                 |      |            |       |           |                |       |          |           |              |       |
| Employer                    | Aberdeen l                         | Harbou     | r Boar      | ·d               |              |                    |                 |      |            |       |           |                |       |          |           |              |       |
|                             |                                    |            |             |                  |              |                    |                 |      | Triaxial   |       | Со        | nsol           | Perme | eability |           | Shearbo      | x     |
| Hole ID                     | Sample depth m                     | Sample no. | Sample type | Specimen depth m | Specimen no. | % Moisture Content | by Bulk Density | Туре | c<br>kPa   | Ø     | Type      | m <sub>v</sub> | Туре  | K<br>m/s | Туре      | c<br>kPa     | Ø     |
| A57                         | 9.20                               | 022        | С           | 9.30             | 2            | 7.8                | 2.33            | uu   | 441        | 0     |           |                | Г     |          |           |              |       |
| A57                         | 17.30                              | 025        | С           | 17.33            | 2            | 9.1                | 2.26            | uu   | 202        | 0     |           |                |       |          |           |              |       |
| A59                         | 10.45                              | 024        | С           | 10.50            | 2            | 8.7                | 2.36            | uu   | 452        | 0     |           |                |       |          |           |              |       |
| A59                         | 21.20                              | 027        | С           | 21.22            | 2            | 8.5                | 2.29            | uu   | 417        | 0     |           |                |       |          |           |              |       |
| B61                         | 2.50                               | 011        | В           | 2.50             | 1            |                    |                 |      |            |       |           |                |       |          | SSB       | p6.9<br>r1.8 | p35.5 |
| C81                         | 4.40                               |            | С           | 4.61             | 2            | 8.4                | 2.36            | uu   | 364        | 0     |           |                |       |          |           |              |       |
| C81                         | 7.59                               |            | С           | 7.61             | 1            | 9.2                | 2.29            | uu   | 218        | 0     |           |                |       |          |           |              |       |
| C83                         | 2.75                               | 008        | С           | 2.77             | 2            | 9.8                | 2.34            | uu   | 131        | 0     |           |                |       |          |           |              |       |
| C84                         | 3.60                               | 006        | С           | 3.80             | 2            | 8.0                | 2.36            | uu   | 380        | 0     |           |                |       |          |           |              |       |
| C87                         | 4.15                               | 005        | С           | 4.17             | 2            | 9.2                | 2.37            | uu   | 254        | 0     |           |                |       |          |           |              |       |
| C87                         | 8.45                               | 007        | С           | 8.48             | 1            | 8.1                | 2.35            | uu   | 374        | 0     |           |                |       |          |           |              |       |
| C88                         | 2.05                               | 005        | С           | 2.24             | 2            | 8.4                | 2.31            | uu   | 228        | 0     |           |                |       |          |           |              |       |
| D99                         | 6.60                               |            | С           | 6.61             | 1            | 9.1                | 2.28            | uu   | 190        | 0     |           |                |       |          |           |              |       |
| E65                         | 8.00                               |            | С           | 8.03             | 2            | 9.3                | 2.25            | cu   |            |       |           |                |       |          |           |              |       |
| E65                         | 9.80                               |            | С           | 10.10            | 1            | 9.3                | 2.24            | uu   | 320        | 0     |           |                |       |          |           |              |       |
| E66                         | 12.80                              |            | С           | 13.06            | 1            | 11                 | 2.24            | uu   | 111        | 0     |           |                |       |          |           |              |       |
| E69                         | 2.50                               | 006        | В           | 2.50             | 1            |                    |                 |      |            |       |           |                |       |          | SSB       | p2.5         | p39   |
| E69                         | 8.10                               |            | С           | 8.12             | 2            | 10                 | 2.39            | cu   |            |       |           |                |       |          |           |              |       |
| E69                         | 8.80                               |            | С           | 8.82             | 2            | 9.1                | 2.28            | uu   | 168        | 0     |           |                |       |          |           |              |       |
| E69                         | 9.80                               |            | С           | 9.85             | 2            | 9.7                | 2.26            | uu   | 173        | 0     |           |                |       |          |           |              |       |
|                             |                                    |            |             |                  |              |                    |                 |      |            |       |           |                |       |          |           |              |       |
| Approved by:                |                                    |            | Leeds       | Laboratory       |              |                    |                 |      |            |       |           |                |       |          |           |              |       |
| Sushil Sharda               |                                    |            |             | ,                |              |                    | 1               |      | Print date | 2     | 8/11/2013 |                |       | SOI      | L eng     | Ineer        | אוויפ |
|                             |                                    | Revisio    | n No.       | 3.03             | l .          | Iss                | ue Date         |      |            | /2012 |           |                |       |          | the Bachy |              |       |

| Project Name<br>Project No. | Bay of Nigo<br>Ground Inv<br>TA7148 |            |             | velopment        |              | Pe                 | St<br>rmea     | reng<br>abilit |            |        | ary       |                |       |          |          |              |              |
|-----------------------------|-------------------------------------|------------|-------------|------------------|--------------|--------------------|----------------|----------------|------------|--------|-----------|----------------|-------|----------|----------|--------------|--------------|
| Engineer                    | Arch Hend                           | erson l    | LP.         |                  |              |                    |                |                |            |        |           |                |       |          |          |              |              |
| Employer                    | Aberdeen I                          | Harbou     | ır Boar     | d                |              |                    |                |                |            |        |           |                |       |          |          |              |              |
|                             |                                     |            |             |                  |              |                    |                |                | Triaxial   |        | Со        | nsol           | Perme | eability | ,        | Shearbo      | х            |
| Hole ID                     | Sample depth m                      | Sample no. | Sample type | Specimen depth m | Specimen no. | % Moisture Content | w/Bulk Density | Туре           | c<br>kPa   | Ø      | Туре      | m <sub>v</sub> | Туре  | K<br>m/s | Туре     | c<br>kPa     | Ø            |
| E71                         | 10.30                               | 0,         | С           | 10.56            | 2            | 9.3                | 2.32           | uu             | 242        | 0      |           |                |       |          | ·        |              |              |
| E71                         | 11.92                               |            | С           | 11.92            | 1            | 10                 | 2.40           | сим            | 19         | 33.0   |           |                |       |          |          |              |              |
| E71                         | 12.55                               |            | С           | 12.76            | 2            | 9.1                | 2.25           | uu             | 312        | 0      |           |                |       |          |          |              |              |
| E105                        | 2.00                                | 008        | В           | 2.00             | 1            |                    |                |                |            |        |           |                |       |          | SSB      | p8.1<br>r4.9 | p39.5<br>r34 |
| E108                        | 1.00                                | 005        | В           | 1.00             | 1            |                    |                |                |            |        |           |                |       |          | SSB      | p10<br>r1.0  | p41<br>r38   |
| E111                        | 1.50                                | 006        | В           | 1.50             | 1            |                    |                |                |            |        |           |                |       |          | SSB      | p0.28        | p42          |
| GS11                        | 4.70                                |            | С           | 4.80             | 1            | 8.4                | 2.32           | uu             | 306        | 0      |           |                |       |          |          |              |              |
| GS11                        | 7.27                                |            | С           | 7.29             | 1            | 9.8                | 2.34           | uu             | 232        | 0      |           |                |       |          |          |              |              |
| GS11                        | 13.70                               |            | С           | 13.72            | 1            | 8.7                | 2.34           | uu             | 478        | 0      |           |                |       |          |          |              |              |
|                             |                                     |            |             |                  |              |                    |                | End            |            |        |           |                |       |          |          |              |              |
| Approved by:                |                                     |            | Leeds       | Laboratory       |              |                    |                |                |            |        |           |                |       |          | 1        |              |              |
| Sushil Sharda               |                                     | Dovi-:     | n Ne        | 2.02             |              | I= -               | nio Dete       |                | Print date |        | 3/11/2013 |                |       | <b></b>  | L eng    | ineer        |              |
|                             |                                     | Revisio    | on No.      | 3.03             |              | Iss                | sue Date       |                | 23/11      | ./2012 |           |                |       | Part of  | ne Bachy | Soletanch    | e Group      |



## SUPPORTING FACTUAL DATA

## **SECTION B**

**Laboratory Testing** 

LABORATORY SOIL TEST DATA SHEETS

| David North              | D of Ni                            |            | .l          | D I              |              |       |   | _      |         |                       |
|--------------------------|------------------------------------|------------|-------------|------------------|--------------|-------|---|--------|---------|-----------------------|
| Project Name Project No. | Bay of Nig<br>Investigat<br>TA7148 |            | bour        | Developm         | ent G        | round | Moisture Cont   | tent   |         |                       |
| Engineer                 | Arch Hend                          | dersor     | ı LLP       |                  |              |       |   | -      |         |                       |
| Employer                 | Aberdeen                           | Harbo      | our Bo      | oard             |              |       | BS1377: Part 2: 1990  | ): 3.2 |         |                       |
| Hole ID                  | Sample depth m                     | Sample no. | Sample type | Specimen depth m | Specimen no. |       | Description   |        | Remarks | Moisture<br>% Content |
| A05                      | 19.64                              |            | С           | 19.64            | 01           |       | ly gravelly CLAY. Gravel is<br>coarse subangular.           |        |         | 8.6                   |
| A08                      | 29.10                              |            | С           | 29.10            | 01           |       | ly gravelly CLAY. Gravel is<br>coarse subangular.           |        |         | 8.5                   |
| A11                      | 25.28                              |            | С           | 25.28            | 01           |       | ly gravelly CLAY. Gravel is<br>coarse subangular.           |        |         | 7.3                   |
| C83                      | 9.05                               | 010        | С           | 9.05             | 02           |       | wn slightly sandy slightly<br>AY. Gravel is fine to medium  |        |         | 8.4                   |
| C87                      | 2.40                               | 004        | С           | 2.40             | 01           |       | ly gravelly CLAY. Gravel is<br>coarse subangular.           |        |         | 8.3                   |
| C88                      | 6.20                               | 007        | С           | 6.20             | 02           |       | wn slightly sandy gravelly<br>el is fine to coarse angular. |        |         | 29                    |
|                          |                                    |            |             |                  |              |       |   |        |         |                       |
| Approved by:             |                                    | <u> </u>   | l eed       | s Laborato       | rv           |       |   |        |         |                       |
| Sushil Sharda            |                                    |            |             |                  | . ,          |       | Drine Jaca 20 (cd. (2                                       | 013    |         | (ineering             |
|                          |                                    |            | Revisi      | on No.           | 2.03         |       | Print date 28/11/2  Issue Date 21/11/2012                   | .012   |         | chy Soletanche Group  |

| Project Nan                     | ne Bay of Nigg<br>Investigatio | Harbour Develo    | pment Ground      | Lie                   | quid And P                          |              | Hole<br>A0                |                     |
|---------------------------------|--------------------------------|-------------------|-------------------|-----------------------|-------------------------------------|--------------|---------------------------|---------------------|
| Project No.                     | TA7148                         |                   |                   |                       | Limit Tes                           | st           | Sample<br>5.98            |                     |
| Engineer                        | Arch Hende                     | rson LLP          |                   |                       |                                     |              | Sample I                  |                     |
| Employer                        | Aberdeen H                     | arbour Board      |                   | Test N                | Method: BS1377: P<br>Clause 4.3 and |              | Sample                    |                     |
| Description                     | Brown sandy                    | gravelly CLAY. Gr | avel is medium to | coarse suba           | angular.                            |              | Specime<br>5.98           |                     |
|                                 |                                |                   |                   |                       |                                     |              | Specimen                  | Number              |
|                                 |                                |                   |                   |                       |                                     |              | 2                         | <u>'</u>            |
| 27                              |                                |                   |                   |                       |                                     |              |                           |                     |
| 25                              |                                |                   |                   |                       |                                     |              |                           |                     |
| _ 23                            |                                |                   |                   |                       |                                     |              |                           |                     |
| шш                              |                                |                   |                   | •                     |                                     |              |                           |                     |
| Cone Penetration mm 17          |                                |                   |                   |                       |                                     |              |                           |                     |
| 19                              |                                |                   |                   |                       |                                     |              |                           |                     |
| е<br>В 17                       |                                |                   |                   |                       |                                     |              |                           |                     |
| ි<br>15                         |                                |                   | ·                 |                       |                                     |              |                           |                     |
|                                 |                                |                   |                   |                       |                                     |              |                           |                     |
| 13                              | 20                             | 24                | 28                |                       | 32                                  | 36           | <br>6                     | <br>40              |
| Natural mois                    | ture content:                  |                   | 11%               | oisture Co<br>Percent | ntent %<br>age retained on 4        | i25μm sieve: |                           | 34%                 |
| Liquid limit:<br>Plastic limit: |                                |                   | 29%<br>15%        |                       | tion of sample: W                   | let sieve    |                           |                     |
| Plasticity ind                  |                                | ina /25           | 14%<br>17%        |                       |                                     |              |                           |                     |
| Liquidity inde                  | ex:                            | ing 425µm         | 0.11              |                       |                                     |              |                           |                     |
|                                 |                                |                   |                   |                       |                                     |              |                           |                     |
| 100                             | 0                              | CL                |                   | CI                    | СН                                  |              | CV I                      | CE                  |
|                                 |                                |                   |                   |                       |                                     |              |                           |                     |
| 80                              |                                |                   |                   |                       |                                     |              |                           |                     |
| (%)×6                           |                                |                   |                   |                       |                                     |              |                           |                     |
| ludex                           |                                |                   |                   |                       |                                     |              |                           |                     |
| Plasticity Index(%)             |                                |                   |                   |                       |                                     |              |                           |                     |
| Plast                           |                                |                   |                   |                       |                                     |              |                           |                     |
| 20                              |                                |                   |                   | $\rightarrow$         |                                     |              |                           |                     |
|                                 |                                |                   |                   | ` <u> </u>            |                                     | _            |                           |                     |
| (                               | 0 10                           | ML<br>20          | 30 40             | MI 50                 | MH<br>60                            | Ť            | <b>V</b> V <b>↓</b> 80 90 | ME 100              |
|                                 | 0 10                           | 20                | 30 40             | Liquid Li             |                                     | 10           | 50 50                     | 100                 |
| Approved by                     |                                | Leeds Labor       | atory             |                       |                                     |              |                           |                     |
| Sushil Shard                    |                                | LCCU3 LabOl       |                   |                       | Drive I to Co. 11                   | 1 (2012      | SOIL 65                   | GINEERING           |
| - ze Silai u                    |                                | Revision No.      | 2.07              | Issue Dat             |                                     | 1/2013       |                           | chy Soletanche Grou |

| Project Name Project No.  | Bay of Nigg Ha<br>Investigation<br>TA7148 | rbour Develop   | oment Ground                             | Liqu         | uid And Pl<br>Limit Tes            |        | Hole ID<br>A05<br>Sample Depth                       |
|---|---|-----------------|--|--------------|------------------------------------|--------|--|
| Engineer  | Arch Henderso                             | n LLP           |  |              |                                    |        | 22.10m<br>Sample Number                              |
| Employer  | Aberdeen Harb                             | our Board       |  | Test Met     | :hod: BS1377: Pa<br>Clause 4.3 and |        | Sample Type<br>C                                     |
| Description   | Brown sandy gra                           | velly CLAY. Gra | vel is medium to c                       | oarse subang |                                    | -      | Specimen Depth 22.10m Specimen Number 1              |
| 27 — 25 — 23 — 21 — 21 — 20 — 25 — 23 — 21 — 20 — 20 — 20 — 25 — 25 — 25 — 26 — 26 — 26 — 26 — 26 |   | 22              | 24<br>Mo                                 | isture Conte | 26<br>ent %                        | 28     | 30   |
| Natural moisture Liquid limit: Plastic limit: Plasticity index: Moisture conter Liquidity index:  |   | 425µm           | 7.4%<br>22%<br>14%<br>8%<br>12%<br>-0.23 | _            | e retained on 4<br>n of sample: W  |        | 39%  |
| 100   |   | CL              |  | CI           | СН                                 | CV     | / CE   |
| 80 -  |   |                 |  |              |                                    |        |  |
| Index(%)  |   |                 |  |              |                                    |        |  |
| Plasticity Index(%)   |   |                 |  |              |                                    |        |  |
| 20 -  |   |                 |  |              |                                    |        |  |
| 0 -   |   | ML<br>20        | 30 40                                    | MI 50        | MH<br>60                           | 70 8   | 1  |
|   |   |                 |  | Liquid Limi  | t (%)                              |        |  |
| Approved by:<br>Sushil Sharda   |   | Leeds Labora    | 2.07                                     | Issue Date   | Print date 28/1: 19/11/2012        | 1/2013 | SOIL ENGINEERING  Part of the Bachy Soletanche Group |

| Project Name                    | Bay of Nigg F<br>Investigation |                  | opment Grou     | ınd         | Liqu        | uid And P                         |           |    | Hole ID<br>A08          |
|---------------------------------|--------------------------------|------------------|-----------------|-------------|-------------|-----------------------------------|-----------|----|-------------------------|
| Project No.                     | TA7148                         |                  |                 |             |             | Limit Te                          | st        |    | Sample Depth            |
| Engineer                        | Arch Henders                   | son LLP          |                 |             |             |                                   |           |    | 7.73m<br>Sample Number  |
| Employer                        | Aberdeen Hai                   | rbour Board      |                 |             | Test Me     | thod: BS1377: I<br>Clause 4.3 and |           |    | Sample Type<br>C        |
| Description                     | Brown sandy g                  | ravelly CLAY. Gr | ravel is mediui | m to co     | arse subanç | gular.                            |           |    | Specimen Depth<br>7.73m |
|                                 |                                |                  |                 |             |             |                                   |           | S  | Specimen Number         |
|                                 |                                |                  |                 |             |             |                                   |           |    | 2                       |
| 27 -                            |                                |                  |                 |             |             |                                   |           |    |                         |
| 25 -                            |                                |                  |                 |             |             |                                   |           |    |                         |
| _ 23 =                          |                                |                  |                 |             |             |                                   |           |    |                         |
| 23 =<br>E<br>E                  |                                |                  |                 |             |             |                                   |           |    |                         |
| 년 21 -<br>일                     |                                |                  |                 |             |             |                                   |           |    |                         |
| - 19 etra                       |                                |                  |                 |             |             |                                   |           |    |                         |
| Cone Penetration mm 12 - 15 -   |                                |                  |                 |             |             |                                   |           |    |                         |
| Б<br>О<br>15 -                  |                                |                  |                 |             |             |                                   |           |    |                         |
|                                 |                                |                  |                 |             |             |                                   |           |    |                         |
| 13 -<br>2                       | n                              | 22               |                 | 24          |             | 26                                |           | 28 | 30                      |
| _                               | •                              |                  |                 |             |             |                                   |           | 20 |                         |
|                                 |                                |                  |                 | IVIOIS      | sture Cont  | ent %                             |           |    |                         |
| Natural moistu                  | re content:                    |                  |                 | 3.7%<br>27% |             | e retained on                     |           | ): | 35%                     |
| Liquid limit:<br>Plastic limit: |                                |                  |                 | 27%<br>15%  | Remarks:    | n of sample: V                    | vet sieve |    |                         |
| Plasticity index                | :<br>nt of soil passin         | o 425um          |                 | 12%<br>13%  |             |                                   |           |    |                         |
| Liquidity index:                |                                | g 423μπ          |                 | 0.13        |             |                                   |           |    |                         |
|                                 |                                |                  |                 |             |             |                                   |           |    |                         |
| 100                             |                                | CL               |                 |             | CI          | СН                                |           | CV | CE                      |
|                                 |                                | CL               |                 |             | j.          |                                   |           |    |                         |
| 80                              |                                |                  |                 |             |             |                                   |           |    |                         |
| (%)                             |                                |                  |                 |             |             |                                   |           |    |                         |
| ))<br>60                        |                                |                  |                 |             |             |                                   |           |    |                         |
| Plasticity Index(%)             |                                |                  |                 |             |             |                                   |           |    |                         |
| olasti<br>O                     |                                |                  |                 |             |             |                                   |           |    |                         |
| 20                              |                                |                  |                 |             |             |                                   |           |    |                         |
|                                 |                                |                  |                 | _           |             |                                   |           |    |                         |
| 0                               |                                | ML               |                 | 1           | MI          | МН                                |           | MV | ME                      |
|                                 | 0 10                           | 20               | 30              | 40          | 50          | 60                                | 70        | 80 | 90 100                  |
|                                 |                                |                  |                 | L           | iquid Limi  | t (%)                             |           |    |                         |
|                                 |                                |                  |                 |             |             |                                   |           |    |                         |
| Approved hv                     |                                | Leeds Labor      | ratorv          |             |             |                                   |           | 1  |                         |
| Approved by:<br>Sushil Sharda   |                                | Leeds Labor      | ratory          |             |             | Print date 28/                    | 11/2013   |    | SOIL ENGINEERIN         |

| Project I  | Name                                | Bay of Nigg H<br>Investigation | arbour Devel    | opment Gro     | und         | Liqu                   | uid And P                         |           |          | Hole ID<br>A08          |    |
|--|-------------------------------------|--------------------------------|-----------------|----------------|-------------|------------------------|-----------------------------------|-----------|----------|-------------------------|----|
| Project I  | No.                                 | TA7148                         |                 |                |             |                        | Limit Tes                         | st        | 5        | Sample Depth            |    |
| Enginee  | r                                   | Arch Henders                   | on LLP          |                |             |                        |                                   |           | Sa       | 17.60m<br>ample Number  |    |
| Employe  | er                                  | Aberdeen Har                   | bour Board      |                |             | Test Me                | thod: BS1377: F<br>Clause 4.3 and |           |          | Sample Type<br>C        |    |
| Descript   | ion                                 | Brown sandy g                  | ravelly CLAY. G | ravel is mediu | ım to co    | arse subanç            | gular.                            |           | Sp       | pecimen Depth<br>17.60m |    |
|  |                                     |                                |                 |                |             |                        |                                   |           | Spe      | ecimen Number<br>2      | r  |
|  |                                     |                                |                 |                |             |                        |                                   |           |          |                         |    |
|  | 27                                  |                                |                 |                |             |                        |                                   |           |          |                         |    |
|  | 25                                  |                                |                 |                |             |                        |                                   |           |          |                         |    |
| ш  | 23                                  |                                |                 |                |             |                        |                                   |           |          | ,<br>                   |    |
| noi m  | 21                                  |                                |                 |                |             |                        |                                   |           |          |                         |    |
| Cone Penetration mm  | 19                                  |                                |                 |                |             |                        |                                   |           |          |                         |    |
| ne Per   | 17                                  |                                |                 |                |             |                        |                                   |           |          |                         |    |
| Co   | 15                                  |                                |                 |                |             |                        |                                   |           |          |                         |    |
|  | 13                                  |                                |                 |                |             |                        |                                   |           |          |                         |    |
|  | 20                                  |                                | 22              |                | 24          |                        | 26                                |           | 28       | 30                      |    |
|  |                                     |                                |                 |                | Mois        | sture Cont             | ent %                             |           |          |                         |    |
|  |                                     | e content:                     |                 |                | 8.6%        |                        | e retained on                     |           |          | 34%                     | ó  |
| Liquid lim<br>Plastic lir  |                                     |                                |                 |                | 26%<br>13%  | Preparatio<br>Remarks: | on of sample: V                   | Vet sieve |          |                         |    |
| Plasticity   |                                     |                                | - /25           |                | 13%         |                        |                                   |           |          |                         |    |
| Liquidity  |                                     | t of soil passin               | ј 425μm         |                | 13%<br>0.01 |                        |                                   |           |          |                         |    |
|  |                                     |                                |                 |                |             |                        |                                   |           |          |                         |    |
|  | 100                                 |                                |                 |                |             |                        |                                   |           |          |                         |    |
|  | 100                                 |                                | CL              |                |             | CI                     | СН                                |           | CV       | CE                      |    |
|  |                                     |                                | CL              |                |             | CI                     | СН                                |           | CV       | CE                      |    |
| (  | 80 -                                |                                | CL              |                | - (         | CI                     | СН                                |           | CV       | CE                      |    |
| 1ex(%)   |                                     |                                | CL              |                |             | CI                     | СН                                |           | CV       | CE                      |    |
| ity Index(%)   | 80 -                                |                                | CL              |                |             | CI                     | СН                                |           | CV       | CE                      |    |
| lasticity Index(%)   | 80 -                                |                                | CL              |                |             | CI                     | СН                                |           | CV       | CE                      |    |
| Plasticity Index(%)  | 80 -                                |                                | CL              |                |             | CI                     | СН                                |           | CV       | CE                      |    |
| Plasticity Index(%)  | 80 -<br>60 -<br>40 -<br>20 -        |                                |                 |                |             |                        |                                   |           |          |                         |    |
| Plasticity Index(%)  | 80 -<br>60 -<br>40 -<br>20 -        | ) 10                           | ML              |                |             | MI                     | MH                                | 70        | MV       | ME                      | 10 |
| Plasticity Index(%)  | 80 -<br>60 -<br>40 -<br>20 -        | ) 10                           |                 | 30             | 40          |                        | MH<br>60                          | 70        |          |                         | 0  |
|  | 80 -<br>60 -<br>40 -<br>20 -        | ) 10                           | ML 20           | 30             | 40          | MI 50                  | MH<br>60                          | 70        | MV       | ME                      |    |
| Approved Sushil Ships Sh | 80 -<br>60 -<br>40 -<br>20 -<br>0 - | ) 10                           | ML              | 30             | 40          | MI 50                  | MH<br>60<br>st (%)                | 70        | MV<br>80 | ME                      |    |

|  | Investiga          |                    | velopment Gro   | und                      | Liq                   | uid And P<br>Limit Tes |              | Hole ID<br>A11                                  |
|--|--------------------|--------------------|-----------------|--------------------------|-----------------------|------------------------|--------------|---|
| Project No.<br>Engineer  | TA7148<br>Arch Hen | derson LLP         |                 |                          |                       | Lilling 163            | _            | Sample Depth<br>8.58m<br>Sample Number          |
|  |                    |                    | <b>.</b>        |                          | Tost Ma               | ethod: BS1377: P       | art 2: 1000: | ·   |
| Employer   |                    | n Harbour Boar     |                 |                          |                       | Clause 4.3 and         |              | Sample Type<br>C                                |
| Description  | Brown gra          | velly slightly sar | dy CLAY. Gravel | is mediu                 | im to coars           | e subangular.          |              | Specimen Depth<br>8.58m<br>Specimen Number<br>1 |
| 27   |                    |                    |                 |                          |                       |                        |              |   |
| 25   |                    |                    |                 |                          |                       |                        |              |   |
| 23<br>E  | -                  |                    |                 |                          |                       |                        |              |   |
| <u> </u>   | -                  |                    |                 |                          |                       |                        |              |   |
| Cone Penetration mm 17   |                    |                    |                 |                          |                       |                        |              |   |
| อ 17   |                    |                    |                 |                          | <b>"</b>              |                        |              |   |
| 5<br>75  |                    |                    |                 | •                        |                       |                        |              |   |
|  |                    |                    |                 |                          |                       |                        |              |   |
| 13   | 20                 | 24                 |                 | 28                       |                       | 32                     | 36           | 40  |
|  |                    |                    |                 | Moi                      | sture Con             | tent %                 |              |   |
| Natural moist  | ture content:      |                    |                 | 7.3%                     | Percentag             | ge retained on 4       | 25µm sieve:  | 33%   |
| Liquid limit:<br>Plastic limit:<br>Plasticity inde<br>Moisture con | tent of soil pa    | assing 425µm       |                 | 31%<br>16%<br>15%<br>11% | Preparati<br>Remarks: | on of sample: W        | let sieve    |   |
| Liquidity inde   | ex:                |                    |                 | -0.33                    |                       |                        |              |   |
| 100  | )                  | CL                 |                 |                          | CI                    | СН                     | CV           | CE  |
| 80   | )                  |                    |                 |                          |                       |                        |              |   |
| 96 (%)   | )                  |                    |                 |                          |                       |                        |              |   |
| Plasticity Index(%)  |                    |                    |                 |                          |                       |                        |              |   |
| 20   |                    |                    | <b>A</b>        |                          | +                     |                        |              |   |
| C  |                    | ML                 |                 | i                        | МІ                    | МН                     | М            | •   |
|  | 0                  | 10 20              | 30              | 40<br>I                  | 50<br>Liquid Lim      | 60<br>it (%)           | 70 8         | 0 90 100  |
| Approved by  |                    | Landa La           | boratory        |                          |                       |                        |              |   |
| Approved by<br>Sushil Sharda                                       |                    | Leeus La           | iboratory       |                          |                       | Print date 28/1        | 1/2013       | SOIL ENGINEERING                                |
|  |                    | Revision N         | lo. 2.07        |                          | Issue Date            | 19/11/2012             | 11/2/13      | Part of the Bachy Soletanche Group              |

| Project Name                       | e Bay of Nigg |                    | lopment Ground        | I        |               | d And P                      |                      |    | Hole ID<br>A29                     |
|------------------------------------|---------------|--------------------|-----------------------|----------|---------------|------------------------------|----------------------|----|------------------------------------|
| Project No.                        | TA7148        | J.1.               |                       |          | L             | imit Te                      | st                   |    | Sample Depth                       |
| Engineer                           | Arch Hend     | erson IIP          |                       |          |               |                              |                      |    | 10.80m<br>Sample Number            |
|                                    |               |                    |                       |          |               |                              |                      |    | 011                                |
| Employer                           |               | Harbour Board      |                       |          | CI            | d: BS1377: F<br>ause 4.3 and | Part 2: 1990:<br>I 5 |    | Sample Type<br>C                   |
| Description                        | Brown sand    | y gravelly CLAY. G | iravel is fine to coa | arse a   | ngular.       |                              |                      |    | Specimen Depth<br>10.80m           |
|                                    |               |                    |                       |          |               |                              |                      | S  | pecimen Number                     |
|                                    |               |                    |                       |          |               |                              |                      |    | 3                                  |
| 27                                 |               |                    |                       |          |               |                              |                      |    |                                    |
| 25                                 |               |                    |                       |          |               |                              |                      |    |                                    |
| 25                                 |               |                    |                       |          |               | 1                            |                      |    |                                    |
| _ 23 -                             |               |                    |                       |          |               |                              |                      |    |                                    |
| E 21 -                             |               |                    |                       |          |               |                              |                      |    |                                    |
| Cone Penetration mm 15             |               |                    |                       |          |               |                              |                      |    |                                    |
| 19 letr                            |               |                    |                       |          |               |                              |                      |    |                                    |
| න 17 -                             |               |                    |                       |          |               |                              |                      |    |                                    |
|                                    |               |                    |                       | <b>√</b> |               |                              |                      |    |                                    |
| 15                                 |               |                    |                       |          |               |                              |                      |    |                                    |
| 13                                 |               |                    |                       |          |               |                              |                      |    |                                    |
| 2                                  | 20            | 24                 | 28                    |          |               | 32                           | 3                    | 6  | 40                                 |
|                                    |               |                    | ľ                     | Moist    | ure Content   | t %                          |                      |    |                                    |
| Natural moistu                     | ure content:  |                    | 8.19                  | % I      | Percentage r  | etained on 4                 | 425µm sieve:         |    | 41%                                |
| Liquid limit:                      |               |                    | 319                   | % I      | Preparation o |                              |                      |    |                                    |
| Plastic limit:<br>Plasticity index | v·            |                    | 179<br>149            |          | Remarks:      |                              |                      |    |                                    |
| Moisture cont                      |               | sing 425µm         | 149                   |          |               |                              |                      |    |                                    |
| Liquidity index                    | :             |                    | -0.2                  | 23       |               |                              |                      |    |                                    |
|                                    |               |                    |                       |          |               |                              |                      |    |                                    |
| 100                                |               | CL                 |                       | С        |               | СН                           |                      | CV | CE                                 |
|                                    |               |                    |                       |          |               |                              |                      |    |                                    |
| 80                                 |               |                    |                       |          |               |                              |                      |    |                                    |
| (%)                                |               |                    |                       |          |               |                              |                      |    |                                    |
| 60 (%                              |               |                    |                       |          |               |                              |                      |    |                                    |
| Plasticity Index(%)                |               |                    |                       |          |               |                              |                      |    |                                    |
| 40 sticit                          |               |                    |                       |          |               |                              |                      |    |                                    |
| Plas                               |               |                    |                       |          |               |                              |                      |    |                                    |
| 20                                 |               |                    |                       |          | $\mathcal{A}$ | -                            |                      |    |                                    |
|                                    |               |                    |                       |          |               |                              |                      |    |                                    |
| 0                                  |               | ML                 | _                     | N        | •             | МН                           | T                    | MV | ME                                 |
|                                    | 0 10          | ) 20               | 30 4                  | 0        | 50            | 60                           | 70                   | 80 | 90 100                             |
|                                    |               |                    |                       | Li       | quid Limit (  | %)                           |                      |    |                                    |
|                                    |               |                    |                       |          |               |                              |                      |    |                                    |
| Approved by:                       |               | Leeds Labo         | oratory               |          |               |                              |                      |    |                                    |
| Sushil Sharda                      |               | _                  |                       |          |               |                              | 11/2013              |    | soil engineering                   |
|                                    |               | Revision No.       | 2.07                  | I        | ssue Date     | 19/11/2012                   |                      | F  | Part of the Bachy Soletanche Group |

| Project                             | Name                                      | Bay of Nigg Hark<br>Investigation   | our Develop     | ment Ground                             | Liqu               | iid And Pl                         |        | Hole ID<br>A31                                   |  |  |
|-------------------------------------|---|-------------------------------------|-----------------|---|--------------------|------------------------------------|--------|--|--|--|
| Project                             | No.                                       | TA7148                              |                 |   |                    | Limit Tes                          | t      | Sample Depth<br>15.76m                           |  |  |
| Engine                              | er  | Arch Henderson                      | LLP             |   |                    |                                    |        | Sample Number                                    |  |  |
| Employ                              | yer                                       | Aberdeen Harbo                      | ur Board        |   |                    | hod: BS1377: Pa<br>Clause 4.3 and  |        | 008<br>Sample Type<br>C                          |  |  |
| Descrip                             | otion                                     | Brown sandy grave                   | elly CLAY. Grav | rel is medium to co                     |                    |                                    |        | Specimen Depth<br>15.76m<br>Specimen Number<br>2 |  |  |
|                                     | <sup>27</sup> T                           |                                     |                 |   |                    |                                    |        |  |  |  |
|                                     | 25  |                                     |                 |   |                    |                                    |        |  |  |  |
| _                                   | 23  |                                     |                 |   |                    |                                    |        |  |  |  |
| n mr                                | 21  |                                     |                 |   |                    |                                    |        |  |  |  |
| tratio                              | 19 -                                      |                                     |                 |   |                    |                                    |        |  |  |  |
| Cone Penetration mm                 |   |                                     |                 |   |                    |                                    |        |  |  |  |
| Cone                                | 17 +                                      |                                     |                 |   |                    |                                    |        |  |  |  |
|                                     | 15 +                                      |                                     |                 |   |                    |                                    |        |  |  |  |
|                                     | 13 <del> </del>                           |                                     | 24              | 28                                      |                    | 32                                 | 36     | 40   |  |  |
|                                     |   |                                     |                 | Mo                                      | sture Conte        | ent %                              |        |  |  |  |
| Liquid li<br>Plastic l<br>Plasticit | imit:<br>limit:<br>ty index:<br>re conter | e content:<br>nt of soil passing 42 | 25µm            | 11%<br>31%<br>16%<br>15%<br>18%<br>0.12 |                    | e retained on 4.<br>n of sample: W |        | 36%  |  |  |
|                                     |   |                                     |                 |   |                    |                                    |        |  |  |  |
|                                     | 100 -                                     | CL                                  | -               |   | CI                 | СН                                 | СУ     | CE   |  |  |
|                                     | 80 -                                      |                                     |                 |   |                    |                                    |        |  |  |  |
| Plasticity Index(%)                 | 60 -                                      |                                     |                 |   |                    |                                    |        |  |  |  |
| Plasticity                          | 40 -                                      |                                     |                 |   |                    |                                    |        |  |  |  |
|                                     | 20 -                                      |                                     |                 | <b>A</b>                                |                    |                                    |        |  |  |  |
|                                     | 0 -                                       | M 10                                | 20              | 30 40                                   | MI 50              | MH<br>60                           | 70 80  | Ī  |  |  |
|                                     | `   | , 10                                | 20              |   | 50<br>Liquid Limit |                                    | 70 80  | , 50 100   |  |  |
| Approve                             | ed by:                                    | L                                   | eeds Laborat    | cory                                    |                    |                                    |        |  |  |  |
| Sushil S                            | Sharda                                    |                                     |                 |   |                    |                                    | ./2013 | SOIL ENGINEERING                                 |  |  |
|                                     |   | R                                   | evision No.     | 2.07                                    | Issue Date         | 19/11/2012                         |        | Part of the Bachy Soletanche Group               |  |  |

| Project Name<br>Project No. | Bay of Nigg Ha<br>Investigation<br>TA7148 | arbour Develop    | ment Ground              |                         | d And Pla                       |            | Hole ID<br>A34<br>Sample Depth                      |
|-----------------------------|---|-------------------|--------------------------|-------------------------|---------------------------------|------------|---|
| Engineer                    | Arch Henderso                             | on LLP            |                          |                         |                                 |            | 6.25m<br>Sample Number                              |
| Employer                    | Aberdeen Harl                             | oour Board        |                          |                         | d: BS1377: Pa<br>ause 4.3 and ! |            | Sample Type<br>C                                    |
| Description                 | Brown sandy gra                           | avelly CLAY. Grav | vel is medium to co      |                         |                                 |            | Specimen Depth<br>6.25m<br>Specimen Number<br>2     |
| 27                          |   |                   |                          |                         |                                 |            |   |
| 25 -                        |   |                   |                          |                         |                                 |            |   |
| 23 +<br>E<br>E<br>E 21 -    |   |                   |                          |                         |                                 |            |   |
| Cone Penetration mm 12 -    |   |                   |                          |                         |                                 |            |   |
| e 17 -                      |   |                   |                          | •                       |                                 |            |   |
| ි<br>15 -                   |   |                   | •                        |                         |                                 |            |   |
| 13 +                        | )   | 24                | 28                       |                         | 32                              | 36         | 40  |
|                             | •   | 21                |                          | sture Content           |                                 | 30         | .0  |
| Natural moistu              | e content:                                |                   | 12%                      | Percentage r            | etained on 42                   | 5µm sieve: | 36%   |
|                             | nt of soil passing                        | յ 425μm           | 29%<br>16%<br>13%<br>18% | Preparation of Remarks: | of sample: We                   | t sieve    |   |
| Liquidity index:            |   |                   | 0.17                     |                         |                                 |            |   |
| 100                         |   | CL                |                          | CI                      | СН                              | CV         | CE  |
| 80                          |   |                   |                          |                         |                                 |            |   |
| 00 (%)                      |   |                   |                          |                         |                                 |            |   |
| Plasticity Index(%)         |   |                   |                          |                         |                                 |            |   |
| 20                          |   |                   | <b>A</b>                 |                         |                                 |            |   |
| 0                           | 0 10                                      | ML 20             | 30 40                    | MI 50                   | MH<br>60                        | 70 80      | <u> </u>  |
|                             | . 10                                      | 20                |                          | 50<br>Liquid Limit (9   |                                 | ,          | , 30 100  |
| Approved by:                |   | Leeds Labora      | tory                     |                         |                                 |            |   |
| Sushil Sharda               |   | Revision No.      | 2.07                     | Priu<br>Issue Date      | nt date 28/11/<br>19/11/2012    | 2013       | SOIL ENGINEERING Part of the Bachy Soletanche Group |

|                        |                 | Bay of Nigg H<br>Investigation | arbour De  | velopment G      | iround      |                         | id And Pl<br>Limit Tes            |          | Hole ID<br>A54                                |        |
|------------------------|-----------------|--------------------------------|------------|------------------|-------------|-------------------------|-----------------------------------|----------|---|--------|
| Project                | No.             | TA7148                         |            |                  |             |                         | riiiii ies                        | •        | Sample De<br>8.00m                            | pth    |
| Engine                 | er              | Arch Henders                   | on LLP     |                  |             |                         |                                   |          | Sample Nur<br>015                             | nber   |
| Employ                 | yer             | Aberdeen Har                   | bour Boar  | d                |             |                         | hod: BS1377: Pa<br>Clause 4.3 and |          | Sample Ty<br>C                                |        |
| Descrip                | otion           | Brown gravelly                 | sandy CLA\ | . Gravel is fine | e to coarse | subangular t            | to subrounded                     |          | Specimen D<br>8.24m                           | epth   |
|                        |                 |                                |            |                  |             |                         |                                   |          | Specimen Nu<br>2                              | ımber  |
|                        | <sup>27</sup> T |                                |            |                  |             |                         |                                   |          |   | $\neg$ |
|                        | 25              |                                |            |                  |             |                         |                                   |          |   |        |
| ٤                      | 23              |                                |            |                  |             |                         |                                   |          | <u>,                                     </u> |        |
| on mr                  | 21              |                                |            |                  |             |                         |                                   |          |   |        |
| netrati                | 19              |                                |            |                  |             |                         |                                   |          |   |        |
| Cone Penetration mm    | 17              |                                |            |                  |             |                         |                                   |          |   |        |
| ŭ                      | 15              |                                | •          |                  |             |                         |                                   |          |   |        |
|                        | 13 -            |                                | 32         |                  | 34          |                         | 36                                | 38       |   | 40     |
|                        | 30              |                                | 52         |                  |             |                         |                                   | 38       |   | 40     |
|                        |                 |                                |            |                  | Mois        | ture Conte              | nt %                              |          |   |        |
|                        |                 | e content:                     |            |                  | 11%         |                         | retained on 4                     |          |   | 32%    |
| Liquid li<br>Plastic l |                 |                                |            |                  | 36%<br>19%  | Preparation<br>Remarks: | n of sample: W                    | et sieve |   |        |
|                        | ty index:       |                                |            |                  | 17%         |                         |                                   |          |   |        |
|                        |                 | nt of soil passing             | g 425µm    |                  | 17%         |                         |                                   |          |   |        |
| Liquidity              | y index:        |                                |            |                  | -0.14       |                         |                                   |          |   |        |
|                        | 100 -           |                                | CL         |                  |             |                         | СН                                | C∜       | CE  |        |
|                        | 80 -            |                                | CL         |                  |             | -1                      | СП                                | CV       | CE  |        |
| (9)                    | 00 -            |                                |            |                  |             |                         |                                   |          |   |        |
| hdex(9                 | 60 -            |                                |            |                  |             |                         |                                   |          |   |        |
| Plasticity Index(%)    | 40 -            |                                |            |                  |             |                         |                                   |          |   |        |
|                        | 20 -            |                                |            |                  |             | 1                       |                                   |          |   | -      |
|                        | 0 -             |                                | ML         |                  | •           | ЛІ                      | МН                                | M        | 1   |        |
|                        | (               | ) 10                           | 20         | 30               | 40<br>L     | 50<br>iquid Limit       | 60                                | 70 80    | 90  | 100    |
|                        |                 |                                | 10-2-1     | la quate         |             |                         |                                   |          |   |        |
| Approve<br>Stuart k    | -               |                                | Leeds La   | boratory         |             |                         |                                   |          |   |        |
| Juan C                 | WI IV           |                                | Revision N | lo. 2.07         |             | Issue Date              | Print date 28/11<br>19/11/2012    | 1/2013   | SOIL ENGIR                                    |        |
|                        |                 |                                |            |                  |             |                         |                                   |          |   | '      |

| 1                                      | Name   | Bay of Nigg H<br>Investigation | arbour Devel   | opment Grour | nd            |             | uid And P                        |                  | Hole ID<br>A57 |                        |          |
|--|--|--------------------------------|--|--------------|---------------|-------------|----------------------------------|------------------|----------------|------------------------|----------|
| Project                                | No.  | TA7148                         |  |              |               |             | Limit Te                         | st               |                | Sample Depth           |          |
| Enginee                                | or   | Arch Henders                   | on II P  |              |               |             |                                  |                  | 5              | 7.00m<br>Sample Number |          |
|  |  |                                |  |              |               |             |                                  |                  | 019            |                        |          |
| Employe                                | er   | Aberdeen Har                   | bour Board   |              |               |             | hod: BS1377: F<br>Clause 4.3 and | Sample Type<br>D |                |                        |          |
| Descript                               | tion   | Brown gravelly                 | y slightly sandy CLAY. Gravel is fine to coarse angular. |              |               |             |                                  |                  | S              | Specimen Depth         |          |
|  |  |                                |  |              |               |             |                                  |                  | Sp             | 7.00m<br>becimen Numbe | r        |
|  |  |                                |  |              |               |             |                                  |                  |                | 1                      |          |
|  | 27 -   |                                |  |              |               |             |                                  |                  |                |                        |          |
|  |  |                                |  |              |               |             |                                  |                  |                |                        |          |
|  | 25   |                                |  |              |               |             |                                  | <u> </u>         |                |                        |          |
| _                                      | 23   |                                |  |              |               |             |                                  |                  |                |                        |          |
| E                                      | 21   |                                |  |              |               |             |                                  |                  |                |                        |          |
| ation                                  | 21   |                                |  |              |               |             |                                  |                  |                |                        |          |
| Cone Penetration mm                    | 19   |                                |  |              |               |             |                                  |                  |                |                        |          |
| le Pe                                  | 17   |                                |  |              |               |             |                                  |                  |                |                        |          |
| Con                                    |  |                                |  |              | 4             |             |                                  |                  |                |                        |          |
|  | 15   |                                |  |              |               |             |                                  |                  |                |                        |          |
|  | 13   |                                |  |              |               |             |                                  |                  |                |                        |          |
|  | 20   |                                | 24   | 2            | 32            | :           | 36                               | 40               |                |                        |          |
|  |  |                                |  |              | Moi           | sture Conte | ent %                            |                  |                |                        |          |
| Natural r                              | moisture   | e content:                     |  | 1            | 0%            | Percentage  | e retained on                    | 425µm sieve:     |                | 609                    | <b>%</b> |
| Liquid lin                             | mit:   |                                |  | 3:           | 1%            | Preparatio  | n of sample: V                   |                  |                |                        |          |
| Plastic lir                            |  |                                |  |              | 7%            | Remarks:    |                                  |                  |                |                        |          |
| Diacticity                             |  |                                |  | 1.           | <b>/.</b> 0/_ |             |                                  |                  |                |                        |          |
| Plasticity<br>Moisture                 |  | nt of soil passing             | g 425µm  |              | 4%<br>6%      |             |                                  |                  |                |                        |          |
|  | e conter   | nt of soil passing             | g 425µm  | 2            |               |             |                                  |                  |                |                        |          |
| Moisture                               | e conter   | nt of soil passino             | g 425µm  | 2            | 6%            |             |                                  |                  |                |                        |          |
| Moisture                               | e conter   | nt of soil passing             |  | 2            | 6%<br>.68     |             | СН                               |                  | CV             | <b>■</b> CE            |          |
| Moisture                               | e conter<br>index:   | nt of soil passing             | g 425μm<br>CL  | 2            | 6%<br>.68     | CI          | СН                               |                  | CV             | CE                     |          |
| Moisture                               | e conter<br>index:   | nt of soil passing             |  | 2            | 6%<br>.68     | CI          | СН                               |                  | CV             | CE                     |          |
| Moisture<br>Liquidity                  | e conter<br>index:   | nt of soil passing             |  | 2            | 6%<br>.68     | CI          | СН                               |                  | CV             | CE                     |          |
| Moisture<br>Liquidity                  | e conter<br>index:   | nt of soil passing             |  | 2            | 6%<br>.68     | CI          | СН                               |                  | CV             | CE                     |          |
| Moisture<br>Liquidity                  | e conter<br>vindex:<br>100 -<br>80 -   | nt of soil passing             |  | 2            | 6%<br>.68     | CI          | СН                               |                  | CV             | CE                     |          |
| Moisture<br>Liquidity                  | e conter<br>vindex:<br>100 -<br>80 -   | nt of soil passing             |  | 2            | 6%<br>.68     | CI          | СН                               |                  | CV             | CE                     |          |
| Moisture                               | e conter<br>vindex:<br>100 -<br>80 -<br>60 -                                 | nt of soil passing             |  | 2            | 6%<br>.68     | CI          | СН                               |                  | CV             | CE                     |          |
| Moisture<br>Liquidity                  | e conter<br>vindex:<br>100 -<br>80 -<br>60 -                                 | nt of soil passing             |  | 2            | 6%<br>.68     | CI          | СН                               |                  | CV             | CE                     |          |
| Moisture<br>Liquidity                  | e conter<br>100 -<br>80 -<br>60 -<br>40 -                                    | nt of soil passing             | CL   | 2            | 6%            |             |                                  |                  |                |                        |          |
| Moisture<br>Liquidity                  | e conter r index:  100 - 80 - 60 - 40 - 20 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - |                                | CL   | 200          | 6%            | MI          | MH                               | 70               | MV             | ME                     |          |
| Moisture<br>Liquidity                  | e conter r index:  100 - 80 - 60 - 40 - 20 - 60 - 60 - 60 - 60 - 60 - 60 - 6 |                                | CL   | 200          | 40            | MI 50       | MH<br>60                         | 70               |                | ME                     | 000      |
| Moisture<br>Liquidity                  | e conter r index:  100 - 80 - 60 - 40 - 20 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - |                                | CL   | 200          | 40            | MI          | MH<br>60                         | 70               | MV             | ME                     | 00       |
| Moisture Figure 7. Plasticity Index(%) | e conter r index:  100 - 80 - 60 - 40 - 60 - 60 - 60 - 60 - 60 - 6           |                                | CL ML 20   | 30           | 40            | MI 50       | MH<br>60                         | 70               | MV             | ME                     | 000      |
| Moisture<br>Liquidity                  | e conter rindex:  100 - 80 - 60 - 40 - 60 - 60 - 60 - 60 - 60 - 6            |                                | CL   | 30           | 40            | MI 50       | MH<br>60<br>t (%)                | 70               | MV<br>80       | ME                     |          |

| Project N           | ame             | Bay of Nigg<br>Investigatio       |            | Developr | nent C | iround      |                       |           | And P                      |                          |                  | Hole ID<br>A59                                  |  |  |
|---------------------|-----------------|-----------------------------------|------------|----------|--------|-------------|-----------------------|-----------|----------------------------|--------------------------|------------------|---|--|--|
| Project N           | 0.              | TA7148                            |            |          |        |             |                       | Lir       | nit Te                     | st                       |                  | Sample Depth<br>7.50m                           |  |  |
| Engineer            |                 | Arch Hende                        | rson LLP   |          |        |             |                       |           |                            |                          |                  | Sample Number<br>020                            |  |  |
| Employer            |                 | Aberdeen H                        | arbour Bo  | ard      |        |             | Tes                   |           | : BS1377: F<br>use 4.3 and |                          | Sample Type<br>D |   |  |  |
| Descriptio          | on              | Brown sandy                       | gravelly C | LAY.     |        |             |                       | Ciac      | une                        |                          |                  | Specimen Depth<br>7.50m<br>Specimen Number<br>1 |  |  |
| 7                   | <sup>27</sup> T |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
| :                   | 25              |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
| <u>ہ</u> 2          | 23              |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
| E G                 | 21              |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
| tratic              | 19              |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
| Pene                | 17              |                                   |            |          |        |             |                       | •         |                            |                          |                  |   |  |  |
|                     |                 |                                   |            |          | •      |             |                       |           |                            |                          |                  |   |  |  |
| 1                   | 15 +            |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
| :                   | 13 ↓<br>30      | 32                                |            |          |        |             |                       |           | 36                         |                          | 38               | 40  |  |  |
|                     |                 | 30 32 34 36 38 Moisture Content % |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
|                     |                 |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
| Natural mo          |                 | e content:                        |            |          |        | 7.7%<br>37% |                       | -         | ained on 4<br>sample: V    | 425µm sieve<br>Vet sieve | e:               | 33%   |  |  |
| Plastic lim         | it:             |                                   |            |          |        | 19%         | Rema                  |           | ourripie. v                | vet sieve                |                  |   |  |  |
| Plasticity i        |                 | nt of soil pass                   | ina 425um  | 1        |        | 18%<br>12%  |                       |           |                            |                          |                  |   |  |  |
| Liquidity ir        |                 | ne or oon paoo                    | g 120µ11   |          |        | -0.41       |                       |           |                            |                          |                  |   |  |  |
|                     |                 |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
| :                   | 100 -           |                                   | CL         |          |        |             | CI                    |           | СН                         |                          | CV               | CE  |  |  |
|                     |                 |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
|                     | 80 -            |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
| (%)xe               | 60 -            |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
| Plasticity Index(%) |                 |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
| sticity             | 40 -            |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
| Pla                 |                 |                                   |            |          |        |             |                       |           |                            |                          |                  |   |  |  |
|                     | 20 -            |                                   |            |          |        |             |                       | 1         |                            |                          |                  |   |  |  |
|                     | 0 -             |                                   | ML         |          |        |             | MI                    |           | МН                         |                          | MV               | ME  |  |  |
|                     |                 | 10                                | 20         | 0        | 30     | 40          |                       | 50        | 60                         | 70                       | 80               | 90 100  |  |  |
|                     |                 |                                   |            |          |        |             | Liquid                | Limit (%) | )                          |                          |                  |   |  |  |
| Approved            | bv:             |                                   | Leeds      | Laborato | ory    |             |                       |           |                            |                          |                  |   |  |  |
| Sushil Sha          | -               |                                   |            |          |        |             | Print date 28/11/2013 |           |                            |                          |                  | SOIL ENGINEERING                                |  |  |
|                     |                 |                                   | Revisio    | n No.    | 2.07   |             | Issue                 |           | .9/11/2012                 |                          |                  | Part of the Bachy Soletanche Group              |  |  |

Project Name Bay of Nigg Harbour Development Ground **Liquid And Plastic** Hole ID A59 Investigation **Limit Test** Sample Depth TA7148 Project No. 26.60m Sample Number Engineer Arch Henderson LLP 028 Aberdeen Harbour Board Test Method: BS1377: Part 2: 1990: Sample Type Employer Clause 4.3 and 5 C Specimen Depth Description Brown sandy gravelly CLAY. Gravel is medium to coarse subangular. 26.60m Specimen Number 27 25 23 Cone Penetration mm 21 19 17 15 13 20 24 28 32 36 40 Moisture Content % Natural moisture content: 5.8% Percentage retained on 425µm sieve: 38% Liquid limit: 30% Preparation of sample: Wet sieve Plastic limit: Remarks: Plasticity index: Moisture content of soil passing 425µm 9.4% Liquidity index: 100 CL CE CI СН C۷ 80 Plasticity Index(%) 60 40 20 ML MI MΗ ΜV ME 0 0 10 20 30 40 50 60 70 80 90 100 Liquid Limit (%) Approved by: Leeds Laboratory Sushil Sharda SOIL ENGINEERING Print date 28/11/2013 2.07 19/11/2012 Part of the Bachy Soletanche Group Revision No. Issue Date

| Project N                 | Vame                     | Bay of Nigg H<br>Investigation |                  | opment Ground | Li          | quid And Pl                          |             | Hole ID<br>A63          |     |  |
|---------------------------|--------------------------|--------------------------------|------------------|---------------|-------------|--------------------------------------|-------------|-------------------------|-----|--|
| Project N                 | No.                      | TA7148                         |                  |               |             | Limit Tes                            | t           | Sample Depth            |     |  |
| Engineer                  | r                        | Arch Henders                   | son LLP          |               |             |                                      |             | 6.50m<br>Sample Numbe   | r   |  |
|                           |                          |                                |                  |               |             |                                      | . 0 4000    | 022                     |     |  |
| Employe                   | er                       | Aberdeen Hai                   | rbour Board      |               | l est l     | Method: BS1377: Pa<br>Clause 4.3 and |             | Sample Type<br>D        |     |  |
| Description               | ion                      | Brown sandy s                  | lightly gravelly | CLAY.         | <u> </u>    |                                      |             | Specimen Deptl<br>6.50m | h   |  |
|                           |                          |                                |                  |               |             |                                      |             | Specimen Numb           | er  |  |
|                           |                          |                                |                  |               |             |                                      |             | 1                       |     |  |
|                           | 27 —                     |                                |                  |               |             |                                      |             |                         |     |  |
|                           | 25                       |                                |                  |               |             |                                      |             |                         |     |  |
|                           |                          |                                |                  |               |             |                                      |             |                         |     |  |
| Ē                         | 23                       |                                |                  |               |             |                                      |             |                         |     |  |
| no<br>m                   | 21                       |                                |                  |               | • .         |                                      |             |                         |     |  |
| trati                     | 19                       |                                |                  |               |             |                                      |             |                         |     |  |
| Pene                      |                          |                                |                  |               | <b>/</b>    |                                      |             |                         |     |  |
| Cone Penetration mm       | 17                       |                                |                  |               |             |                                      |             |                         |     |  |
|                           | 15                       |                                |                  | <b>V</b>      |             |                                      |             |                         |     |  |
|                           | 13                       |                                |                  |               |             |                                      |             |                         |     |  |
|                           | 20                       |                                | 24               | 28            |             | 32                                   | 36          | 40                      | )   |  |
|                           |                          |                                |                  | N             | Noisture Co | ontent %                             |             |                         |     |  |
| Natural m                 | noisture                 | e content:                     |                  | 12%           | Percen      | tage retained on 4                   | 25um sieve: | 34                      | 4%  |  |
| Liquid lim                | nit:                     |                                |                  | 30%           | Prepara     | ation of sample: W                   |             |                         | .,, |  |
| Plastic lim<br>Plasticity |                          |                                |                  | 17%<br>13%    |             | (S:                                  |             |                         |     |  |
| Moisture                  | conter                   | nt of soil passin              | g 425µm          | 18%           | b           |                                      |             |                         |     |  |
| Liquidity i               | index:                   |                                |                  | 0.06          | i           |                                      |             |                         |     |  |
|                           |                          |                                |                  |               |             |                                      |             |                         |     |  |
|                           | 100 -                    |                                | CL               |               | CI          | СН                                   | CV          | CE                      | 7   |  |
|                           | 00                       |                                |                  |               |             |                                      |             |                         |     |  |
|                           | 80 -                     |                                |                  |               |             |                                      |             |                         |     |  |
| (%)×                      |                          |                                |                  |               |             |                                      |             |                         |     |  |
| <u> </u>                  | 60 -                     |                                |                  |               |             |                                      |             |                         |     |  |
| <u> </u>                  | 60 -                     |                                |                  |               |             |                                      |             |                         |     |  |
| icity Inc                 | 60 -                     |                                |                  |               |             |                                      |             |                         |     |  |
| Plasticity Index(%)       |                          |                                |                  |               |             |                                      |             |                         |     |  |
| Plasticity Inc            |                          |                                |                  |               |             |                                      |             |                         |     |  |
| Plasticity Inc            | 40 -                     |                                |                  |               |             |                                      |             |                         |     |  |
| Plasticity Inc            | 40 -                     |                                | ML               |               | MI          | MH                                   | M           | •                       |     |  |
| Plasticity Inc            | 40 -                     | 0 10                           | ML 20            | 30 4          | ) 50        | 0 60                                 | 70 80       | †                       | 100 |  |
| Plasticity Inc            | 40 -                     | ) 10                           | 1                | 30 4          | •           | 0 60                                 | Ť           | †                       | 100 |  |
|                           | 40 -<br>20 -<br>0 -      | ) 10                           | 20               |               | ) 50        | 0 60                                 | Ť           | †                       | 100 |  |
| Approved Susshicity Ind   | 40 -<br>20 -<br>0 -<br>0 | ) 10                           | 1                |               | ) 50        | 0 60<br>imit (%)                     | Ť           | †                       |     |  |

| Project Name  | Investigation  | arbour Devel   | opment Grou    | und                               | Liq             | uid And P<br>Limit Tes             |                  | Hole ID<br>B61                                   |  |
|---|----------------|----------------|----------------|-----------------------------------|-----------------|------------------------------------|------------------|--|--|
| Project No.   | TA7148         |                |                |                                   |                 | LIMIT 169                          | ST               | Sample Depth<br>30.30m                           |  |
| Engineer  | Arch Henders   | on LLP         |                |                                   |                 |                                    |                  | Sample Number<br>021                             |  |
| Employer  | Aberdeen Harl  | bour Board     |                |                                   | Test Me         | ethod: BS1377: F<br>Clause 4.3 and | Sample Type<br>C |  |  |
| Description   | Brown gravelly | slightly sandy | CLAY. Gravel i | s fine to                         | coarse an       | gular.                             |                  | Specimen Depth<br>30.30m<br>Specimen Number<br>3 |  |
| 25  |                |                |                |                                   |                 |                                    |                  |  |  |
| 23 +  |                |                |                |                                   |                 |                                    | •                |  |  |
| E<br>E<br>c 21 +  |                |                |                |                                   |                 |                                    |                  |  |  |
| ation   |                |                | /              |                                   |                 |                                    |                  |  |  |
| e netr  |                |                |                |                                   |                 |                                    |                  |  |  |
| Cone Penetration mm 17 - 17 - 17 - 17 - 17 - 17 - 17 - 1                                    |                |                |                |                                   |                 |                                    |                  |  |  |
| රි<br>15 +  | •              |                |                |                                   |                 |                                    |                  |  |  |
| 13  |                |                |                |                                   |                 |                                    |                  |  |  |
| 30  | )              | 32             |                | 34                                |                 | 36                                 | 38               | 40   |  |
|   |                |                |                | Mois                              | sture Cont      | ent %                              |                  |  |  |
| Natural moistur   | e content:     |                | <del>.</del>   | 7.2%                              | Percentag       | ge retained on 4                   | 425µm sieve:     | 38%  |  |
| Liquid limit:<br>Plastic limit:<br>Plasticity index:<br>Moisture conter<br>Liquidity index: |                | յ 425µm        |                | 34%<br>20%<br>14%<br>12%<br>-0.60 |                 | on of sample: W                    |                  |  |  |
| 1   |                |                |                |                                   |                 |                                    |                  |  |  |
| 100 -   |                | CL             |                |                                   | CI              | СН                                 | С                | V CE   |  |
| 80 -  |                |                |                |                                   |                 |                                    |                  |  |  |
| - 00 mgex(%)  |                |                |                |                                   |                 |                                    |                  |  |  |
| Plasticity Index(%)   |                |                |                |                                   |                 |                                    |                  |  |  |
| 20 -  |                |                | 4              |                                   | 1               |                                    |                  |  |  |
| 0 -   |                | ML             |                | -                                 | ΜI              | МН                                 | 1                | IV ME  |  |
|   | 0 10           | 20             | 30             | 40<br>L                           | 50<br>iquid Lim | 60<br>it (%)                       | 70 8             | 30 90 100  |  |
|   |                |                |                |                                   |                 |                                    |                  |  |  |
| Approved by:  |                | Leeds Labo     | ratory         |                                   |                 |                                    |                  |  |  |
| Sushil Sharda   |                | Revision No.   | 2.07           |                                   | Issue Date      | Print date 28/1                    | SOIL ENGINEERING |  |  |
|   |                | vension ino.   | 2.01           |                                   | issue Date      | 13/11/2012                         |                  | Part of the Bachy Soletanche Group               |  |

| Project N                 | lame               | Bay of Nigg F<br>Investigation |                | opment Grour    | ıd        |                             | nd Plastic      |                  | Hole ID<br>C81          |  |
|---------------------------|--------------------|--------------------------------|----------------|-----------------|-----------|-----------------------------|-----------------|------------------|-------------------------|--|
| Project N                 | lo.                | TA7148                         |                |                 |           | Limi                        | t Test          |                  | Sample Depth<br>4.40m   |  |
| Engineer                  |                    | Arch Henders                   | son LLP        |                 |           |                             |                 |                  | Sample Number           |  |
| Employe                   | r                  | Aberdeen Ha                    | rbour Board    |                 |           | Test Method: BS<br>Clause   | 0:              | Sample Type<br>C |                         |  |
| Descripti                 | on                 | Brown gravelly                 | slightly sandy | CLAY. Gravel is | ine to co | arse angular.               |                 |                  | Specimen Depth<br>4.40m |  |
|                           |                    |                                |                |                 |           |                             |                 |                  | Specimen Number         |  |
|                           |                    |                                |                |                 |           |                             |                 |                  | 1                       |  |
|                           | <sup>27</sup> T    |                                |                |                 |           |                             |                 |                  |                         |  |
|                           | 25                 |                                |                |                 |           |                             | _               |                  |                         |  |
|                           | 23                 |                                |                |                 |           |                             | ,               |                  |                         |  |
| ш                         |                    |                                |                |                 |           |                             |                 |                  |                         |  |
| tion                      | 21 +               |                                |                |                 |           |                             |                 |                  |                         |  |
| Cone Penetration mm       | 19                 |                                |                |                 |           | <b>/</b>                    |                 |                  |                         |  |
| e Per                     | 17                 |                                |                |                 |           |                             |                 |                  |                         |  |
|                           |                    |                                |                | */              |           |                             |                 |                  |                         |  |
|                           | 15 +               |                                |                |                 |           |                             |                 |                  |                         |  |
|                           | 13 <del> </del> 20 | 1                              | 24             | 2               | •         | 32                          | <u> </u>        | 36               | 40                      |  |
|                           | 20                 |                                | 24             | 2               |           |                             |                 | 30               | 40                      |  |
|                           |                    |                                |                |                 | Moisti    | re Content %                |                 |                  |                         |  |
|                           |                    | e content:                     |                |                 |           |                             | ed on 425µm sie | eve:             | 40%                     |  |
| Liquid lim<br>Plastic lim |                    |                                |                |                 |           | eparation or sar<br>emarks: | mple: Wet sieve |                  |                         |  |
| Plasticity                |                    | nt of soil passin              | 00 (2Eum       |                 | 3%<br>6%  |                             |                 |                  |                         |  |
| Liquidity i               |                    | it of soil passiii             | ig 423μπ       |                 | .09       |                             |                 |                  |                         |  |
|                           |                    |                                |                |                 |           |                             |                 |                  |                         |  |
|                           | 100 -              |                                | CL             |                 | CI        | С                           | н Т             | CV               | CE                      |  |
|                           |                    |                                |                |                 |           |                             |                 |                  |                         |  |
|                           | 80 -               |                                |                |                 |           |                             |                 |                  |                         |  |
| (%)                       |                    |                                |                |                 |           |                             |                 |                  |                         |  |
| Plasticity Index(%)       | 60 -               |                                |                |                 |           |                             |                 |                  |                         |  |
| city I                    | 40 -               |                                |                |                 |           |                             |                 |                  |                         |  |
| Plasti                    | 40 -               |                                |                |                 |           |                             |                 |                  |                         |  |
| ш.                        | 20 -               |                                |                |                 |           | _                           |                 |                  |                         |  |
|                           |                    |                                |                |                 | +         |                             |                 |                  |                         |  |
|                           | 0 -                |                                | ML             |                 | MI        | Ť                           | 1H              | MV               | ME                      |  |
|                           | (                  | 0 10                           | 20             | 30              | 40        |                             | 50 70           | 80               | 90 100                  |  |
|                           |                    |                                |                |                 | Liq       | uid Limit (%)               |                 |                  |                         |  |
|                           |                    |                                |                |                 |           |                             |                 |                  |                         |  |
| Λ · · ·                   | 1 1                |                                | l oodo Laka    | raton:          |           |                             |                 | Г                |                         |  |
| Approved                  | -                  |                                | Leeds Labo     | ratory          |           | Print date                  | 28/11/2013      |                  | soil engineering        |  |

|                                     |   | Bay of Nigg H<br>Investigation   | arbour [ | Developmen     | t Ground                                | Liqu              | uid And Pla                          |                  | Hole ID<br>C83                    |      |  |
|-------------------------------------|---|----------------------------------|----------|----------------|---|-------------------|--------------------------------------|------------------|-----------------------------------|------|--|
| Project                             | : No.                                     | TA7148                           |          |                |   |                   | LIIIII Iesi                          | •                | Sample Dep<br>2.75m               | oth  |  |
| Engine                              | er  | Arch Henders                     | on LLP   |                |   |                   |                                      |                  | Sample Num<br>008                 | ber  |  |
| Employ                              | yer                                       | Aberdeen Har                     | bour Bo  | ard            |   | Test Me           | thod: BS1377: Pa<br>Clause 4.3 and ! |                  | Sample Type<br>C                  |      |  |
| Descrip                             | otion                                     | Reddish brown                    | gravelly | slightly sandy | CLAY. Gravel                            | is fine to co     |                                      |                  | Specimen De<br>2.75m              | epth |  |
|                                     |   |                                  |          |                |   |                   |                                      |                  | Specimen Nu                       | mber |  |
|                                     | 27 _                                      |                                  | ı        |                | T                                       |                   |                                      | 1                |                                   | _    |  |
|                                     | 25  |                                  |          |                |   |                   |                                      |                  |                                   |      |  |
|                                     | 23  |                                  |          |                |   |                   |                                      |                  |                                   |      |  |
| nm r                                | 21  |                                  |          |                |   |                   |                                      |                  |                                   |      |  |
| tration                             | 19  |                                  |          |                |   | •                 |                                      |                  |                                   |      |  |
| Cone Penetration mm                 | 17  |                                  |          |                |   |                   |                                      |                  |                                   |      |  |
| Cone                                | 15  |                                  |          |                |   | •                 |                                      |                  |                                   |      |  |
|                                     |   |                                  |          |                |   |                   |                                      |                  |                                   |      |  |
|                                     | 13 <del> </del><br>20                     | )                                | 24       |                | 28                                      |                   | 32                                   |                  | <del> </del><br>40                |      |  |
| Liquid li<br>Plastic l<br>Plasticit | imit:<br>limit:<br>ty index:<br>re conter | e content:<br>nt of soil passino | ց 425µm  |                | 12%<br>32%<br>15%<br>17%<br>22%<br>0.38 |                   | e retained on 42<br>n of sample: We  |                  |                                   | 44%  |  |
| Elquidity                           | у шаск.                                   |                                  |          |                | 0.50                                    | 1                 |                                      |                  |                                   |      |  |
|                                     | 100 -                                     |                                  | CL       |                |   | CI                | СН                                   | CV               | CE                                |      |  |
|                                     | 80 -                                      |                                  |          |                |   |                   |                                      |                  |                                   |      |  |
| udex(%)                             | 60 -                                      |                                  |          |                |   |                   |                                      |                  |                                   |      |  |
| Plasticity Index(%)                 | 40 -                                      |                                  |          |                |   |                   |                                      |                  |                                   |      |  |
|                                     | 20 -                                      |                                  |          | 4              |   |                   |                                      |                  |                                   |      |  |
|                                     | 0 -                                       | 0 10                             | ML 20    | 30             | 40                                      | MI 50             | MH<br>60                             | 70 80            | •                                 | 100  |  |
|                                     | ·   | . 10                             | 20       | 30             |   | Jo<br>Liquid Limi |                                      | , , , , ,        | . 30                              | 100  |  |
| Approve<br>Sushil S                 |   |                                  | Leeds    | Laboratory     |   |                   | Print date 28/11.                    | SOIL ENGINEERING |                                   |      |  |
|                                     |   |                                  | Revision | n No. 2.0      | 7                                       | Issue Date        | 19/11/2012                           |                  | Part of the Bachy Soletanche Grou |      |  |

|                                    | Bay of Nigg Ha     | arbour Develo  | pment Ground        | Lic          | uid And P<br>Limit Tes             |            | Hole ID<br>C84                                  |  |
|------------------------------------|--------------------|----------------|---------------------|--------------|------------------------------------|------------|---|--|
| Project No.                        | TA7148             |                |                     |              | Limit 169                          | <b>S</b> L | Sample Depth<br>5.50m                           |  |
| Engineer                           | Arch Henderso      | on LLP         |                     |              |                                    |            | Sample Number<br>007                            |  |
| Employer                           | Aberdeen Hark      | our Board      |                     | Test M       | ethod: BS1377: P<br>Clause 4.3 and |            | Sample Type<br>C                                |  |
| Description                        | Brown gravelly s   | andy CLAY. Gra | avel is fine to coa | rse angular  |                                    |            | Specimen Depth<br>5.50m<br>Specimen Number<br>2 |  |
| 27 <sub>T</sub>                    |                    |                |                     |              |                                    |            |   |  |
| 25 -                               |                    |                |                     |              | •                                  |            |   |  |
| 23 +                               |                    |                |                     |              |                                    |            |   |  |
| E 21                               |                    |                |                     |              |                                    |            |   |  |
| ation 21 -                         |                    |                |                     |              |                                    |            |   |  |
| 19 -                               |                    |                |                     |              |                                    |            |   |  |
| Cone Penetration mm 12 -           | •/                 |                |                     |              |                                    |            |   |  |
| ت<br>15 -                          |                    |                |                     |              |                                    |            |   |  |
| 13 -                               |                    |                |                     |              |                                    |            |   |  |
| 30                                 | )                  | 32             | 34                  |              | 36                                 | 38         | 40  |  |
|                                    |                    |                | N                   | loisture Cor | ntent %                            |            |   |  |
| Natural moistu                     | e content:         |                | 9.4%                |              | nge retained on 4                  |            | 46%   |  |
| Liquid limit:<br>Plastic limit:    |                    |                | 33%<br>17%          |              | ion of sample: W<br>::             | let sieve  |   |  |
| Plasticity index:                  |                    | <b>/2</b> 5.   | 16%                 |              |                                    |            |   |  |
| Moisture conte<br>Liquidity index: | nt of soil passing | 425µm          | 17%<br>0.01         |              |                                    |            |   |  |
|                                    |                    |                |                     | -            |                                    |            |   |  |
| 100                                |                    | CL             |                     | CI           | СН                                 | CV         | CE  |  |
|                                    |                    |                |                     |              |                                    |            |   |  |
| 80                                 |                    |                |                     |              |                                    |            |   |  |
| (%)×60                             |                    |                |                     |              |                                    |            |   |  |
| Plasticity Index(%)                |                    |                |                     |              |                                    |            |   |  |
| sticity<br>40                      |                    |                |                     |              |                                    |            |   |  |
|                                    |                    |                |                     |              |                                    |            |   |  |
| 20                                 |                    |                | <b>A</b>            |              |                                    |            |   |  |
| 0                                  |                    | ML             |                     | МІ           | МН                                 | M\         | / ME  |  |
|                                    | 0 10               | 20             | 30 40               | 50           | 60                                 | 70 80      | 90 100  |  |
|                                    |                    |                |                     | Liquid Lin   | nit (%)                            |            |   |  |
| Approved by:                       |                    | Leeds Labor    | atorv               |              |                                    |            |   |  |
| Stuart Kirk                        |                    |                |                     |              | Print date 28/1                    | 11/2013    | SOIL ENGINEERING                                |  |
|                                    |                    | Revision No.   | 2.07                | Issue Date   |                                    | 22, 2010   | Part of the Bachy Soletanche Group              |  |

| Project Name                        | Bay of Nigg H<br>Investigation |                  | opment Ground | I  |              | id And P                 |            |     | Hole ID<br>C84          |    |  |
|-------------------------------------|--------------------------------|------------------|---------------|--|--------------|--------------------------|------------|-----|-------------------------|----|--|
| Project No.                         | TA7148                         |                  |               |  | L            | imit Te                  | st         |     | Sample Depth            |    |  |
| Engineer                            | Arch Henders                   | son LLP          |               |  |              |                          |            |     | 7.10m<br>Sample Number  |    |  |
|                                     |                                |                  |               |  | <b>-</b>     |                          | D . 0 4006 |     | 008                     |    |  |
| Employer                            | Aberdeen Har                   | bour Board       |               | Test Method: BS1377: Part 2: 1990:<br>Clause 4.3 and 5 |              |                          |            |     | Sample Type<br>C        |    |  |
| Description                         | Brown slightly                 | sandy slightly g | ravelly CLAY. |  |              |                          |            |     | Specimen Depth<br>7.10m | l  |  |
|                                     |                                |                  |               |  |              |                          |            |     | Specimen Numbe          | er |  |
|                                     |                                |                  |               |  |              |                          |            |     | 2                       |    |  |
| 27 _                                |                                |                  |               |  |              |                          |            |     |                         |    |  |
| 25                                  |                                |                  |               |  |              |                          |            |     |                         |    |  |
|                                     |                                |                  |               |  |              |                          |            |     |                         |    |  |
| 돌 23 +                              |                                |                  |               |  |              |                          |            |     |                         |    |  |
| E 21                                |                                |                  |               |  |              |                          |            |     |                         |    |  |
| stratic +                           |                                |                  |               |  | <b>/</b> *   |                          |            |     |                         |    |  |
| Pene                                |                                |                  | •             |  |              |                          |            |     | ]                       |    |  |
| Cone Penetration mm 17 -            |                                |                  |               |  |              |                          |            |     |                         |    |  |
| 15                                  |                                |                  |               |  |              |                          |            |     |                         |    |  |
| 13                                  |                                |                  |               |  |              |                          |            |     |                         |    |  |
| 20                                  | )                              | 24               | 28            |  |              | 32                       |            | 36  | 40                      |    |  |
|                                     |                                |                  |               |  |              |                          |            |     |                         |    |  |
| Natural moistur                     |                                |                  | 10.0          | 00/ Ir   |              |                          | /25 sia:   |     | 320                     | 0/ |  |
| Liquid limit:                       | e content:                     |                  | 30%           |  |              | retained on of sample: V |            | /e: | 32                      | 70 |  |
| Plastic limit:                      |                                |                  |               | 15% Remarks:   |              |                          |            |     |                         |    |  |
| Plasticity index:<br>Moisture conte |                                | a 425um          | 15%<br>15%    |  |              |                          |            |     |                         |    |  |
| Liquidity index:                    |                                |                  | -0.0          |  |              |                          |            |     |                         |    |  |
|                                     |                                |                  |               |  |              |                          |            |     |                         |    |  |
| 100                                 |                                | CL               |               | CI   |              | СН                       |            | CV  | CE                      | 1  |  |
|                                     |                                |                  |               |  |              |                          |            |     |                         |    |  |
| 80                                  |                                |                  |               |  |              |                          |            |     |                         | -  |  |
| (%)                                 |                                |                  |               |  |              |                          |            |     |                         |    |  |
| ))x 60                              |                                |                  |               |  |              |                          |            |     |                         | 1  |  |
| Plasticity Index(%)                 |                                |                  |               |  |              |                          |            |     |                         |    |  |
| astici                              |                                |                  |               |  |              |                          |            |     |                         |    |  |
|                                     |                                |                  |               |  |              |                          |            |     |                         |    |  |
| 20                                  |                                |                  | <b>A</b>      |  |              |                          |            |     |                         |    |  |
| 0 -                                 |                                | ML               |               | М  | II _         | МН                       |            | MV  | ME                      |    |  |
|                                     | 0 10                           | 20               | 30 4          | 0  | 50           | 60                       | 70         | 80  | 90 1                    | 00 |  |
|                                     |                                |                  |               | Lic  | quid Limit ( | (%)                      |            |     |                         |    |  |
| Approved by:                        |                                | Leeds Labor      | <br>ratorv    | $\overline{}$  |              |                          |            |     |                         |    |  |
|                                     |                                |                  |               | $\perp \perp$  |              |                          |            |     | soil engineering        |    |  |
| Sushil Sharda                       |                                |                  |               |  |              | rint date 28/            | /11/2013   |     | SOIL ADGIDAGE           |    |  |

|                                 | Bay of Nigg H<br>Investigation | arbour Develo    | opment Grou     | ınd         | Liq                   | uid And P                         |                  | Hole ID<br>C88                         |  |
|---------------------------------|--------------------------------|------------------|-----------------|-------------|-----------------------|-----------------------------------|------------------|--|--|
| Project No.                     | TA7148                         |                  |                 |             |                       | LIMIT 165                         | ST.              | Sample Depth<br>4.30m                  |  |
| Engineer                        | Arch Henders                   | on LLP           |                 |             |                       |                                   |                  | Sample Number<br>006                   |  |
| Employer                        | Aberdeen Har                   | bour Board       |                 |             | Test Me               | thod: BS1377: P<br>Clause 4.3 and | Sample Type<br>C |  |  |
| Description                     | Brown sandy gr                 | ravelly CLAY. Gr | ravel is mediur | n to co     | arse suban            |                                   |                  | Specimen Depth 4.30m Specimen Number 1 |  |
| 27                              |                                |                  |                 |             |                       |                                   |                  |  |  |
| 25 -                            |                                |                  |                 |             |                       | •                                 |                  |  |  |
| 23<br>E                         |                                |                  |                 |             |                       |                                   |                  |  |  |
| E 21 +                          |                                |                  |                 |             |                       |                                   |                  |  |  |
| Cone Penetration mm 12 -        |                                |                  |                 |             |                       |                                   |                  |  |  |
| e 17 -                          |                                |                  |                 |             | <b>/*</b>             |                                   |                  |  |  |
|                                 |                                |                  |                 |             |                       |                                   |                  |  |  |
| 15 -                            |                                |                  |                 |             |                       |                                   |                  |  |  |
| 13 <del>-</del><br>20           | <u> </u>                       | 24               |                 | 28          |                       | 32                                | 36               | 40                                     |  |
| 20                              | J                              | 24               |                 |             |                       |                                   | 30               | 40                                     |  |
|                                 |                                |                  |                 | Moi         | sture Cont            | ent %                             |                  |  |  |
| Natural moistu                  | e content:                     |                  |                 | 3.9%<br>30% |                       | e retained on 4                   |                  | 35%                                    |  |
| Liquid limit:<br>Plastic limit: |                                |                  |                 | 18%         | Remarks:              | on of sample: W                   | ret sieve        |  |  |
| Plasticity index:               | nt of soil passing             | . 425um          |                 | 12%<br>14%  |                       |                                   |                  |  |  |
| Liquidity index:                | nt or son passing              | g 423μπ          |                 | 0.36        |                       |                                   |                  |  |  |
|                                 |                                |                  |                 |             |                       |                                   |                  |  |  |
| 100                             |                                | CL               |                 |             | CI                    | СН                                | C                | V CE                                   |  |
|                                 |                                |                  |                 |             |                       |                                   |                  |  |  |
| 80                              |                                |                  |                 |             |                       |                                   |                  |  |  |
| (%)×3 60                        |                                |                  |                 |             |                       |                                   |                  |  |  |
| Inde                            |                                |                  |                 |             |                       |                                   |                  |  |  |
| Plasticity Index(%)             |                                |                  |                 |             | -                     |                                   |                  |  |  |
| 20                              |                                |                  |                 |             | $\rightarrow$         |                                   |                  |  |  |
|                                 |                                | ML               |                 |             | MI                    | MH                                |                  | 1V ME                                  |  |
| 0                               | 0 10                           | 20               | 30              | 40          | 50                    | 60                                | Ť                | 30 90 100                              |  |
|                                 |                                |                  |                 |             | Liquid Lim            |                                   |                  |  |  |
| Approved by:                    |                                | Leeds Labor      | ratory          |             |                       |                                   |                  |  |  |
| Sushil Sharda                   |                                | LOCAS LADOI      | acory           |             | Print date 28/11/2013 |                                   |                  | SOIL ENGINEERING                       |  |
|                                 |                                | Revision No.     | 2.07            |             | Issue Date            | Print date 28/1 19/11/2012        | 1/2013           | Part of the Bachy Soletanche Gro       |  |

| Project<br>Project                  |                              | Bay of Nigg H<br>Investigation<br>TA7148 | arbour Develo | opment Gro | und                                 | Liqu                               | ıid And F<br>Limit Te           |   | Sa                     | Hole ID<br>D100<br>Sample Depth            |              |  |
|-------------------------------------|------------------------------|--|---------------|------------|-------------------------------------|------------------------------------|---------------------------------|---|------------------------|--|--------------|--|
| Engine                              |                              | Arch Henders                             | on LLP        |            |                                     |                                    |                                 |   | 1.50m<br>Sample Number |  |              |  |
| Employ                              | yer                          | Aberdeen Har                             | bour Board    |            |                                     | Test Method: BS1377: Part 2: 1990: |                                 |   |                        | 006<br>ample Type                          | <del>)</del> |  |
| Descrip                             | otion                        | Brown SAND.                              |               |            |                                     |                                    | Clause 4.4 an                   | d 5<br>_  | -                      | B<br>ecimen Dep<br>1.50m<br>eimen Num<br>1 |              |  |
|                                     | 27 <sub>T</sub>              |  |               |            |                                     |                                    |                                 |   |                        |  | 1            |  |
|                                     | 25                           |  |               |            |                                     |                                    |                                 |   |                        |  | _            |  |
| _                                   | 23                           |  |               |            |                                     |                                    |                                 |   |                        |  |              |  |
| n mn                                | 21                           |  |               |            |                                     |                                    |                                 |   |                        |  |              |  |
| etratic                             | 19                           |  |               |            |                                     |                                    | •                               |   |                        |  | _            |  |
| Cone Penetration mm                 | 17                           |  |               |            |                                     |                                    |                                 |   |                        |  |              |  |
| Cor                                 | 15                           |  |               |            |                                     |                                    |                                 |   |                        |  | -            |  |
|                                     | 13                           |  |               |            |                                     |                                    |                                 |   |                        |  |              |  |
|                                     | 20                           | )  | 22            |            | 24                                  |                                    | 26                              | 2   | 8                      | \$   | 30           |  |
| Liquid li<br>Plastic l<br>Plasticit | imit:<br>limit:<br>ty index: | re content:                              | g 425μm       |            | 24%<br>26%<br>NP<br>NP<br>NP<br>24% | Preparatio                         | n of sample: I<br>Tested as 1 ր | etained on 425µ<br>Natural<br>point Limit Liqu<br>nd it is very diffi | id due to tl           | ne sample b                                |              |  |
|                                     | y index:                     |  |               |            |                                     |                                    |                                 |   |                        |  |              |  |
|                                     | 100                          |  | CL            |            | (                                   | CI                                 | СН                              |   | CV                     | CE   |              |  |
|                                     | 80                           |  |               |            |                                     |                                    |                                 |   |                        |  |              |  |
| ndex(%)                             | 60                           |  |               |            |                                     |                                    |                                 |   |                        |  |              |  |
| Plasticity Index(%)                 | 40                           |  |               |            |                                     |                                    |                                 |   |                        | 1  |              |  |
| Ē                                   | 20                           |  |               |            |                                     |                                    |                                 |   |                        |  |              |  |
|                                     | 0 -                          | 0 10                                     | ML            | 30         | 40                                  | МI 50                              | MH                              | 70  | MV                     | ME   | 100          |  |
|                                     | '                            | 0 10                                     | 20            | 30         |                                     | 50<br>Liquid Limit                 | 60<br>t (%)                     | 10  | 80                     | 90   | 100          |  |
| Approve<br>Sushil S                 | -                            |  | Leeds Labor   | ratory     |                                     |                                    |                                 |   |                        | soil engineering                           |              |  |
|                                     |                              |  | Revision No.  | 2.07       |                                     | Issue Date                         | Print date 28<br>19/11/2012     | /11/2013  |                        | f the Bachy Solet                          |              |  |

|  | e Bay of Nigg<br>Investigation |                  | opment Groun      | ıd       |                         | id And P<br>Limit Tes            |              |            | Hole ID<br>E65                        |  |
|--|--------------------------------|------------------|-------------------|----------|-------------------------|----------------------------------|--------------|------------|---------------------------------------|--|
| Project No.<br>Engineer  | TA7148  Arch Hender            | son LLP          |                   |          |                         | Lilling 163                      | _            |            | ple Depth<br>9.80m<br>ole Number      |  |
| Employer   | Aberdeen Ha                    |                  |                   |          |                         | nod: BS1377: P<br>Clause 4.3 and |              |            | nple Type<br>C                        |  |
| Description  | Brown gravell                  | y slightly sandy | CLAY. Gravel is f | fine to  |                         |                                  | _            | -          | men Depth<br>9.80m<br>nen Number<br>1 |  |
| 27<br>25   |                                |                  |                   |          |                         |                                  |              |            |                                       |  |
| 23   |                                |                  |                   |          |                         |                                  | •            |            |                                       |  |
| Cone Penetration mm 12   |                                |                  |                   |          |                         |                                  |              |            |                                       |  |
| stration<br>19   |                                |                  |                   |          |                         |                                  |              |            |                                       |  |
| e Bene<br>17   |                                |                  |                   |          |                         |                                  |              |            |                                       |  |
| 9<br>0<br>15   |                                |                  |                   | 1        |                         |                                  |              |            |                                       |  |
| 13   |                                |                  |                   |          |                         |                                  |              |            |                                       |  |
|  | 20                             | 24               | 2                 | 8        |                         | 32                               | 30           | 6          | 40                                    |  |
|  |                                |                  |                   | Mois     | ture Conte              | nt %                             |              |            |                                       |  |
| Natural moist  | ure content:                   |                  | 9.0               | 6%       | Percentage              | retained on 4                    | i25µm sieve: |            | 45%                                   |  |
| Liquid limit:<br>Plastic limit:<br>Plasticity inde<br>Moisture con<br>Liquidity inde | tent of soil passi             | ng 425µm         | 19<br>12<br>18    |          | Preparatior<br>Remarks: | n of sample: W                   | let sieve    |            |                                       |  |
|  | ···                            |                  |                   |          |                         |                                  |              |            |                                       |  |
| 100  |                                | CL               |                   | С        | l                       | СН                               | (            | CV         | CE                                    |  |
| 80   | -                              |                  |                   |          |                         |                                  |              |            |                                       |  |
| Index(%)   |                                |                  |                   |          |                         |                                  |              |            |                                       |  |
| Plasticity Index(%)  |                                |                  |                   |          |                         |                                  |              |            |                                       |  |
| 20   |                                |                  |                   |          | 1                       |                                  |              |            |                                       |  |
| C  |                                | ML               |                   | N N      | Ť                       | МН                               | 1            | ИV         | ME                                    |  |
|  | 0 10                           | 20               | 30                | 40<br>Li | 50<br>quid Limit        | 60 (%)                           | 70           | 80 9       | 90 100                                |  |
| Approved by:   |                                | Leeds Labo       | ratory            |          |                         |                                  |              |            |                                       |  |
| Sushil Sharda  |                                | Leeus Labo       | . acory           |          | Print date 28/11/2013   |                                  |              |            | SOIL ENGINEERING                      |  |
|  |                                | Revision No.     | 2.07              |          | ssue Date               | 19/11/2012                       |              | Part of th | e Bachy Soletanche Group              |  |

| Project Name   | e Bay of Nigg Ha<br>Investigation<br>TA7148 | arbour Develop    | ment Ground                             | Liquid And F<br>Limit Te                                       |                  | Hole ID<br>E66<br>Sample Depth          |
|--|---|-------------------|---|--|------------------|---|
| Engineer   | Arch Henders                                | on LLP            |   |  |                  | 12.80m<br>Sample Number                 |
| Employer   | Aberdeen Harl                               | bour Board        |   | Test Method: BS1377:<br>Clause 4.3 an                          | Sample Type<br>C |   |
| Description  | Brown gravelly                              | slightly sandy CL | AY. Gravel is fine to                   |  |                  | Specimen Depth 12.80m Specimen Number 2 |
| 27 ·<br>25 ·   |   |                   |   |  |                  |   |
| 23   |   |                   |   |  |                  |   |
| Cone Penetration mm 17   |   |                   |   | <b>y</b> /   |                  |   |
| enetratii<br>61  |   |                   |   |  |                  |   |
|  |   |                   | •                                       |  |                  |   |
| 15   |   |                   |   |  |                  |   |
|  | 20  | 24                | 28                                      | 32   | 36               | 40                                      |
|  |   |                   | Moi                                     | sture Content %  |                  |   |
| Natural moistu<br>Liquid limit:<br>Plastic limit:<br>Plasticity index<br>Moisture contu<br>Liquidity index | c<br>ent of soil passing                    | յ 425µm           | 11%<br>31%<br>16%<br>15%<br>20%<br>0.28 | Percentage retained on<br>Preparation of sample: \<br>Remarks: | •                | 45%                                     |
|  |   |                   |   |  |                  |   |
| 100  |   | CL                |   | СІ СН  | CV               | CE                                      |
| 80   |   |                   |   |  |                  |   |
| 60 (%)   |   |                   |   |  |                  |   |
| Plasticity Index(%) 09 09  |   |                   |   |  |                  |   |
| 20   |   |                   | <b>A</b>                                |  |                  |   |
| 0  | 0 10  | ML 20             | 30 40                                   | MI MH 50 60  | 70 80            | •                                       |
|  |   |                   |   | Liquid Limit (%)   |                  | 200                                     |
| Approved by:<br>Sushil Sharda  |   | Leeds Laborat     | ory                                     | Print date 28.   | /11/2013         | SOIL ENGINEERING                        |
|  |   | Revision No.      | 2.07                                    | Issue Date 19/11/2012  |                  | Part of the Bachy Soletanche Group      |

| Project Nam                     | Bay of Nigg<br>Investigation |                    | pment Ground        | Lic         | quid And P                            |           | Hole ID<br>E69          |  |  |
|---------------------------------|------------------------------|--------------------|---------------------|-------------|---------------------------------------|-----------|-------------------------|--|--|
| Project No.                     | TA7148                       |                    |                     |             | Limit Tes                             | st        | Sample Depth            |  |  |
| Engineer                        | Arch Hender                  | son LLP            |                     |             |                                       |           | 8.80m<br>Sample Number  |  |  |
| Employer                        | Aberdeen Ha                  | arbour Board       |                     | Test M      | lethod: BS1377: P<br>Clause 4.3 and   |           | Sample Type<br>C        |  |  |
| Description                     | Brown gravell                | y slightly sandy C | LAY. Gravel is fine | to coarse a | ngular.                               |           | Specimen Depth<br>8.80m |  |  |
|                                 |                              |                    |                     |             |                                       |           | Specimen Number         |  |  |
|                                 |                              |                    |                     |             |                                       |           | 1                       |  |  |
| 27                              | 1                            |                    |                     |             |                                       |           |                         |  |  |
| 25                              |                              |                    |                     |             |                                       |           |                         |  |  |
| 25                              |                              |                    |                     |             |                                       |           | <u> </u>                |  |  |
| 23<br>E                         |                              |                    |                     |             |                                       |           |                         |  |  |
| E 21                            |                              |                    |                     |             |                                       |           |                         |  |  |
| stratic<br>19                   |                              |                    |                     |             |                                       |           |                         |  |  |
| Pene                            |                              |                    |                     |             | •                                     |           |                         |  |  |
| -<br>9 17                       |                              |                    |                     |             |                                       |           |                         |  |  |
| 15                              |                              |                    |                     |             |                                       |           |                         |  |  |
| 13                              |                              |                    |                     |             |                                       |           |                         |  |  |
|                                 | 20                           | 22                 | 24                  |             | 26                                    | 28        | 30                      |  |  |
|                                 |                              |                    |                     | oisture Cor |                                       |           |                         |  |  |
| Natural moisto<br>Liquid limit: | ıre content:                 |                    | 8.0%<br>27%         |             | age retained on 4<br>ion of sample: W |           | 40%                     |  |  |
| Plastic limit:                  |                              |                    | 20%                 | Remarks     |                                       | ret sieve |                         |  |  |
| Plasticity inde                 | र:<br>ent of soil passiı     | na 425um           | 7%<br>13%           |             |                                       |           |                         |  |  |
| Liquidity index                 |                              | ig 423μm           | -0.96               | i           |                                       |           |                         |  |  |
|                                 |                              |                    |                     |             |                                       |           |                         |  |  |
| 100                             | T                            | CL                 |                     | CI          | СН                                    | CV        | / CE                    |  |  |
|                                 |                              | CL                 |                     | Ci          | Cili                                  |           |                         |  |  |
| 80                              |                              |                    |                     |             |                                       |           |                         |  |  |
| (%                              |                              |                    |                     |             |                                       |           |                         |  |  |
| 5)<br>(xep) 60                  |                              |                    |                     |             |                                       |           |                         |  |  |
| ity In                          |                              |                    |                     |             |                                       |           |                         |  |  |
| Plasticity Index(%) 09          |                              |                    |                     | -+          |                                       |           |                         |  |  |
|                                 |                              |                    |                     |             |                                       |           |                         |  |  |
| 20                              |                              |                    |                     |             |                                       |           |                         |  |  |
| _                               |                              | ML '               |                     | MI          | МН                                    | М         | V ME                    |  |  |
| 0                               | 0 10                         | 20                 | 30 40               | •           | 1                                     | 70 8      | 1                       |  |  |
|                                 |                              |                    |                     | Liquid Lir  | mit (%)                               |           |                         |  |  |
|                                 |                              |                    |                     |             |                                       |           |                         |  |  |
| Approved by:                    |                              | Leeds Labor        | atory               |             |                                       |           |                         |  |  |
| Approved by:<br>Sushil Sharda   |                              | Leeds Labor        | atory               |             | Print date 28/1                       | 11/2013   | SOIL ENGINEERING        |  |  |

|   | Bay of Nigg Ha        | arbour Develo    | pment Ground        | Liq              | uid And Pl<br>Limit Tes             |                  | Hole ID<br>E71<br>Sample Depth                   |  |  |
|---|-----------------------|------------------|---------------------|------------------|-------------------------------------|------------------|--|--|--|
| Project No.<br>Engineer   | TA7148  Arch Henderso | on LLP           |                     |                  | <u> </u>                            | _                | 10.30m<br>Sample Number                          |  |  |
| Employer  | Aberdeen Hark         | oour Board       |                     | Test Mo          | ethod: BS1377: Pa<br>Clause 4.3 and | Sample Type<br>C |  |  |  |
| Description   | Brown gravelly s      | slightly sandy C | LAY. Gravel is fine | e to coarse an   |                                     |                  | Specimen Depth<br>10.30m<br>Specimen Number<br>1 |  |  |
| 27  |                       |                  |                     |                  |                                     |                  |  |  |  |
| 25 +  |                       |                  |                     |                  | ,                                   |                  |  |  |  |
| E 23 + E 25 + E 21 + E |                       |                  |                     |                  |                                     |                  |  |  |  |
| Cone Penetration mm 17 -  |                       |                  |                     |                  |                                     |                  |  |  |  |
| ei<br>9 17 +  |                       |                  | •                   |                  |                                     |                  |  |  |  |
| 15 -  |                       |                  |                     |                  |                                     |                  |  |  |  |
| 13 <del> </del><br>20   | )                     | 24               | 28                  |                  | 32                                  | 36               | 40   |  |  |
|   |                       |                  | N                   | oisture Con      | tent %                              |                  |  |  |  |
| Natural moistur   | e content:            |                  | 10%                 |                  | ge retained on 42                   | •                | 44%  |  |  |
| Liquid limit:<br>Plastic limit:   |                       |                  | 31%<br>17%          |                  | on of sample: W                     | et sieve         |  |  |  |
| Plasticity index:   |                       |                  | 14%                 |                  |                                     |                  |  |  |  |
| Moisture conte  | nt of soil passing    | 425µm            | 19%<br>0.11         |                  |                                     |                  |  |  |  |
|   |                       |                  |                     |                  |                                     |                  |  |  |  |
| 100 -   |                       | CL               |                     | CI               | СН                                  | CV               | CE   |  |  |
| 80 -  |                       |                  |                     |                  |                                     |                  |  |  |  |
| 60 - 60 -   |                       |                  |                     |                  |                                     |                  |  |  |  |
| Plasticity Index(%)   |                       |                  |                     |                  |                                     |                  |  |  |  |
| <u>급</u><br>20 -  |                       |                  |                     |                  |                                     |                  |  |  |  |
| 0 -   |                       | ML               |                     | MI               | МН                                  | M                | •  |  |  |
|   | 0 10                  | 20               | 30 40               | 50<br>Liquid Lim | 60<br>nit (%)                       | 70 80            | 90 100   |  |  |
| Approved by:  |                       | Leeds Labora     | atory               |                  |                                     |                  |  |  |  |
| Sushil Sharda   |                       | Revision No.     | 2.07                | Issue Date       | Print date 28/11 19/11/2012         | 1/2013           | SOIL ENGINEERING                                 |  |  |
|   |                       | REVISION NO.     | 2.01                | issue Date       | 13/11/2012                          |                  | Part of the Bachy Soletanche Group               |  |  |

| Project N               | Vame                  | Bay of Nigg Investigation | Harbour Devel    | opment Grour    | nd                    | Liqu             | iid And P                         |           |                  | Hole ID<br>GS11         |  |  |
|-------------------------|-----------------------|---------------------------|------------------|-----------------|-----------------------|------------------|-----------------------------------|-----------|------------------|-------------------------|--|--|
| Project N               | Vo.                   | TA7148                    |                  |                 |                       |                  | Limit Tes                         | st        |                  | Sample Depth<br>6.80m   |  |  |
| Engineer                | r                     | Arch Hender               | son LLP          |                 |                       |                  |                                   |           | Sample Number    |                         |  |  |
| Employe                 | er                    | Aberdeen Ha               | rbour Board      |                 |                       |                  | hod: BS1377: F<br>Clause 4.3 and  |           | Sample Type<br>C |                         |  |  |
| Descripti               | ion                   | Brown sandy (             | gravelly CLAY. G | ravel is medium | n to coa              | rse subang       | ular.                             |           |                  | Specimen Depth<br>6.80m |  |  |
|                         |                       |                           |                  |                 |                       |                  |                                   |           |                  | Specimen Number         |  |  |
|                         |                       |                           |                  |                 |                       |                  |                                   |           |                  | 1                       |  |  |
|                         | <sup>27</sup> T       |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
|                         | 25                    |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
|                         | 23                    |                           |                  |                 |                       |                  |                                   | ^         |                  |                         |  |  |
| E E                     |                       |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
| tion                    | 21 +                  |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
| Cone Penetration mm     | 19                    |                           |                  |                 |                       | •/               |                                   |           |                  |                         |  |  |
| ne Pe                   | 17                    |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
|                         | 15                    |                           |                  |                 | •                     |                  |                                   |           |                  |                         |  |  |
|                         |                       |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
|                         | 13 <del>↓</del><br>40 |                           | 44               | 4               | <del> </del>          |                  | 52                                |           | 56               | 60                      |  |  |
|                         |                       |                           |                  |                 | Mois                  | ture Conte       | ent %                             |           |                  |                         |  |  |
|                         |                       |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
| Natural m<br>Liquid lim |                       | e content:                |                  |                 |                       |                  | e retained on 4<br>n of sample: W |           |                  | 37%                     |  |  |
| Plastic lin             | nit:                  |                           |                  | 2               | 1%                    | Remarks:         |                                   |           |                  |                         |  |  |
| Plasticity<br>Moisture  |                       | nt of soil passin         | na 425um         |                 | 1%<br>3%              |                  |                                   |           |                  |                         |  |  |
| Liquidity i             |                       | '                         |                  |                 | 0.27                  |                  |                                   |           |                  |                         |  |  |
|                         |                       |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
|                         | 100 -                 |                           | CL               |                 | С                     | :1               | СН                                |           | CV               | CE                      |  |  |
|                         |                       |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
|                         | 80 -                  |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
| (%)>                    | 60 -                  |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
| Plasticity Index(%)     | 00 -                  |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
| ticity                  | 40 -                  |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
| Plast                   |                       |                           |                  |                 |                       |                  |                                   |           |                  |                         |  |  |
|                         | 20 -                  |                           |                  |                 |                       | $\nearrow$       |                                   |           |                  |                         |  |  |
|                         |                       |                           | N.A.I            | _               | 1.                    |                  | B. 41.                            |           | D 63.6           |                         |  |  |
|                         | 0 -                   | ) 10                      | ML 20            | 30              | 40                    | /II              | MH<br>60                          | 70        | MV<br>80         | 90 100                  |  |  |
|                         | (                     | , 10                      | 20               | 30              |                       | 50<br>iquid Limi |                                   | 10        | ٥ <b>U</b>       | 90 100                  |  |  |
|                         |                       |                           |                  |                 | L                     | iquiu LIIIII     | . (/0)                            |           |                  |                         |  |  |
| Approved                | d bv:                 |                           | Leeds Labo       | ratory          |                       |                  |                                   |           | T                |                         |  |  |
| Sushil Sh               | -                     |                           |                  | •               | Print date 28/11/2013 |                  |                                   |           | soil engineering |                         |  |  |
| Justin Jii              |                       |                           |                  |                 |                       |                  |                                   | LLI CULLI |                  |                         |  |  |

|                               |      | Investigation     |             |          |      |              |            | iquid A                     |                        |            |         | Hole ID<br>TP01                                     |  |
|-------------------------------|------|-------------------|-------------|----------|------|--------------|------------|-----------------------------|------------------------|------------|---------|---|--|
| Project No.                   |      | TA7148            |             |          |      |              | Limit Test |                             |                        |            |         | Sample Depth<br>0.50m                               |  |
| Engineer                      |      | Arch Hender       | son LLP     |          |      |              |            |                             |                        |            |         | Sample Number<br>003                                |  |
| Employer                      |      | Aberdeen Ha       | rbour Bo    | ard      |      |              | Test       | Method: B                   | S1377: Pa<br>e 4.3 and |            |         | Sample Type<br>B                                    |  |
| Description                   |      | Brown sandy o     | gravelly CL | AY.      |      |              |            |                             |                        |            |         | Specimen Depth<br>0.50m<br>Specimen Number<br>1     |  |
| 27                            | ' т  |                   |             |          |      |              |            |                             |                        |            |         |   |  |
| 25                            | 5    |                   |             |          |      |              |            |                             |                        |            |         |   |  |
| <u> </u>                      | 3 +  |                   |             |          |      |              |            |                             |                        |            |         |   |  |
| Cone Penetration mm           | ı    |                   |             |          |      |              |            |                             |                        | •          |         |   |  |
| netrati                       | }    |                   |             |          |      |              |            | •                           |                        |            |         |   |  |
| eu 17                         | ,    |                   |             |          |      |              | /          |                             |                        |            |         |   |  |
| රි<br>15                      | 5    |                   |             |          |      |              |            |                             |                        |            |         |   |  |
| 13                            |      |                   |             |          |      |              |            |                             | _                      |            |         |   |  |
|                               | 30   |                   | 32          |          |      | 34           |            | 30                          | 6                      |            | 38      | 40  |  |
|                               |      |                   |             |          |      | Mo           | isture C   | ontent %                    |                        |            |         |   |  |
| Natural mois<br>Liquid limit: |      | e content:        |             |          |      | 9.4%<br>36%  |            | ated percer<br>ration of sa |                        | ained on 4 | 25µm si | eve: 51%  |  |
| Plastic limit:                |      |                   |             |          |      | 21%          | Remai      |                             | iitipie.               |            |         |   |  |
| Plasticity ind                |      |                   |             |          |      | 15%          |            |                             |                        |            |         |   |  |
| Moisture co<br>Liquidity ind  |      | it of soil passir | ig 425μm    |          |      | 19%<br>-0.13 |            |                             |                        |            |         |   |  |
|                               |      |                   |             |          |      |              |            |                             |                        |            |         |   |  |
| 10                            | 00 - |                   | CL          |          |      |              | CI         |                             | СН                     |            | CV      | CE  |  |
| 8                             | 30 - |                   |             |          |      |              |            |                             |                        |            |         |   |  |
| (%)                           |      |                   |             |          |      |              |            |                             |                        |            |         |   |  |
| lndex(                        | 50 - |                   |             |          |      |              |            |                             |                        |            |         |   |  |
| Plasticity Index(%)           | 40 - |                   |             |          |      |              |            |                             |                        |            |         |   |  |
| 2                             | 20 - |                   |             |          |      |              |            |                             |                        |            |         |   |  |
|                               | 0 -  |                   | ML          |          |      |              | МІ         | Ť                           | ИΗ                     |            | MV      | ME  |  |
|                               | (    | ) 10              | 20          | )        | 30   | 40           |            | 50<br>Limit (%)             | 60                     | 70         | 80      | 90 100  |  |
|                               |      |                   |             |          |      |              | T          |                             |                        |            |         | -   |  |
| Approved by                   | -    |                   | Leeds       | Laborate | ory  |              |            |                             |                        |            |         |   |  |
| Sushil Shard                  | ıa   |                   | Revisio     | n No     | 2.07 |              | Issue D    | Print date                  | 28/11<br>11/2012       | 1/2013     |         | SOIL ENGINEERING  Part of the Bachy Soletanche Grou |  |
|                               |      |                   | 1/6/12/01   | II INU.  | 2.01 |              | เออนซ D    | uic 13/                     | 11/2012                |            |         | i art or the bachy soletalithe Grou                 |  |

| Project                             | t Name                                    | Bay of Nigg Hai                    | rbour Develop    | ment Ground                             |              | id And Pla                           |       | Hole ID<br>TP03                        |  |  |
|-------------------------------------|---|------------------------------------|------------------|---|--------------|--------------------------------------|-------|--|--|--|
| Project                             | t No.                                     | TA7148                             |                  |   |              | Limit Test                           |       | Sample Depth<br>1.50m                  |  |  |
| Engine                              | er  | Arch Henderson                     | n LLP            |   |              |                                      |       | Sample Number                          |  |  |
| Employ                              | yer                                       | Aberdeen Harbo                     | our Board        |   |              | nod: BS1377: Par<br>Clause 4.3 and 5 |       | 005<br>Sample Type<br>B                |  |  |
| Descrip                             | otion                                     | Brown slightly sa                  | ndy gravelly CLA | AY.                                     |              |                                      |       | Specimen Depth 1.50m Specimen Number 1 |  |  |
|                                     | <sup>27</sup> T                           |                                    |                  |   |              |                                      |       |  |  |  |
|                                     | 25  |                                    |                  |   |              |                                      |       |  |  |  |
| _                                   | 23  |                                    |                  |   |              | /                                    |       |  |  |  |
| um u                                | 21  |                                    |                  |   | /•           |                                      |       |  |  |  |
| etratio                             | 19  |                                    |                  |   |              |                                      |       |  |  |  |
| Cone Penetration mm                 | 17  |                                    |                  | <b>"</b>                                |              |                                      |       |  |  |  |
| Con                                 | 15  |                                    |                  | •                                       |              |                                      |       |  |  |  |
|                                     | 13  |                                    |                  |   |              |                                      |       |  |  |  |
|                                     | 20  |                                    | 24               | 28                                      |              | 32                                   | 36    | 40                                     |  |  |
|                                     |   |                                    |                  | Mois                                    | sture Conte  | nt %                                 |       |  |  |  |
| Liquid li<br>Plastic l<br>Plasticit | imit:<br>limit:<br>ty index:<br>re conter | e content:<br>nt of soil passing 4 | 425μm            | 14%<br>30%<br>18%<br>12%<br>22%<br>0.30 |              | retained on 42!<br>of sample: Wet    |       | 37%                                    |  |  |
|                                     |   |                                    |                  |   |              |                                      |       |  |  |  |
|                                     | 100 -                                     | C                                  | CL               |   | CI           | СН                                   | CV    | CE                                     |  |  |
|                                     | 80 -                                      |                                    |                  |   |              |                                      |       |  |  |  |
| Plasticity Index(%)                 | 60 -                                      |                                    |                  |   |              |                                      |       |  |  |  |
| Plasticity                          | 40 -                                      |                                    |                  |   |              |                                      |       |  |  |  |
|                                     | 20 -                                      |                                    |                  |   | _            |                                      |       |  |  |  |
|                                     | 0 -                                       | ) 10                               | ИL 20            | 30 40                                   | MI 50        | MH<br>60                             | 70 80 | 90 100                                 |  |  |
|                                     | ·   | 10                                 |                  |   | iquid Limit. |                                      |       | 23 100                                 |  |  |
| Approv                              |   |                                    | Leeds Laborat    | ory                                     |              |                                      |       |  |  |  |
| Sushil S                            | Sharda                                    |                                    | Dovision N-      | 2.07                                    |              | Print date 28/11/2                   | 2013  | SOIL ENGINEERING                       |  |  |
|                                     |   |                                    | Revision No.     | 2.07                                    | Issue Date   | 19/11/2012                           |       | Part of the Bachy Soletanche Group     |  |  |

|   |                                    | Bay of Nigg Ha<br>Investigation<br>TA7148 | arbour Develo   | opment Gi   | round                            | Liqu             | uid And Pl<br>Limit Tes           |             | Hole ID<br>TP05<br>Sample Depth                 |          |  |
|---|------------------------------------|---|-----------------|-------------|----------------------------------|------------------|-----------------------------------|-------------|---|----------|--|
| Project<br>Enginee  |                                    | Arch Henderso                             | on LLP          |             |                                  |                  |                                   |             | 1.50m Sample Number                             |          |  |
| Employ  |                                    | Aberdeen Harl                             |                 |             |                                  |                  | hod: BS1377: Pa<br>Clause 4.4 and |             | 005<br>Sample Type<br>B                         |          |  |
| Descript  | tion                               | Grey mottled br                           | own slightly sa | andy gravel | ly CLAY. G                       |                  |                                   |             | Specimen Depth<br>1.50m<br>Specimen Number<br>1 |          |  |
|   | <sup>27</sup> T                    |   |                 |             |                                  |                  |                                   |             |   |          |  |
|   | 25                                 |   |                 |             |                                  |                  |                                   | •           |   |          |  |
| E<br>E  | 23                                 |   |                 |             |                                  |                  |                                   |             |   |          |  |
| ration  | 21                                 |   |                 |             |                                  |                  |                                   |             |   |          |  |
| Cone Penetration mm   | 19 <del> </del><br>17 <del> </del> |   |                 | <i>&gt;</i> |                                  |                  |                                   |             |   |          |  |
| Cone  | 15                                 |   | •               |             |                                  |                  |                                   |             |   |          |  |
|   | 13                                 |   |                 |             |                                  |                  |                                   |             |   |          |  |
|   | 20                                 | 1   | 22              |             | 24                               | Ct               | 26                                | 28          | 30  |          |  |
| Natural r   | moistur                            | e content:                                |                 |             | 12%                              | ture Conte       | ent %<br>e retained on 4          | 25μm sieve: | 44%   |          |  |
| Liquid lir<br>Plastic li<br>Plasticity<br>Moisture<br>Liquidity | mit:<br>y index:<br>e conter       | nt of soil passing                        | յ 425μm         |             | 26%<br>14%<br>12%<br>22%<br>0.67 | _                | n of sample: W                    | •           |   |          |  |
| qu.u.s  |                                    |   |                 |             | 0.0.                             |                  |                                   |             |   |          |  |
|   | 100 -                              |   | CL              |             | (                                | Cl               | СН                                | CV          | CE  |          |  |
|   | 80 -                               |   |                 |             |                                  |                  |                                   |             |   |          |  |
| (%)xəpu   | 60 -                               |   |                 |             |                                  |                  |                                   |             |   |          |  |
| Plasticity Index(%)   | 40 -                               |   |                 |             |                                  |                  |                                   |             |   |          |  |
| <u> </u>  | 20 -                               |   |                 |             |                                  | 1                |                                   |             |   |          |  |
|   | 0 -                                |   | ML 30           |             |                                  | MI FO            | МН                                | M)          | •   | <u> </u> |  |
|   |                                    | 0 10                                      | 20              | 30          | 40<br>L                          | 50<br>iquid Limi | 60<br>t (%)                       | 70 80       | 90 100  | J        |  |
| Approve<br>Sushil SI  | -                                  |   | Leeds Labor     | ratory      |                                  |                  | Print date 28/1                   | 1/2013      | SOIL ENGINEERII                                 | ng       |  |
|   |                                    |   | Revision No.    | 2.07        |                                  | Issue Date       | 19/11/2012                        |             | Part of the Bachy Soletanche                    |          |  |

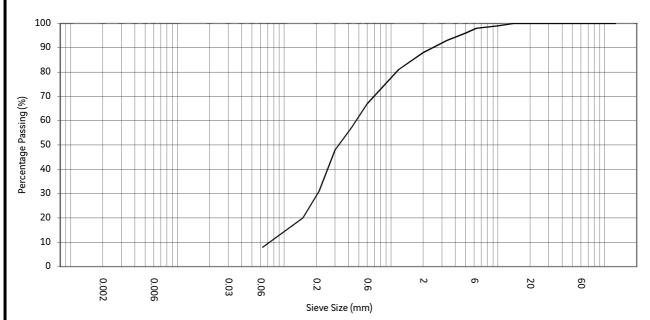
| Project Name                       | Bay of Nigg Ha           | arbour Develo       | pment Ground | Liquid And Pl                             |                  | Hole ID<br>TP09                    |  |  |
|------------------------------------|--------------------------|---------------------|--------------|---|------------------|------------------------------------|--|--|
| Project No.                        | TA7148                   |                     |              | Limit Tes                                 | t                | Sample Depth                       |  |  |
| Engineer                           | Arch Henders             | on II P             |              |   |                  | 2.50m<br>Sample Number             |  |  |
|                                    | Alciillelluels           | JII LLI             |              |   |                  | 800                                |  |  |
| Employer                           | Aberdeen Harl            | bour Board          |              | Test Method: BS1377: Pa<br>Clause 4.3 and | Sample Type<br>D |                                    |  |  |
| Description                        | Brown slightly o         | gravelly slightly o | clayey SAND. | Clause 4.5 allu                           | Specimen Depth   |                                    |  |  |
|                                    |                          |                     |              |   |                  | 2.50m<br>Specimen Number           |  |  |
|                                    |                          |                     |              |   |                  | Specimen Number  1                 |  |  |
|                                    |                          |                     |              |   |                  |                                    |  |  |
| 27 -                               |                          |                     |              |   |                  |                                    |  |  |
| 25 -                               |                          |                     |              |   |                  |                                    |  |  |
|                                    |                          |                     |              | 7   |                  |                                    |  |  |
| 23 -<br>E                          |                          |                     |              |   |                  |                                    |  |  |
| ⊆ 21 -                             |                          |                     |              |   |                  |                                    |  |  |
| stratic<br>19 -                    |                          |                     |              |   |                  |                                    |  |  |
| enet                               |                          |                     |              | <i>/</i> *                                |                  |                                    |  |  |
| Cone Penetration mm 12 - 11        |                          |                     |              | /   |                  |                                    |  |  |
| රි<br>15 -                         |                          |                     | - ✓          |   |                  |                                    |  |  |
| 15                                 |                          |                     |              |   |                  |                                    |  |  |
| 13 -                               | 0                        | 1.                  | 10           | 22  | 20               |                                    |  |  |
| 1                                  | 0                        | 14                  | 18           | 22  | 26               | 30                                 |  |  |
|                                    |                          |                     | Moi          | sture Content %                           |                  |                                    |  |  |
| Natural moistu                     | re content:              |                     | 15%          | Percentage retained on 4                  | 25um sieve:      | 34%                                |  |  |
| Liquid limit:                      |                          |                     | 20%          | Preparation of sample: W                  |                  |                                    |  |  |
| Plastic limit:                     |                          |                     | NP<br>NP     | Remarks:                                  |                  |                                    |  |  |
| Plasticity index<br>Moisture conte | :<br>ent of soil passing | յ 425μm             | 23%          |   |                  |                                    |  |  |
| Liquidity index:                   |                          | , ,<br>             |              |   |                  |                                    |  |  |
|                                    |                          |                     |              |   |                  |                                    |  |  |
| 100                                |                          | CL                  |              | CI CIII                                   | CV               | CF                                 |  |  |
|                                    |                          | CL                  |              | СІ СН                                     | CV               | CE                                 |  |  |
| 80                                 |                          |                     |              |   |                  |                                    |  |  |
|                                    |                          |                     |              |   |                  |                                    |  |  |
| Plasticity Index(%) 6 0            |                          |                     |              |   |                  |                                    |  |  |
| Inde                               |                          |                     |              |   |                  |                                    |  |  |
| icity<br>40                        |                          |                     |              |   |                  |                                    |  |  |
| lasti                              |                          |                     |              |   |                  |                                    |  |  |
|                                    |                          |                     |              |   |                  |                                    |  |  |
| 20                                 |                          |                     |              |   |                  |                                    |  |  |
| _                                  |                          | ML                  | 1            | мі мн                                     | MV               | , ME                               |  |  |
| 0                                  | 0 10                     | 20                  | 30 40        | 50 60                                     | 70 80            | 1                                  |  |  |
|                                    | _ 10                     | 20                  |              |   |                  | 100                                |  |  |
|                                    |                          |                     |              | Liquid Limit (%)                          |                  |                                    |  |  |
|                                    |                          |                     |              | 1   |                  | т-                                 |  |  |
| Approved by:                       |                          | Leeds Labora        | atory        |   |                  |                                    |  |  |
| Sushil Sharda                      |                          |                     |              |   | 1/2013           | SOIL ENGINEERING                   |  |  |
|                                    | <del></del>              | Revision No.        | 2.07         | Issue Date 19/11/2012                     |                  | Part of the Bachy Soletanche Group |  |  |

| Project Name                         | Bay of Nigg H<br>Investigation | arbour Develo    | opment Gro     | und         | Liq  | uid And P                           |    | Hole ID<br>TP11       |  |  |
|--------------------------------------|--------------------------------|------------------|----------------|-------------|--|-------------------------------------|----|-----------------------|--|--|
| Project No.                          | TA7148                         |                  |                |             |  | Limit Tes                           | ST | Sample Depth<br>2.80m |  |  |
| Engineer                             | Arch Henders                   | on LLP           |                |             |  |                                     |    | Sample Number<br>007  |  |  |
| Employer                             | Aberdeen Har                   | bour Board       |                |             | Test Me  | thod: BS1377: P<br>Clause 4.3 and   |    | Sa                    | imple Type<br>B                          |  |
| Description                          | Brown slightly s               | sandy gravelly ( | CLAY. Gravel i | s fine to   | o coarse ang   |                                     |    | -                     | cimen Depth<br>2.80m<br>imen Number<br>1 |  |
| 27                                   |                                |                  |                |             |  |                                     |    |                       |  |  |
| 25                                   |                                |                  |                |             |  |                                     |    |                       |  |  |
| 23 +                                 |                                |                  |                |             |  |                                     |    |                       |  |  |
| Cone Penetration mm 17 -             |                                |                  |                |             |  |                                     |    |                       |  |  |
| stratio                              |                                |                  |                |             | <u>/</u>   |                                     |    |                       |  |  |
| Pene                                 |                                |                  |                |             |  |                                     |    |                       |  |  |
|                                      |                                |                  |                |             |  |                                     |    |                       |  |  |
| 15 +                                 |                                |                  | •              |             |  |                                     |    |                       |  |  |
| 13 1                                 | <u> </u>                       | 24               |                | 28          |  | 32                                  |    | 86                    | 40                                       |  |
| 20                                   | ,                              | <b>4</b> 4       |                |             | - <b></b>  |                                     | 3  | ,,                    | 4∪                                       |  |
|                                      |                                |                  |                |             | sture Cont   |                                     |    |                       |  |  |
| Natural moisture<br>Liquid limit:    | e content:                     |                  |                | 5.9%<br>29% | _  | ge retained on 4<br>on of sample: W |    |                       | 44%                                      |  |
| Plastic limit:                       |                                |                  |                | 19%         | Remarks:   |                                     |    |                       |  |  |
| Plasticity index:<br>Moisture conter |                                | g 425µm          |                | 10%<br>11%  |  |                                     |    |                       |  |  |
| Liquidity index:                     |                                |                  |                | -0.84       |  |                                     |    |                       |  |  |
| 100                                  |                                |                  |                |             |  |                                     |    |                       |  |  |
| 100 -                                |                                | CL               |                |             | CI   | СН                                  |    | CV                    | CE                                       |  |
| 80 -                                 |                                |                  |                |             |  |                                     |    |                       |  |  |
| (%                                   |                                |                  |                |             |  |                                     |    |                       |  |  |
| %) 60 -                              |                                |                  |                |             |  |                                     |    |                       |  |  |
| Plasticity Index(%)                  |                                |                  |                |             |  |                                     |    |                       |  |  |
| <u>e</u><br>20 -                     |                                |                  |                |             |  |                                     |    |                       |  |  |
| 20 -                                 |                                |                  |                | _           |  |                                     |    |                       |  |  |
| 0 -                                  |                                | ML               |                | 1           | MI   | МН                                  | 7  | MV                    | ME                                       |  |
|                                      | 0 10                           | 20               | 30             | 40<br>I     | 50<br>Liquid Limi  | 60<br>it (%)                        | 70 | 80                    | 90 100                                   |  |
|                                      |                                | 11-2-2           |                |             |  |                                     |    | Т                     | 48*                                      |  |
| Approved by:<br>Sushil Sharda        |                                | Leeds Labor      | ratory         |             |  |                                     |    |                       |  |  |
| Justill Stidlud                      |                                |                  |                |             | Print date 28/11/2013 <b>SOIL ENGINEER</b> Issue Date 19/11/2012 Part of the Bachy Soletanch |                                     |    |                       | i engineeping                            |  |

| Project Nar  |             | f Nigg Ha<br>tigation | rbour Deve  | elopment G | round  | Liq                   | uid And P                          |                | Hole ID<br>TP13 |                               |  |
|--|-------------|-----------------------|-------------|------------|--|-----------------------|------------------------------------|----------------|-----------------|-------------------------------|--|
| Project No.  |             |                       |             |            |  |                       | Limit Te                           | st             |                 | Sample Depth<br>3.50m         |  |
| Engineer   | Arch        | Henderso              | n LLP       |            |  |                       |                                    |                |                 | Sample Number<br>008          |  |
| Employer   | Abero       | deen Harb             | our Board   |            |  | Test M                | ethod: BS1377:  <br>Clause 4.3 an  |                |                 | Sample Type<br>D              |  |
| Description  | Brown       | n sandy gra           | velly CLAY. |            |  | <u> </u>              | 2.2.200 1.0 dil                    | <del>- •</del> |                 | Specimen Depth                |  |
| 27 25 23 24 21 25 26 27 27 27 28 20 21 21 21 21 21 21 21 21 21 21 21 21 21 | sture conte | ent:                  | 22          |            | 24<br>Moi<br>7.0%<br>27%<br>15%<br>12%<br>11%<br>-0.32 |                       | ge retained on<br>ion of sample: \ | •              | 28              | 3.50m<br>Specimen Number<br>1 |  |
| 4.0  |             |                       |             |            |  |                       |                                    |                |                 |                               |  |
| 10   |             |                       | CL          |            |  | CI                    | СН                                 |                | CV              | CE                            |  |
| 8  | 80          |                       |             |            |  | -                     |                                    |                |                 |                               |  |
| Index(%)   | 50          |                       |             |            |  | -                     |                                    |                |                 |                               |  |
| Plasticity Index(%)  | 60          |                       |             |            |  |                       |                                    |                |                 |                               |  |
| 2  | 20          |                       |             | <b>A</b>   |  | 1                     |                                    |                |                 |                               |  |
|  | 0           |                       | VIL 20      |            | -  | МІ                    | МН                                 | 70             | MV              | ME 100                        |  |
|  | 0           | 10                    | 20          | 30         | 40   | 50<br>Liquid Lin      | 60<br>nit (%)                      | 70             | 80              | 90 100                        |  |
| A m. m. co   |             |                       | l oods Lat  | oratoni    |  |                       |                                    |                | Т               |                               |  |
| Approved by  | y:          |                       | Leeds Lab   | oratory    |  | Print date 28/11/2013 |                                    |                |                 | SOIL ENGINEERING              |  |
| Sushil Shard   | da          |                       |             |            |  |                       | Daine des                          | /11 /2012      |                 | SOIL EDGIDEEDIDG              |  |

|                     |                       | Bay of Nigg H<br>Investigation | arbour Devel | opment G | uid And Pl<br>Limit Tes |            | Hole ID<br>TP17                   |                    |   |            |  |
|---------------------|-----------------------|--------------------------------|--------------|----------|-------------------------|------------|-----------------------------------|--------------------|---|------------|--|
| Project             | t No.                 | TA7148                         |              |          |                         |            | FIIII 162                         | •                  | Sample De<br>1.20m                        |            |  |
| Engine              | er                    | Arch Henders                   | on LLP       |          |                         |            |                                   |                    | Sample Number<br>003                      |            |  |
| Employ              | yer                   | Aberdeen Har                   | bour Board   |          |                         | Test Met   | hod: BS1377: Pa<br>Clause 4.4 and |                    | Sample Type<br>D                          |            |  |
| Descrip             | otion                 | Brown slightly o               | clayey SAND. |          |                         |            |                                   |                    | Specimen De<br>1.20m                      | epth       |  |
|                     |                       |                                |              |          |                         |            |                                   |                    | Specimen Nu                               | mber       |  |
|                     |                       |                                |              |          |                         |            |                                   |                    | 1   |            |  |
|                     | <sup>27</sup> T       |                                |              |          |                         |            |                                   |                    |   |            |  |
|                     | 25                    |                                |              |          |                         |            |                                   |                    |   |            |  |
| _                   | 23                    |                                |              |          |                         |            |                                   |                    |   |            |  |
| שש ר                | 21                    |                                |              |          |                         |            |                                   |                    |   |            |  |
| tratior             | 19                    |                                | •            |          |                         |            |                                   |                    |   |            |  |
| Cone Penetration mm |                       |                                |              |          |                         |            |                                   |                    |   |            |  |
| Cone                | 17 +                  |                                |              |          |                         |            |                                   |                    |   |            |  |
|                     | 15 +                  |                                |              |          |                         |            |                                   |                    |   |            |  |
|                     | 13 <del> </del><br>20 |                                | 22           |          | 24                      |            | 26                                | 28                 |   | <br>30     |  |
|                     |                       |                                |              |          |                         |            |                                   |                    |   |            |  |
|                     |                       |                                |              |          | Mois                    | ture Conte | ent %                             |                    |   |            |  |
|                     |                       | e content:                     |              |          | 25%                     |            |                                   | ained on 425µm     | sieve:                                    | 0%         |  |
| Liquid li           |                       |                                |              |          | 22%                     | -          | n of sample: Na                   |                    |   |            |  |
| Plastic I           | limit:<br>ty index:   |                                |              |          | NP<br>NP                | Remarks:   |                                   |                    | due to the sample<br>It to get all four p |            |  |
|                     |                       | nt of soil passing             | g 425µm      |          | 25%                     |            | line.                             | it is very difficu | it to get all lour p                      | onits on a |  |
| Liquidity           |                       |                                |              |          |                         |            |                                   |                    |   |            |  |
|                     |                       |                                |              |          |                         |            |                                   |                    |   |            |  |
|                     | 100 -                 |                                | CL           |          |                         | CI         | СН                                | CV                 | CE  |            |  |
|                     |                       |                                |              |          |                         |            |                                   |                    |   |            |  |
|                     | 80 -                  |                                |              |          |                         |            |                                   |                    |   |            |  |
| (%)xə               | 60 -                  |                                |              |          |                         |            |                                   |                    |   |            |  |
| ty Ind              |                       |                                |              |          |                         |            |                                   |                    |   |            |  |
| Plasticity Index(%) | 40 -                  |                                |              |          |                         |            |                                   |                    |   |            |  |
| <u>.</u>            | 20 -                  |                                |              |          |                         | $\nearrow$ |                                   |                    |   |            |  |
|                     |                       |                                | ML           |          |                         | ΜI         | МН                                | M                  | / ME                                      |            |  |
|                     | 0 -                   | ) 10                           | 20           | 30       | 40                      | 50         | 60                                | 70 80              | Ť   | 100        |  |
|                     |                       |                                |              |          |                         | iquid Limi |                                   |                    |   |            |  |
| Approve             | ed by:                |                                | Leeds Labo   | ratory   |                         |            |                                   |                    |   |            |  |
| Sushil S            | -                     |                                |              | -        |                         |            | Print date 28/11                  | ./2013             | soil engir                                | eering     |  |
|                     |                       |                                | Revision No. | 2.07     |                         | Issue Date | 19/11/2012                        |                    | Part of the Bachy So                      |            |  |

| Project Name | Bay of Nigg Harbour Development Ground | Particle Size              | Hole ID        |
|--------------|--|----------------------------|----------------|
|              | Investigation                          |                            | D101           |
| Project No.  | TA7148                                 | Distribution               | Sample Depth   |
|              |  |                            | 1.50m          |
| Engineer     | Arch Henderson LLP                     |                            | Sample Number  |
| ŭ            |  |                            | 004            |
| Employer     | Aberdeen Harbour Board                 | PC 1277, Part 2, 1000, 0.2 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brown slightly gravelly SAND.          |                            | Specimen Depth |
|              |  |                            | 1.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

 Silt and clay:
 8

 Sand:
 80

 Gravel:
 12

 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 99         |
|               |            | 6.3        |    | 98         |
| 125.0         | 100        | 5.0        |    | 96         |
| 90.0          | 100        | 3.35       |    | 93         |
| 75.0          | 100        | 2.00       |    | 88         |
| 63.0          | 100        | 1.18       |    | 81         |
| 50.0          | 100        | 0.600      |    | 67         |
| 37.5          | 100        | 0.425      |    | 57         |
| 28.0          | 100        | 0.300      |    | 48         |
| 20.0          | 100        | 0.212      |    | 31         |
|               |            | 0.150      |    | 20         |
|               |            | 0.063      |    | 8          |

Approved by:

Sushil Sharda

Revision No. 3.03

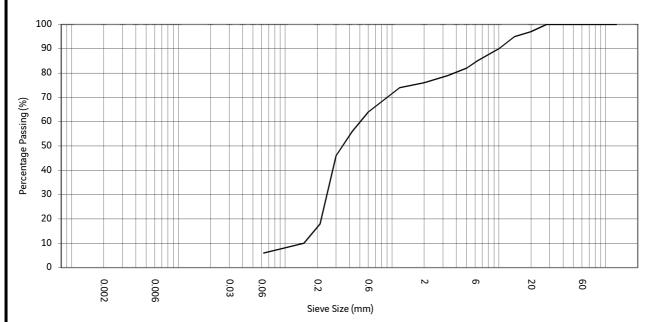
Leeds Laboratory

Print date 28/11/2013

Revision No. 1 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground            | Particle Size              | Hole ID        |
|--------------|---|----------------------------|----------------|
|              | Investigation                                     | Distribution               | D101           |
| Project No.  | TA7148  | Distribution               | Sample Depth   |
|              |   |                            | 3.50m          |
| Engineer     | Arch Henderson LLP                                |                            | Sample Number  |
|              |   |                            | 008            |
| Employer     | Aberdeen Harbour Board                            | BS 1377: Part 2: 1990: 9.2 | Sample type    |
|              |   | BS 1377. Part 2. 1990. 9.2 | В              |
| Description  | Brown slightly gravelly SAND. Gravel is medium to | coarse subrounded.         | Specimen Depth |
|              |   |                            | 3.50m          |
|              |   |                            | Specimen No.   |
|              |   |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 6
Sand: 71
Gravel: 24
Cobbles: 0

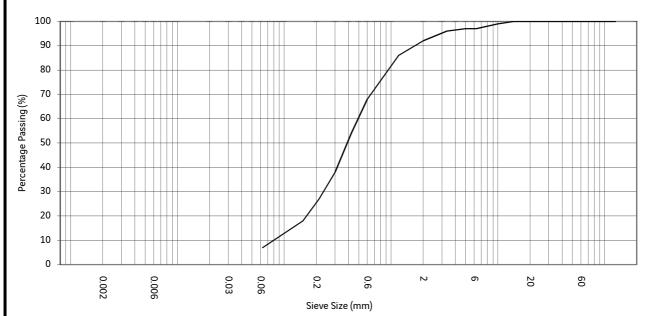
| T          |           |
|------------|-----------|
| C          | remarks   |
| ICaenera I | ı remarks |

|               | WET SIEVE DATA |               |            |  |  |  |
|---------------|----------------|---------------|------------|--|--|--|
| Sieve size mm | Cumulative     | Sieve size mm | Cumulative |  |  |  |
|               | % passing      |               | % passing  |  |  |  |
|               |                | 14.0          | 95         |  |  |  |
|               |                | 10.0          | 90         |  |  |  |
|               |                | 6.3           | 85         |  |  |  |
| 125.0         | 100            | 5.0           | 82         |  |  |  |
| 90.0          | 100            | 3.35          | 79         |  |  |  |
| 75.0          | 100            | 2.00          | 76         |  |  |  |
| 63.0          | 100            | 1.18          | 74         |  |  |  |
| 50.0          | 100            | 0.600         | 64         |  |  |  |
| 37.5          | 100            | 0.425         | 56         |  |  |  |
| 28.0          | 100            | 0.300         | 46         |  |  |  |
| 20.0          | 97             | 0.212         | 18         |  |  |  |
|               |                | 0.150         | 10         |  |  |  |
|               |                | 0.063         | 6          |  |  |  |

| Approved by:  | Leeds Laboratory  |   |            |            |            |
|---------------|-------------------|---|------------|------------|------------|
| Sushil Sharda |                   |   |            | Print date | 28/11/2013 |
|               | Revision No. 3.03 | I | Issue Date | 19/11/20   | 012        |



| Project Name | Bay of Nigg Harbour Development Ground | Particle Size              | Hole ID<br>L01          |
|--------------|--|----------------------------|-------------------------|
| Project No.  | Investigation<br>TA7148                | Distribution               | Sample Depth<br>0.50m   |
| Engineer     | Arch Henderson LLP                     |                            | Sample Number<br>001    |
| Employer     | Aberdeen Harbour Board                 | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B        |
| Description  | Brown SAND with occasional gravel.     |                            | Specimen Depth<br>0.50m |
|              |  |                            | Specimen No.<br>1       |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 Silt and clay:
 7

 Sand:
 85

 Gravel:
 8

 Cobbles:
 0

General remarks

|               | WET SIEVE DATA |               |            |  |  |  |
|---------------|----------------|---------------|------------|--|--|--|
| Sieve size mm | Cumulative     | Sieve size mm | Cumulative |  |  |  |
|               | % passing      |               | % passing  |  |  |  |
|               |                | 14.0          | 100        |  |  |  |
|               |                | 10.0          | 99         |  |  |  |
|               |                | 6.3           | 97         |  |  |  |
| 125.0         | 100            | 5.0           | 97         |  |  |  |
| 90.0          | 100            | 3.35          | 96         |  |  |  |
| 75.0          | 100            | 2.00          | 92         |  |  |  |
| 63.0          | 100            | 1.18          | 86         |  |  |  |
| 50.0          | 100            | 0.600         | 68         |  |  |  |
| 37.5          | 100            | 0.425         | 54         |  |  |  |
| 28.0          | 100            | 0.300         | 38         |  |  |  |
| 20.0          | 100            | 0.212         | 27         |  |  |  |
|               |                | 0.150         | 18         |  |  |  |
|               |                | 0.063         | 7          |  |  |  |

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Sushil Sharda

Revision No. 3.03

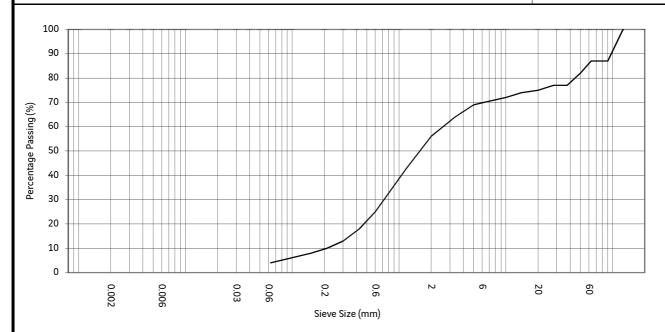
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Print date 28/11/2013

Revision No. 1 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground            | Particle Size              | Hole ID        |
|--------------|---|----------------------------|----------------|
|              | Investigation                                     |                            | L01            |
| Project No.  | TA7148  | Distribution               | Sample Depth   |
|              |   |                            | 2.50m          |
| Engineer     | Arch Henderson LLP                                |                            | Sample Number  |
|              |   |                            | 005            |
| Employer     | Aberdeen Harbour Board                            | BS 1377: Part 2: 1990: 9.2 | Sample type    |
| ] ' '        |   | BS 1377. Part 2. 1990. 9.2 | В              |
| Description  | Brown gravelly SAND. Gravel is medium to coarse s | ubrounded with cobbles.    | Specimen Depth |
|              |   |                            | 2.50m          |
|              |   |                            | Specimen No.   |
|              |   |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

14

Silt and clay: 4 Sand: 52 Gravel: 30 Cobbles:

General remarks

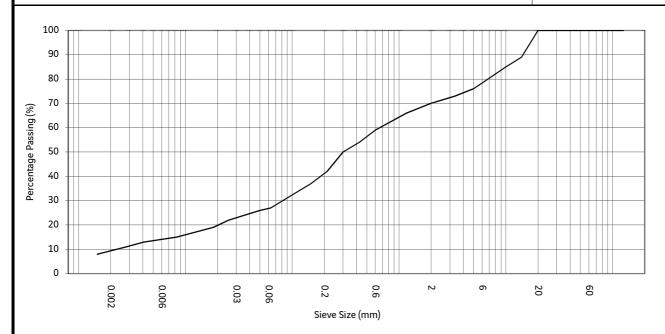
Sample size was insufficient to be representative of particle size

|               | WET SIEV   | 'E DATA       |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 74         |
|               |            | 10.0          | 72         |
|               |            | 6.3           | 70         |
| 125.0         | 100        | 5.0           | 69         |
| 90.0          | 87         | 3.35          | 64         |
| 75.0          | 87         | 2.00          | 56         |
| 63.0          | 87         | 1.18          | 43         |
| 50.0          | 82         | 0.600         | 25         |
| 37.5          | 77         | 0.425         | 18         |
| 28.0          | 77         | 0.300         | 13         |
| 20.0          | 75         | 0.212         | 10         |
|               |            | 0.150         | 8          |
|               |            | 0.063         | 4          |

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| Project Name | Bay of Nigg Harbour Development Ground               | Particle Size                   | Hole ID        |
|--------------|--|---------------------------------|----------------|
|              | Investigation  |                                 | A05            |
| Project No.  | TA7148   | Distribution                    | Sample Depth   |
|              |  |                                 | 1.40m          |
| Engineer     | Arch Henderson LLP                                   |                                 | Sample Number  |
|              |  |                                 | 001            |
| Employer     | Aberdeen Harbour Board                               | DC 1277, Dow+ 2, 1000, 0.2. 0.E | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2, 9.5 | В              |
| Description  | Brown slightly clayey slightly gravelly SAND. Gravel | is fine to medium.              | Specimen Depth |
|              |  |                                 | 1.40m          |
|              |  |                                 | Specimen No.   |
|              |  |                                 | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAT |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 9

 Silt:
 18

 Sand:
 43

 Gravel:
 30

 Cobbles:
 0

General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | SEDIMENTAT    | ION DATA   |             |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 89         | diameter mm |            |
|               |            | 10.0          | 85         | 0.0501      | 26         |
|               |            | 6.3           | 79         | 0.0255      | 22         |
| 125.0         | 100        | 5.0           | 76         | 0.0183      | 19         |
| 90.0          | 100        | 3.35          | 73         | 0.0083      | 15         |
| 75.0          | 100        | 2.00          | 70         | 0.0041      | 13         |
| 63.0          | 100        | 1.18          | 66         | 0.0028      | 11         |
| 50.0          | 100        | 0.600         | 59         | 0.0015      | 8          |
| 37.5          | 100        | 0.425         | 54         |             |            |
| 28.0          | 100        | 0.300         | 50         |             |            |
| 20.0          | 100        | 0.212         | 42         |             |            |
|               |            | 0.150         | 37         |             |            |
|               |            | 0.063         | 27         |             |            |

Approved by:

Sushil Sharda

Revision No. 3.03

Leeds Laboratory

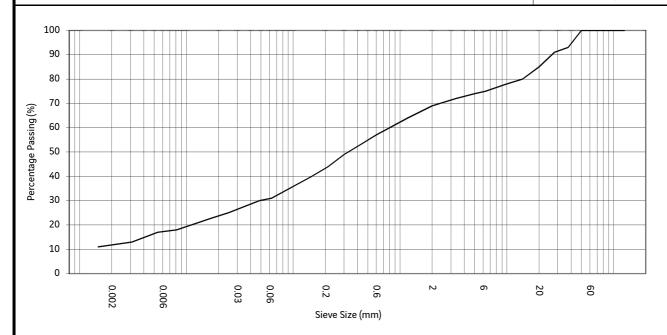
Print date 28/11/2013

Revision No. 1.03

Revision No. 2.03



| Project Name | ct Name Bay of Nigg Harbour Development Ground Particle Size |                                 | Hole ID          |
|--------------|--|---------------------------------|------------------|
|              | Investigation  |                                 | A05              |
| Project No.  | TA7148   | Distribution                    | Sample Depth     |
|              |  |                                 | 5.98m            |
| Engineer     | Arch Henderson LLP   |                                 | Sample Number    |
| Employer     | Aberdeen Harbour Board                                       | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type<br>C |
| Description  | Brown gravelly sandy CLAY. Gravel is medium to coa           | arse subangular.                | Specimen Depth   |
| -            |  |                                 | 5.98m            |
|              |  |                                 | Specimen No.     |
|              |  |                                 | 3                |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 12

 Silt:
 19

 Sand:
 38

 Gravel:
 31

 Cobbles:
 0

General remarks

|               | WET SIEV   |               | SEDIMENTAT | ION DATA    |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 80         | diameter mm |            |
|               |            | 10.0          | 78         | 0.0484      | 30         |
|               |            | 6.3           | 75         | 0.0248      | 25         |
| 125.0         | 100        | 5.0           | 74         | 0.0177      | 23         |
| 90.0          | 100        | 3.35          | 72         | 0.0081      | 18         |
| 75.0          | 100        | 2.00          | 69         | 0.0054      | 17         |
| 63.0          | 100        | 1.18          | 64         | 0.0031      | 13         |
| 50.0          | 100        | 0.600         | 57         | 0.0015      | 11         |
| 37.5          | 93         | 0.425         | 53         |             |            |
| 28.0          | 91         | 0.300         | 49         |             |            |
| 20.0          | 85         | 0.212         | 44         |             |            |
|               |            | 0.150         | 40         |             |            |
|               |            | 0.063         | 31         |             |            |

| Approved by:  | Leeds Laborato | ory  |            |            |            |
|---------------|----------------|------|------------|------------|------------|
| Sushil Sharda |                |      |            | Print date | 28/11/2013 |
|               | Revision No    | 3.03 | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                    | Hole ID        |
|--------------|---|----------------------------------|----------------|
|              | Investigation                                       |                                  | A08            |
| Project No.  | TA7148  | Distribution                     | Sample Depth   |
| '            |   |                                  | 0.50m          |
| Engineer     | Arch Henderson LLP                                  |                                  | Sample Number  |
|              |   |                                  | 001            |
| Employer     | Aberdeen Harbour Board                              | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2, 9.5  | В              |
| Description  | Orangish brown mottled grey slightly clayey sandy ( | GRAVEL                           | Specimen Depth |
|              |   |                                  | 0.50m          |
|              |   |                                  | Specimen No.   |
|              |   |                                  | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 5

 Silt:
 13

 Sand:
 27

 Gravel:
 55

 Cobbles:
 0

General remarks

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   |               | SEDIMENTAT | ION DATA    |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 86         | diameter mm |            |
|               |            | 10.0          | 78         | 0.0497      | 18         |
|               |            | 6.3           | 64         | 0.0257      | 13         |
| 125.0         | 100        | 5.0           | 58         | 0.0183      | 12         |
| 90.0          | 100        | 3.35          | 51         | 0.0083      | 10         |
| 75.0          | 100        | 2.00          | 45         | 0.0044      | 8          |
| 63.0          | 100        | 1.18          | 40         | 0.0029      | 6          |
| 50.0          | 100        | 0.600         | 34         | 0.0015      | 4          |
| 37.5          | 100        | 0.425         | 32         |             |            |
| 28.0          | 100        | 0.300         | 29         |             |            |
| 20.0          | 93         | 0.212         | 26         |             |            |
|               |            | 0.150         | 23         |             |            |
|               |            | 0.063         | 17         |             |            |

 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                   | Hole ID          |  |
|--------------|---|---------------------------------|------------------|--|
|              | Investigation                                       |                                 | A08              |  |
| Project No.  | TA7148  | Distribution                    | Sample Depth     |  |
|              |   |                                 | 7.73m            |  |
| Engineer     | Arch Henderson LLP                                  |                                 | Sample Number    |  |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type<br>C |  |
| Description  | Brown gravelly sandy CLAY. Gravel is fine to coarse | subangular.                     | Specimen Depth   |  |
|              |   |                                 | 7.73m            |  |
|              |   |                                 | Specimen No.     |  |
|              |   |                                 | 3                |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

General remarks

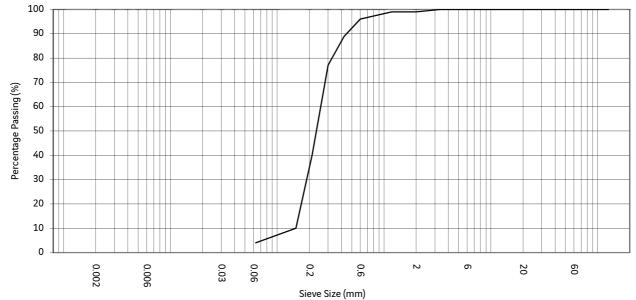
Sample size was insufficient to be representative of particle size

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | ION DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 79         | diameter mm |            |
|               |            | 10.0          | 77         | 0.0481      | 29         |
|               |            | 6.3           | 75         | 0.0246      | 25         |
| 125.0         | 100        | 5.0           | 73         | 0.0175      | 24         |
| 90.0          | 100        | 3.35          | 71         | 0.0093      | 20         |
| 75.0          | 100        | 2.00          | 68         | 0.0057      | 17         |
| 63.0          | 100        | 1.18          | 65         | 0.0031      | 14         |
| 50.0          | 100        | 0.600         | 59         | 0.0015      | 11         |
| 37.5          | 100        | 0.425         | 55         |             |            |
| 28.0          | 87         | 0.300         | 51         |             |            |
| 20.0          | 83         | 0.212         | 46         |             |            |
|               |            | 0.150         | 42         |             |            |
|               |            | 0.063         | 31         |             |            |

| Approved by: | Leeds Laborato |      |            |            |            |
|--------------|----------------|------|------------|------------|------------|
| Stuart Kirk  |                |      |            | Print date | 28/11/2013 |
|              | Revision No.   | 3.03 | Issue Date | 19/11/2    | 012        |



| Project Name<br>Project No. | Bay of Nigg Harbour Development Ground<br>Investigation<br>TA7148 | Particle Size Distribution | Hole ID A11 Sample Depth 0.00m               |  |  |
|-----------------------------|---|----------------------------|--|--|--|
| Engineer<br>Employer        | Arch Henderson LLP  Aberdeen Harbour Board                        | BS 1377: Part 2: 1990: 9.2 | Sample Number<br>002<br>Sample type<br>B     |  |  |
| Description                 | Brown SAND  |                            | Specimen Depth<br>0.00m<br>Specimen No.<br>1 |  |  |
| 100                         |   |                            |  |  |  |
| 90                          |   |                            |  |  |  |
| 70                          |   |                            |  |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | L      | COBBLES |

 Silt and clay:
 4

 Sand:
 95

 Gravel:
 1

 Cobbles:
 0

General remarks

|               | WET SIEVE    | DATA       |    |            |
|---------------|--------------|------------|----|------------|
| Sieve size mn | n Cumulative | Sieve size | mm | Cumulative |
|               | % passing    |            |    | % passing  |
|               |              | 14.0       |    | 100        |
|               |              | 10.0       |    | 100        |
|               |              | 6.3        |    | 100        |
| 125.0         | 100          | 5.0        |    | 100        |
| 90.0          | 100          | 3.35       |    | 100        |
| 75.0          | 100          | 2.00       |    | 99         |
| 63.0          | 100          | 1.18       |    | 99         |
| 50.0          | 100          | 0.600      | )  | 96         |
| 37.5          | 100          | 0.425      | ;  | 89         |
| 28.0          | 100          | 0.300      | )  | 77         |
| 20.0          | 100          | 0.212      | !  | 40         |
|               |              | 0.150      | )  | 10         |
|               |              | 0.063      | 1  | 4          |

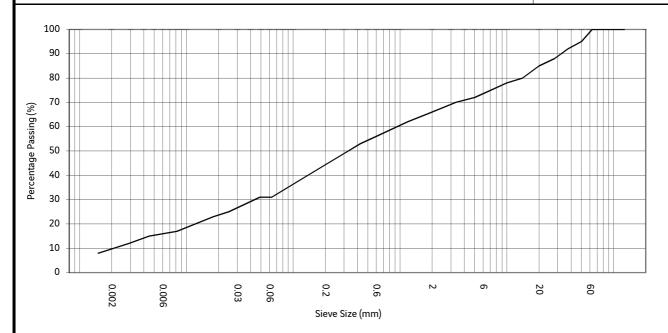
 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                   | Hole ID          |
|--------------|---|---------------------------------|------------------|
|              | Investigation                                       |                                 | A11              |
| Project No.  | TA7148  | Distribution                    | Sample Depth     |
| <b>l</b> '   |   |                                 | 8.58m            |
| Engineer     | Arch Henderson LLP                                  |                                 | Sample Number    |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type<br>C |
| Description  | Brown gravelly sandy CLAY. Gravel is fine to coarse | subangular.                     | Specimen Depth   |
|              |   |                                 | 8.58m            |
|              |   |                                 | Specimen No.     |
|              |   |                                 | 2                |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 9

 Silt:
 22

 Sand:
 35

 Gravel:
 33

 Cobbles:
 1

General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m<sup>3</sup> Assumed

| WET SIEVE DATA SEDIMEN  Sieve size mm Cumulative Sieve size mm Cumulative Equivalent | ITATION DATA  Cumulative |
|--|--------------------------|
| Sieve size mm Cumulative Sieve size mm Cumulative Equivalent                         | Cumulative               |
| -1   |                          |
| % passing % passing particle   | % passing                |
| 14.0 80 diameter mm  |                          |
| 10.0 78 0.0488   | 31                       |
| 6.3 74 0.0250  | 25                       |
| 125.0 100 5.0 72 0.0179  | 23                       |
| 90.0 100 3.35 70 0.0082  | 17                       |
| 75.0 100 2.00 66 0.0045  | 15                       |
| 63.0 100 1.18 62 0.0029  | 12                       |
| 50.0 95 0.600 56 0.0015  | 8                        |
| 37.5 92 0.425 53   |                          |
| 28.0 88 0.300 49   |                          |
| 20.0 85 0.212 45   |                          |
| 0.150 41   |                          |
| 0.063 31   |                          |

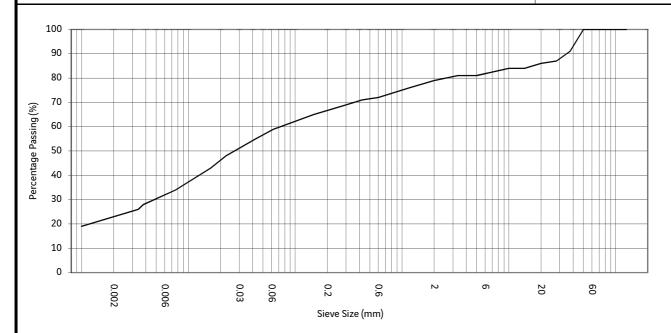
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 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                   | Hole ID          |
|--------------|---|---------------------------------|------------------|
|              | Investigation                                       |                                 | A11              |
| Project No.  | TA7148  | Distribution                    | Sample Depth     |
| <b>l</b>     |   |                                 | 12.78m           |
| Engineer     | Arch Henderson LLP                                  |                                 | Sample Number    |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type<br>C |
| Description  | Brown gravelly sandy CLAY. Gravel is fine to coarse | subangular.                     | Specimen Depth   |
| -            |   |                                 | 12.78m           |
|              |   |                                 | Specimen No.     |
|              |   |                                 | 1                |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | SEDIMENTAT    | ION DATA   |             |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 84         | diameter mm |            |
|               |            | 10.0          | 84         | 0.0429      | 55         |
|               |            | 6.3           | 82         | 0.0225      | 48         |
| 125.0         | 100        | 5.0           | 81         | 0.0162      | 43         |
| 90.0          | 100        | 3.35          | 81         | 0.0076      | 34         |
| 75.0          | 100        | 2.00          | 79         | 0.0038      | 28         |
| 63.0          | 100        | 1.18          | 76         | 0.0034      | 26         |
| 50.0          | 100        | 0.600         | 72         | 0.0010      | 19         |
| 37.5          | 91         | 0.425         | 71         |             |            |
| 28.0          | 87         | 0.300         | 69         |             |            |
| 20.0          | 86         | 0.212         | 67         |             |            |
|               |            | 0.150         | 65         |             |            |
|               |            | 0.063         | 59         |             |            |

| Approved by: | Leeds Laborato | ory  |            |            |            |
|--------------|----------------|------|------------|------------|------------|
| Stuart Kirk  |                |      |            | Print date | 28/11/2013 |
|              | Revision No.   | 3.03 | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                   | Hole ID          |
|--------------|---|---------------------------------|------------------|
|              | Investigation                                       |                                 | A11              |
| Project No.  | TA7148  | Distribution                    | Sample Depth     |
| <b>l</b>     |   |                                 | 25.28m           |
| Engineer     | Arch Henderson LLP                                  |                                 | Sample Number    |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type<br>C |
| Description  | Brown gravelly sandy CLAY. Gravel is fine to coarse | subangular                      | Specimen Depth   |
| -            |   |                                 | 25.28m           |
|              |   |                                 | Specimen No.     |
|              |   |                                 | 2                |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAT |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

General remarks

Sample size was insufficient to be representative of particle size

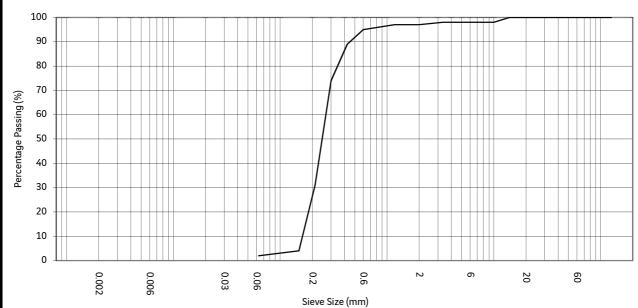
Particle density: 2.65Mg/m³ Assumed

|               |            | i di ticio dell | 51ty. 2.001vig | 7111 7105011100 |            |
|---------------|------------|-----------------|----------------|-----------------|------------|
|               | WET SIEV   | E DATA          |                | SEDIMENTAT      | ION DATA   |
| Sieve size mm | Cumulative | Sieve size mm   | Cumulative     | Equivalent      | Cumulative |
|               | % passing  |                 | % passing      | particle        | % passing  |
|               |            | 14.0            | 80             | diameter mm     |            |
|               |            | 10.0            | 77             | 0.0503          | 24         |
|               |            | 6.3             | 74             | 0.0254          | 23         |
| 125.0         | 100        | 5.0             | 72             | 0.0182          | 20         |
| 90.0          | 100        | 3.35            | 71             | 0.0083          | 15         |
| 75.0          | 100        | 2.00            | 67             | 0.0043          | 12         |
| 63.0          | 100        | 1.18            | 61             | 0.0037          | 10         |
| 50.0          | 92         | 0.600           | 53             | 0.0010          | 7          |
| 37.5          | 92         | 0.425           | 49             |                 |            |
| 28.0          | 88         | 0.300           | 44             |                 |            |
| 20.0          | 84         | 0.212           | 40             |                 |            |
|               |            | 0.150           | 36             |                 |            |
|               |            | 0.063           | 27             |                 |            |
|               |            |                 |                |                 | _          |

| Approved by: | Leeds Laboratory  |   |            |            |            |
|--------------|-------------------|---|------------|------------|------------|
| Stuart Kirk  |                   |   |            | Print date | 28/11/2013 |
|              | Revision No. 3.03 | } | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>A29 |
|--------------|--|----------------------------|----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth   |
|              |  |                            | 0.50m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
|              |  |                            | 003            |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type    |
|              |  | B3 1377. Part 2. 1990. 9.2 | В              |
| Description  | Brown SAND with rare medium gravel.                  |                            | Specimen Depth |
|              |  |                            | 0.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

 Silt and clay:
 2

 Sand:
 95

 Gravel:
 3

 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 100        |
|               |            | 10.0          | 98         |
|               |            | 6.3           | 98         |
| 125.0         | 100        | 5.0           | 98         |
| 100.0         | 100        | 3.35          | 98         |
| 75.0          | 100        | 2.00          | 97         |
| 63.0          | 100        | 1.18          | 97         |
| 50.0          | 100        | 0.600         | 95         |
| 37.5          | 100        | 0.425         | 89         |
| 28.0          | 100        | 0.300         | 74         |
| 20.0          | 100        | 0.212         | 31         |
|               |            | 0.150         | 4          |
|               |            | 0.063         | 2          |

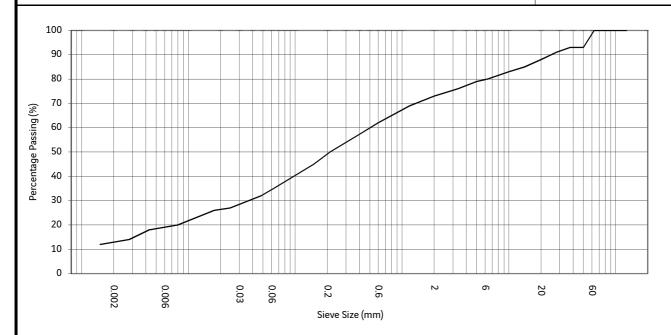
 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground                | Particle Size                   | Hole ID        |
|--------------|---|---------------------------------|----------------|
| ,            | Investigation   |                                 | A29            |
| Project No.  | TA7148  | Distribution                    | Sample Depth   |
| <b>'</b>     |   |                                 | 4.70m          |
| Engineer     | Arch Henderson LLP                                    |                                 | Sample Number  |
|              |   |                                 | 010            |
| Employer     | Aberdeen Harbour Board                                | DC 1277: Dowt 2: 1000: 0.2. 0.5 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2, 9.5 | C              |
| Description  | Brown sandy slightly gravelly CLAY. Gravel is fine to | o coarse subangular.            | Specimen Depth |
| ·            |   |                                 | 4.70m          |
|              |   |                                 | Specimen No.   |
|              |   | ·                               | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 13

 Silt:
 22

 Sand:
 39

 Gravel:
 25

 Cobbles:
 2

General remarks

Dispersant used when soaking specimen.

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | TON DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 85         | diameter mm |            |
|               |            | 10.0          | 83         | 0.0479      | 32         |
|               |            | 6.3           | 80         | 0.0246      | 27         |
| 125.0         | 100        | 5.0           | 79         | 0.0175      | 26         |
| 100.0         | 100        | 3.35          | 76         | 0.0080      | 20         |
| 75.0          | 100        | 2.00          | 73         | 0.0043      | 18         |
| 63.0          | 100        | 1.18          | 69         | 0.0028      | 14         |
| 50.0          | 93         | 0.600         | 62         | 0.0015      | 12         |
| 37.5          | 93         | 0.425         | 58         |             |            |
| 28.0          | 91         | 0.300         | 54         |             |            |
| 20.0          | 88         | 0.212         | 50         |             |            |
|               |            | 0.150         | 45         |             |            |
|               |            | 0.063         | 35         |             |            |

| Approved by:  | Leeds Laborato | ry   |            |            |            |
|---------------|----------------|------|------------|------------|------------|
| Sushil Sharda |                |      |            | Print date | 28/11/2013 |
|               | Revision No.   | 3.03 | Issue Date | 19/11/2    | 2012       |



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                    | Hole ID        |
|--------------|---|----------------------------------|----------------|
|              | Investigation                                       |                                  | A29            |
| Project No.  | TA7148  | Distribution                     | Sample Depth   |
| <b>l</b>     |   |                                  | 15.25m         |
| Engineer     | Arch Henderson LLP                                  |                                  | Sample Number  |
|              |   |                                  | 012            |
| Employer     | Aberdeen Harbour Board                              | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2, 9.5  | С              |
| Description  | Brown gravelly sandy CLAY. Gravel is fine to coarse | subangular.                      | Specimen Depth |
|              |   |                                  | 15.25m         |
|              |   |                                  | Specimen No.   |
|              |   |                                  | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | L      | COBBLES |

General remarks

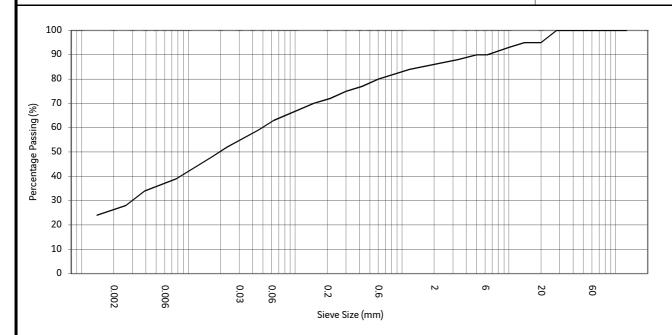
Sample size was insufficient to be representative of particle size

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | ION DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 77         | diameter mm |            |
|               |            | 10.0          | 74         | 0.0502      | 29         |
|               |            | 6.3           | 71         | 0.0257      | 23         |
| 125.0         | 100        | 5.0           | 69         | 0.0182      | 23         |
| 100.0         | 100        | 3.35          | 67         | 0.0083      | 17         |
| 75.0          | 100        | 2.00          | 63         | 0.0047      | 15         |
| 63.0          | 100        | 1.18          | 60         | 0.0029      | 11         |
| 50.0          | 100        | 0.600         | 54         | 0.0015      | 8          |
| 37.5          | 89         | 0.425         | 51         |             |            |
| 28.0          | 87         | 0.300         | 47         |             |            |
| 20.0          | 81         | 0.212         | 43         |             |            |
|               |            | 0.150         | 39         |             |            |
|               |            | 0.063         | 31         |             |            |

| Approved by: | Leeds Laboratory  |   |            |            |            |
|--------------|-------------------|---|------------|------------|------------|
| Stuart Kirk  |                   |   |            | Print date | 28/11/2013 |
|              | Revision No. 3.03 | } | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground                | Davida Cina                     | Hole ID          |
|--------------|---|---------------------------------|------------------|
| Project Name | Investigation   | Particle Size                   | A29              |
| Project No.  | TA7148  | Distribution                    | Sample Depth     |
| '            |   |                                 | 21.50m           |
| Engineer     | Arch Henderson LLP                                    |                                 | Sample Number    |
|              |   |                                 | 014              |
| Employer     | Aberdeen Harbour Board                                | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type<br>C |
| Description  | Brown sandy slightly gravelly CLAY. Gravel is fine to | coarse angular.                 | Specimen Depth   |
|              |   |                                 | 21.71m           |
|              |   |                                 | Specimen No.     |
|              |   |                                 | 1                |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

PARTICLE SIZE %
Clay: 26
Silt: 36
Sand: 24

Sand: 24
Gravel: 14
Cobbles: 0

General remarks

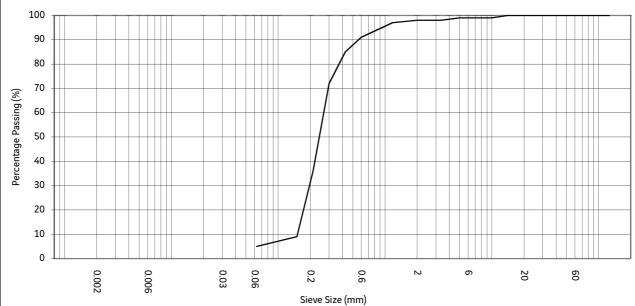
Dispersant used when soaking specimen.

|               |            | li ai ticle dell | sity. 2.03ivig/ | Assumed     |            |
|---------------|------------|------------------|-----------------|-------------|------------|
|               | WET SIEV   | E DATA           |                 | SEDIMENTAT  | ION DATA   |
| Sieve size mm | Cumulative | Sieve size mm    | Cumulative      | Equivalent  | Cumulative |
|               | % passing  |                  | % passing       | particle    | % passing  |
|               |            | 14.0             | 95              | diameter mm |            |
|               |            | 10.0             | 93              | 0.0450      | 59         |
|               |            | 6.3              | 90              | 0.0231      | 52         |
| 125.0         | 100        | 5.0              | 90              | 0.0166      | 48         |
| 100.0         | 100        | 3.35             | 88              | 0.0077      | 39         |
| 75.0          | 100        | 2.00             | 86              | 0.0039      | 34         |
| 63.0          | 100        | 1.18             | 84              | 0.0026      | 28         |
| 50.0          | 100        | 0.600            | 80              | 0.0014      | 24         |
| 37.5          | 100        | 0.425            | 77              |             |            |
| 28.0          | 100        | 0.300            | 75              |             |            |
| 20.0          | 95         | 0.212            | 72              |             |            |
|               |            | 0.150            | 70              |             |            |
|               |            | 0.063            | 63              |             |            |

| Approved by:  | Leeds Laboratory |    |            |            |            |
|---------------|------------------|----|------------|------------|------------|
| Sushil Sharda |                  |    |            | Print date | 28/11/2013 |
|               | Revision No. 3.0 | 13 | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>A31 |
|--------------|--|----------------------------|----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth   |
|              |  |                            | 0.50m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
|              |  |                            | 002            |
| Employer     | Aberdeen Harbour Board                               | DC 1277, D- + 2, 1000, 0.2 | Sample type    |
| , ,          |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brownish grey SAND with occasional medium gravel     |                            | Specimen Depth |
| -            |  |                            | 0.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | . 1            |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 5
Sand: 93
Gravel: 2
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |               |
|---------------|------------|------------|---------------|
| Sieve size mm | Cumulative | Sieve size | mm Cumulative |
|               | % passing  |            | % passing     |
|               |            | 14.0       | 100           |
|               |            | 10.0       | 99            |
|               |            | 6.3        | 99            |
| 125.0         | 100        | 5.0        | 99            |
| 100.0         | 100        | 3.35       | 98            |
| 75.0          | 100        | 2.00       | 98            |
| 63.0          | 100        | 1.18       | 97            |
| 50.0          | 100        | 0.600      | 91            |
| 37.5          | 100        | 0.425      | 85            |
| 28.0          | 100        | 0.300      | 72            |
| 20.0          | 100        | 0.212      | 36            |
|               |            | 0.150      | 9             |
|               |            | 0.063      | 5             |

 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                    | Hole ID        |
|--------------|---|----------------------------------|----------------|
|              | Investigation                                       |                                  | A31            |
| Project No.  | TA7148  | Distribution                     | Sample Depth   |
| <b>'</b>     |   |                                  | 4.80m          |
| Engineer     | Arch Henderson LLP                                  |                                  | Sample Number  |
|              |   |                                  | 005            |
| Employer     | Aberdeen Harbour Board                              | DC 1377, David 3, 1000, 0 3, 0 F | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2, 9.5  | С              |
| Description  | Brown gravelly sandy CLAY. Gravel is fine to coarse | subangular                       | Specimen Depth |
|              |   |                                  | 4.80m          |
|              |   |                                  | Specimen No.   |
|              |   |                                  | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 11

 Silt:
 21

 Sand:
 36

 Gravel:
 32

 Cobbles:
 0

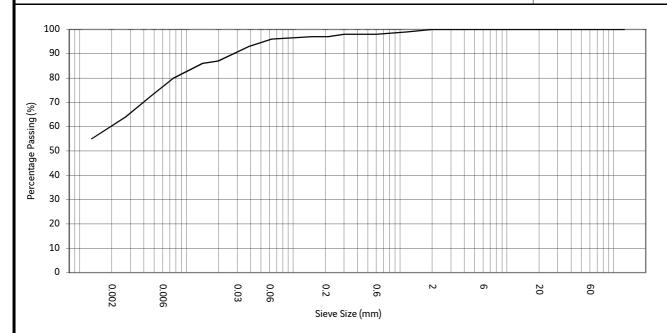
General remarks

|               | WET SIEV   | SEDIMENTAT    | TON DATA   |             |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 80         | diameter mm |            |
|               |            | 10.0          | 78         | 0.0500      | 31         |
|               |            | 6.3           | 75         | 0.0255      | 26         |
| 125.0         | 100        | 5.0           | 73         | 0.0181      | 24         |
| 100.0         | 100        | 3.35          | 71         | 0.0082      | 20         |
| 75.0          | 100        | 2.00          | 68         | 0.0048      | 17         |
| 63.0          | 100        | 1.18          | 65         | 0.0030      | 13         |
| 50.0          | 100        | 0.600         | 59         | 0.0015      | 10         |
| 37.5          | 96         | 0.425         | 55         |             |            |
| 28.0          | 92         | 0.300         | 51         |             |            |
| 20.0          | 83         | 0.212         | 47         |             |            |
|               |            | 0.150         | 43         |             |            |
|               |            | 0.063         | 32         |             |            |

| Approved by: | Leeds Laborato |      |            |            |            |
|--------------|----------------|------|------------|------------|------------|
| Stuart Kirk  |                |      |            | Print date | 28/11/2013 |
|              | Revision No.   | 3.03 | Issue Date | 19/11/2    | 2012       |



| Project Name | Bay of Nigg Harbour Development Ground    | Particle Size                    | Hole ID        |
|--------------|---|----------------------------------|----------------|
|              | Investigation                             |                                  | A31            |
| Project No.  | TA7148                                    | Distribution                     | Sample Depth   |
| <b>l</b> '   |   |                                  | 19.30m         |
| Engineer     | Arch Henderson LLP                        |                                  | Sample Number  |
|              |   |                                  | 009            |
| Employer     | Aberdeen Harbour Board                    | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2, 9.5  | С              |
| Description  | Brown CLAY with rare fine angular gravel. |                                  | Specimen Depth |
|              |   |                                  | 19.52m         |
|              |   |                                  | Specimen No.   |
|              |   |                                  | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

General remarks

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | SEDIMENTAT    | ION DATA   |             |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 100        | diameter mm |            |
|               |            | 10.0          | 100        | 0.0386      | 93         |
|               |            | 6.3           | 100        | 0.0199      | 87         |
| 125.0         | 100        | 5.0           | 100        | 0.0142      | 86         |
| 100.0         | 100        | 3.35          | 100        | 0.0076      | 80         |
| 75.0          | 100        | 2.00          | 100        | 0.0048      | 73         |
| 63.0          | 100        | 1.18          | 99         | 0.0027      | 64         |
| 50.0          | 100        | 0.600         | 98         | 0.0013      | 55         |
| 37.5          | 100        | 0.425         | 98         |             |            |
| 28.0          | 100        | 0.300         | 98         |             |            |
| 20.0          | 100        | 0.212         | 97         |             |            |
|               |            | 0.150         | 97         |             |            |
|               |            | 0.063         | 96         |             |            |

Approved by:

Sushil Sharda

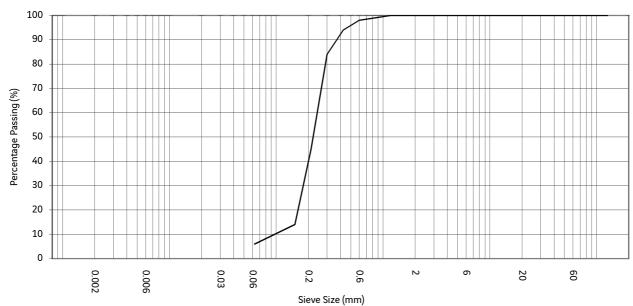
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Print date 28/11/2013

Revision No. 3.03 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground | Particle Size              | Hole ID        |  |  |
|--------------|--|----------------------------|----------------|--|--|
| •            | Investigation                          |                            | A34            |  |  |
| Project No.  | TA7148                                 | Distribution               | Sample Depth   |  |  |
| ,            |  |                            | 0.50m          |  |  |
| Engineer     | Arch Henderson LLP                     |                            | Sample Number  |  |  |
| 3            |  |                            | 002            |  |  |
| Employer     | Aberdeen Harbour Board                 | BS 1377: Part 2: 1990: 9.2 | Sample type    |  |  |
| . ,          |  | BS 1377: Part 2: 1990: 9.2 | D              |  |  |
| Description  | Greyish brown SAND                     |                            | Specimen Depth |  |  |
|              |  |                            | 0.50m          |  |  |
|              |  |                            | Specimen No.   |  |  |
|              |  |                            | 1              |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 6
Sand: 94
Gravel: 0
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |              |
|---------------|------------|---------------|--------------|
| Sieve size mm | Cumulative | Sieve size mi | m Cumulative |
|               | % passing  |               | % passing    |
|               |            | 14.0          | 100          |
|               |            | 10.0          | 100          |
|               |            | 6.3           | 100          |
| 125.0         | 100        | 5.0           | 100          |
| 90.0          | 100        | 3.35          | 100          |
| 75.0          | 100        | 2.00          | 100          |
| 63.0          | 100        | 1.18          | 100          |
| 50.0          | 100        | 0.600         | 98           |
| 37.5          | 100        | 0.425         | 94           |
| 28.0          | 100        | 0.300         | 84           |
| 20.0          | 100        | 0.212         | 45           |
|               |            | 0.150         | 14           |
|               |            | 0.063         | 6            |

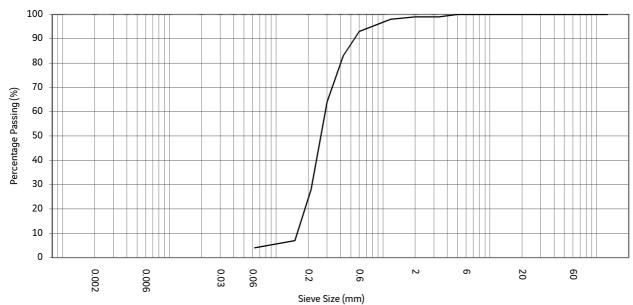
 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground | Particle Size               | Hole ID        |
|--------------|--|-----------------------------|----------------|
| •            | Investigation                          |                             | A34            |
| Project No.  | TA7148                                 | Distribution                | Sample Depth   |
| ,            |  |                             | 1.50m          |
| Engineer     | Arch Henderson LLP                     |                             | Sample Number  |
| 3            |  |                             | 006            |
| Employer     | Aberdeen Harbour Board                 | DC 1277, David 2, 1000, 0.2 | Sample type    |
| . ,          |  | BS 1377: Part 2: 1990: 9.2  | В              |
| Description  | Greyish brown SAND.                    |                             | Specimen Depth |
| ·            |  |                             | 1.50m          |
|              |  |                             | Specimen No.   |
|              |  |                             | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium |         | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|---------|
| CLAT |      | SILT   |        | SAND |        |        | G    | RAVE   | COBBLES |         |

Silt and clay: 4
Sand: 95
Gravel: 1
Cobbles: 0

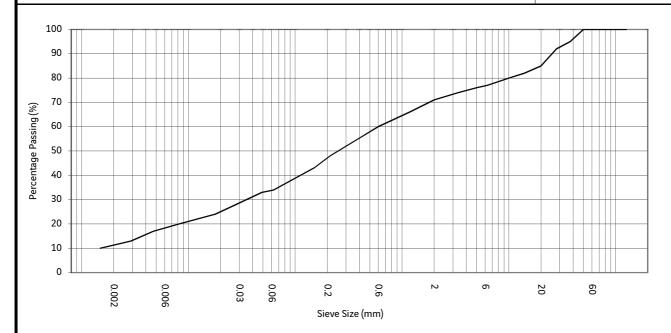
General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 100        |
|               |            | 6.3        |    | 100        |
| 125.0         | 100        | 5.0        |    | 100        |
| 100.0         | 100        | 3.35       |    | 99         |
| 75.0          | 100        | 2.00       |    | 99         |
| 63.0          | 100        | 1.18       |    | 98         |
| 50.0          | 100        | 0.600      | )  | 93         |
| 37.5          | 100        | 0.425      | ;  | 83         |
| 28.0          | 100        | 0.300      | )  | 64         |
| 20.0          | 100        | 0.212      |    | 28         |
|               |            | 0.150      | )  | 7          |
|               |            | 0.063      | 1  | 4          |

| Approved by: | Leeds Laborato | ry   |            |            |            |
|--------------|----------------|------|------------|------------|------------|
| Stuart Kirk  |                |      |            | Print date | 28/11/2013 |
|              | Revision No    | 3.03 | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                   | Hole ID          |
|--------------|---|---------------------------------|------------------|
|              | Investigation                                       |                                 | A34              |
| Project No.  | TA7148  | Distribution                    | Sample Depth     |
| <b>l</b>     |   |                                 | 4.75m            |
| Engineer     | Arch Henderson LLP                                  |                                 | Sample Number    |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type<br>C |
| Description  | Brown gravelly sandy CLAY. Gravel is fine to coarse | subangular.                     | Specimen Depth   |
| -            |   |                                 | 4.75m            |
|              |   |                                 | Specimen No.     |
|              |   |                                 | 1                |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 11

 Silt:
 23

 Sand:
 37

 Gravel:
 29

 Cobbles:
 0

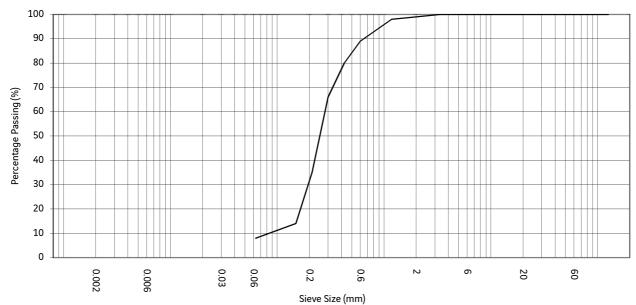
General remarks

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | TON DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 82         | diameter mm |            |
|               |            | 10.0          | 80         | 0.0488      | 33         |
|               |            | 6.3           | 77         | 0.0250      | 27         |
| 125.0         | 100        | 5.0           | 76         | 0.0179      | 24         |
| 100.0         | 100        | 3.35          | 74         | 0.0082      | 20         |
| 75.0          | 100        | 2.00          | 71         | 0.0047      | 17         |
| 63.0          | 100        | 1.18          | 66         | 0.0029      | 13         |
| 50.0          | 100        | 0.600         | 60         | 0.0015      | 10         |
| 37.5          | 95         | 0.425         | 56         |             |            |
| 28.0          | 92         | 0.300         | 52         |             |            |
| 20.0          | 85         | 0.212         | 48         |             |            |
|               |            | 0.150         | 43         |             |            |
|               |            | 0.063         | 34         |             |            |

| Approved by: | Leeds Laborato | ory  |            |            |            |
|--------------|----------------|------|------------|------------|------------|
| Stuart Kirk  |                |      |            | Print date | 28/11/2013 |
|              | Revision No.   | 3.03 | Issue Date | 19/11/2    | 2012       |



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>A51                               |
|--------------|--|----------------------------|--|
| Project No.  | TA7148   | Distribution               | Sample Depth                                 |
| Engineer     | Arch Henderson LLP                                   |                            | 0.50m<br>Sample Number<br>003                |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B                             |
| Description  | Brown SAND.  |                            | Specimen Depth<br>0.50m<br>Specimen No.<br>1 |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 8
Sand: 92
Gravel: 1
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 100        |
|               |            | 6.3        |    | 100        |
| 125.0         | 100        | 5.0        |    | 100        |
| 100.0         | 100        | 3.35       |    | 100        |
| 75.0          | 100        | 2.00       |    | 99         |
| 63.0          | 100        | 1.18       |    | 98         |
| 50.0          | 100        | 0.600      |    | 89         |
| 37.5          | 100        | 0.425      |    | 80         |
| 28.0          | 100        | 0.300      |    | 66         |
| 20.0          | 100        | 0.212      |    | 35         |
|               |            | 0.150      |    | 14         |
|               |            | 0.063      |    | 8          |

Approved by:

Sushil Sharda

Revision No. 3.03

Leeds Laboratory

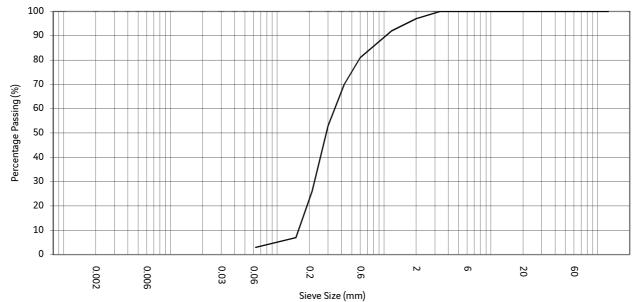
Print date 28/11/2013

Revision No. 1.03

Revision No. 2.03



| Project Name<br>Project No. | Bay of Nigg Harbour Development Ground<br>Investigation<br>TA7148 | Particle Size Distribution | Hole ID<br>A54<br>Sample Depth<br>1.50m      |
|-----------------------------|---|----------------------------|--|
| Engineer                    | Arch Henderson LLP  |                            | Sample Number<br>006                         |
| Employer                    | Aberdeen Harbour Board  | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B                             |
| Description                 | Grey SAND.  |                            | Specimen Depth<br>1.50m<br>Specimen No.<br>1 |
| 100                         |   |                            |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | L      | COBBLES |

Silt and clay: 4
Sand: 94
Gravel: 3
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 100        |
|               |            | 6.3        |    | 100        |
| 125.0         | 100        | 5.0        |    | 100        |
| 100.0         | 100        | 3.35       |    | 100        |
| 75.0          | 100        | 2.00       |    | 97         |
| 63.0          | 100        | 1.18       |    | 92         |
| 50.0          | 100        | 0.600      |    | 81         |
| 37.5          | 100        | 0.425      |    | 70         |
| 28.0          | 100        | 0.300      |    | 53         |
| 20.0          | 100        | 0.212      |    | 26         |
|               |            | 0.150      |    | 7          |
|               |            | 0.063      |    | 3          |

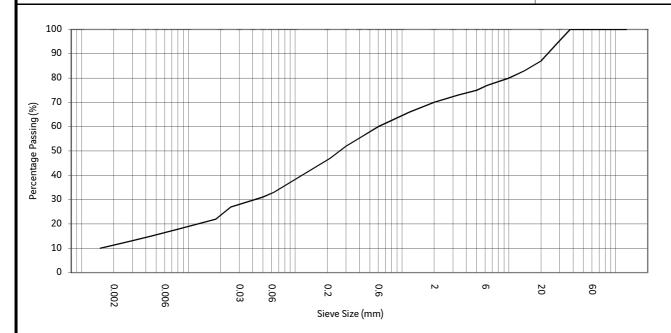
 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground             | Particle Size                   | Hole ID        |
|--------------|--|---------------------------------|----------------|
|              | Investigation                                      |                                 | A54            |
| Project No.  | TA7148   | Distribution                    | Sample Depth   |
| <b>l</b>     |  |                                 | 6.00m          |
| Engineer     | Arch Henderson LLP                                 |                                 | Sample Number  |
| Ĭ            |  |                                 | 014            |
| Employer     | Aberdeen Harbour Board                             | DC 4277: Deat 2: 4000: 0.2. 0.5 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2, 9.5 | С              |
| Description  | Brown clayey gravelly SAND. Gravel is medium to co | parse subrounded.               | Specimen Depth |
|              |  |                                 | 6.00m          |
|              |  |                                 | Specimen No.   |
|              |  |                                 | 2              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 11

 Silt:
 22

 Sand:
 37

 Gravel:
 30

 Cobbles:
 0

General remarks

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | TON DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 83         | diameter mm |            |
|               |            | 10.0          | 80         | 0.0494      | 31         |
|               |            | 6.3           | 77         | 0.0251      | 27         |
| 125.0         | 100        | 5.0           | 75         | 0.0181      | 22         |
| 90.0          | 100        | 3.35          | 73         | 0.0082      | 18         |
| 75.0          | 100        | 2.00          | 70         | 0.0045      | 15         |
| 63.0          | 100        | 1.18          | 66         | 0.0029      | 13         |
| 50.0          | 100        | 0.600         | 60         | 0.0015      | 10         |
| 37.5          | 100        | 0.425         | 56         |             |            |
| 28.0          | 94         | 0.300         | 52         |             |            |
| 20.0          | 87         | 0.212         | 47         |             |            |
|               |            | 0.150         | 43         |             |            |
|               |            | 0.063         | 33         |             |            |

Approved by:

Sushil Sharda

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| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                   | Hole ID        |
|--------------|---|---------------------------------|----------------|
|              | Investigation                                       | D: . :I .:                      | A54            |
| Project No.  | TA7148  | Distribution                    | Sample Depth   |
| '            |   |                                 | 10.15m         |
| Engineer     | Arch Henderson LLP                                  |                                 | Sample Number  |
|              |   |                                 | 016            |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type    |
|              |   | B3 1377. Part 2. 1990. 9.2, 9.3 | С              |
| Description  | Brown sandy slightly gravelly CLAY. Gravel is mediu | m to coarse subangular.         | Specimen Depth |
| -            |   |                                 | 10.15m         |
|              |   |                                 | Specimen No.   |
|              |   |                                 | 2              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 20

 Silt:
 23

 Sand:
 33

 Gravel:
 24

 Cobbles:
 0

General remarks

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | TON DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 87         | diameter mm |            |
|               |            | 10.0          | 84         | 0.0476      | 41         |
|               |            | 6.3           | 82         | 0.0243      | 37         |
| 125.0         | 100        | 5.0           | 80         | 0.0174      | 33         |
| 90.0          | 100        | 3.35          | 79         | 0.0079      | 29         |
| 75.0          | 100        | 2.00          | 76         | 0.0041      | 25         |
| 63.0          | 100        | 1.18          | 73         | 0.0027      | 22         |
| 50.0          | 100        | 0.600         | 67         | 0.0014      | 19         |
| 37.5          | 96         | 0.425         | 64         |             |            |
| 28.0          | 92         | 0.300         | 60         |             |            |
| 20.0          | 90         | 0.212         | 57         |             |            |
|               |            | 0.150         | 53         |             |            |
|               |            | 0.063         | 44         |             |            |

Approved by:

Sushil Sharda

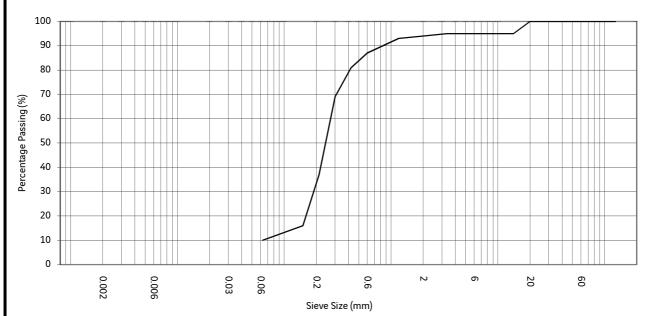
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| Project Name | Bay of Nigg Harbour Development Ground                 | Particle Size              | Hole ID        |
|--------------|--|----------------------------|----------------|
|              | Investigation  | D: . :! .:                 | A57            |
| Project No.  | TA7148   | Distribution               | Sample Depth   |
| •            |  |                            | 0.50m          |
| Engineer     | Arch Henderson LLP                                     |                            | Sample Number  |
| 3            |  |                            | 003            |
| Employer     | Aberdeen Harbour Board                                 | DC 1277, D- + 2, 1000, 0.2 | Sample type    |
| 1 7          |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brown slightly gravelly slightly clayey SAND. Gravel i | s fine to medium angular.  | Specimen Depth |
| ·            |  |                            | 0.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAT |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 10
Sand: 84
Gravel: 6
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 95         |
|               |            | 10.0       |    | 95         |
|               |            | 6.3        |    | 95         |
| 125.0         | 100        | 5.0        |    | 95         |
| 100.0         | 100        | 3.35       |    | 95         |
| 75.0          | 100        | 2.00       |    | 94         |
| 63.0          | 100        | 1.18       |    | 93         |
| 50.0          | 100        | 0.600      |    | 87         |
| 37.5          | 100        | 0.425      |    | 81         |
| 28.0          | 100        | 0.300      |    | 69         |
| 20.0          | 100        | 0.212      |    | 37         |
|               |            | 0.150      |    | 16         |
|               |            | 0.063      |    | 10         |

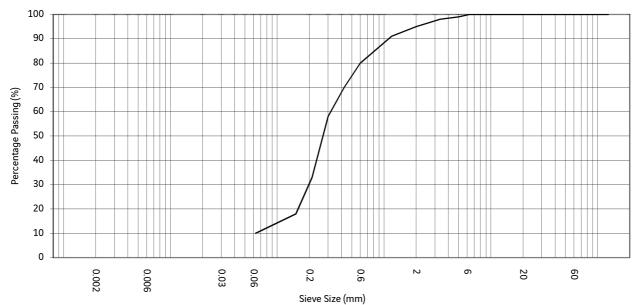
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| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>A57 |
|--------------|--|----------------------------|----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth   |
| ,            |  |                            | 1.50m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
| · ·          |  |                            | 006            |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type    |
|              |  | B3 1377. Part 2. 1990. 9.2 | В              |
| Description  | Brown slightly gravelly SAND. Gravel is fine.        |                            | Specimen Depth |
|              |  |                            | 1.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 10
Sand: 84
Gravel: 5
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 100        |
|               |            | 6.3        |    | 100        |
| 125.0         | 100        | 5.0        |    | 99         |
| 90.0          | 100        | 3.35       |    | 98         |
| 75.0          | 100        | 2.00       |    | 95         |
| 63.0          | 100        | 1.18       |    | 91         |
| 50.0          | 100        | 0.600      |    | 80         |
| 37.5          | 100        | 0.425      |    | 70         |
| 28.0          | 100        | 0.300      |    | 58         |
| 20.0          | 100        | 0.212      |    | 33         |
|               |            | 0.150      |    | 18         |
|               |            | 0.063      |    | 10         |

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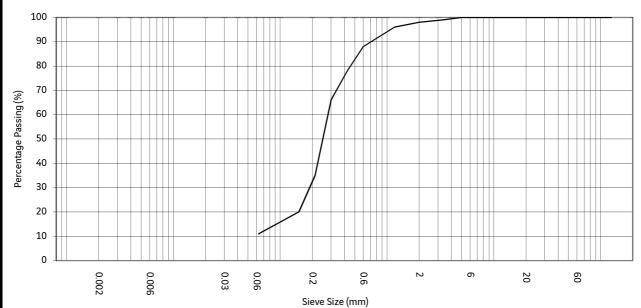
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| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>A57 |
|--------------|--|----------------------------|----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth   |
|              |  |                            | 4.50m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
|              |  |                            | 015            |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type    |
| . ,          |  | BS 1377. Part 2. 1990. 9.2 | В              |
| Description  | Brownish grey SAND.                                  |                            | Specimen Depth |
|              |  |                            | 4.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

 Silt and clay:
 11

 Sand:
 87

 Gravel:
 2

 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 100        |
|               |            | 6.3        |    | 100        |
| 125.0         | 100        | 5.0        |    | 100        |
| 100.0         | 100        | 3.35       |    | 99         |
| 75.0          | 100        | 2.00       |    | 98         |
| 63.0          | 100        | 1.18       |    | 96         |
| 50.0          | 100        | 0.600      |    | 88         |
| 37.5          | 100        | 0.425      |    | 78         |
| 28.0          | 100        | 0.300      |    | 66         |
| 20.0          | 100        | 0.212      |    | 35         |
|               |            | 0.150      |    | 20         |
|               |            | 0.063      |    | 11         |

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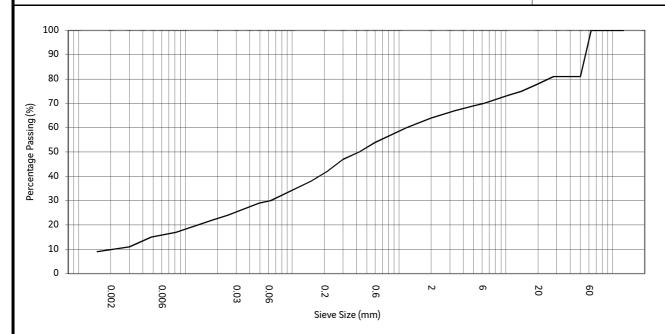
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Revision No. 1.03

Revision No. 2.03



| Project Name | Bay of Nigg Harbour Development Ground               | Particle Size                   | Hole ID        |
|--------------|--|---------------------------------|----------------|
|              | Investigation  |                                 | A57            |
| Project No.  | TA7148   | Distribution                    | Sample Depth   |
| <b>.</b> .   |  |                                 | 9.20m          |
| Engineer     | Arch Henderson LLP                                   |                                 | Sample Number  |
|              |  |                                 | 022            |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type    |
|              |  | B3 1377. Part 2. 1330. 3.2, 3.3 | С              |
| Description  | Brown sandy gravelly CLAY. Gravel is fine to coarse. |                                 | Specimen Depth |
|              |  |                                 | 9.20m          |
|              |  |                                 | Specimen No.   |
|              |  |                                 | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAT |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | ION DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 75         | diameter mm |            |
|               |            | 10.0          | 73         | 0.0489      | 29         |
|               |            | 6.3           | 70         | 0.0251      | 24         |
| 125.0         | 100        | 5.0           | 69         | 0.0179      | 22         |
| 100.0         | 100        | 3.35          | 67         | 0.0082      | 17         |
| 75.0          | 100        | 2.00          | 64         | 0.0048      | 15         |
| 63.0          | 100        | 1.18          | 60         | 0.0030      | 11         |
| 50.0          | 81         | 0.600         | 54         | 0.0015      | 9          |
| 37.5          | 81         | 0.425         | 50         |             |            |
| 28.0          | 81         | 0.300         | 47         |             |            |
| 20.0          | 78         | 0.212         | 42         |             |            |
|               |            | 0.150         | 38         |             |            |
|               |            | 0.063         | 30         |             |            |

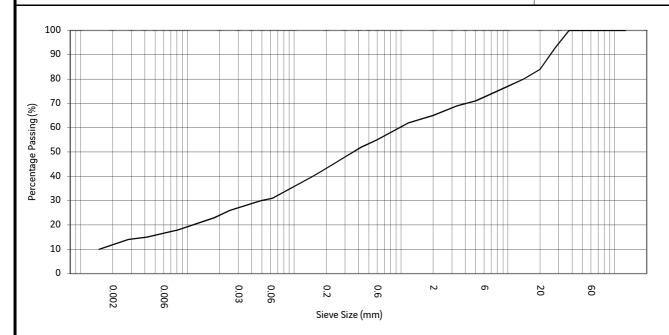
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 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground            | Particle Size                    | Hole ID        |
|--------------|---|----------------------------------|----------------|
|              | Investigation                                     |                                  | A57            |
| Project No.  | TA7148  | Distribution                     | Sample Depth   |
| <b>l</b>     |   |                                  | 17.30m         |
| Engineer     | Arch Henderson LLP                                |                                  | Sample Number  |
|              |   |                                  | 025            |
| Employer     | Aberdeen Harbour Board                            | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2, 9.5  | С              |
| Description  | Brown sandy gravelly CLAY. Gravel is medium to co | arse subangular.                 | Specimen Depth |
| ·            |   |                                  | 17.30m         |
|              |   |                                  | Specimen No.   |
|              |   |                                  | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 11

 Silt:
 19

 Sand:
 35

 Gravel:
 35

 Cobbles:
 0

General remarks

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | TON DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 80         | diameter mm |            |
|               |            | 10.0          | 77         | 0.0491      | 30         |
|               |            | 6.3           | 73         | 0.0251      | 26         |
| 125.0         | 100        | 5.0           | 71         | 0.0179      | 23         |
| 90.0          | 100        | 3.35          | 69         | 0.0082      | 18         |
| 75.0          | 100        | 2.00          | 65         | 0.0042      | 15         |
| 63.0          | 100        | 1.18          | 62         | 0.0028      | 14         |
| 50.0          | 100        | 0.600         | 55         | 0.0015      | 10         |
| 37.5          | 100        | 0.425         | 52         |             |            |
| 28.0          | 93         | 0.300         | 48         |             |            |
| 20.0          | 84         | 0.212         | 44         |             |            |
|               |            | 0.150         | 40         |             |            |
|               |            | 0.063         | 31         |             |            |

Approved by:

Sushil Sharda

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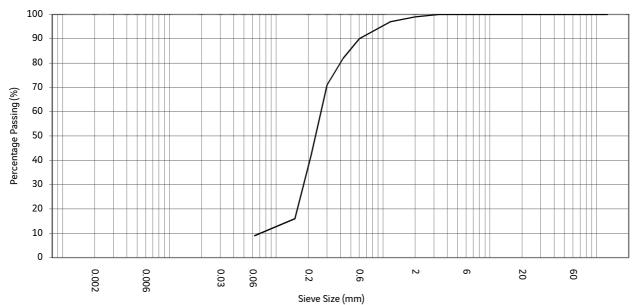
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| Project Name | Bay of Nigg Harbour Development Ground | Particle Size               | Hole ID        |
|--------------|--|-----------------------------|----------------|
| •            | Investigation                          |                             | A59            |
| Project No.  | TA7148                                 | Distribution                | Sample Depth   |
| ,            |  |                             | 1.50m          |
| Engineer     | Arch Henderson LLP                     |                             | Sample Number  |
| · ·          |  |                             | 006            |
| Employer     | Aberdeen Harbour Board                 | DC 1277, David 2, 1000, 0.2 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2  | В              |
| Description  | Grey mottled brown SAND                |                             | Specimen Depth |
| ·            |  |                             | 1.50m          |
|              |  |                             | Specimen No.   |
|              |  |                             | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAT |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

 Silt and clay:
 9

 Sand:
 90

 Gravel:
 1

 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 100        |
|               |            | 10.0          | 100        |
|               |            | 6.3           | 100        |
| 125.0         | 100        | 5.0           | 100        |
| 90.0          | 100        | 3.35          | 100        |
| 75.0          | 100        | 2.00          | 99         |
| 63.0          | 100        | 1.18          | 97         |
| 50.0          | 100        | 0.600         | 90         |
| 37.5          | 100        | 0.425         | 82         |
| 28.0          | 100        | 0.300         | 71         |
| 20.0          | 100        | 0.212         | 42         |
|               |            | 0.150         | 16         |
|               |            | 0.063         | 9          |

| Approved by: | Leeds Laborato | ory  |            |            |            |
|--------------|----------------|------|------------|------------|------------|
| Stuart Kirk  |                |      |            | Print date | 28/11/2013 |
|              | Revision No    | 3.03 | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground            | Particle Size                     | Hole ID        |
|--------------|---|-----------------------------------|----------------|
|              | Investigation                                     |                                   | A59            |
| Project No.  | TA7148  | Distribution                      | Sample Depth   |
| <b>'</b>     |   |                                   | 5.50m          |
| Engineer     | Arch Henderson LLP                                |                                   | Sample Number  |
|              |   |                                   | 016            |
| Employer     | Aberdeen Harbour Board                            | DC 1277: Dovt 2: 1000: 0.2. 0.E   | Sample type    |
|              |   | BS 1377: Part 2: 1990: 9.2, 9.5   | В              |
| Description  | Brown sandy gravelly CLAY with occasional cobbles | Gravel is fine to coarse angular. | Specimen Depth |
|              |   |                                   | 5.50m          |
|              |   |                                   | Specimen No.   |
|              |   |                                   | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine   | Medium |  | COBBLES |
|------|------|--------|--------|------|--------|--------|--------|--------|--|---------|
|      |      | SILT   |        | SAND |        |        | GRAVEL |        |  | COBBLES |

 General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | ION DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 62         | diameter mm |            |
|               |            | 10.0          | 59         | 0.0512      | 21         |
|               |            | 6.3           | 57         | 0.0260      | 18         |
| 125.0         | 100        | 5.0           | 57         | 0.0185      | 17         |
| 100.0         | 100        | 3.35          | 55         | 0.0084      | 13         |
| 75.0          | 73         | 2.00          | 53         | 0.0051      | 11         |
| 63.0          | 73         | 1.18          | 50         | 0.0031      | 8          |
| 50.0          | 73         | 0.600         | 45         | 0.0015      | 6          |
| 37.5          | 73         | 0.425         | 42         |             |            |
| 28.0          | 71         | 0.300         | 38         |             |            |
| 20.0          | 67         | 0.212         | 33         |             |            |
|               |            | 0.150         | 28         |             |            |
|               |            | 0.063         | 22         |             |            |

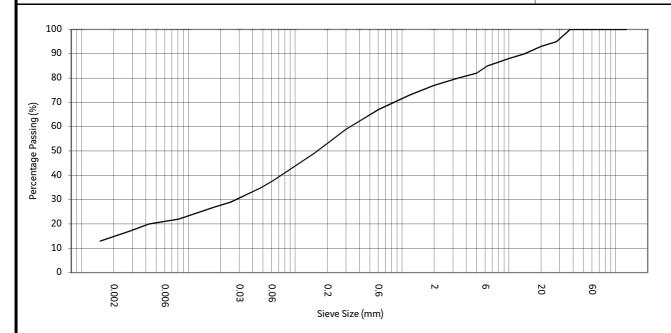
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| Project Name | Bay of Nigg Harbour Development Ground                | Particle Size                    | Hole ID        |
|--------------|---|----------------------------------|----------------|
|              | Investigation   |                                  | A59            |
| Project No.  | TA7148  | Distribution                     | Sample Depth   |
| <b>l</b>     |   |                                  | 10.45m         |
| Engineer     | Arch Henderson LLP                                    |                                  | Sample Number  |
| Ĭ            |   |                                  | 024            |
| Employer     | Aberdeen Harbour Board                                | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2, 9.5  | С              |
| Description  | Brown sandy slightly gravelly CLAY. Gravel is fine to | coarse angular.                  | Specimen Depth |
| ·            |   |                                  | 10.72m         |
|              |   |                                  | Specimen No.   |
|              |   |                                  | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine   | Medium | Coarse | COBBLES |
|------|------|--------|--------|------|--------|--------|--------|--------|--------|---------|
| CLAY |      | SILT   |        | SAND |        |        | GRAVEL |        |        | COBBLES |

General remarks

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   |               | SEDIMENTAT | TON DATA    |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 90         | diameter mm |            |
|               |            | 10.0          | 88         | 0.0485      | 35         |
|               |            | 6.3           | 85         | 0.0249      | 29         |
| 125.0         | 100        | 5.0           | 82         | 0.0177      | 27         |
| 100.0         | 100        | 3.35          | 80         | 0.0081      | 22         |
| 75.0          | 100        | 2.00          | 77         | 0.0043      | 20         |
| 63.0          | 100        | 1.18          | 73         | 0.0028      | 17         |
| 50.0          | 100        | 0.600         | 67         | 0.0015      | 13         |
| 37.5          | 100        | 0.425         | 63         |             |            |
| 28.0          | 95         | 0.300         | 59         |             |            |
| 20.0          | 93         | 0.212         | 54         |             |            |
|               |            | 0.150         | 49         |             |            |
|               |            | 0.063         | 38         |             |            |

Approved by:

Sushil Sharda

Revision No. 3.03

Leeds Laboratory

Print date 28/11/2013

Revision No. 1.03

Revision No. 2.03



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                   | Hole ID        |
|--------------|---|---------------------------------|----------------|
|              | Investigation                                       |                                 | A59            |
| Project No.  | TA7148  | Distribution                    | Sample Depth   |
|              |   |                                 | 21.20m         |
| Engineer     | Arch Henderson LLP                                  |                                 | Sample Number  |
|              |   |                                 | 027            |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type    |
| . ,          |   | BS 1377. Part 2. 1990. 9.2, 9.5 | С              |
| Description  | Brown sandy gravelly CLAY. Gravel is fine to coarse | angular                         | Specimen Depth |
|              |   |                                 | 21.43m         |
|              |   |                                 | Specimen No.   |
|              |   |                                 | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine   | Medium |  | COBBLES |
|------|------|--------|--------|------|--------|--------|--------|--------|--|---------|
| CLAY |      | SILT   |        | SAND |        |        | GRAVEL |        |  | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 9

 Silt:
 17

 Sand:
 39

 Gravel:
 32

 Cobbles:
 2

General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | ION DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 78         | diameter mm |            |
|               |            | 10.0          | 75         | 0.0487      | 25         |
|               |            | 6.3           | 73         | 0.0250      | 20         |
| 125.0         | 100        | 5.0           | 71         | 0.0177      | 20         |
| 100.0         | 100        | 3.35          | 69         | 0.0081      | 15         |
| 75.0          | 100        | 2.00          | 66         | 0.0045      | 13         |
| 63.0          | 100        | 1.18          | 61         | 0.0029      | 10         |
| 50.0          | 92         | 0.600         | 53         | 0.0015      | 9          |
| 37.5          | 92         | 0.425         | 49         |             |            |
| 28.0          | 87         | 0.300         | 44         |             |            |
| 20.0          | 82         | 0.212         | 40         |             |            |
|               |            | 0.150         | 36         |             |            |
|               |            | 0.063         | 27         |             |            |

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Revision No. 3.03

Leeds Laboratory

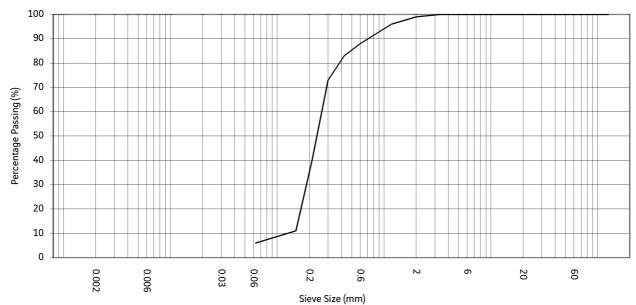
Print date 28/11/2013

Revision No. 1.03

Revision No. 2.03



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>A63          |  |  |  |
|--------------|--|----------------------------|-------------------------|--|--|--|
| Project No.  | TA7148   | Distribution               |                         |  |  |  |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number<br>006    |  |  |  |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B        |  |  |  |
| Description  | Brown SAND with some shell fragments                 |                            | Specimen Depth<br>1.00m |  |  |  |
|              |  |                            | Specimen No.<br>1       |  |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine   | Medium |  | COBBLES |
|------|------|--------|--------|------|--------|--------|--------|--------|--|---------|
| CLAY |      | SILT   |        | SAND |        |        | GRAVEL |        |  | COBBLES |

Silt and clay: 6
Sand: 92
Gravel: 1
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 100        |
|               |            | 6.3        |    | 100        |
| 125.0         | 100        | 5.0        |    | 100        |
| 90.0          | 100        | 3.35       |    | 100        |
| 75.0          | 100        | 2.00       |    | 99         |
| 63.0          | 100        | 1.18       |    | 96         |
| 50.0          | 100        | 0.600      |    | 88         |
| 37.5          | 100        | 0.425      |    | 83         |
| 28.0          | 100        | 0.300      |    | 73         |
| 20.0          | 100        | 0.212      |    | 40         |
|               |            | 0.150      |    | 11         |
|               |            | 0.063      |    | 6          |

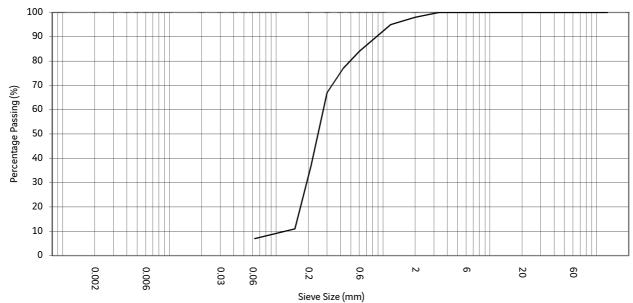
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 Stuart Kirk
 Print date 28/11/2013

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 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>A63 |
|--------------|--|----------------------------|----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth   |
|              |  |                            | 2.00m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
|              |  |                            | 010            |
|              | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type    |
|              |  | D3 1377.1 att 2. 1330. 3.2 | В              |
| Description  | Brown SAND.  |                            | Specimen Depth |
|              |  |                            | 2.00m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAT |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

 Silt and clay:
 7

 Sand:
 91

 Gravel:
 2

 Cobbles:
 0

| ٠ |           |         |
|---|-----------|---------|
| ı | Canara    | remarks |
| ı | ltaenera. | remarks |

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 100        |
|               |            | 6.3        |    | 100        |
| 125.0         | 100        | 5.0        |    | 100        |
| 90.0          | 100        | 3.35       |    | 100        |
| 75.0          | 100        | 2.00       |    | 98         |
| 63.0          | 100        | 1.18       |    | 95         |
| 50.0          | 100        | 0.600      |    | 84         |
| 37.5          | 100        | 0.425      |    | 77         |
| 28.0          | 100        | 0.300      |    | 67         |
| 20.0          | 100        | 0.212      |    | 37         |
|               |            | 0.150      |    | 11         |
|               |            | 0.063      |    | 7          |

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Sushil Sharda

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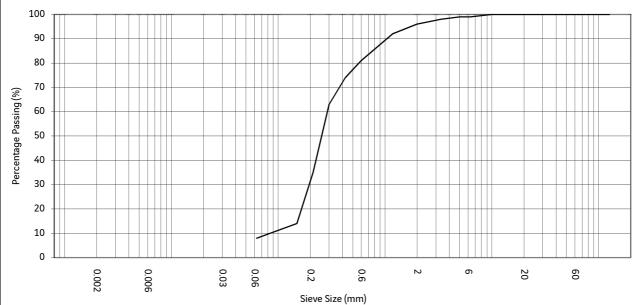
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Revision No. 1 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>A63 |  |  |
|--------------|--|----------------------------|----------------|--|--|
| Project No.  | TA7148   | Distribution               | Sample Depth   |  |  |
|              |  |                            | 3.00m          |  |  |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |  |  |
|              |  |                            | 014            |  |  |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type    |  |  |
|              |  | B3 1377. Falt 2. 1990. 9.2 | В              |  |  |
| Description  | Brown slightly gravelly SAND.                        |                            | Specimen Depth |  |  |
|              |  |                            | 3.00m          |  |  |
|              |  |                            | Specimen No.   |  |  |
|              |  |                            | 1              |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 8
Sand: 89
Gravel: 4
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 100        |
|               |            | 6.3        |    | 99         |
| 125.0         | 100        | 5.0        |    | 99         |
| 90.0          | 100        | 3.35       |    | 98         |
| 75.0          | 100        | 2.00       |    | 96         |
| 63.0          | 100        | 1.18       |    | 92         |
| 50.0          | 100        | 0.600      |    | 81         |
| 37.5          | 100        | 0.425      |    | 74         |
| 28.0          | 100        | 0.300      |    | 63         |
| 20.0          | 100        | 0.212      |    | 35         |
|               |            | 0.150      |    | 14         |
|               |            | 0.063      |    | 8          |

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| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                    | Hole ID        |
|--------------|---|----------------------------------|----------------|
|              | Investigation                                       |                                  | A63            |
| Project No.  | TA7148  | Distribution                     | Sample Depth   |
| <b>l</b>     |   |                                  | 7.50m          |
| Engineer     | Arch Henderson LLP                                  |                                  | Sample Number  |
|              |   |                                  | 024            |
| Employer     | Aberdeen Harbour Board                              | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| . ,          |   | BS 1377: Part 2: 1990: 9.2, 9.5  | В              |
| Description  | Brown sandy gravelly CLAY. Gravel is fine to coarse | angular.                         | Specimen Depth |
| -            |   |                                  | 7.50m          |
|              |   | Specimen No.                     |                |
|              |   |                                  | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

General remarks

Sample size was insufficient to be representative of particle size

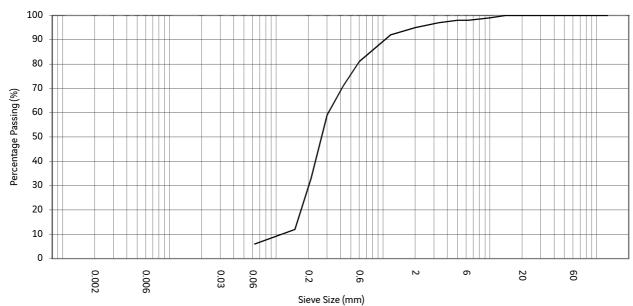
Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | ION DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 69         | diameter mm |            |
|               |            | 10.0          | 68         | 0.0507      | 26         |
|               |            | 6.3           | 65         | 0.0258      | 21         |
| 125.0         | 100        | 5.0           | 64         | 0.0183      | 20         |
| 100.0         | 100        | 3.35          | 63         | 0.0083      | 16         |
| 75.0          | 100        | 2.00          | 60         | 0.0053      | 15         |
| 63.0          | 100        | 1.18          | 56         | 0.0031      | 11         |
| 50.0          | 100        | 0.600         | 50         | 0.0015      | 7          |
| 37.5          | 91         | 0.425         | 47         |             |            |
| 28.0          | 83         | 0.300         | 43         |             |            |
| 20.0          | 76         | 0.212         | 39         |             |            |
|               |            | 0.150         | 34         |             |            |
|               |            | 0.063         | 27         |             |            |

| Approved by: | Leeds Laboratory |      |  |            |            |            |    |
|--------------|------------------|------|--|------------|------------|------------|----|
| Stuart Kirk  |                  |      |  |            | Print date | 28/11/2013 | 5  |
|              | Revision No.     | 3.03 |  | Issue Date | 19/11/2    | .012       | Pa |



| Project Name | Bay of Nigg Harbour Development Ground | Particle Size               | Hole ID        |
|--------------|--|-----------------------------|----------------|
|              | Investigation                          |                             | B61            |
| Project No.  | TA7148                                 | Distribution                | Sample Depth   |
| ,            |  |                             | 1.50m          |
| Engineer     | Arch Henderson LLP                     |                             | Sample Number  |
| J            |  |                             | 007            |
| Employer     | Aberdeen Harbour Board                 | DC 1277, David 2, 1000, 0.2 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2  | В              |
| Description  | Grey slightly gravelly SAND            |                             | Specimen Depth |
| ·            |  |                             | 1.50m          |
|              |  |                             | Specimen No.   |
|              |  |                             | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 6
Sand: 89
Gravel: 5
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |              |
|---------------|------------|---------------|--------------|
| Sieve size mm | Cumulative | Sieve size mr | n Cumulative |
|               | % passing  |               | % passing    |
|               |            | 14.0          | 100          |
|               |            | 10.0          | 99           |
|               |            | 6.3           | 98           |
| 125.0         | 100        | 5.0           | 98           |
| 90.0          | 100        | 3.35          | 97           |
| 75.0          | 100        | 2.00          | 95           |
| 63.0          | 100        | 1.18          | 92           |
| 50.0          | 100        | 0.600         | 81           |
| 37.5          | 100        | 0.425         | 71           |
| 28.0          | 100        | 0.300         | 59           |
| 20.0          | 100        | 0.212         | 33           |
|               |            | 0.150         | 12           |
|               |            | 0.063         | 6            |

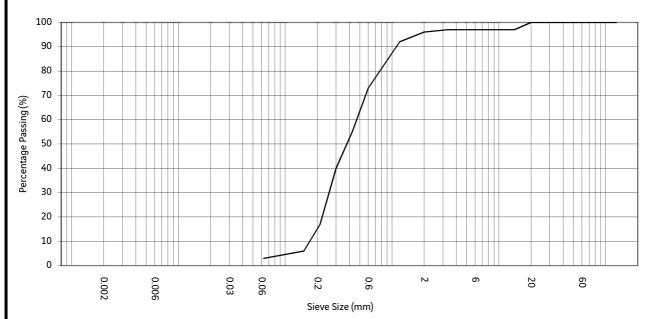
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 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground<br>Investigation | Particle Size              | Hole ID<br>B61                      |
|--------------|---|----------------------------|-------------------------------------|
| Project No.  | TA7148  | Distribution               | Sample Depth<br>3.50m               |
| Engineer     | Arch Henderson LLP                                      |                            | Sample Number<br>015                |
| Employer     | Aberdeen Harbour Board                                  | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B                    |
| Description  | Brown slightly gravelly SAND                            |                            | Specimen Depth 3.50m Specimen No. 1 |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 3
Sand: 93
Gravel: 4
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |            |  |
|---------------|------------|---------------|------------|--|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |  |
|               | % passing  |               | % passing  |  |
|               |            | 14.0          | 97         |  |
|               |            | 10.0          | 97         |  |
|               |            | 6.3           | 97         |  |
| 125.0         | 100        | 5.0           | 97         |  |
| 90.0          | 100        | 3.35          | 97         |  |
| 75.0          | 100        | 2.00          | 96         |  |
| 63.0          | 100        | 1.18          | 92         |  |
| 50.0          | 100        | 0.600         | 73         |  |
| 37.5          | 100        | 0.425         | 55         |  |
| 28.0          | 100        | 0.300         | 40         |  |
| 20.0          | 100        | 0.212         | 17         |  |
|               |            | 0.150         | 6          |  |
|               |            | 0.063         | 3          |  |

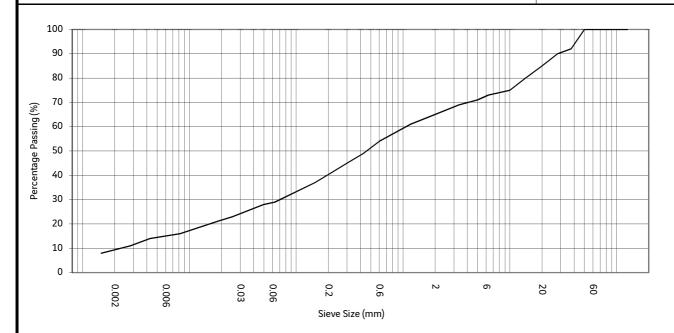
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| Project Name | Bay of Nigg Harbour Development Ground | Particle Size                    | Hole ID        |
|--------------|--|----------------------------------|----------------|
|              | Investigation                          |                                  | B61            |
| Project No.  | TA7148                                 | Distribution                     | Sample Depth   |
| <b>l</b> ′   |  |                                  | 28.05m         |
| Engineer     | Arch Henderson LLP                     |                                  | Sample Number  |
| Ĭ            |  |                                  | 020            |
| Employer     | Aberdeen Harbour Board                 | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2, 9.5  | С              |
| Description  | Brown sandy gravelly CLAY.             |                                  | Specimen Depth |
| -            |  |                                  | 28.10m         |
|              |  |                                  | Specimen No.   |
|              |  |                                  | 2              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 9

 Silt:
 20

 Sand:
 36

 Gravel:
 35

 Cobbles:
 0

General remarks

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | TON DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 80         | diameter mm |            |
|               |            | 10.0          | 75         | 0.0495      | 28         |
|               |            | 6.3           | 73         | 0.0253      | 23         |
| 125.0         | 100        | 5.0           | 71         | 0.0181      | 21         |
| 90.0          | 100        | 3.35          | 69         | 0.0082      | 16         |
| 75.0          | 100        | 2.00          | 65         | 0.0043      | 14         |
| 63.0          | 100        | 1.18          | 61         | 0.0028      | 11         |
| 50.0          | 100        | 0.600         | 54         | 0.0015      | 8          |
| 37.5          | 92         | 0.425         | 49         |             |            |
| 28.0          | 90         | 0.300         | 45         |             |            |
| 20.0          | 85         | 0.212         | 41         |             |            |
|               |            | 0.150         | 37         |             |            |
|               |            | 0.063         | 29         |             |            |

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| Project Name | Bay of Nigg Harbour Development Ground            | Particle Size                    | Hole ID        |
|--------------|---|----------------------------------|----------------|
|              | Investigation                                     |                                  | B61            |
| Project No.  | TA7148  | Distribution                     | Sample Depth   |
| <b>l</b>     |   |                                  | 30.30m         |
| Engineer     | Arch Henderson LLP                                |                                  | Sample Number  |
|              |   |                                  | 021            |
| Employer     | Aberdeen Harbour Board                            | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2, 9.5  | С              |
| Description  | Brown sandy gravely CLAY. Gravel is medium to coa | rse subangular.                  | Specimen Depth |
|              |   |                                  | 30.30m         |
|              |   |                                  | Specimen No.   |
|              |   |                                  | 2              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | TON DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 76         | diameter mm |            |
|               |            | 10.0          | 73         | 0.0436      | 29         |
|               |            | 6.3           | 70         | 0.0228      | 24         |
| 125.0         | 100        | 5.0           | 69         | 0.0165      | 22         |
| 90.0          | 100        | 3.35          | 67         | 0.0077      | 17         |
| 75.0          | 100        | 2.00          | 64         | 0.0043      | 15         |
| 63.0          | 100        | 1.18          | 60         | 0.0028      | 12         |
| 50.0          | 100        | 0.600         | 53         | 0.0014      | 9          |
| 37.5          | 100        | 0.425         | 50         |             |            |
| 28.0          | 89         | 0.300         | 46         |             |            |
| 20.0          | 83         | 0.212         | 42         |             |            |
|               |            | 0.150         | 38         |             |            |
|               |            | 0.063         | 30         |             |            |

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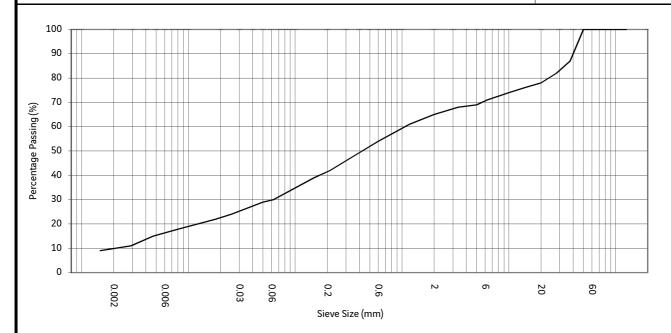
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| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                    | Hole ID        |
|--------------|---|----------------------------------|----------------|
|              | Investigation                                       |                                  | B61            |
| Project No.  | TA7148  | Distribution                     | Sample Depth   |
| <b>l</b>     |   |                                  | 30.80m         |
| Engineer     | Arch Henderson LLP                                  |                                  | Sample Number  |
|              |   |                                  | 022            |
| Employer     | Aberdeen Harbour Board                              | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2, 9.5  | С              |
| Description  | Brown sandy gravelly CLAY. Gravel is fine to coarse | subrounded.                      | Specimen Depth |
|              |   |                                  | 30.80m         |
|              |   |                                  | Specimen No.   |
|              |   |                                  | 2              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | ION DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 76         | diameter mm |            |
|               |            | 10.0          | 74         | 0.0498      | 29         |
|               |            | 6.3           | 71         | 0.0254      | 24         |
| 125.0         | 100        | 5.0           | 69         | 0.0181      | 22         |
| 90.0          | 100        | 3.35          | 68         | 0.0082      | 18         |
| 75.0          | 100        | 2.00          | 65         | 0.0047      | 15         |
| 63.0          | 100        | 1.18          | 61         | 0.0029      | 11         |
| 50.0          | 100        | 0.600         | 54         | 0.0015      | 9          |
| 37.5          | 87         | 0.425         | 50         |             |            |
| 28.0          | 82         | 0.300         | 46         |             |            |
| 20.0          | 78         | 0.212         | 42         |             |            |
|               |            | 0.150         | 39         |             |            |
|               |            | 0.063         | 30         |             |            |

Approved by:

Sushil Sharda

Revision No. 3.03

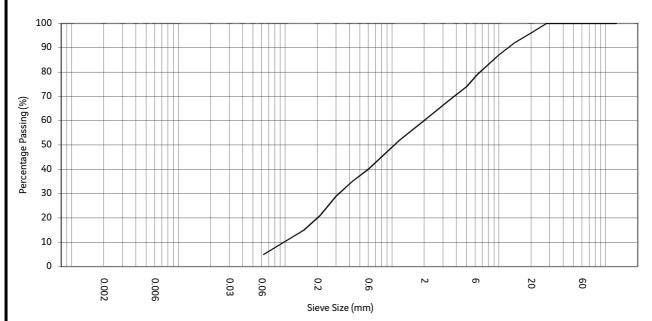
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| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>C79                               |
|--------------|--|----------------------------|--|
| Project No.  | TA7148   | Distribution               | Sample Depth<br>0.50m                        |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number<br>002                         |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B                             |
| Description  | Brown gravelly SAND. Gravel is fine to coarse angula | ır.                        | Specimen Depth<br>0.50m<br>Specimen No.<br>1 |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 5
Sand: 55
Gravel: 40
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |              |
|---------------|------------|---------------|--------------|
| Sieve size mm | Cumulative | Sieve size mr | n Cumulative |
|               | % passing  |               | % passing    |
|               |            | 14.0          | 92           |
|               |            | 10.0          | 87           |
|               |            | 6.3           | 79           |
| 125.0         | 100        | 5.0           | 74           |
| 90.0          | 100        | 3.35          | 68           |
| 75.0          | 100        | 2.00          | 60           |
| 63.0          | 100        | 1.18          | 52           |
| 50.0          | 100        | 0.600         | 40           |
| 37.5          | 100        | 0.425         | 35           |
| 28.0          | 100        | 0.300         | 29           |
| 20.0          | 96         | 0.212         | 21           |
|               |            | 0.150         | 15           |
|               |            | 0.063         | 5            |

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| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>C81 |
|--------------|--|----------------------------|----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth   |
|              |  |                            | 0.50m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
|              |  |                            | 002            |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brown mottled grey gravelly SAND. Gravel is fine to  | coarse subangular.         | Specimen Depth |
|              |  |                            | 0.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 6
Sand: 53
Gravel: 41
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 86         |
|               |            | 10.0       |    | 82         |
|               |            | 6.3        |    | 76         |
| 125.0         | 100        | 5.0        |    | 72         |
| 90.0          | 100        | 3.35       |    | 66         |
| 75.0          | 100        | 2.00       |    | 59         |
| 63.0          | 100        | 1.18       |    | 52         |
| 50.0          | 100        | 0.600      |    | 41         |
| 37.5          | 94         | 0.425      |    | 35         |
| 28.0          | 94         | 0.300      |    | 30         |
| 20.0          | 90         | 0.212      |    | 22         |
|               |            | 0.150      |    | 15         |
|               |            | 0.063      |    | 6          |

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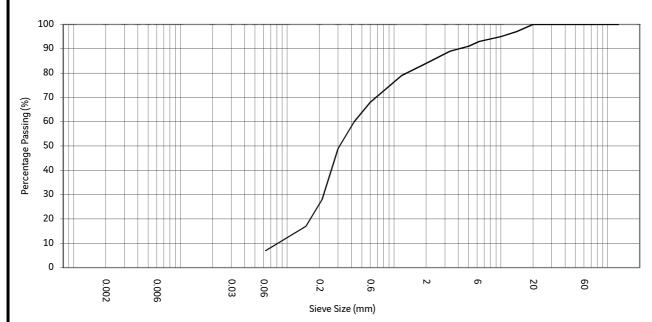
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| Project Name | Bay of Nigg Harbour Development Ground Investigation  | Particle Size              | Hole ID<br>C81 |
|--------------|---|----------------------------|----------------|
| Project No.  | TA7148  | Distribution               | Sample Depth   |
| -            |   |                            | 1.50m          |
| Engineer     | Arch Henderson LLP                                    |                            | Sample Number  |
| _            |   |                            | 004            |
| Employer     | Aberdeen Harbour Board                                | BS 1377: Part 2: 1990: 9.2 | Sample type    |
|              |   | B3 1377. Falt 2. 1390. 9.2 | В              |
| Description  | Brown slightly gravelly SAND. Gravel is fine to mediu | m angular                  | Specimen Depth |
|              |   |                            | 1.50m          |
|              |   |                            | Specimen No.   |
|              |   |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

 Silt and clay:
 7

 Sand:
 77

 Gravel:
 16

 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 97         |
|               |            | 10.0          | 95         |
|               |            | 6.3           | 93         |
| 125.0         | 100        | 5.0           | 91         |
| 90.0          | 100        | 3.35          | 89         |
| 75.0          | 100        | 2.00          | 84         |
| 63.0          | 100        | 1.18          | 79         |
| 50.0          | 100        | 0.600         | 68         |
| 37.5          | 100        | 0.425         | 60         |
| 28.0          | 100        | 0.300         | 49         |
| 20.0          | 100        | 0.212         | 28         |
|               |            | 0.150         | 17         |
|               |            | 0.063         | 7          |

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| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                   | Hole ID<br>C81          |
|--------------|---|---------------------------------|-------------------------|
| Project No.  | Investigation<br>TA7148                             | Distribution                    | Sample Depth            |
| Engineer     | Arch Henderson LLP                                  |                                 | 6.30m<br>Sample Number  |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type<br>C        |
| Description  | Brown gravelly sandy CLAY. Gravel is fine to coarse | subangular.                     | Specimen Depth<br>6.30m |
|              |   |                                 | Specimen No.<br>1       |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 10

 Silt:
 25

 Sand:
 40

 Gravel:
 25

 Cobbles:
 0

General remarks

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | SEDIMENTAT    | TON DATA   |             |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 89         | diameter mm |            |
|               |            | 10.0          | 87         | 0.0503      | 33         |
|               |            | 6.3           | 84         | 0.0256      | 28         |
| 125.0         | 100        | 5.0           | 82         | 0.0182      | 25         |
| 90.0          | 100        | 3.35          | 79         | 0.0083      | 19         |
| 75.0          | 100        | 2.00          | 76         | 0.0044      | 14         |
| 63.0          | 100        | 1.18          | 71         | 0.0038      | 12         |
| 50.0          | 100        | 0.600         | 64         | 0.0010      | 9          |
| 37.5          | 100        | 0.425         | 60         |             |            |
| 28.0          | 97         | 0.300         | 56         |             |            |
| 20.0          | 93         | 0.212         | 50         |             |            |
|               |            | 0.150         | 46         |             |            |
|               |            | 0.063         | 36         |             |            |

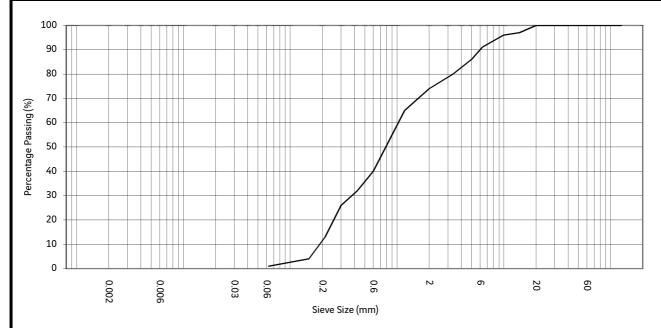
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 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground                | Particle Size              | Hole ID<br>C83                          |
|--------------|---|----------------------------|---|
| Project No.  | Investigation<br>TA7148                               | Distribution               | Sample Depth                            |
| Engineer     | Arch Henderson LLP                                    |                            | 0.00m<br>Sample Number                  |
| Employer     | Aberdeen Harbour Board                                | BS 1377: Part 2: 1990: 9.2 | 002<br>Sample type<br>B                 |
| Description  | Brown slightly gravelly SAND. Gravel is fine to medic | m angular                  | Specimen Depth<br>0.00m<br>Specimen No. |
|              |   |                            | 1                                       |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 2
Sand: 72
Gravel: 27
Cobbles: 0

Approved by: Stuart Kirk General remarks

|               | WET SIEV   | E DATA     |               |
|---------------|------------|------------|---------------|
| Sieve size mm | Cumulative | Sieve size | mm Cumulative |
|               | % passing  |            | % passing     |
|               |            | 14.0       | 97            |
|               |            | 10.0       | 96            |
|               |            | 6.3        | 91            |
| 125.0         | 100        | 5.0        | 86            |
| 90.0          | 100        | 3.35       | 80            |
| 75.0          | 100        | 2.00       | 74            |
| 63.0          | 100        | 1.18       | 65            |
| 50.0          | 100        | 0.600      | 40            |
| 37.5          | 100        | 0.425      | 32            |
| 28.0          | 100        | 0.300      | 26            |
| 20.0          | 100        | 0.212      | 13            |
|               |            | 0.150      | 4             |
|               |            | 0.063      | 1             |

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19/11/2012

Issue Date

28/11/2013

SOIL ENGINEERING

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| Project Name | Bay of Nigg Harbour Development Ground                | Particle Size                    | Hole ID        |
|--------------|---|----------------------------------|----------------|
|              | Investigation   |                                  | C83            |
| Project No.  | TA7148  | Distribution                     | Sample Depth   |
|              |   |                                  | 2.75m          |
| Engineer     | Arch Henderson LLP                                    |                                  | Sample Number  |
|              |   |                                  | 800            |
| Employer     | Aberdeen Harbour Board                                | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2, 9.5  | С              |
| Description  | Brown sandy slightly gravelly CLAY. Gravel is fine to | coarse angular.                  | Specimen Depth |
| -            |   |                                  | 2.90m          |
|              |   |                                  | Specimen No.   |
|              |   |                                  | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 14

 Silt:
 22

 Sand:
 37

 Gravel:
 27

 Cobbles:
 0

General remarks

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | SEDIMENTAT    | TON DATA   |             |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 87         | diameter mm |            |
|               |            | 10.0          | 85         | 0.0474      | 33         |
|               |            | 6.3           | 80         | 0.0244      | 28         |
| 125.0         | 100        | 5.0           | 78         | 0.0174      | 26         |
| 100.0         | 100        | 3.35          | 76         | 0.0080      | 21         |
| 75.0          | 100        | 2.00          | 73         | 0.0046      | 18         |
| 63.0          | 100        | 1.18          | 70         | 0.0029      | 15         |
| 50.0          | 100        | 0.600         | 63         | 0.0014      | 13         |
| 37.5          | 100        | 0.425         | 60         |             |            |
| 28.0          | 95         | 0.300         | 56         |             |            |
| 20.0          | 93         | 0.212         | 51         |             |            |
|               |            | 0.150         | 46         |             |            |
|               |            | 0.063         | 37         |             |            |

Approved by:

Sushil Sharda

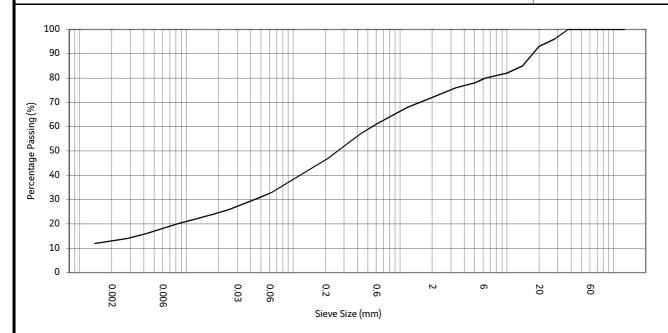
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| Project Name | Bay of Nigg Harbour Development Ground                 | Particle Size                   | Hole ID        |
|--------------|--|---------------------------------|----------------|
|              | Investigation  |                                 | C83            |
| Project No.  | TA7148   | Distribution                    | Sample Depth   |
|              |  |                                 | 9.05m          |
| Engineer     | Arch Henderson LLP                                     |                                 | Sample Number  |
|              |  |                                 | 010            |
| Employer     | Aberdeen Harbour Board                                 | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type    |
|              |  | BS 1511. Fait 2. 1990. 9.2, 9.3 | С              |
| Description  | Brown clayey slightly gravelly SAND, Gravel is fine to | o coarse angular.               | Specimen Depth |
|              |  |                                 | 9.05m          |
|              |  |                                 | Specimen No.   |
|              |  |                                 | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 13

 Silt:
 19

 Sand:
 40

 Gravel:
 28

 Cobbles:
 0

General remarks

Dispersant used when soaking specimen.

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | SEDIMENTAT    | ION DATA   |             |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 85         | diameter mm |            |
|               |            | 10.0          | 82         | 0.0494      | 31         |
|               |            | 6.3           | 80         | 0.0253      | 26         |
| 125.0         | 100        | 5.0           | 78         | 0.0180      | 24         |
| 100.0         | 100        | 3.35          | 76         | 0.0082      | 20         |
| 75.0          | 100        | 2.00          | 72         | 0.0042      | 16         |
| 63.0          | 100        | 1.18          | 68         | 0.0028      | 14         |
| 50.0          | 100        | 0.600         | 61         | 0.0014      | 12         |
| 37.5          | 100        | 0.425         | 57         |             |            |
| 28.0          | 96         | 0.300         | 52         |             |            |
| 20.0          | 93         | 0.212         | 47         |             |            |
|               |            | 0.150         | 43         |             |            |
|               |            | 0.063         | 33         |             |            |

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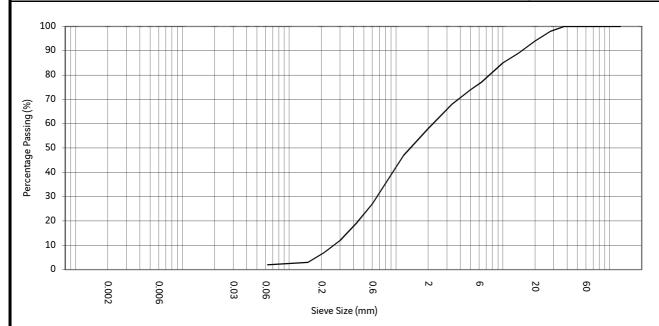
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| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size               | Hole ID<br>C84 |
|--------------|--|-----------------------------|----------------|
| Project No.  | TA7148   | Distribution                | Sample Depth   |
|              |  |                             | 0.30m          |
| Engineer     | Arch Henderson LLP                                   |                             | Sample Number  |
|              |  |                             | 002            |
| Employer     | Aberdeen Harbour Board                               | DC 1277: David 2: 1000, 0.2 | Sample type    |
| ,            |  | BS 1377: Part 2: 1990: 9.2  | В              |
| Description  | Brown gravelly SAND. Gravel is fine to coarse subro  | unded.                      | Specimen Depth |
|              |  |                             | 0.30m          |
|              |  |                             | Specimen No.   |
|              |  |                             | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 2
Sand: 56
Gravel: 42
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 89         |
|               |            | 10.0       |    | 85         |
|               |            | 6.3        |    | 77         |
| 125.0         | 100        | 5.0        |    | 74         |
| 90.0          | 100        | 3.35       |    | 68         |
| 75.0          | 100        | 2.00       |    | 58         |
| 63.0          | 100        | 1.18       |    | 47         |
| 50.0          | 100        | 0.600      |    | 27         |
| 37.5          | 100        | 0.425      |    | 19         |
| 28.0          | 98         | 0.300      |    | 12         |
| 20.0          | 94         | 0.212      |    | 7          |
|               |            | 0.150      |    | 3          |
|               |            | 0.063      |    | 2          |

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 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

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| Project Name | Bay of Nigg Harbour Development Ground                | Particle Size                   | Hole ID        |
|--------------|---|---------------------------------|----------------|
|              | Investigation   |                                 | C84            |
| Project No.  | TA7148  | Distribution                    | Sample Depth   |
| <b>'</b>     |   |                                 | 3.60m          |
| Engineer     | Arch Henderson LLP                                    |                                 | Sample Number  |
|              |   |                                 | 006            |
| Employer     | Aberdeen Harbour Board                                | DC 1277: Dowt 2: 1000: 0.2. 0.E | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2, 9.5 | С              |
| Description  | Brown sandy slightly gravelly CLAY. Gravel is fine to | coarse angular with cobbles.    | Specimen Depth |
|              |   |                                 | 3.75m          |
|              |   |                                 | Specimen No.   |
|              |   |                                 | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 7

 Silt:
 12

 Sand:
 24

 Gravel:
 18

 Cobbles:
 38

General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | TON DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 51         | diameter mm |            |
|               |            | 10.0          | 50         | 0.0489      | 19         |
|               |            | 6.3           | 48         | 0.0251      | 15         |
| 125.0         | 100        | 5.0           | 47         | 0.0178      | 14         |
| 100.0         | 100        | 3.35          | 46         | 0.0081      | 12         |
| 75.0          | 62         | 2.00          | 44         | 0.0047      | 10         |
| 63.0          | 62         | 1.18          | 41         | 0.0029      | 8          |
| 50.0          | 62         | 0.600         | 37         | 0.0015      | 7          |
| 37.5          | 62         | 0.425         | 34         |             |            |
| 28.0          | 56         | 0.300         | 31         |             |            |
| 20.0          | 54         | 0.212         | 29         |             |            |
|               |            | 0.150         | 26         |             |            |
|               |            | 0.063         | 20         |             |            |

Approved by:

Sushil Sharda

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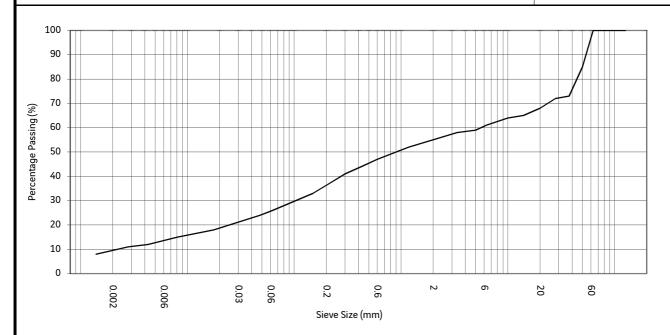
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| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                   | Hole ID        |
|--------------|---|---------------------------------|----------------|
|              | Investigation                                       |                                 | C84            |
| Project No.  | TA7148  | Distribution                    | Sample Depth   |
| <b>l</b>     |   |                                 | 7.10m          |
| Engineer     | Arch Henderson LLP                                  |                                 | Sample Number  |
|              |   |                                 | 800            |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type    |
| ' '          |   | BS 1377. Part 2. 1990. 9.2, 9.5 | С              |
| Description  | Brown sandy gravelly CLAY. Gravel is fine to coarse | angular.                        | Specimen Depth |
|              |   |                                 | 7.10m          |
|              |   |                                 | Specimen No.   |
|              |   |                                 | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 10

 Silt:
 16

 Sand:
 29

 Gravel:
 42

 Cobbles:
 3

General remarks

Sample size was insufficient to be representative of particle size Dispersant used when soaking specimen.

Particle density: 2.65Mg/m³ Assumed

|            |   |  | ,   |   |
|------------|---|--|---|---|
| WET SIEV   | E DATA  |  | SEDIMENTAT  | ION DATA  |
| Cumulative | Sieve size mm   | Cumulative   | Equivalent  | Cumulative  |
| % passing  |   | % passing  | particle  | % passing   |
|            | 14.0  | 65   | diameter mm   |   |
|            | 10.0  | 64   | 0.0483  | 24  |
|            | 6.3   | 61   | 0.0248  | 20  |
| 100        | 5.0   | 59   | 0.0177  | 18  |
| 100        | 3.35  | 58   | 0.0081  | 15  |
| 100        | 2.00  | 55   | 0.0043  | 12  |
| 100        | 1.18  | 52   | 0.0028  | 11  |
| 85         | 0.600   | 47   | 0.0014  | 8   |
| 73         | 0.425   | 44   |   |   |
| 72         | 0.300   | 41   |   |   |
| 68         | 0.212   | 37   |   |   |
|            | 0.150   | 33   |   |   |
|            | 0.063   | 26   |   |   |
|            | Cumulative<br>% passing<br>100<br>100<br>100<br>100<br>85<br>73<br>72 | WET SIEVE DATA  Cumulative Sieve size mm % passing  14.0 10.0 6.3 100 5.0 100 3.35 100 2.00 100 1.18 85 0.600 73 0.425 72 0.300 68 0.212 0.150 | WET SIEVE DATA           Cumulative % passing         Sieve size mm         Cumulative % passing           14.0         65           10.0         64           6.3         61           100         5.0         59           100         3.35         58           100         2.00         55           100         1.18         52           85         0.600         47           73         0.425         44           72         0.300         41           68         0.212         37           0.150         33 | WET SIEVE DATA         SEDIMENTAT           Cumulative % passing         Sieve size mm         Cumulative % passing         Equivalent particle           14.0         65         diameter mm           10.0         64         0.0483           6.3         61         0.0248           100         5.0         59         0.0177           100         3.35         58         0.0081           100         2.00         55         0.0043           100         1.18         52         0.0028           85         0.600         47         0.0014           73         0.425         44           72         0.300         41           68         0.212         37           0.150         33 |

Approved by:

Sushil Sharda

Revision No. 3.03

Leeds Laboratory

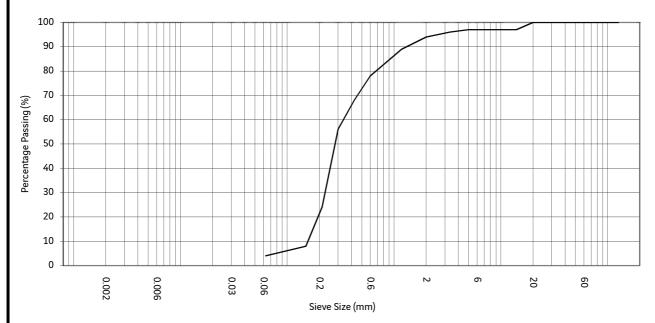
Print date 28/11/2013

Revision No. 1.03

Revision No. 2.03



| Project Name | Bay of Nigg Harbour Development Ground               | Particle Size              | Hole ID<br>C87                               |
|--------------|--|----------------------------|--|
| Project No.  | Investigation<br>TA7148                              | Distribution               | Sample Depth                                 |
| Engineer     | Arch Henderson LLP                                   |                            | 0.00m<br>Sample Number<br>002                |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B                             |
| Description  | Brown slightly gravelly SAND. Gravel is fine to medi | um subangular.             | Specimen Depth<br>0.00m<br>Specimen No.<br>1 |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 Silt and clay:
 4

 Sand:
 90

 Gravel:
 6

 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA     |               |
|---------------|------------|------------|---------------|
| Sieve size mm | Cumulative | Sieve size | mm Cumulative |
|               | % passing  |            | % passing     |
|               |            | 14.0       | 97            |
|               |            | 10.0       | 97            |
|               |            | 6.3        | 97            |
| 125.0         | 100        | 5.0        | 97            |
| 100.0         | 100        | 3.35       | 96            |
| 75.0          | 100        | 2.00       | 94            |
| 63.0          | 100        | 1.18       | 89            |
| 50.0          | 100        | 0.600      | 78            |
| 37.5          | 100        | 0.425      | 68            |
| 28.0          | 100        | 0.300      | 56            |
| 20.0          | 100        | 0.212      | 24            |
|               |            | 0.150      | 8             |
|               |            | 0.063      | 4             |

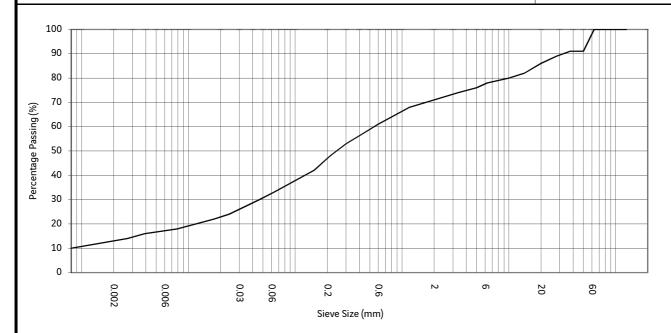
 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground                | Particle Size                    | Hole ID        |
|--------------|---|----------------------------------|----------------|
|              | Investigation   |                                  | C87            |
| Project No.  | TA7148  | Distribution                     | Sample Depth   |
| <b>l</b>     |   |                                  | 4.15m          |
| Engineer     | Arch Henderson LLP                                    |                                  | Sample Number  |
| Ĭ            |   |                                  | 005            |
| Employer     | Aberdeen Harbour Board                                | DC 1277: David 2: 1000: 0.2. 0.5 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2, 9.5  | С              |
| Description  | Brown sandy slightly gravelly CLAY. Gravel is fine to | coarse subangular.               | Specimen Depth |
|              |   |                                  | 4.37m          |
|              |   |                                  | Specimen No.   |
|              |   |                                  | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   |               | SEDIMENTAT | ION DATA    |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 82         | diameter mm |            |
|               |            | 10.0          | 80         | 0.0463      | 30         |
|               |            | 6.3           | 78         | 0.0241      | 24         |
| 125.0         | 100        | 5.0           | 76         | 0.0173      | 22         |
| 100.0         | 100        | 3.35          | 74         | 0.0079      | 18         |
| 75.0          | 100        | 2.00          | 71         | 0.0039      | 16         |
| 63.0          | 100        | 1.18          | 68         | 0.0027      | 14         |
| 50.0          | 91         | 0.600         | 61         | 0.0008      | 10         |
| 37.5          | 91         | 0.425         | 57         |             |            |
| 28.0          | 89         | 0.300         | 53         |             |            |
| 20.0          | 86         | 0.212         | 48         |             |            |
|               |            | 0.150         | 42         |             |            |
|               |            | 0.063         | 33         |             |            |

Approved by:

Sushil Sharda

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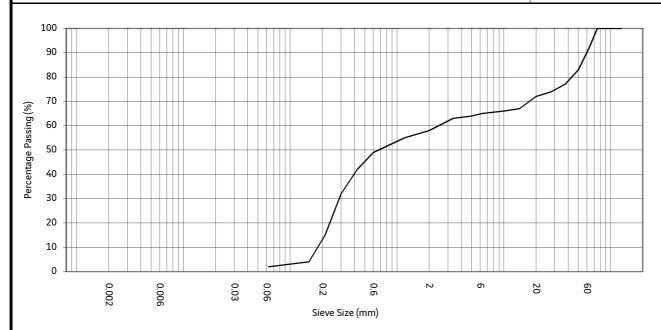
Print date 28/11/2013

Revision No. 1.03

Revision No. 2.03



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size                | Hole ID<br>C88 |
|--------------|--|------------------------------|----------------|
| Project No.  | TA7148   | Distribution                 | Sample Depth   |
| ·            |  |                              | 0.00m          |
| Engineer     | Arch Henderson LLP                                   |                              | Sample Number  |
|              |  |                              | 002            |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2   | Sample type    |
| , ,          |  | BS 13/1. Part 2. 1990. 9.2   | В              |
| Description  | Brown gravelly SAND with cobbles. Gravel is fine to  | coarse sunagular to rounded. | Specimen Depth |
|              |  |                              | 0.00m          |
|              |  |                              | Specimen No.   |
|              |  |                              | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

Silt and clay: 2
Sand: 56
Gravel: 32
Cobbles: 10

General remarks

Sample size was insufficient to be representative of particle size

|               | WET SIEV   | 'E DATA       |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 67         |
|               |            | 10.0          | 66         |
|               |            | 6.3           | 65         |
| 125.0         | 100        | 5.0           | 64         |
| 90.0          | 100        | 3.35          | 63         |
| 75.0          | 100        | 2.00          | 58         |
| 63.0          | 92         | 1.18          | 55         |
| 50.0          | 83         | 0.600         | 49         |
| 37.5          | 77         | 0.425         | 42         |
| 28.0          | 74         | 0.300         | 32         |
| 20.0          | 72         | 0.212         | 15         |
|               |            | 0.150         | 4          |
|               |            | 0.063         | 2          |

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 28/11/2013
 SOIL (CONTINUE)

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 3.03
 Issue Date
 19/11/2012
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| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                   | Hole ID        |
|--------------|---|---------------------------------|----------------|
| <b>.</b> .   | Investigation                                       |                                 | C88            |
| Project No.  | TA7148  | Distribution                    | Sample Depth   |
| <b>'</b>     |   |                                 | 2.05m          |
| Engineer     | Arch Henderson LLP                                  |                                 | Sample Number  |
| Ĭ            |   |                                 | 005            |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type    |
| ' '          |   | BS 1377: Part 2. 1990. 9.2, 9.5 | С              |
| Description  | Brown sandy gravelly CLAY. Gravel is fine to coarse | angular.                        | Specimen Depth |
|              |   |                                 | 2.05m          |
|              |   |                                 | Specimen No.   |
|              |   |                                 | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 10

 Silt:
 16

 Sand:
 31

 Gravel:
 29

 Cobbles:
 14

General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m³ Assumed

|            |  |   | ,  |   |
|------------|--|---|--|---|
| WET SIEV   | E DATA   |   | SEDIMENTAT   | ION DATA  |
| Cumulative | Sieve size mm  | Cumulative  | Equivalent   | Cumulative  |
| % passing  |  | % passing   | particle   | % passing   |
|            | 14.0   | 66  | diameter mm  |   |
|            | 10.0   | 64  | 0.0475   | 24  |
|            | 6.3  | 61  | 0.0244   | 20  |
| 100        | 5.0  | 61  | 0.0175   | 18  |
| 100        | 3.35   | 59  | 0.0080   | 15  |
| 100        | 2.00   | 57  | 0.0041   | 13  |
| 88         | 1.18   | 54  | 0.0027   | 11  |
| 81         | 0.600  | 49  | 0.0008   | 7   |
| 78         | 0.425  | 46  |  |   |
| 71         | 0.300  | 42  |  |   |
| 67         | 0.212  | 39  |  |   |
|            | 0.150  | 35  |  |   |
|            | 0.063  | 26  |  |   |
|            | Cumulative<br>% passing<br>100<br>100<br>100<br>88<br>81<br>78<br>71 | WET SIEVE DATA  Cumulative Sieve size mm % passing  14.0 10.0 6.3 100 5.0 100 3.35 100 2.00 88 1.18 81 0.600 78 0.425 71 0.300 67 0.212 0.150 | WET SIEVE DATA           Cumulative % passing         Sieve size mm         Cumulative % passing           14.0         66           10.0         64           6.3         61           100         5.0         61           100         3.35         59           100         2.00         57           88         1.18         54           81         0.600         49           78         0.425         46           71         0.300         42           67         0.212         39           0.150         35 | WET SIEVE DATA         SEDIMENTAT           Cumulative % passing         Sieve size mm         Cumulative particle         Equivalent particle           14.0         66         diameter mm           10.0         64         0.0475           6.3         61         0.0244           100         5.0         61         0.0175           100         3.35         59         0.0080           100         2.00         57         0.0041           88         1.18         54         0.0027           81         0.600         49         0.0008           78         0.425         46           71         0.300         42           67         0.212         39           0.150         35 |

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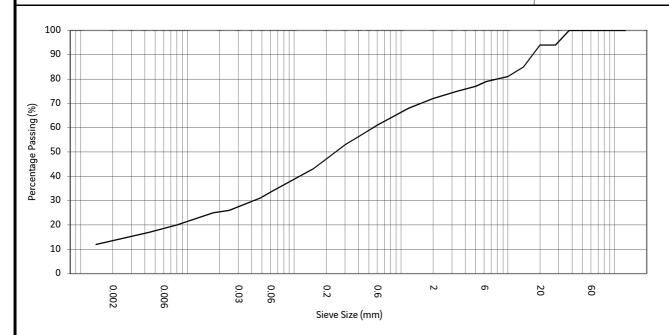
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Revision No. 2.03



| Project Name | Bay of Nigg Harbour Development Ground | Particle Size                    | Hole ID        |
|--------------|--|----------------------------------|----------------|
|              | Investigation                          |                                  | C88            |
| Project No.  | TA7148                                 | Distribution                     | Sample Depth   |
| <b>l</b> ′   |  |                                  | 6.20m          |
| Engineer     | Arch Henderson LLP                     |                                  | Sample Number  |
| Ĭ            |  |                                  | 007            |
| Employer     | Aberdeen Harbour Board                 | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2, 9.5  | С              |
| Description  | Brown sandy slightly gravelly CLAY.    |                                  | Specimen Depth |
|              |  |                                  | 6.20m          |
|              |  |                                  | Specimen No.   |
|              |  |                                  | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 13

 Silt:
 20

 Sand:
 38

 Gravel:
 28

 Cobbles:
 0

General remarks

Dispersant used when soaking specimen.

Particle density: 2.65Mg/m³ Assumed

|               |            |               | =          | 7.000  |            |
|---------------|------------|---------------|------------|--|------------|
|               | WET SIEV   | 'E DATA       |            | SEDIMENTAT   | ION DATA   |
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent   | Cumulative |
|               | % passing  |               | % passing  | particle   | % passing  |
|               |            | 14.0          | 85         | diameter mm  |            |
|               |            | 10.0          | 81         | 0.0480   | 31         |
|               |            | 6.3           | 79         | 0.0247   | 26         |
| 125.0         | 100        | 5.0           | 77         | 0.0175   | 25         |
| 100.0         | 100        | 3.35          | 75         | 0.0080   | 20         |
| 75.0          | 100        | 2.00          | 72         | 0.0044   | 17         |
| 63.0          | 100        | 1.18          | 68         | 0.0028   | 15         |
| 50.0          | 100        | 0.600         | 61         | 0.0014   | 12         |
| 37.5          | 100        | 0.425         | 57         |  |            |
| 28.0          | 94         | 0.300         | 53         |  |            |
| 20.0          | 94         | 0.212         | 48         |  |            |
|               |            | 0.150         | 43         |  |            |
|               |            | 0.063         | 34         |  |            |
|               |            |               |            | The state of the s |            |

Approved by:

Sushil Sharda

Revision No. 3.03

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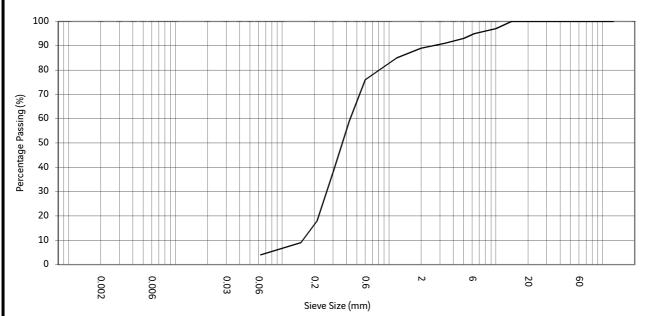
Print date 28/11/2013

Revision No. 1.03

Revision No. 2.03



| Project Name | Bay of Nigg Harbour Development Ground | Particle Size              | Hole ID<br>C96          |
|--------------|--|----------------------------|-------------------------|
| Project No.  | Investigation<br>TA7148                | Distribution               | Sample Depth<br>0.50m   |
| Engineer     | Arch Henderson LLP                     |                            | Sample Number<br>003    |
| Employer     | Aberdeen Harbour Board                 | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B        |
| Description  | Brown slightly gravelly SAND           |                            | Specimen Depth<br>0.50m |
|              |  |                            | Specimen No.<br>1       |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 4
Sand: 85
Gravel: 11
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 97         |
|               |            | 6.3        |    | 95         |
| 125.0         | 100        | 5.0        |    | 93         |
| 90.0          | 100        | 3.35       |    | 91         |
| 75.0          | 100        | 2.00       |    | 89         |
| 63.0          | 100        | 1.18       |    | 85         |
| 50.0          | 100        | 0.600      |    | 76         |
| 37.5          | 100        | 0.425      |    | 59         |
| 28.0          | 100        | 0.300      |    | 38         |
| 20.0          | 100        | 0.212      |    | 18         |
|               |            | 0.150      |    | 9          |
|               |            | 0.063      |    | 4          |

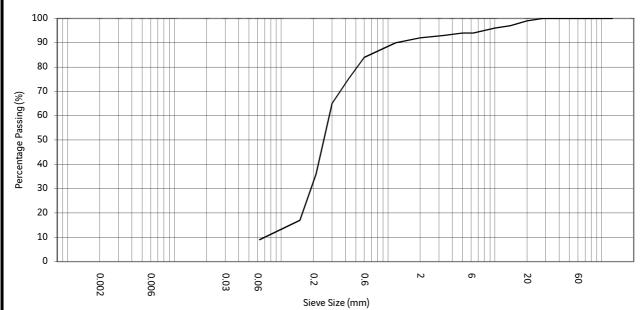
 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size              | Hole ID        |  |  |
|--------------|---|----------------------------|----------------|--|--|
|              | Investigation                                       |                            | C96            |  |  |
| Project No.  | TA7148  | Distribution               | Sample Depth   |  |  |
| ,            |   |                            | 3.50m          |  |  |
| Engineer     | Arch Henderson LLP                                  |                            | Sample Number  |  |  |
| J            |   |                            | 012            |  |  |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2 | Sample type    |  |  |
| . ,          |   | BS 1377: Part 2: 1990: 9.2 | В              |  |  |
| Description  | Brown gravelly SAND. Gravel is fine to medium subro | unded                      | Specimen Depth |  |  |
| •            |   |                            | 3.50m          |  |  |
|              |   |                            | Specimen No.   |  |  |
|              |   |                            | 1              |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 Silt and clay:
 9

 Sand:
 83

 Gravel:
 8

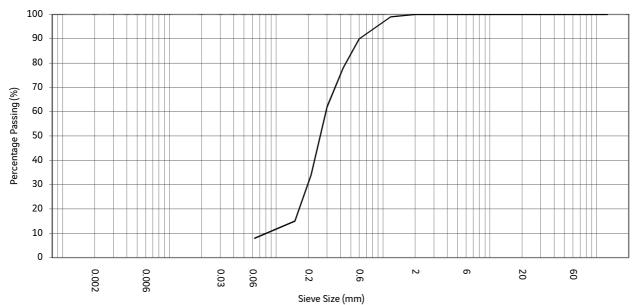
 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 97         |
|               |            | 10.0          | 96         |
|               |            | 6.3           | 94         |
| 125.0         | 100        | 5.0           | 94         |
| 90.0          | 100        | 3.35          | 93         |
| 75.0          | 100        | 2.00          | 92         |
| 63.0          | 100        | 1.18          | 90         |
| 50.0          | 100        | 0.600         | 84         |
| 37.5          | 100        | 0.425         | 75         |
| 28.0          | 100        | 0.300         | 65         |
| 20.0          | 99         | 0.212         | 36         |
|               |            | 0.150         | 17         |
|               |            | 0.063         | 9          |



| Project Name<br>Project No. | Bay of Nigg Harbour Development Ground<br>Investigation<br>TA7148 | Particle Size Distribution | Hole ID<br>D98<br>Sample Depth |  |
|-----------------------------|---|----------------------------|--------------------------------|--|
| Engineer                    | Arch Henderson LLP  |                            | 0.00m<br>Sample Number<br>001  |  |
| Employer                    | Aberdeen Harbour Board  | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B               |  |
| Description                 | Brown SAND  |                            | Specimen Depth<br>0.00m        |  |
|                             |   |                            | Specimen No.<br>1              |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 8
Sand: 92
Gravel: 0
Cobbles: 0

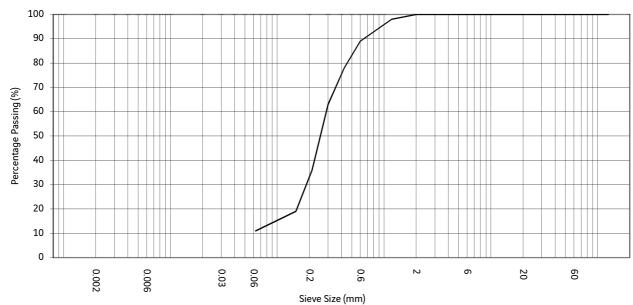
General remarks

|               | WET SIEV   | E DATA        |            |  |
|---------------|------------|---------------|------------|--|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |  |
|               | % passing  |               | % passing  |  |
|               |            | 14.0          | 100        |  |
|               |            | 10.0          | 100        |  |
|               |            | 6.3           | 100        |  |
| 125.0         | 100        | 5.0           | 100        |  |
| 90.0          | 100        | 3.35          | 100        |  |
| 75.0          | 100        | 2.00          | 100        |  |
| 63.0          | 100        | 1.18          | 99         |  |
| 50.0          | 100        | 0.600         | 90         |  |
| 37.5          | 100        | 0.425         | 78         |  |
| 28.0          | 100        | 0.300         | 62         |  |
| 20.0          | 100        | 0.212         | 34         |  |
|               |            | 0.150         | 15         |  |
|               |            | 0.063         | 8          |  |

| Approved by: | Leeds Laborato | ory  |            |            |            |
|--------------|----------------|------|------------|------------|------------|
| Stuart Kirk  |                |      |            | Print date | 28/11/2013 |
|              | Revision No.   | 3.03 | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground<br>Investigation | Particle Size Distribution | Hole ID D98 Sample Depth 1.50m               |  |  |
|--------------|---|----------------------------|--|--|--|
| Project No.  | TA7148  | Distribution               |  |  |  |
| Engineer     | Arch Henderson LLP                                      |                            | Sample Number<br>006                         |  |  |
| Employer     | Aberdeen Harbour Board                                  | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B                             |  |  |
| Description  | Brown SAND  |                            | Specimen Depth<br>1.50m<br>Specimen No.<br>1 |  |  |
| 100          |   |                            |  |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 11
Sand: 89
Gravel: 0
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 100        |
|               |            | 10.0          | 100        |
|               |            | 6.3           | 100        |
| 125.0         | 100        | 5.0           | 100        |
| 90.0          | 100        | 3.35          | 100        |
| 75.0          | 100        | 2.00          | 100        |
| 63.0          | 100        | 1.18          | 98         |
| 50.0          | 100        | 0.600         | 89         |
| 37.5          | 100        | 0.425         | 78         |
| 28.0          | 100        | 0.300         | 63         |
| 20.0          | 100        | 0.212         | 36         |
|               |            | 0.150         | 19         |
|               |            | 0.063         | 11         |

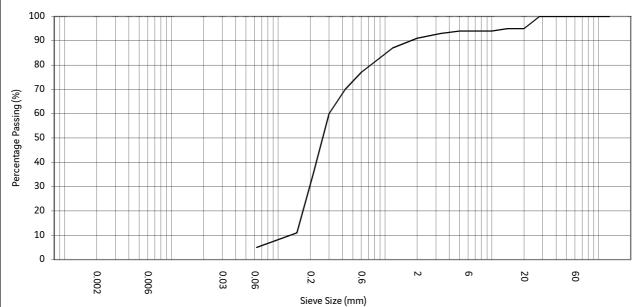
 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size              | Hole ID        |
|--------------|---|----------------------------|----------------|
| •            | Investigation                                       |                            | D99            |
| Project No.  | TA7148  | Distribution               | Sample Depth   |
| ,            |   |                            | 0.50m          |
| Engineer     | Arch Henderson LLP                                  |                            | Sample Number  |
| J            |   |                            | 003            |
| Employer     | Aberdeen Harbour Board                              | DC 1277: Deat 2: 1000: 0.2 | Sample type    |
| , ,          |   | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Greyish brown SAND with occasional fine to coarse g | ravel                      | Specimen Depth |
| ·            |   |                            | 0.50m          |
|              |   |                            | Specimen No.   |
|              |   |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

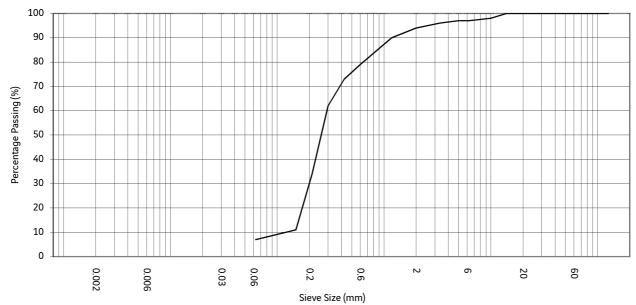
Silt and clay: 5
Sand: 86
Gravel: 9
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA       |               |
|---------------|------------|--------------|---------------|
| Sieve size mm | Cumulative | Sieve size m | nm Cumulative |
|               | % passing  |              | % passing     |
|               |            | 14.0         | 95            |
|               |            | 10.0         | 94            |
|               |            | 6.3          | 94            |
| 125.0         | 100        | 5.0          | 94            |
| 90.0          | 100        | 3.35         | 93            |
| 75.0          | 100        | 2.00         | 91            |
| 63.0          | 100        | 1.18         | 87            |
| 50.0          | 100        | 0.600        | 77            |
| 37.5          | 100        | 0.425        | 70            |
| 28.0          | 100        | 0.300        | 60            |
| 20.0          | 95         | 0.212        | 35            |
|               |            | 0.150        | 11            |
|               |            | 0.063        | 5             |



| Project Name | Bay of Nigg Harbour Development Ground           | Particle Size              | Hole ID        |
|--------------|--|----------------------------|----------------|
|              | Investigation                                    |                            | D99            |
| Project No.  | TA7148   | Distribution               | Sample Depth   |
| ,            |  |                            | 1.50m          |
| Engineer     | Arch Henderson LLP                               |                            | Sample Number  |
| · ·          |  |                            | 006            |
| Employer     | Aberdeen Harbour Board                           | BS 1377: Part 2: 1990: 9.2 | Sample type    |
|              |  | BS 1377. Part 2. 1990. 9.2 | В              |
| Description  | Greyish brown SAND with occasional medium gravel |                            | Specimen Depth |
| •            |  |                            | 1.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 Silt and clay:
 7

 Sand:
 88

 Gravel:
 6

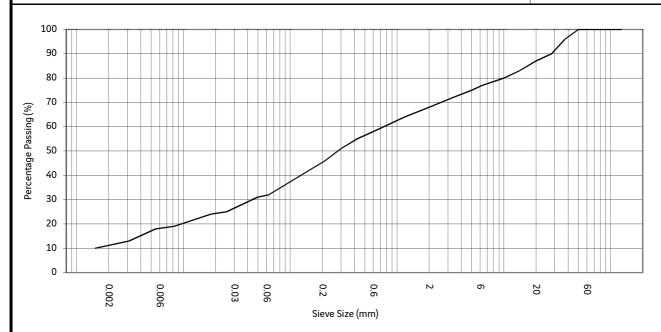
 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 98         |
|               |            | 6.3        |    | 97         |
| 125.0         | 100        | 5.0        |    | 97         |
| 100.0         | 100        | 3.35       |    | 96         |
| 75.0          | 100        | 2.00       |    | 94         |
| 63.0          | 100        | 1.18       |    | 90         |
| 50.0          | 100        | 0.600      | )  | 79         |
| 37.5          | 100        | 0.425      |    | 73         |
| 28.0          | 100        | 0.300      | )  | 62         |
| 20.0          | 100        | 0.212      | !  | 34         |
|               |            | 0.150      | )  | 11         |
|               |            | 0.063      | 1  | 7          |



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size                   | Hole ID<br>D99   |
|--------------|--|---------------------------------|------------------|
| Project No.  | TA7148   | Distribution                    | Sample Depth     |
|              |  |                                 | 6.00m            |
| Engineer     | Arch Henderson LLP                                   |                                 | Sample Number    |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type<br>C |
| Description  | Brown gravelly sandy CLAY. Gravel is fine to coarse  | subangular.                     | Specimen Depth   |
|              |  | -                               | 6.00m            |
|              |  |                                 | Specimen No.     |
|              |  |                                 | 1                |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 11

 Silt:
 21

 Sand:
 36

 Gravel:
 32

 Cobbles:
 0

General remarks

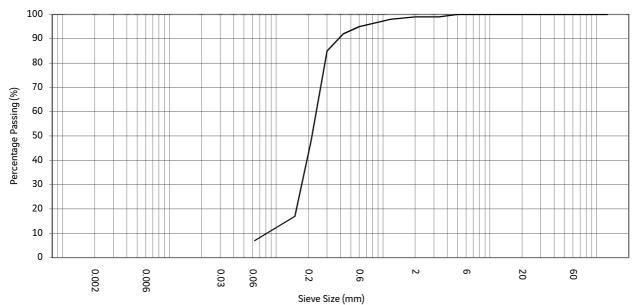
Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | TON DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 83         | diameter mm |            |
|               |            | 10.0          | 80         | 0.0495      | 31         |
|               |            | 6.3           | 77         | 0.0254      | 25         |
| 125.0         | 100        | 5.0           | 75         | 0.0181      | 24         |
| 90.0          | 100        | 3.35          | 72         | 0.0082      | 19         |
| 75.0          | 100        | 2.00          | 68         | 0.0055      | 18         |
| 63.0          | 100        | 1.18          | 64         | 0.0031      | 13         |
| 50.0          | 100        | 0.600         | 58         | 0.0015      | 10         |
| 37.5          | 96         | 0.425         | 55         |             |            |
| 28.0          | 90         | 0.300         | 51         |             |            |
| 20.0          | 87         | 0.212         | 46         |             |            |
|               |            | 0.150         | 42         |             |            |
|               |            | 0.063         | 32         |             |            |

| Approved by: | Leeds Laborato | ory  |            |            |            |
|--------------|----------------|------|------------|------------|------------|
| Stuart Kirk  |                |      |            | Print date | 28/11/2013 |
|              | Revision No.   | 3.03 | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground           | Particle Size               | Hole ID        |
|--------------|--|-----------------------------|----------------|
| •            | Investigation                                    |                             | D100           |
| Project No.  | TA7148   | Distribution                | Sample Depth   |
| .,           |  |                             | 0.50m          |
| Engineer     | Arch Henderson LLP                               |                             | Sample Number  |
| J            |  |                             | 003            |
| Employer     | Aberdeen Harbour Board                           | DC 1277, David 2, 1000, 0.2 | Sample type    |
|              |  | BS 1377: Part 2: 1990: 9.2  | В              |
| Description  | Greyish brown mottled black fine to medium SAND. |                             | Specimen Depth |
| -            |  |                             | 0.50m          |
|              |  |                             | Specimen No.   |
|              |  |                             | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 Silt and clay:
 7

 Sand:
 92

 Gravel:
 1

 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 100        |
|               |            | 10.0          | 100        |
|               |            | 6.3           | 100        |
| 125.0         | 100        | 5.0           | 100        |
| 100.0         | 100        | 3.35          | 99         |
| 75.0          | 100        | 2.00          | 99         |
| 63.0          | 100        | 1.18          | 98         |
| 50.0          | 100        | 0.600         | 95         |
| 37.5          | 100        | 0.425         | 92         |
| 28.0          | 100        | 0.300         | 85         |
| 20.0          | 100        | 0.212         | 48         |
|               |            | 0.150         | 17         |
|               |            | 0.063         | 7          |

Approved by:

Sushil Sharda

Revision No. 3.03

Leeds Laboratory

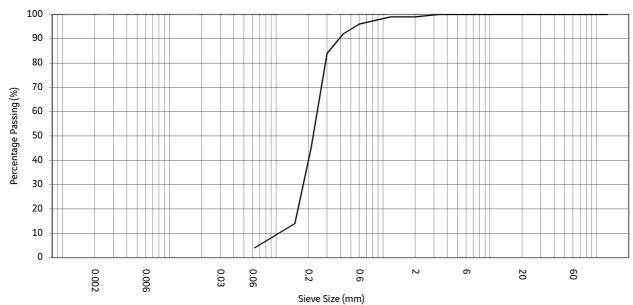
Print date 28/11/2013

Revision No. 1.03

Revision No. 2.03



| Project Name | Bay of Nigg Harbour Development Ground | Particle Size              | Hole ID        |
|--------------|--|----------------------------|----------------|
| •            | Investigation                          |                            | D100           |
| Project No.  | TA7148                                 | Distribution               | Sample Depth   |
| ,            |  |                            | 2.50m          |
| Engineer     | Arch Henderson LLP                     |                            | Sample Number  |
| J            |  |                            | 009            |
| Employer     | Aberdeen Harbour Board                 | DC 1277, Deat 2, 1000, 0.2 | Sample type    |
| , ,          |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Greyish brown SAND.                    |                            | Specimen Depth |
| ·            |  |                            | 2.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 5
Sand: 95
Gravel: 1
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |               |
|---------------|------------|------------|---------------|
| Sieve size mm | Cumulative | Sieve size | mm Cumulative |
|               | % passing  |            | % passing     |
|               |            | 14.0       | 100           |
|               |            | 10.0       | 100           |
|               |            | 6.3        | 100           |
| 125.0         | 100        | 5.0        | 100           |
| 100.0         | 100        | 3.35       | 100           |
| 75.0          | 100        | 2.00       | 99            |
| 63.0          | 100        | 1.18       | 99            |
| 50.0          | 100        | 0.600      | 96            |
| 37.5          | 100        | 0.425      | 92            |
| 28.0          | 100        | 0.300      | 84            |
| 20.0          | 100        | 0.212      | 45            |
|               |            | 0.150      | 14            |
|               |            | 0.063      | 4             |

Approved by:

Sushil Sharda

Revision No. 3.03

Leeds Laboratory

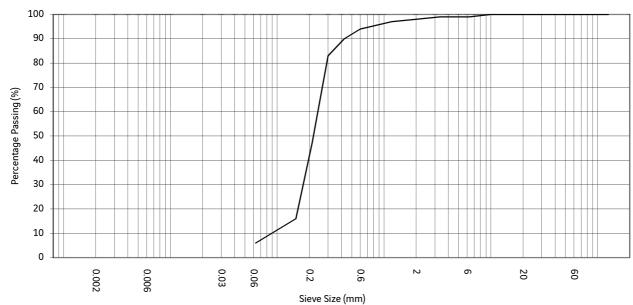
Print date 28/11/2013

Revision No. 1.03

Revision No. 2.03



| Project Name | Bay of Nigg Harbour Development Ground | Particle Size               | Hole ID        |
|--------------|--|-----------------------------|----------------|
| •            | Investigation                          |                             | D102           |
| Project No.  | TA7148                                 | Distribution                | Sample Depth   |
| ,            |  |                             | 0.50m          |
| Engineer     | Arch Henderson LLP                     |                             | Sample Number  |
| J            |  |                             | 003            |
| Employer     | Aberdeen Harbour Board                 | DC 1277, David 2, 1000, 0.2 | Sample type    |
| , ,          |  | BS 1377: Part 2: 1990: 9.2  | В              |
| Description  | Brownish grey SAND.                    |                             | Specimen Depth |
| -            |  |                             | 0.50m          |
|              |  |                             | Specimen No.   |
|              |  |                             | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

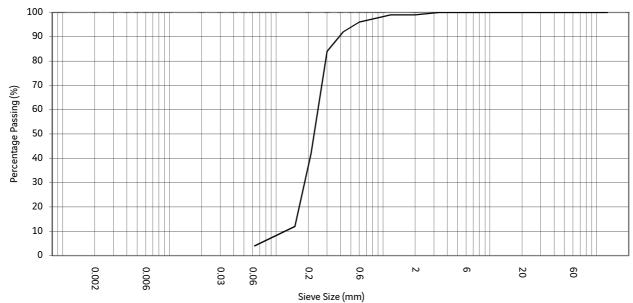
Silt and clay: 6
Sand: 92
Gravel: 2
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA       |               |
|---------------|------------|--------------|---------------|
| Sieve size mm | Cumulative | Sieve size r | nm Cumulative |
|               | % passing  |              | % passing     |
|               |            | 14.0         | 100           |
|               |            | 10.0         | 100           |
|               |            | 6.3          | 99            |
| 125.0         | 100        | 5.0          | 99            |
| 100.0         | 100        | 3.35         | 99            |
| 75.0          | 100        | 2.00         | 98            |
| 63.0          | 100        | 1.18         | 97            |
| 50.0          | 100        | 0.600        | 94            |
| 37.5          | 100        | 0.425        | 90            |
| 28.0          | 100        | 0.300        | 83            |
| 20.0          | 100        | 0.212        | 47            |
|               |            | 0.150        | 16            |
|               |            | 0.063        | 6             |



| Project Name Bay of Nigg Harbour Development Ground Investigation Project No. TA7148 |                        | Particle Size Distribution | Hole ID D102 Sample Depth     |  |  |
|--|------------------------|----------------------------|-------------------------------|--|--|
| Engineer   | Arch Henderson LLP     |                            | 2.50m<br>Sample Number<br>009 |  |  |
| Employer   | Aberdeen Harbour Board | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B              |  |  |
| Description  | Brown SAND             |                            | Specimen Depth<br>2.50m       |  |  |
|  |                        |                            | Specimen No.<br>1             |  |  |
| 100  |                        |                            |                               |  |  |
| 90   |                        |                            |                               |  |  |
| 80   |                        |                            |                               |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

 Silt and clay:
 4

 Sand:
 95

 Gravel:
 1

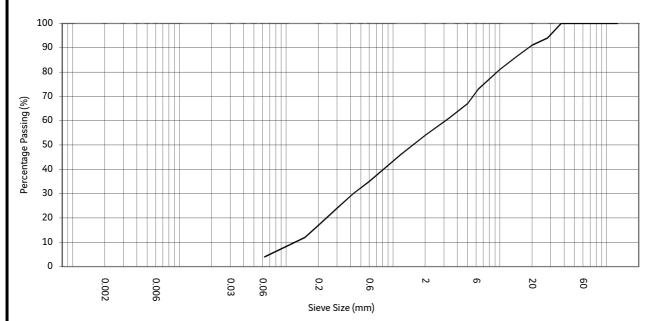
 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 100        |
|               |            | 6.3        |    | 100        |
| 125.0         | 100        | 5.0        |    | 100        |
| 90.0          | 100        | 3.35       |    | 100        |
| 75.0          | 100        | 2.00       |    | 99         |
| 63.0          | 100        | 1.18       |    | 99         |
| 50.0          | 100        | 0.600      |    | 96         |
| 37.5          | 100        | 0.425      |    | 92         |
| 28.0          | 100        | 0.300      |    | 84         |
| 20.0          | 100        | 0.212      |    | 42         |
|               |            | 0.150      |    | 12         |
|               |            | 0.063      |    | 4          |



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>D104 |
|--------------|--|----------------------------|-----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth    |
|              |  |                            | 1.50m           |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number   |
| · ·          |  |                            | 004             |
| Employer     | Aberdeen Harbour Board                               | DC 1277, Doub 2, 1000, 0.2 | Sample type     |
| . ,          |  | BS 1377: Part 2: 1990: 9.2 | В               |
| Description  | Brown SAND and GRAVEL. Gravel is fine to coarse a    | ngular                     | Specimen Depth  |
|              |  |                            | 1.50m           |
|              |  |                            | Specimen No.    |
|              |  |                            | 1               |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

Silt and clay: 4
Sand: 50
Gravel: 46
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 86         |
|               |            | 10.0       |    | 81         |
|               |            | 6.3        |    | 73         |
| 125.0         | 100        | 5.0        |    | 67         |
| 90.0          | 100        | 3.35       |    | 61         |
| 75.0          | 100        | 2.00       |    | 54         |
| 63.0          | 100        | 1.18       |    | 46         |
| 50.0          | 100        | 0.600      |    | 35         |
| 37.5          | 100        | 0.425      |    | 30         |
| 28.0          | 94         | 0.300      |    | 24         |
| 20.0          | 91         | 0.212      |    | 18         |
|               |            | 0.150      |    | 12         |
|               |            | 0.063      |    | 4          |

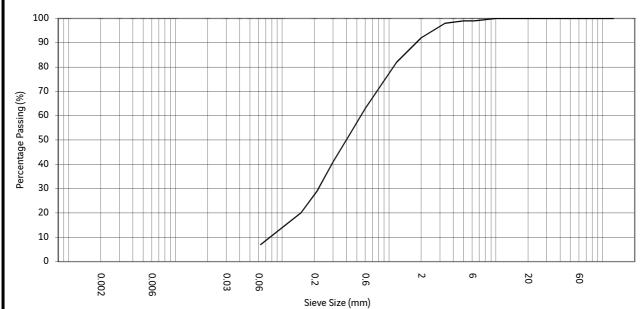
 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground | Particle Size              | Hole ID        |
|--------------|--|----------------------------|----------------|
| •            | Investigation                          |                            | D104           |
| Project No.  | TA7148                                 | Distribution               | Sample Depth   |
| ,            |  |                            | 5.50m          |
| Engineer     | Arch Henderson LLP                     |                            | Sample Number  |
| · ·          |  |                            | 012            |
| Employer     | Aberdeen Harbour Board                 | BS 1377: Part 2: 1990: 9.2 | Sample type    |
| . ,          |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brown SAND                             |                            | Specimen Depth |
| ·            |  |                            | 5.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

 Silt and clay:
 7

 Sand:
 85

 Gravel:
 8

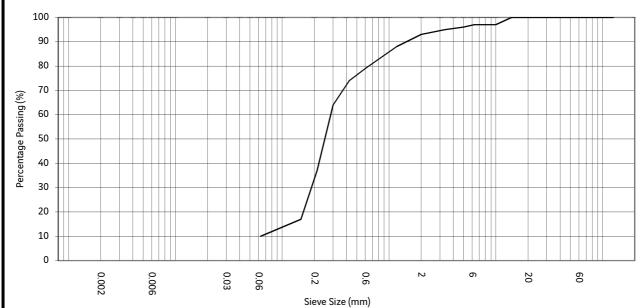
 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 100        |
|               |            | 10.0          | 100        |
|               |            | 6.3           | 99         |
| 125.0         | 100        | 5.0           | 99         |
| 90.0          | 100        | 3.35          | 98         |
| 75.0          | 100        | 2.00          | 92         |
| 63.0          | 100        | 1.18          | 82         |
| 50.0          | 100        | 0.600         | 63         |
| 37.5          | 100        | 0.425         | 52         |
| 28.0          | 100        | 0.300         | 41         |
| 20.0          | 100        | 0.212         | 29         |
|               |            | 0.150         | 20         |
|               |            | 0.063         | 7          |



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>E65 |
|--------------|--|----------------------------|----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth   |
|              |  |                            | 0.50m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
|              |  |                            | 003            |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type    |
|              |  | B3 1377. Part 2. 1990. 9.2 | В              |
| Description  | Brown slightly gravelly SAND                         |                            | Specimen Depth |
|              |  |                            | 0.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAT |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

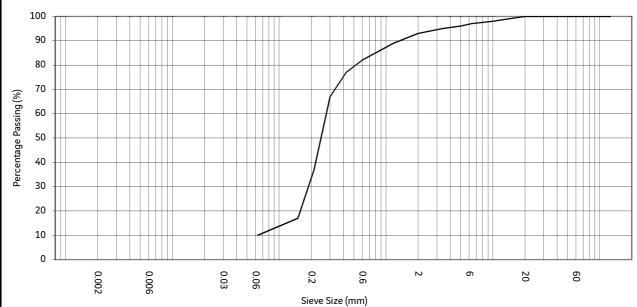
Silt and clay: 10
Sand: 83
Gravel: 7
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 100        |
|               |            | 10.0          | 97         |
|               |            | 6.3           | 97         |
| 125.0         | 100        | 5.0           | 96         |
| 90.0          | 100        | 3.35          | 95         |
| 75.0          | 100        | 2.00          | 93         |
| 63.0          | 100        | 1.18          | 88         |
| 50.0          | 100        | 0.600         | 79         |
| 37.5          | 100        | 0.425         | 74         |
| 28.0          | 100        | 0.300         | 64         |
| 20.0          | 100        | 0.212         | 37         |
|               |            | 0.150         | 17         |
|               |            | 0.063         | 10         |



| Project Name | Bay of Nigg Harbour Development Ground                | Particle Size              | Hole ID        |
|--------------|---|----------------------------|----------------|
|              | Investigation   | Distribution               | E65            |
| Project No.  | TA7148  | Distribution               | Sample Depth   |
|              |   |                            | 2.50m          |
| Engineer     | Arch Henderson LLP                                    |                            | Sample Number  |
| J            |   |                            | 009            |
| Employer     | Aberdeen Harbour Board                                | BS 1377: Part 2: 1990: 9.2 | Sample type    |
|              |   | BS 1377. Part 2. 1990. 9.2 | В              |
| Description  | Brown slightly gravelly SAND. Gravel is fine to mediu | m subangular               | Specimen Depth |
| •            |   |                            | 2.50m          |
|              |   |                            | Specimen No.   |
|              |   |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | L      | COBBLES |

Silt and clay: 10
Sand: 83
Gravel: 8
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |            |   |
|---------------|------------|---------------|------------|---|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |   |
|               | % passing  |               | % passing  |   |
|               |            | 14.0          | 99         |   |
|               |            | 10.0          | 98         |   |
|               |            | 6.3           | 97         |   |
| 125.0         | 100        | 5.0           | 96         |   |
| 90.0          | 100        | 3.35          | 95         |   |
| 75.0          | 100        | 2.00          | 93         |   |
| 63.0          | 100        | 1.18          | 89         |   |
| 50.0          | 100        | 0.600         | 82         |   |
| 37.5          | 100        | 0.425         | 77         |   |
| 28.0          | 100        | 0.300         | 67         |   |
| 20.0          | 100        | 0.212         | 37         |   |
|               |            | 0.150         | 17         |   |
|               |            | 0.063         | 10         |   |
|               |            |               |            | T |

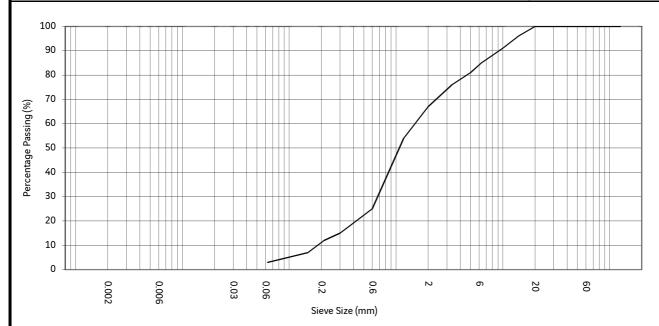
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 Stuart Kirk
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 Revision No. 3.03
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| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>E65          |
|--------------|--|----------------------------|-------------------------|
| Project No.  | TA7148   | Distribution               | Sample Depth<br>4.50m   |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number<br>015    |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B        |
| Description  | Brown slightly gravelly SAND. Gravel is fine to medi | um subangular              | Specimen Depth<br>4.50m |
|              |  |                            | Specimen No.<br>1       |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 3
Sand: 63
Gravel: 34
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 96         |
|               |            | 10.0          | 91         |
|               |            | 6.3           | 85         |
| 125.0         | 100        | 5.0           | 81         |
| 90.0          | 100        | 3.35          | 76         |
| 75.0          | 100        | 2.00          | 67         |
| 63.0          | 100        | 1.18          | 54         |
| 50.0          | 100        | 0.600         | 25         |
| 37.5          | 100        | 0.425         | 20         |
| 28.0          | 100        | 0.300         | 15         |
| 20.0          | 100        | 0.212         | 12         |
|               |            | 0.150         | 7          |
|               |            | 0.063         | 3          |



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                   | Hole ID          |
|--------------|---|---------------------------------|------------------|
|              | Investigation                                       |                                 | E65              |
| Project No.  | TA7148  | Distribution                    | Sample Depth     |
| <b>'</b>     |   |                                 | 8.00m            |
| Engineer     | Arch Henderson LLP                                  |                                 | Sample Number    |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type<br>C |
| Description  | Brown sandy gravelly CLAY. Gravel is fine to coarse | angular to subrounded.          | Specimen Depth   |
|              |   |                                 | 8.24m            |
|              |   |                                 | Specimen No.     |
|              |   |                                 | 1                |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 10

 Silt:
 22

 Sand:
 33

 Gravel:
 36

 Cobbles:
 0

General remarks

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | SEDIMENTAT    | TON DATA   |             |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 81         | diameter mm |            |
|               |            | 10.0          | 77         | 0.0483      | 30         |
|               |            | 6.3           | 73         | 0.0248      | 25         |
| 125.0         | 100        | 5.0           | 71         | 0.0177      | 22         |
| 90.0          | 100        | 3.35          | 68         | 0.0081      | 17         |
| 75.0          | 100        | 2.00          | 64         | 0.0040      | 15         |
| 63.0          | 100        | 1.18          | 60         | 0.0028      | 11         |
| 50.0          | 100        | 0.600         | 55         | 0.0014      | 9          |
| 37.5          | 100        | 0.425         | 52         |             |            |
| 28.0          | 92         | 0.300         | 48         |             |            |
| 20.0          | 88         | 0.212         | 44         |             |            |
|               |            | 0.150         | 40         |             |            |
|               |            | 0.063         | 32         |             |            |

Approved by:

Sushil Sharda

Revision No. 3.03

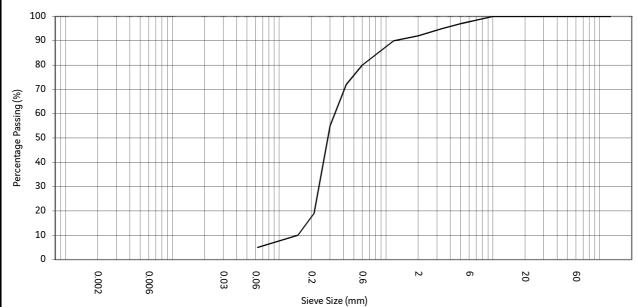
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| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>E66                               |
|--------------|--|----------------------------|--|
| Project No.  | TA7148   | Distribution               | Sample Depth                                 |
| Engineer     | Arch Henderson LLP                                   |                            | 1.50m<br>Sample Number<br>004                |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B                             |
| Description  | Brown slightly gravelly SAND.                        |                            | Specimen Depth<br>1.50m<br>Specimen No.<br>1 |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAT |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

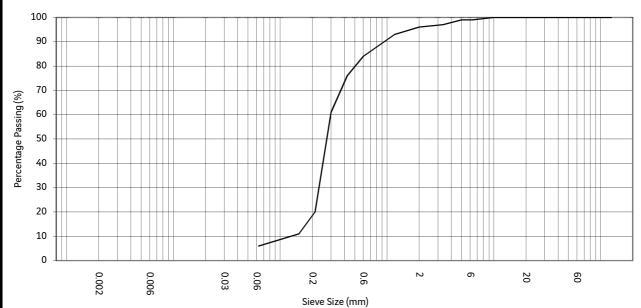
Silt and clay: 5
Sand: 87
Gravel: 8
Cobbles: 0

General remarks

|               | WET SIEVE DATA |            |           |            |  |  |  |  |
|---------------|----------------|------------|-----------|------------|--|--|--|--|
| Sieve size mm | Cumulative     | Sieve size | mm        | Cumulative |  |  |  |  |
|               | % passing      |            | % passing |            |  |  |  |  |
|               |                | 14.0       |           | 100        |  |  |  |  |
|               |                | 10.0       |           | 100        |  |  |  |  |
|               |                | 6.3        |           | 98         |  |  |  |  |
| 125.0         | 100            | 5.0        |           | 97         |  |  |  |  |
| 90.0          | 100            | 3.35       |           | 95         |  |  |  |  |
| 75.0          | 100            | 2.00       |           | 92         |  |  |  |  |
| 63.0          | 100            | 1.18       |           | 90         |  |  |  |  |
| 50.0          | 100            | 0.600      | )         | 80         |  |  |  |  |
| 37.5          | 100            | 0.425      | ;         | 72         |  |  |  |  |
| 28.0          | 100            | 0.300      | )         | 55         |  |  |  |  |
| 20.0          | 100            | 0.212      |           | 19         |  |  |  |  |
|               |                | 0.150      | )         | 10         |  |  |  |  |
|               |                | 0.063      |           | 5          |  |  |  |  |



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>E66 |
|--------------|--|----------------------------|----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth   |
|              |  |                            | 3.50m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
|              |  |                            | 800            |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type    |
|              |  | B3 1377. Part 2. 1990. 9.2 | В              |
| Description  | Brown slightly gravelly SAND                         |                            | Specimen Depth |
|              |  |                            | 3.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 6
Sand: 89
Gravel: 4
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 100        |
|               |            | 10.0          | 100        |
|               |            | 6.3           | 99         |
| 125.0         | 100        | 5.0           | 99         |
| 90.0          | 100        | 3.35          | 97         |
| 75.0          | 100        | 2.00          | 96         |
| 63.0          | 100        | 1.18          | 93         |
| 50.0          | 100        | 0.600         | 84         |
| 37.5          | 100        | 0.425         | 76         |
| 28.0          | 100        | 0.300         | 61         |
| 20.0          | 100        | 0.212         | 20         |
|               |            | 0.150         | 11         |
|               |            | 0.063         | 6          |

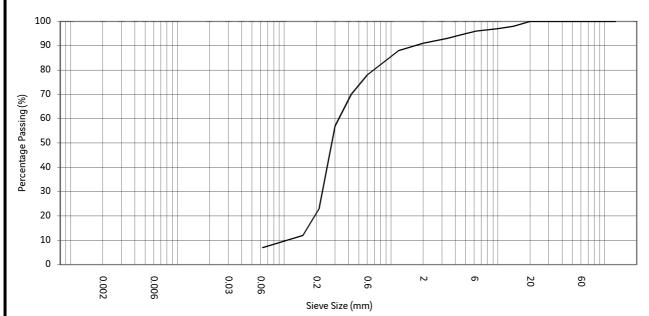
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| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>E66          |
|--------------|--|----------------------------|-------------------------|
| Project No.  | TA7148   | Distribution               | Sample Depth<br>6.50m   |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number<br>014    |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B        |
| Description  | Brown slightly gravelly SAND                         |                            | Specimen Depth<br>6.50m |
|              |  |                            | Specimen No.<br>1       |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

 Silt and clay:
 7

 Sand:
 84

 Gravel:
 9

 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA     |           |            |
|---------------|------------|------------|-----------|------------|
| Sieve size mm | Cumulative | Sieve size | mm        | Cumulative |
|               | % passing  |            | % passing |            |
|               |            | 14.0       |           | 98         |
|               |            | 10.0       |           | 97         |
|               |            | 6.3        |           | 96         |
| 125.0         | 100        | 5.0        |           | 95         |
| 90.0          | 100        | 3.35       |           | 93         |
| 75.0          | 100        | 2.00       |           | 91         |
| 63.0          | 100        | 1.18       |           | 88         |
| 50.0          | 100        | 0.600      |           | 78         |
| 37.5          | 100        | 0.425      |           | 70         |
| 28.0          | 100        | 0.300      |           | 57         |
| 20.0          | 100        | 0.212      |           | 23         |
|               |            | 0.150      |           | 12         |
|               |            | 0.063      |           | 7          |

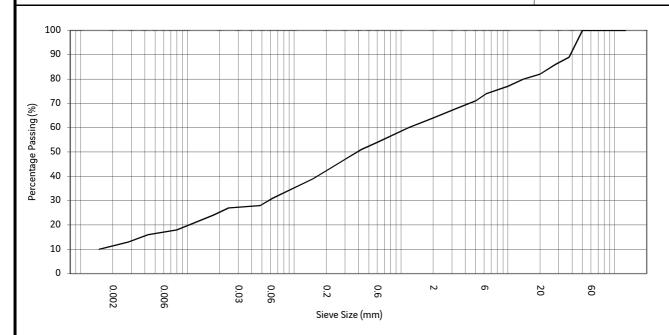
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 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                   | Hole ID          |
|--------------|---|---------------------------------|------------------|
|              | Investigation                                       |                                 | E66              |
| Project No.  | TA7148  | Distribution                    | Sample Depth     |
| <b>l</b>     |   |                                 | 11.60m           |
| Engineer     | Arch Henderson LLP                                  |                                 | Sample Number    |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type<br>C |
| Description  | Brown sandy gravelly CLAY. Gravel is fine to coarse | angular.                        | Specimen Depth   |
| -            |   |                                 | 11.60m           |
|              |   |                                 | Specimen No.     |
|              |   |                                 | 1                |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

General remarks

Sample size was insufficient to be representative of particle size

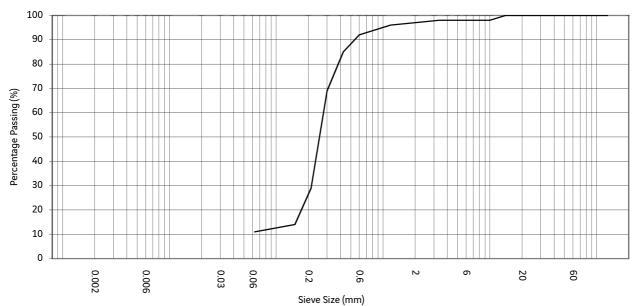
Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | SEDIMENTATION DATA |            |             |            |
|---------------|------------|--------------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm      | Cumulative | Equivalent  | Cumulative |
|               | % passing  |                    | % passing  | particle    | % passing  |
|               |            | 14.0               | 80         | diameter mm |            |
|               |            | 10.0               | 77         | 0.0481      | 28         |
|               |            | 6.3                | 74         | 0.0243      | 27         |
| 125.0         | 100        | 5.0                | 71         | 0.0175      | 24         |
| 90.0          | 100        | 3.35               | 68         | 0.0080      | 18         |
| 75.0          | 100        | 2.00               | 64         | 0.0043      | 16         |
| 63.0          | 100        | 1.18               | 60         | 0.0028      | 13         |
| 50.0          | 100        | 0.600              | 54         | 0.0015      | 10         |
| 37.5          | 89         | 0.425              | 51         |             |            |
| 28.0          | 86         | 0.300              | 47         |             |            |
| 20.0          | 82         | 0.212              | 43         |             |            |
|               |            | 0.150              | 39         |             |            |
|               |            | 0.063              | 31         |             |            |

| Approved by:  | Leeds Laboratory |      |  |            |            |            |
|---------------|------------------|------|--|------------|------------|------------|
| Sushil Sharda |                  |      |  |            | Print date | 28/11/2013 |
|               | Revision No.     | 3.03 |  | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>E69 |
|--------------|--|----------------------------|----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth   |
|              |  |                            | 1.50m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
|              |  |                            | 004            |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type    |
|              |  | B3 1377. Part 2. 1990. 9.2 | В              |
| Description  | Brown SAND   |                            | Specimen Depth |
| •            |  |                            | 1.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 11
Sand: 87
Gravel: 3
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |              |
|---------------|------------|---------------|--------------|
| Sieve size mm | Cumulative | Sieve size mr | n Cumulative |
|               | % passing  |               | % passing    |
|               |            | 14.0          | 100          |
|               |            | 10.0          | 98           |
|               |            | 6.3           | 98           |
| 125.0         | 100        | 5.0           | 98           |
| 90.0          | 100        | 3.35          | 98           |
| 75.0          | 100        | 2.00          | 97           |
| 63.0          | 100        | 1.18          | 96           |
| 50.0          | 100        | 0.600         | 92           |
| 37.5          | 100        | 0.425         | 85           |
| 28.0          | 100        | 0.300         | 69           |
| 20.0          | 100        | 0.212         | 29           |
|               |            | 0.150         | 14           |
|               |            | 0.063         | 11           |

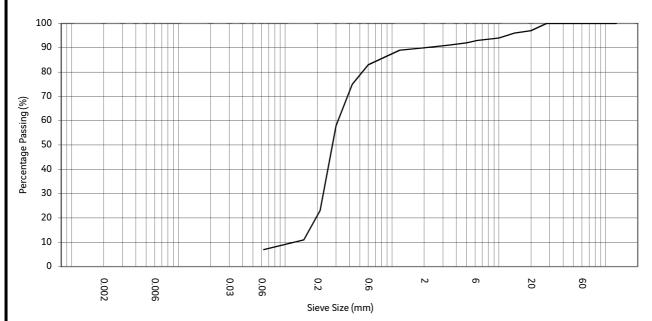
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| Project Name | Bay of Nigg Harbour Development Ground Investigation  | Particle Size              | Hole ID<br>E69 |
|--------------|---|----------------------------|----------------|
| Project No.  | TA7148  | Distribution               | Sample Depth   |
|              |   |                            | 3.50m          |
| Engineer     | Arch Henderson LLP                                    |                            | Sample Number  |
| · ·          |   |                            | 800            |
| Employer     | Aberdeen Harbour Board                                | BS 1377: Part 2: 1990: 9.2 | Sample type    |
| . ,          |   | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brown slightly gravelly SAND. Gravel is fine to coars | e subangular               | Specimen Depth |
|              |   |                            | 3.50m          |
|              |   |                            | Specimen No.   |
|              |   |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 Silt and clay:
 8

 Sand:
 83

 Gravel:
 10

 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 96         |
|               |            | 10.0          | 94         |
|               |            | 6.3           | 93         |
| 125.0         | 100        | 5.0           | 92         |
| 90.0          | 100        | 3.35          | 91         |
| 75.0          | 100        | 2.00          | 90         |
| 63.0          | 100        | 1.18          | 89         |
| 50.0          | 100        | 0.600         | 83         |
| 37.5          | 100        | 0.425         | 75         |
| 28.0          | 100        | 0.300         | 58         |
| 20.0          | 97         | 0.212         | 23         |
|               |            | 0.150         | 11         |
|               |            | 0.063         | 7          |

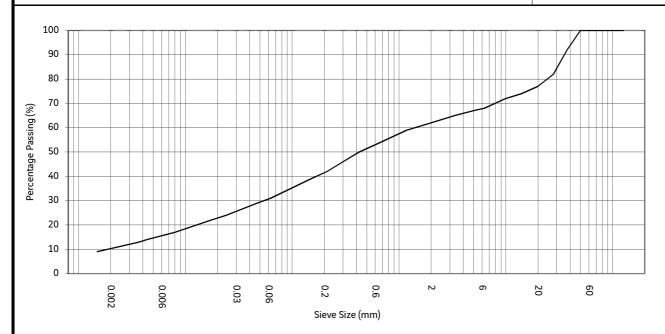
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| Project Name | Bay of Nigg Harbour Development Ground | Particle Size                   | Hole ID          |
|--------------|--|---------------------------------|------------------|
|              | Investigation                          |                                 | E69              |
| Project No.  | TA7148                                 | Distribution                    | Sample Depth     |
| <b>'</b>     |  |                                 | 8.10m            |
| Engineer     | Arch Henderson LLP                     |                                 | Sample Number    |
| Employer     | Aberdeen Harbour Board                 | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type<br>C |
| Description  | Brown sandy gravelly CLAY.             |                                 | Specimen Depth   |
|              |  |                                 | 8.10m            |
|              |  |                                 | Specimen No.     |
|              |  |                                 | 1                |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | L      | COBBLES |

General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | SEDIMENTATION DATA |            |             |            |
|---------------|------------|--------------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm      | Cumulative | Equivalent  | Cumulative |
|               | % passing  |                    | % passing  | particle    | % passing  |
|               |            | 14.0               | 74         | diameter mm |            |
|               |            | 10.0               | 72         | 0.0470      | 29         |
|               |            | 6.3                | 68         | 0.0243      | 24         |
| 125.0         | 100        | 5.0                | 67         | 0.0174      | 22         |
| 90.0          | 100        | 3.35               | 65         | 0.0080      | 17         |
| 75.0          | 100        | 2.00               | 62         | 0.0044      | 14         |
| 63.0          | 100        | 1.18               | 59         | 0.0037      | 13         |
| 50.0          | 100        | 0.600              | 53         | 0.0015      | 9          |
| 37.5          | 92         | 0.425              | 50         |             |            |
| 28.0          | 82         | 0.300              | 46         |             |            |
| 20.0          | 77         | 0.212              | 42         |             |            |
|               |            | 0.150              | 39         |             |            |
|               |            | 0.063              | 31         |             |            |

Approved by:

Sushil Sharda

Revision No. 3.03

Leeds Laboratory

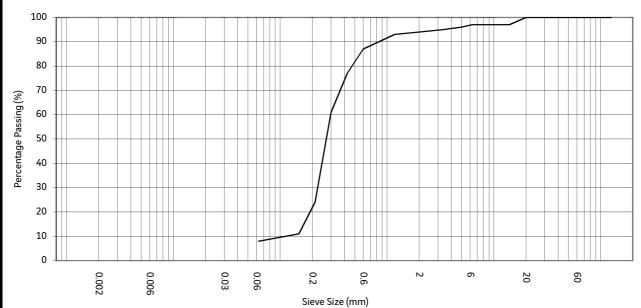
Print date 28/11/2013

Revision No. 1.03

Revision No. 2.03



| Project Name | Bay of Nigg Harbour Development Ground Investigation  | Particle Size              | Hole ID<br>E71 |
|--------------|---|----------------------------|----------------|
| Project No.  | TA7148  | Distribution               | Sample Depth   |
|              |   |                            | 1.50m          |
| Engineer     | Arch Henderson LLP                                    |                            | Sample Number  |
|              |   |                            | 004            |
| Employer     | Aberdeen Harbour Board                                | BS 1377: Part 2: 1990: 9.2 | Sample type    |
|              |   | B3 1377. Part 2. 1990. 9.2 | В              |
| Description  | Brown slightly gravelly SAND. Gravel is fine to mediu | m angular                  | Specimen Depth |
|              |   |                            | 1.50m          |
|              |   |                            | Specimen No.   |
|              |   |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 8
Sand: 86
Gravel: 6
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 97         |
|               |            | 10.0          | 97         |
|               |            | 6.3           | 97         |
| 125.0         | 100        | 5.0           | 96         |
| 90.0          | 100        | 3.35          | 95         |
| 75.0          | 100        | 2.00          | 94         |
| 63.0          | 100        | 1.18          | 93         |
| 50.0          | 100        | 0.600         | 87         |
| 37.5          | 100        | 0.425         | 77         |
| 28.0          | 100        | 0.300         | 61         |
| 20.0          | 100        | 0.212         | 24         |
|               |            | 0.150         | 11         |
|               |            | 0.063         | 8          |

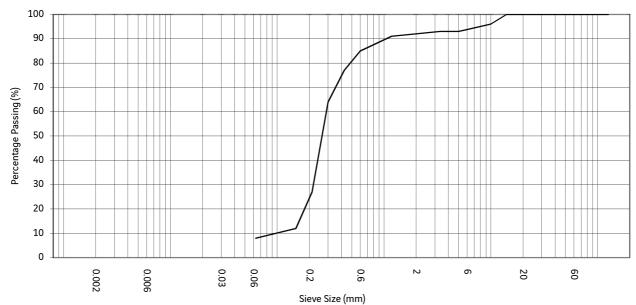
 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>E71 |
|--------------|--|----------------------------|----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth   |
|              |  |                            | 4.50m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
|              |  |                            | 010            |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type    |
|              |  | B3 1377. Fait 2. 1990. 9.2 | В              |
| Description  | Brown slightly gravelly SAND                         |                            | Specimen Depth |
|              |  |                            | 4.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | L      | COBBLES |

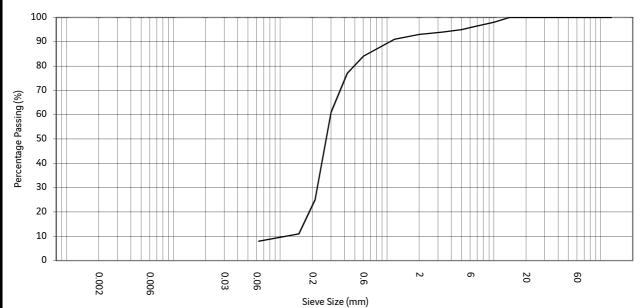
Silt and clay: 8
Sand: 84
Gravel: 8
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA       |               |
|---------------|------------|--------------|---------------|
| Sieve size mm | Cumulative | Sieve size m | nm Cumulative |
|               | % passing  |              | % passing     |
|               |            | 14.0         | 100           |
|               |            | 10.0         | 96            |
|               |            | 6.3          | 94            |
| 125.0         | 100        | 5.0          | 93            |
| 90.0          | 100        | 3.35         | 93            |
| 75.0          | 100        | 2.00         | 92            |
| 63.0          | 100        | 1.18         | 91            |
| 50.0          | 100        | 0.600        | 85            |
| 37.5          | 100        | 0.425        | 77            |
| 28.0          | 100        | 0.300        | 64            |
| 20.0          | 100        | 0.212        | 27            |
|               |            | 0.150        | 12            |
|               |            | 0.063        | 8             |



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>E71 |
|--------------|--|----------------------------|----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth   |
|              |  |                            | 9.00m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
|              |  |                            | 016            |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type    |
|              |  | B3 1377. Part 2. 1990. 9.2 | В              |
| Description  | Brown slightly gravelly SAND.                        |                            | Specimen Depth |
|              |  |                            | 9.00m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

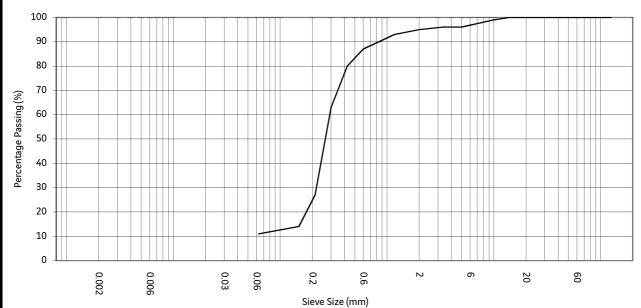
Silt and clay: 8
Sand: 85
Gravel: 7
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 100        |
|               |            | 10.0          | 98         |
|               |            | 6.3           | 96         |
| 125.0         | 100        | 5.0           | 95         |
| 90.0          | 100        | 3.35          | 94         |
| 75.0          | 100        | 2.00          | 93         |
| 63.0          | 100        | 1.18          | 91         |
| 50.0          | 100        | 0.600         | 84         |
| 37.5          | 100        | 0.425         | 77         |
| 28.0          | 100        | 0.300         | 61         |
| 20.0          | 100        | 0.212         | 25         |
|               |            | 0.150         | 11         |
|               |            | 0.063         | 8          |



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>E72 |
|--------------|--|----------------------------|----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth   |
|              |  |                            | 1.50m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
|              |  |                            | 004            |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type    |
| . ,          |  | BS 1377. Part 2. 1990. 9.2 | В              |
| Description  | Brownish grey SAND                                   |                            | Specimen Depth |
|              |  |                            | 1.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

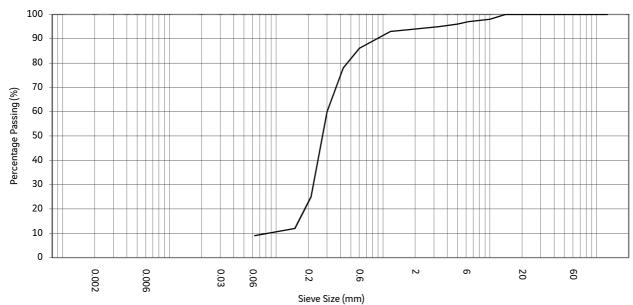
Silt and clay: 11
Sand: 84
Gravel: 5
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |              |
|---------------|------------|---------------|--------------|
| Sieve size mm | Cumulative | Sieve size mr | n Cumulative |
|               | % passing  |               | % passing    |
|               |            | 14.0          | 100          |
|               |            | 10.0          | 99           |
|               |            | 6.3           | 97           |
| 125.0         | 100        | 5.0           | 96           |
| 90.0          | 100        | 3.35          | 96           |
| 75.0          | 100        | 2.00          | 95           |
| 63.0          | 100        | 1.18          | 93           |
| 50.0          | 100        | 0.600         | 87           |
| 37.5          | 100        | 0.425         | 80           |
| 28.0          | 100        | 0.300         | 63           |
| 20.0          | 100        | 0.212         | 27           |
|               |            | 0.150         | 14           |
|               |            | 0.063         | 11           |



| Project Name | Bay of Nigg Harbour Development Ground                | Particle Size               | Hole ID        |  |  |
|--------------|---|-----------------------------|----------------|--|--|
|              | Investigation   |                             | E72            |  |  |
| Project No.  | TA7148  | Distribution                | Sample Depth   |  |  |
| ,            |   |                             | 3.50m          |  |  |
| Engineer     | Arch Henderson LLP                                    |                             | Sample Number  |  |  |
| J            |   |                             | 008            |  |  |
| Employer     | Aberdeen Harbour Board                                | DC 1277, David 2, 1000, 0.2 | Sample type    |  |  |
| , ,          |   | BS 1377: Part 2: 1990: 9.2  | В              |  |  |
| Description  | Brown slightly gravelly SAND. Gravel is fine to mediu | m.                          | Specimen Depth |  |  |
| •            |   |                             | 3.50m          |  |  |
|              |   |                             | Specimen No.   |  |  |
|              |   |                             | 1              |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

 Silt and clay:
 9

 Sand:
 86

 Gravel:
 6

 Cobbles:
 0

General remarks

|               | WET SIEV   |               |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 100        |
|               |            | 10.0          | 98         |
|               |            | 6.3           | 97         |
| 125.0         | 100        | 5.0           | 96         |
| 90.0          | 100        | 3.35          | 95         |
| 75.0          | 100        | 2.00          | 94         |
| 63.0          | 100        | 1.18          | 93         |
| 50.0          | 100        | 0.600         | 86         |
| 37.5          | 100        | 0.425         | 78         |
| 28.0          | 100        | 0.300         | 60         |
| 20.0          | 100        | 0.212         | 25         |
|               |            | 0.150         | 12         |
|               |            | 0.063         | 9          |

Approved by:

Sushil Sharda

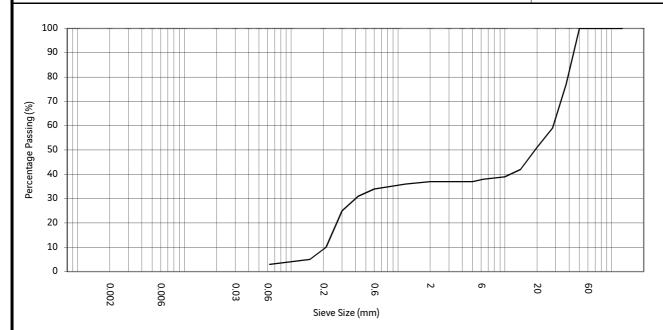
Leeds Laboratory

Print date 28/11/2013

Revision No. 3.03 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>E75 |
|--------------|--|----------------------------|----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth   |
|              |  |                            | 0.50m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
|              |  |                            | 002            |
| Employer     | Aberdeen Harbour Board                               | DC 1277, Dowt 2, 1000, 0.2 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brown sandy GRAVEL. Gravel is fine to coarse angula  | ar.                        | Specimen Depth |
| ]            |  |                            | 0.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

General remarks

Sample size was insufficient to be representative of particle size

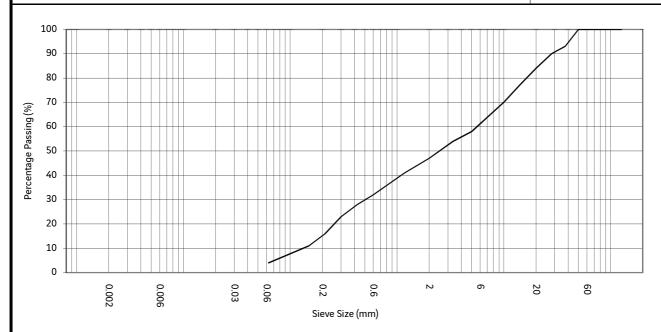
| Silt and clay: | 3  |
|----------------|----|
| Sand:          | 33 |
| Gravel:        | 63 |
| Cobbles:       | 0  |
|                |    |

|               | WET SIEV   | E DATA       |               |
|---------------|------------|--------------|---------------|
| Sieve size mm | Cumulative | Sieve size r | nm Cumulative |
|               | % passing  |              | % passing     |
|               |            | 14.0         | 42            |
|               |            | 10.0         | 39            |
|               |            | 6.3          | 38            |
| 125.0         | 100        | 5.0          | 37            |
| 90.0          | 100        | 3.35         | 37            |
| 75.0          | 100        | 2.00         | 37            |
| 63.0          | 100        | 1.18         | 36            |
| 50.0          | 100        | 0.600        | 34            |
| 37.5          | 77         | 0.425        | 31            |
| 28.0          | 59         | 0.300        | 25            |
| 20.0          | 51         | 0.212        | 10            |
|               |            | 0.150        | 5             |
|               |            | 0.063        | 3             |

| Approved by:  | Leeds Laboratory |   |            |            |            |
|---------------|------------------|---|------------|------------|------------|
| Sushil Sharda |                  |   |            | Print date | 28/11/2013 |
|               | Revision No. 3.0 | 3 | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size              | Hole ID        |
|--------------|---|----------------------------|----------------|
|              | Investigation                                       |                            | E75            |
| Project No.  | TA7148  | Distribution               | Sample Depth   |
| ĺ            |   |                            | 2.50m          |
| Engineer     | Arch Henderson LLP                                  |                            | Sample Number  |
| Ĭ            |   |                            | 006            |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2 | Sample type    |
| ' '          |   | BS 1377: Part 2, 1990, 9,2 | В              |
| Description  | Brown gravelly SAND. Gravel is fine to coarse subro | unded and angular.         | Specimen Depth |
|              |   |                            | 2.50m          |
|              |   |                            | Specimen No.   |
|              |   |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

Silt and clay: 4
Sand: 43
Gravel: 53
Cobbles: 0

General remarks

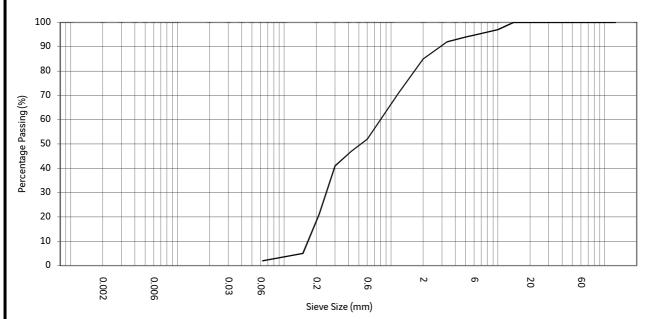
Sample size was insufficient to be representative of particle size

|               | WET SIEV   | 'E DATA       |            |  |
|---------------|------------|---------------|------------|--|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |  |
|               | % passing  |               | % passing  |  |
|               |            | 14.0          | 77         |  |
|               |            | 10.0          | 70         |  |
|               |            | 6.3           | 62         |  |
| 125.0         | 100        | 5.0           | 58         |  |
| 90.0          | 100        | 3.35          | 54         |  |
| 75.0          | 100        | 2.00          | 47         |  |
| 63.0          | 100        | 1.18          | 41         |  |
| 50.0          | 100        | 0.600         | 32         |  |
| 37.5          | 93         | 0.425         | 28         |  |
| 28.0          | 90         | 0.300         | 23         |  |
| 20.0          | 84         | 0.212         | 16         |  |
|               |            | 0.150         | 11         |  |
|               |            | 0.063         | 4          |  |

| Approved by:  | Leeds Laborate | ory  |            |            |            |     |
|---------------|----------------|------|------------|------------|------------|-----|
| Sushil Sharda |                |      |            | Print date | 28/11/2013 | S   |
|               | Revision No.   | 3.03 | Issue Date | 19/11/2    | 2012       | Pai |



| Project Name | Bay of Nigg Harbour Development Ground<br>Investigation | Particle Size              | Hole ID<br>E105                              |
|--------------|---|----------------------------|--|
| Project No.  | TA7148  | Distribution               | Sample Depth<br>0.00m                        |
| Engineer     | Arch Henderson LLP                                      |                            | Sample Number<br>002                         |
| Employer     | Aberdeen Harbour Board                                  | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B                             |
| Description  | Brown slightly gravelly SAND                            |                            | Specimen Depth<br>0.00m<br>Specimen No.<br>1 |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | L      | COBBLES |

 Silt and clay:
 2

 Sand:
 83

 Gravel:
 15

 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 97         |
|               |            | 6.3        |    | 95         |
| 125.0         | 100        | 5.0        |    | 94         |
| 90.0          | 100        | 3.35       |    | 92         |
| 75.0          | 100        | 2.00       |    | 85         |
| 63.0          | 100        | 1.18       |    | 71         |
| 50.0          | 100        | 0.600      |    | 52         |
| 37.5          | 100        | 0.425      |    | 47         |
| 28.0          | 100        | 0.300      |    | 41         |
| 20.0          | 100        | 0.212      |    | 21         |
|               |            | 0.150      |    | 5          |
|               |            | 0.063      |    | 2          |

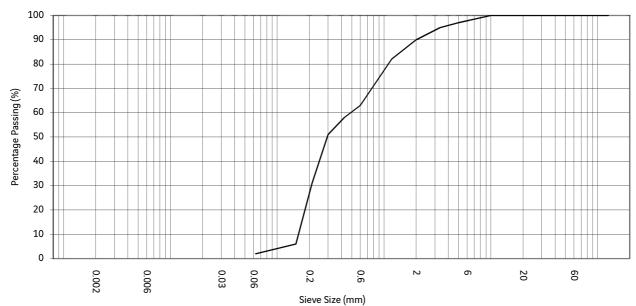
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| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>E105         |
|--------------|--|----------------------------|-------------------------|
| Project No.  | TA7148   | Distribution               | Sample Depth<br>3.50m   |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number<br>014    |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B        |
| Description  | Greyish brown slightly gravelly SAND                 |                            | Specimen Depth<br>3.50m |
|              |  |                            | Specimen No.<br>1       |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

 Silt and clay:
 2

 Sand:
 88

 Gravel:
 10

 Cobbles:
 0

General remarks

|               | WET SIEV   | E DATA       |               |
|---------------|------------|--------------|---------------|
| Sieve size mm | Cumulative | Sieve size r | nm Cumulative |
|               | % passing  |              | % passing     |
|               |            | 14.0         | 100           |
|               |            | 10.0         | 100           |
|               |            | 6.3          | 98            |
| 125.0         | 100        | 5.0          | 97            |
| 90.0          | 100        | 3.35         | 95            |
| 75.0          | 100        | 2.00         | 90            |
| 63.0          | 100        | 1.18         | 82            |
| 50.0          | 100        | 0.600        | 63            |
| 37.5          | 100        | 0.425        | 58            |
| 28.0          | 100        | 0.300        | 51            |
| 20.0          | 100        | 0.212        | 31            |
|               |            | 0.150        | 6             |
|               |            | 0.063        | 2             |

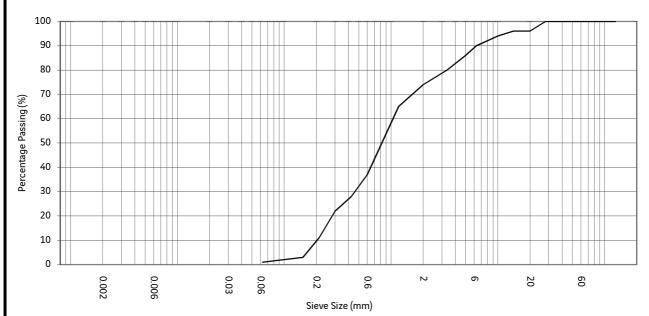
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 Print date 28/11/2013

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| Project Name | Bay of Nigg Harbour Development Ground               | Particle Size              | Hole ID        |
|--------------|--|----------------------------|----------------|
| •            | Investigation  |                            | E105           |
| Project No.  | TA7148   | Distribution               | Sample Depth   |
| •            |  |                            | 5.50m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
| · ·          |  |                            | 022            |
| Employer     | Aberdeen Harbour Board                               | DC 1277, D- + 2, 1000, 0.2 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brown gravelly SAND. Gravel is fine to coarse subrou | nded                       | Specimen Depth |
| ·            |  |                            | 5.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 1
Sand: 73
Gravel: 26
Cobbles: 0

General remarks

|               | WET SIEV   |               |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 96         |
|               |            | 10.0          | 94         |
|               |            | 6.3           | 90         |
| 125.0         | 100        | 5.0           | 86         |
| 90.0          | 100        | 3.35          | 80         |
| 75.0          | 100        | 2.00          | 74         |
| 63.0          | 100        | 1.18          | 65         |
| 50.0          | 100        | 0.600         | 37         |
| 37.5          | 100        | 0.425         | 28         |
| 28.0          | 100        | 0.300         | 22         |
| 20.0          | 96         | 0.212         | 11         |
|               |            | 0.150         | 3          |
|               |            | 0.063         | 1          |

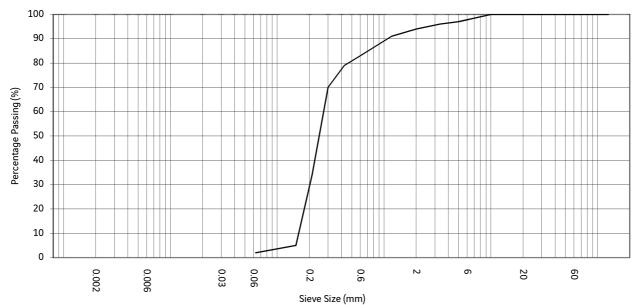
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| Project Name | Bay of Nigg Harbour Development Ground | Particle Size              | Hole ID        |
|--------------|--|----------------------------|----------------|
| •            | Investigation                          |                            | E106           |
| Project No.  | TA7148                                 | Distribution               | Sample Depth   |
| ,            |  |                            | 0.00m          |
| Engineer     | Arch Henderson LLP                     |                            | Sample Number  |
| J            |  |                            | 002            |
| Employer     | Aberdeen Harbour Board                 | DC 1277: D-++ 2: 1000: 0.2 | Sample type    |
| . ,          |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brownish grey slightly gravelly SAND   |                            | Specimen Depth |
|              |  |                            | 0.00m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 2
Sand: 92
Gravel: 6
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 100        |
|               |            | 6.3        |    | 98         |
| 125.0         | 100        | 5.0        |    | 97         |
| 90.0          | 100        | 3.35       |    | 96         |
| 75.0          | 100        | 2.00       |    | 94         |
| 63.0          | 100        | 1.18       |    | 91         |
| 50.0          | 100        | 0.600      |    | 83         |
| 37.5          | 100        | 0.425      |    | 79         |
| 28.0          | 100        | 0.300      |    | 70         |
| 20.0          | 100        | 0.212      |    | 34         |
|               |            | 0.150      |    | 5          |
|               |            | 0.063      |    | 2          |

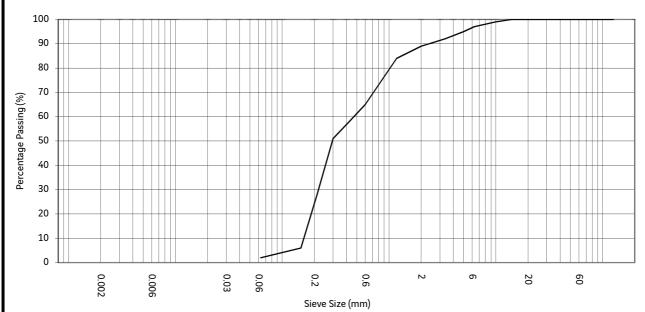
 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground                | Particle Size              | Hole ID        |
|--------------|---|----------------------------|----------------|
| •            | Investigation   |                            | E106           |
| Project No.  | TA7148  | Distribution               | Sample Depth   |
| •            |   |                            | 2.50m          |
| Engineer     | Arch Henderson LLP                                    |                            | Sample Number  |
| J            |   |                            | 010            |
| Employer     | Aberdeen Harbour Board                                | DC 1277, Doub 2, 1000, 0.2 | Sample type    |
| . ,          |   | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brown slightly gravelly SAND. Gravel is fine to mediu | m subangular.              | Specimen Depth |
| ·            |   |                            | 2.50m          |
|              |   |                            | Specimen No.   |
|              |   |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

 Silt and clay:
 2

 Sand:
 87

 Gravel:
 11

 Cobbles:
 0

General remarks

| WET SIEVE DATA |            |            |    |            |  |
|----------------|------------|------------|----|------------|--|
| Sieve size mm  | Cumulative | Sieve size | mm | Cumulative |  |
|                | % passing  |            |    | % passing  |  |
|                |            | 14.0       |    | 100        |  |
|                |            | 10.0       |    | 99         |  |
|                |            | 6.3        |    | 97         |  |
| 125.0          | 100        | 5.0        |    | 95         |  |
| 100.0          | 100        | 3.35       |    | 92         |  |
| 75.0           | 100        | 2.00       |    | 89         |  |
| 63.0           | 100        | 1.18       |    | 84         |  |
| 50.0           | 100        | 0.600      | )  | 65         |  |
| 37.5           | 100        | 0.425      |    | 58         |  |
| 28.0           | 100        | 0.300      | )  | 51         |  |
| 20.0           | 100        | 0.212      |    | 28         |  |
|                |            | 0.150      | )  | 6          |  |
|                |            | 0.063      |    | 2          |  |

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| Project Name | Bay of Nigg Harbour Development Ground<br>Investigation | Particle Size              | Hole ID<br>E106 |
|--------------|---|----------------------------|-----------------|
| Project No.  | TA7148  | Distribution               | Sample Depth    |
|              |   |                            | 4.50m           |
| Engineer     | Arch Henderson LLP                                      |                            | Sample Number   |
|              |   |                            | 018             |
| Employer     | Aberdeen Harbour Board                                  | BS 1377: Part 2: 1990: 9.2 | Sample type     |
| ' '          |   | BS 1377. Part 2. 1990. 9.2 | В               |
| Description  | Brown SAND  |                            | Specimen Depth  |
|              |   |                            | 4.50m           |
|              |   |                            | Specimen No.    |
|              |   |                            | 1               |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

 Silt and clay:
 2

 Sand:
 93

 Gravel:
 5

 Cobbles:
 0

General remarks

Sample size was insufficient to be representative of particle size

|               | WET SIEV   | 'E DATA       |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 100        |
|               |            | 10.0          | 100        |
|               |            | 6.3           | 99         |
| 125.0         | 100        | 5.0           | 98         |
| 90.0          | 100        | 3.35          | 96         |
| 75.0          | 100        | 2.00          | 95         |
| 63.0          | 100        | 1.18          | 93         |
| 50.0          | 100        | 0.600         | 73         |
| 37.5          | 100        | 0.425         | 63         |
| 28.0          | 100        | 0.300         | 58         |
| 20.0          | 100        | 0.212         | 32         |
|               |            | 0.150         | 7          |
|               |            | 0.063         | 2          |

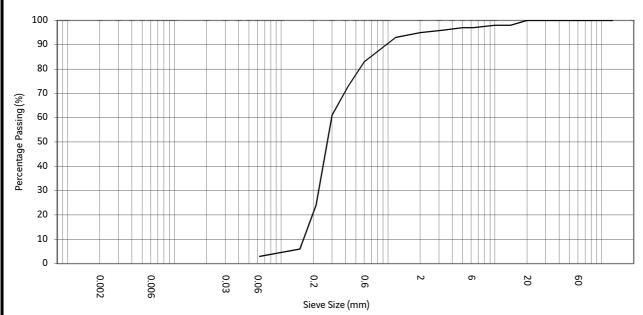
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 Print date 28/11/2013

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 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground | Particle Size              | Hole ID        |
|--------------|--|----------------------------|----------------|
|              | Investigation                          |                            | E107           |
| Project No.  | TA7148                                 | Distribution               | Sample Depth   |
| •            |  |                            | 0.50m          |
| Engineer     | Arch Henderson LLP                     |                            | Sample Number  |
| J            |  |                            | 003            |
| Employer     | Aberdeen Harbour Board                 | DC 1277, Dart 2, 1000, 0.2 | Sample type    |
| , ,          |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brown slightly gravelly SAND           |                            | Specimen Depth |
| ·            |  |                            | 0.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

Silt and clay: 3
Sand: 93
Gravel: 5
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 98         |
|               |            | 10.0          | 98         |
|               |            | 6.3           | 97         |
| 125.0         | 100        | 5.0           | 97         |
| 90.0          | 100        | 3.35          | 96         |
| 75.0          | 100        | 2.00          | 95         |
| 63.0          | 100        | 1.18          | 93         |
| 50.0          | 100        | 0.600         | 83         |
| 37.5          | 100        | 0.425         | 73         |
| 28.0          | 100        | 0.300         | 61         |
| 20.0          | 100        | 0.212         | 24         |
|               |            | 0.150         | 6          |
|               |            | 0.063         | 3          |

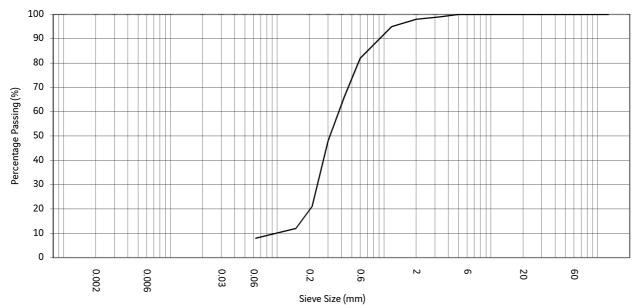
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 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground | Particle Size              | Hole ID        |
|--------------|--|----------------------------|----------------|
| ·            | Investigation                          |                            | E107           |
| Project No.  | TA7148                                 | Distribution               | Sample Depth   |
| ,            |  |                            | 4.50m          |
| Engineer     | Arch Henderson LLP                     |                            | Sample Number  |
| 3            |  |                            | 011            |
| Employer     | Aberdeen Harbour Board                 | DC 1277, Dart 2, 1000, 0.2 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Grey SAND.                             |                            | Specimen Depth |
|              |  |                            | 4.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 8
Sand: 90
Gravel: 3
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 100        |
|               |            | 6.3        |    | 100        |
| 125.0         | 100        | 5.0        |    | 100        |
| 100.0         | 100        | 3.35       |    | 99         |
| 75.0          | 100        | 2.00       |    | 98         |
| 63.0          | 100        | 1.18       |    | 95         |
| 50.0          | 100        | 0.600      |    | 82         |
| 37.5          | 100        | 0.425      |    | 66         |
| 28.0          | 100        | 0.300      |    | 48         |
| 20.0          | 100        | 0.212      |    | 21         |
|               |            | 0.150      |    | 12         |
|               |            | 0.063      |    | 8          |

Approved by:

Sushil Sharda

Revision No. 3.03

Leeds Laboratory

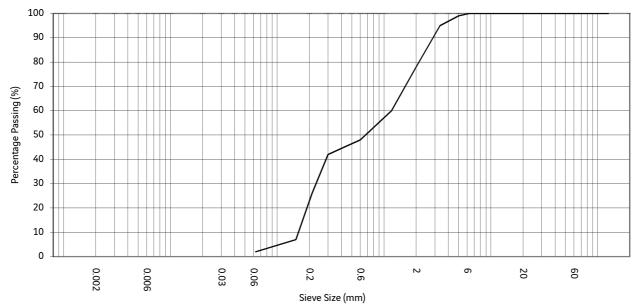
Print date 28/11/2013

Revision No. 1.03

Revision No. 2.03



| Project Name                            | Bay of Nigg Harbour Development Ground | Particle Size              | Hole ID        |
|---|--|----------------------------|----------------|
| •                                       | Investigation                          |                            | E108           |
| Project No.                             | TA7148                                 | Distribution               | Sample Depth   |
| ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, |  |                            | 0.00m          |
| Engineer                                | Arch Henderson LLP                     |                            | Sample Number  |
| J                                       |  |                            | 001            |
| Employer                                | Aberdeen Harbour Board                 | BS 1377: Part 2: 1990: 9.2 | Sample type    |
| , ,                                     |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description                             | Brown gravelly SAND.                   |                            | Specimen Depth |
| -                                       |  |                            | 0.00m          |
|   |  |                            | Specimen No.   |
|   |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | L      | COBBLES |

Silt and clay: 2
Sand: 75
Gravel: 22
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 100        |
|               |            | 6.3        |    | 100        |
| 125.0         | 100        | 5.0        |    | 99         |
| 90.0          | 100        | 3.35       |    | 95         |
| 75.0          | 100        | 2.00       |    | 78         |
| 63.0          | 100        | 1.18       |    | 60         |
| 50.0          | 100        | 0.600      | )  | 48         |
| 37.5          | 100        | 0.425      | ;  | 45         |
| 28.0          | 100        | 0.300      | )  | 42         |
| 20.0          | 100        | 0.212      | !  | 26         |
|               |            | 0.150      | )  | 7          |
|               |            | 0.063      | }  | 2          |

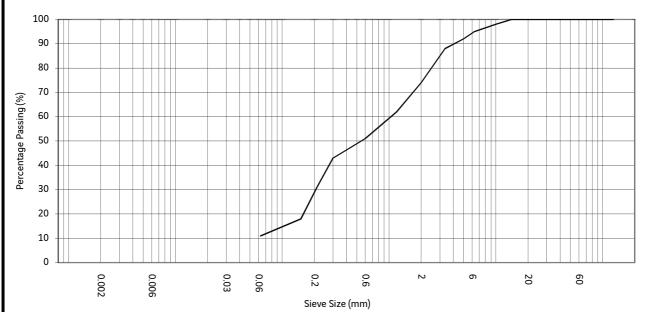
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 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground                  | Particle Size              | Hole ID        |
|--------------|---|----------------------------|----------------|
| •            | Investigation   |                            | E108           |
| Project No.  | TA7148  | Distribution               | Sample Depth   |
| ,            |   |                            | 2.00m          |
| Engineer     | Arch Henderson LLP                                      |                            | Sample Number  |
| J            |   |                            | 800            |
| Employer     | Aberdeen Harbour Board                                  | DC 1277, Doub 2, 1000, 0.2 | Sample type    |
| . ,          |   | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Grey slightly clayey gravelly SAND. Gravel is fine to n | nedium rounded             | Specimen Depth |
| ·            |   |                            | 2.00m          |
|              |   |                            | Specimen No.   |
|              |   |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 11
Sand: 63
Gravel: 26
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 98         |
|               |            | 6.3        |    | 95         |
| 125.0         | 100        | 5.0        |    | 92         |
| 90.0          | 100        | 3.35       |    | 88         |
| 75.0          | 100        | 2.00       |    | 74         |
| 63.0          | 100        | 1.18       |    | 62         |
| 50.0          | 100        | 0.600      | )  | 51         |
| 37.5          | 100        | 0.425      |    | 47         |
| 28.0          | 100        | 0.300      | )  | 43         |
| 20.0          | 100        | 0.212      |    | 31         |
|               |            | 0.150      | )  | 18         |
|               |            | 0.063      |    | 11         |

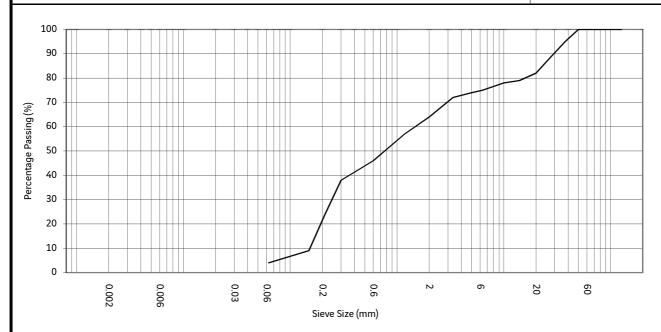
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 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size              | Hole ID        |
|--------------|---|----------------------------|----------------|
|              | Investigation                                       |                            | E108           |
| Project No.  | TA7148  | Distribution               | Sample Depth   |
| ,            |   |                            | 3.00m          |
| Engineer     | Arch Henderson LLP                                  |                            | Sample Number  |
| Ĭ            |   |                            | 011            |
| Employer     | Aberdeen Harbour Board                              | DC 1277: Dowt 2: 1000: 0.2 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Greyish brown gravelly SAND. Gravel is fine to coar | se well rounded.           | Specimen Depth |
|              |   |                            | 3.00m          |
|              |   |                            | Specimen No.   |
|              |   |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

4

General remarks

Sample size was insufficient to be representative of particle size

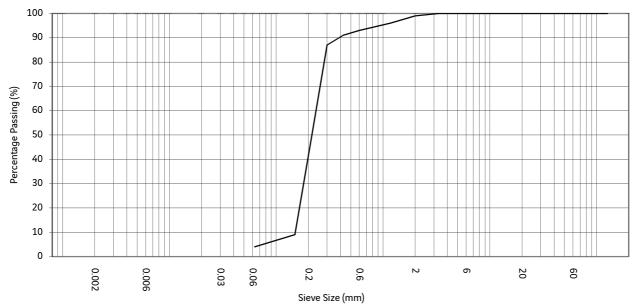
Silt and clay: Sand: 60 Gravel: 36 Cobbles: 0

|               | WET SIEV   | E DATA        |            |  |
|---------------|------------|---------------|------------|--|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |  |
|               | % passing  |               | % passing  |  |
|               |            | 14.0          | 79         |  |
|               |            | 10.0          | 78         |  |
|               |            | 6.3           | 75         |  |
| 125.0         | 100        | 5.0           | 74         |  |
| 100.0         | 100        | 3.35          | 72         |  |
| 75.0          | 100        | 2.00          | 64         |  |
| 63.0          | 100        | 1.18          | 57         |  |
| 50.0          | 100        | 0.600         | 46         |  |
| 37.5          | 95         | 0.425         | 42         |  |
| 28.0          | 89         | 0.300         | 38         |  |
| 20.0          | 82         | 0.212         | 24         |  |
|               |            | 0.150         | 9          |  |
|               |            | 0.063         | 4          |  |
|               |            |               |            |  |

| Approved by: | Leeds Laborato | ry   |            |            |            |
|--------------|----------------|------|------------|------------|------------|
| Stuart Kirk  |                |      |            | Print date | 28/11/2013 |
|              | Revision No.   | 3.03 | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground | Particle Size              | Hole ID        |
|--------------|--|----------------------------|----------------|
| •            | Investigation                          |                            | E109           |
| Project No.  | TA7148                                 | Distribution               | Sample Depth   |
| ,            |  |                            | 0.00m          |
| Engineer     | Arch Henderson LLP                     |                            | Sample Number  |
| J            |  |                            | 002            |
| Employer     | Aberdeen Harbour Board                 | BS 1377: Part 2: 1990: 9.2 | Sample type    |
| . ,          |  | BS 1377. Part 2. 1990. 9.2 | В              |
| Description  | Greyish brown SAND                     |                            | Specimen Depth |
| -            |  |                            | 0.00m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 4
Sand: 95
Gravel: 1
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |            |  |
|---------------|------------|---------------|------------|--|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |  |
|               | % passing  |               | % passing  |  |
|               |            | 14.0          | 100        |  |
|               |            | 10.0          | 100        |  |
|               |            | 6.3           | 100        |  |
| 125.0         | 100        | 5.0           | 100        |  |
| 90.0          | 100        | 3.35          | 100        |  |
| 75.0          | 100        | 2.00          | 99         |  |
| 63.0          | 100        | 1.18          | 96         |  |
| 50.0          | 100        | 0.600         | 93         |  |
| 37.5          | 100        | 0.425         | 91         |  |
| 28.0          | 100        | 0.300         | 87         |  |
| 20.0          | 100        | 0.212         | 48         |  |
|               |            | 0.150         | 9          |  |
|               |            | 0.063         | 4          |  |

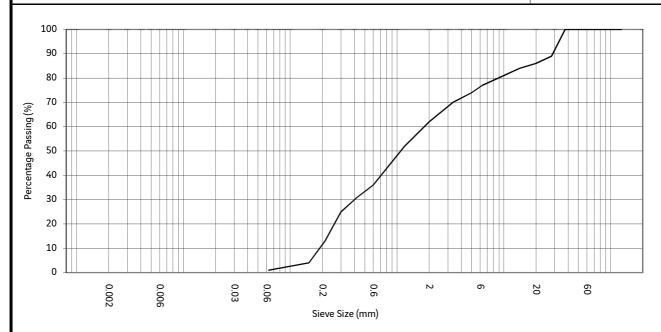
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 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size              | Hole ID        |
|--------------|---|----------------------------|----------------|
|              | Investigation                                       |                            | E109           |
| Project No.  | TA7148  | Distribution               | Sample Depth   |
|              |   |                            | 2.50m          |
| Engineer     | Arch Henderson LLP                                  |                            | Sample Number  |
|              |   |                            | 010            |
| Employer     | Aberdeen Harbour Board                              | DC 1277, Dowt 2, 1000, 0.2 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brwon gravelly SAND. Gravel is fine to coarse round | ed                         | Specimen Depth |
|              |   |                            | 2.50m          |
|              |   |                            | Specimen No.   |
|              |   |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAT |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

1

Silt and clay: Sand: 61 Gravel: 38 Cobbles: 0

General remarks

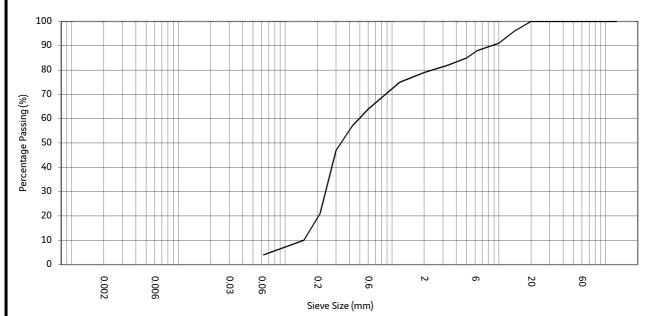
Sample size was insufficient to be representative of particle size

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 84         |
|               |            | 10.0          | 81         |
|               |            | 6.3           | 77         |
| 125.0         | 100        | 5.0           | 74         |
| 90.0          | 100        | 3.35          | 70         |
| 75.0          | 100        | 2.00          | 62         |
| 63.0          | 100        | 1.18          | 52         |
| 50.0          | 100        | 0.600         | 36         |
| 37.5          | 100        | 0.425         | 31         |
| 28.0          | 89         | 0.300         | 25         |
| 20.0          | 86         | 0.212         | 13         |
|               |            | 0.150         | 4          |
|               |            | 0.063         | 1          |

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| Project Name | Bay of Nigg Harbour Development Ground             | Particle Size              | Hole ID        |  |  |
|--------------|--|----------------------------|----------------|--|--|
| •            | Investigation                                      |                            | E109           |  |  |
| Project No.  | TA7148   | Distribution               | Sample Depth   |  |  |
| •            |  |                            | 5.00m          |  |  |
| Engineer     | Arch Henderson LLP                                 |                            | Sample Number  |  |  |
| · ·          |  |                            | 019            |  |  |
| Employer     | Aberdeen Harbour Board                             | DC 1277, D- + 2, 1000, 0.2 | Sample type    |  |  |
| ' '          |  | BS 1377: Part 2: 1990: 9.2 | В              |  |  |
| Description  | Brown gravelly SAND. Gravel is fine to medium roun | ded                        | Specimen Depth |  |  |
| ·            |  |                            | 5.00m          |  |  |
|              |  |                            | Specimen No.   |  |  |
|              |  |                            | 1              |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

Silt and clay: 4
Sand: 75
Gravel: 21
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |               |
|---------------|------------|---------------|---------------|
| Sieve size mm | Cumulative | Sieve size in | nm Cumulative |
|               | % passing  |               | % passing     |
|               |            | 14.0          | 96            |
|               |            | 10.0          | 91            |
|               |            | 6.3           | 88            |
| 125.0         | 100        | 5.0           | 85            |
| 90.0          | 100        | 3.35          | 82            |
| 75.0          | 100        | 2.00          | 79            |
| 63.0          | 100        | 1.18          | 75            |
| 50.0          | 100        | 0.600         | 64            |
| 37.5          | 100        | 0.425         | 57            |
| 28.0          | 100        | 0.300         | 47            |
| 20.0          | 100        | 0.212         | 21            |
|               |            | 0.150         | 10            |
|               |            | 0.063         | 4             |

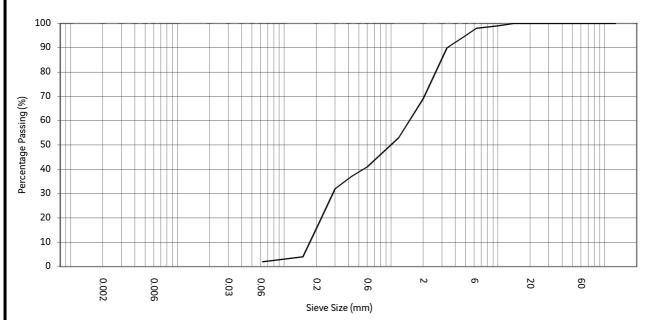
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 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
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| Project Name | Bay of Nigg Harbour Development Ground            | Particle Size               | Hole ID        |
|--------------|---|-----------------------------|----------------|
|              | Investigation                                     |                             | E110           |
| Project No.  | TA7148  | Distribution                | Sample Depth   |
| ,            |   |                             | 1.50m          |
| Engineer     | Arch Henderson LLP                                |                             | Sample Number  |
| Ŭ            |   |                             | 005            |
| Employer     | Aberdeen Harbour Board                            | DC 1277, David 2, 1000, 0.2 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2  | В              |
| Description  | Brown slightly gravelly SAND with shell fragments |                             | Specimen Depth |
|              |   |                             | 1.50m          |
|              |   |                             | Specimen No.   |
|              |   |                             | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

Silt and clay: 2
Sand: 67
Gravel: 31
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 99         |
|               |            | 6.3        |    | 98         |
| 125.0         | 100        | 5.0        |    | 95         |
| 100.0         | 100        | 3.35       |    | 90         |
| 75.0          | 100        | 2.00       |    | 69         |
| 63.0          | 100        | 1.18       |    | 53         |
| 50.0          | 100        | 0.600      |    | 41         |
| 37.5          | 100        | 0.425      |    | 37         |
| 28.0          | 100        | 0.300      |    | 32         |
| 20.0          | 100        | 0.212      |    | 18         |
|               |            | 0.150      |    | 4          |
|               |            | 0.063      |    | 2          |

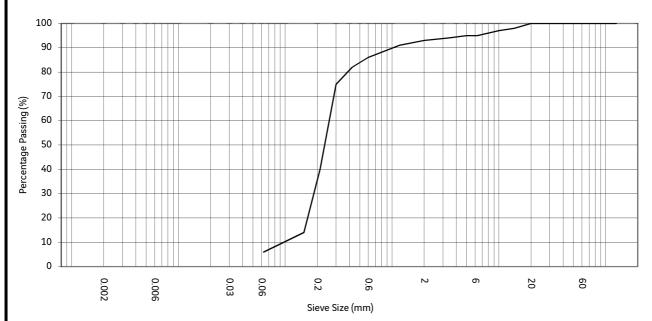
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| Project Name | Bay of Nigg Harbour Development Ground Investigation  | Particle Size              | Hole ID<br>E111 |
|--------------|---|----------------------------|-----------------|
| Project No.  | TA7148  | Distribution               | Sample Depth    |
|              |   |                            | 0.50m           |
| Engineer     | Arch Henderson LLP                                    |                            | Sample Number   |
|              |   |                            | 003             |
| Employer     | Aberdeen Harbour Board                                | DC 1277, D-+ 2, 1000, 0.2  | Sample type     |
| . ,          |   | BS 1377: Part 2: 1990: 9.2 | В               |
| Description  | Brown slightly gravelly SAND. Gravel is fine to media | ım subangular.             | Specimen Depth  |
|              |   |                            | 0.50m           |
|              |   |                            | Specimen No.    |
|              |   |                            | 1               |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

Silt and clay: 6
Sand: 87
Gravel: 7
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 98         |
|               |            | 10.0       |    | 97         |
|               |            | 6.3        |    | 95         |
| 125.0         | 100        | 5.0        |    | 95         |
| 100.0         | 100        | 3.35       |    | 94         |
| 75.0          | 100        | 2.00       |    | 93         |
| 63.0          | 100        | 1.18       |    | 91         |
| 50.0          | 100        | 0.600      | )  | 86         |
| 37.5          | 100        | 0.425      |    | 82         |
| 28.0          | 100        | 0.300      | )  | 75         |
| 20.0          | 100        | 0.212      |    | 40         |
|               |            | 0.150      | )  | 14         |
|               |            | 0.063      | 1  | 6          |

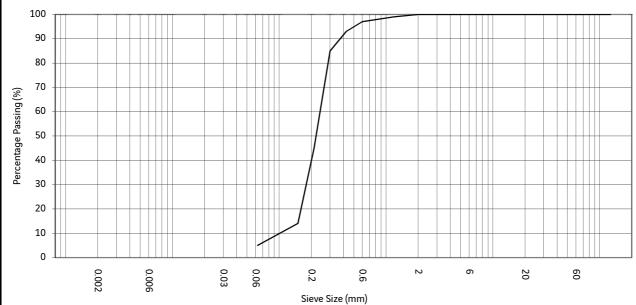
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| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>E111                              |  |  |
|--------------|--|----------------------------|--|--|--|
| Project No.  | TA7148   | Distribution               | Sample Depth<br>2.50m                        |  |  |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number<br>009                         |  |  |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B                             |  |  |
| Description  | Brown SAND   |                            | Specimen Depth<br>2.50m<br>Specimen No.<br>1 |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

Silt and clay: 5
Sand: 94
Gravel: 0
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA       |               |
|---------------|------------|--------------|---------------|
| Sieve size mm | Cumulative | Sieve size m | nm Cumulative |
|               | % passing  |              | % passing     |
|               |            | 14.0         | 100           |
|               |            | 10.0         | 100           |
|               |            | 6.3          | 100           |
| 125.0         | 100        | 5.0          | 100           |
| 100.0         | 100        | 3.35         | 100           |
| 75.0          | 100        | 2.00         | 100           |
| 63.0          | 100        | 1.18         | 99            |
| 50.0          | 100        | 0.600        | 97            |
| 37.5          | 100        | 0.425        | 93            |
| 28.0          | 100        | 0.300        | 85            |
| 20.0          | 100        | 0.212        | 45            |
|               |            | 0.150        | 14            |
|               |            | 0.063        | 5             |

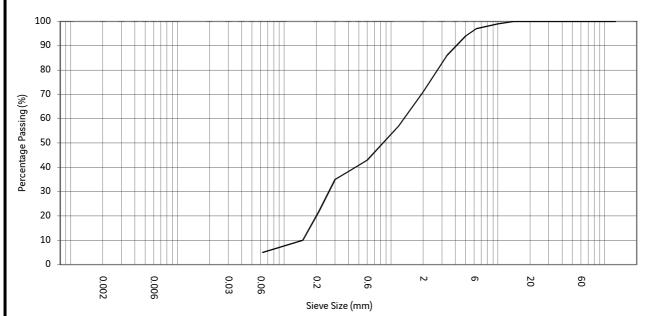
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| Project Name | Bay of Nigg Harbour Development Ground         | Particle Size              | Hole ID        |  |
|--------------|--|----------------------------|----------------|--|
|              | Investigation                                  | D:-4-:1                    | E112           |  |
| Project No.  | TA7148   | Distribution               | Sample Depth   |  |
| ,            |  |                            | 0.00m          |  |
| Engineer     | Arch Henderson LLP                             |                            | Sample Number  |  |
| · ·          |  |                            | 001            |  |
| Employer     | Aberdeen Harbour Board                         | BS 1377: Part 2: 1990: 9.2 | Sample type    |  |
| , ,          |  | BS 1377: Part 2: 1990: 9.2 | В              |  |
| Description  | Brown gravelly SAND. Gravel is fine to medium. |                            | Specimen Depth |  |
| -            |  |                            | 0.00m          |  |
|              |  |                            | Specimen No.   |  |
|              |  |                            | 1              |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 5
Sand: 65
Gravel: 30
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 100        |
|               |            | 10.0       |    | 99         |
|               |            | 6.3        |    | 97         |
| 125.0         | 100        | 5.0        |    | 94         |
| 100.0         | 100        | 3.35       |    | 86         |
| 75.0          | 100        | 2.00       |    | 71         |
| 63.0          | 100        | 1.18       |    | 57         |
| 50.0          | 100        | 0.600      | )  | 43         |
| 37.5          | 100        | 0.425      | ;  | 39         |
| 28.0          | 100        | 0.300      | )  | 35         |
| 20.0          | 100        | 0.212      |    | 22         |
|               |            | 0.150      | )  | 10         |
|               |            | 0.063      | 1  | 5          |

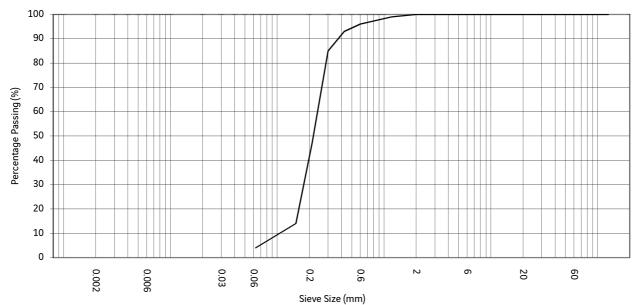
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| Project Name<br>Project No. | Bay of Nigg Harbour Development Ground Investigation TA7148  Particle Size Distribution |                            | Hole ID<br>E112<br>Sample Depth<br>2.00m |  |
|-----------------------------|---|----------------------------|--|--|
| Engineer                    | Arch Henderson LLP  |                            | Sample Number<br>006                     |  |
| Employer                    | Aberdeen Harbour Board  | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B                         |  |
| Description                 | Brown SAND  |                            | Specimen Depth<br>2.00m<br>Specimen No.  |  |
|                             |   |                            | 1  |  |
| 100                         |   |                            |  |  |
| 90                          |   |                            |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 4
Sand: 96
Gravel: 0
Cobbles: 0

General remarks

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 100        |
|               |            | 10.0          | 100        |
|               |            | 6.3           | 100        |
| 125.0         | 100        | 5.0           | 100        |
| 90.0          | 100        | 3.35          | 100        |
| 75.0          | 100        | 2.00          | 100        |
| 63.0          | 100        | 1.18          | 99         |
| 50.0          | 100        | 0.600         | 96         |
| 37.5          | 100        | 0.425         | 93         |
| 28.0          | 100        | 0.300         | 85         |
| 20.0          | 100        | 0.212         | 47         |
|               |            | 0.150         | 14         |
|               |            | 0.063         | 4          |

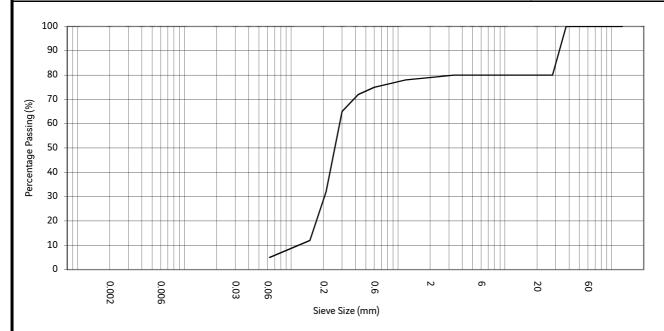
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| Project Name | Bay of Nigg Harbour Development Ground                | Particle Size              | Hole ID<br>E115         |
|--------------|---|----------------------------|-------------------------|
| Project No.  | Investigation<br>TA7148                               | Distribution               | Sample Depth<br>0.50m   |
| Engineer     | Arch Henderson LLP                                    |                            | Sample Number<br>003    |
| Employer     | Aberdeen Harbour Board                                | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B        |
| Description  | Brown slightly gravelly SAND. Gravel is fine to coars | se angular. (Diesel odour) | Specimen Depth<br>0.50m |
|              |   |                            | Specimen No.<br>1       |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

PARTICLE SIZE % Genera Sample

0

Silt and clay: 5
Sand: 74
Gravel: 21

Cobbles:

General remarks

Sample size was insufficient to be representative of particle size

|               | WET SIEV   | 'E DATA       |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 80         |
|               |            | 10.0          | 80         |
|               |            | 6.3           | 80         |
| 125.0         | 100        | 5.0           | 80         |
| 100.0         | 100        | 3.35          | 80         |
| 75.0          | 100        | 2.00          | 79         |
| 63.0          | 100        | 1.18          | 78         |
| 50.0          | 100        | 0.600         | 75         |
| 37.5          | 100        | 0.425         | 72         |
| 28.0          | 80         | 0.300         | 65         |
| 20.0          | 80         | 0.212         | 32         |
|               |            | 0.150         | 12         |
|               |            | 0.063         | 5          |

| Approved by: | Leeds Labora | atory |            |            |            |  |
|--------------|--------------|-------|------------|------------|------------|--|
| Stuart Kirk  |              |       |            | Print date | 28/11/2013 |  |
|              | Revision No. | 3.03  | Issue Date | 19/11/     | 2012       |  |



| Project Name | Bay of Nigg Harbour Development Ground               | Particle Size               | Hole ID        |
|--------------|--|-----------------------------|----------------|
|              | Investigation  |                             | E116           |
| Project No.  | TA7148   | Distribution                | Sample Depth   |
|              |  |                             | 0.50m          |
| Engineer     | Arch Henderson LLP                                   |                             | Sample Number  |
|              |  |                             | 002            |
| Employer     | Aberdeen Harbour Board                               | DC 1277, Do at 2, 1000, 0.2 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2  | В              |
| Description  | Brown gravelly SAND. Gravel is fine to coarse angula | r.                          | Specimen Depth |
|              |  |                             | 0.50m          |
|              |  |                             | Specimen No.   |
|              |  |                             | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

General rei

PARTICLE SIZE %

Silt and clay: 7
Sand: 58
Gravel: 27
Cobbles: 8

General remarks

Sample size was insufficient to be representative of particle size

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 75         |
|               |            | 10.0          | 74         |
|               |            | 6.3           | 71         |
| 125.0         | 100        | 5.0           | 70         |
| 100.0         | 100        | 3.35          | 68         |
| 75.0          | 100        | 2.00          | 64         |
| 63.0          | 92         | 1.18          | 60         |
| 50.0          | 91         | 0.600         | 52         |
| 37.5          | 83         | 0.425         | 47         |
| 28.0          | 82         | 0.300         | 39         |
| 20.0          | 79         | 0.212         | 23         |
|               |            | 0.150         | 9          |
|               |            | 0.063         | 6          |

|               | 0.00              | 3 0                |            |                                  |
|---------------|-------------------|--------------------|------------|----------------------------------|
| Approved by:  | Leeds Laboratory  |                    |            |                                  |
| Sushil Sharda |                   | Print date         | 28/11/2013 | SOIL ENGINEERING                 |
|               | Revision No. 3.03 | Issue Date 19/11/2 | 012        | Part of the Bachy Soletanche Gro |

| Project Name | Bay of Nigg Harbour Development Ground              | of Nigg Harbour Development Ground Particle Size |                  |
|--------------|---|--|------------------|
|              | Investigation                                       |  | GS11             |
| Project No.  | TA7148  | Distribution                                     | Sample Depth     |
| <b>l</b>     |   |  | 6.80m            |
| Engineer     | Arch Henderson LLP                                  |  | Sample Number    |
| Employer     | Aberdeen Harbour Board                              | BS 1377: Part 2: 1990: 9.2, 9.5                  | Sample type<br>C |
| Description  | Brown gravelly sandy CLAY. Gravel is fine to coarse | subangular                                       | Specimen Depth   |
| -            |   |  | 6.80m            |
|              |   |  | Specimen No.     |
|              |   |  | 2                |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium |         | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|---------|
| CLAY |      | SILT   |        | SAND |        | GRAVEL |      |        | COBBLES |         |

 PARTICLE SIZE
 %

 Clay:
 10

 Silt:
 23

 Sand:
 40

 Gravel:
 27

 Cobbles:
 0

General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | SEDIMENTAT    | ION DATA   |             |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 87         | diameter mm |            |
|               |            | 10.0          | 84         | 0.0497      | 32         |
|               |            | 6.3           | 81         | 0.0254      | 27         |
| 125.0         | 100        | 5.0           | 79         | 0.0181      | 24         |
| 100.0         | 100        | 3.35          | 77         | 0.0083      | 19         |
| 75.0          | 100        | 2.00          | 74         | 0.0045      | 14         |
| 63.0          | 100        | 1.18          | 69         | 0.0039      | 13         |
| 50.0          | 100        | 0.600         | 61         | 0.0010      | 9          |
| 37.5          | 100        | 0.425         | 57         |             |            |
| 28.0          | 95         | 0.300         | 52         |             |            |
| 20.0          | 92         | 0.212         | 47         |             |            |
|               |            | 0.150         | 43         |             |            |
|               |            | 0.063         | 34         |             |            |

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| Project Name | Bay of Nigg Harbour Development Ground<br>Investigation | Particle Size                  | Hole ID<br>TP01 |
|--------------|---|--------------------------------|-----------------|
| Project No.  | TA7148  | Distribution                   | Sample Depth    |
|              |   |                                | 0.10m           |
| Engineer     | Arch Henderson LLP                                      |                                | Sample Number   |
|              |   |                                | 001             |
| Employer     | Aberdeen Harbour Board                                  | BS 1377: Part 2: 1990: 9.2     | Sample type     |
| ' ´          |   | BS 1377: Part 2, 1990, 9,2     | В               |
| Description  | Brown sandy GRAVEL with cobbles. Gravel is fine to      | coarse rounded and subangular. | Specimen Depth  |
|              |   |                                | 0.10m           |
|              |   |                                | Specimen No.    |
|              |   |                                | 1               |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

20

General remarks

Silt and clay: 2
Sand: 11

Sand: 11 Gravel: 67

Cobbles:

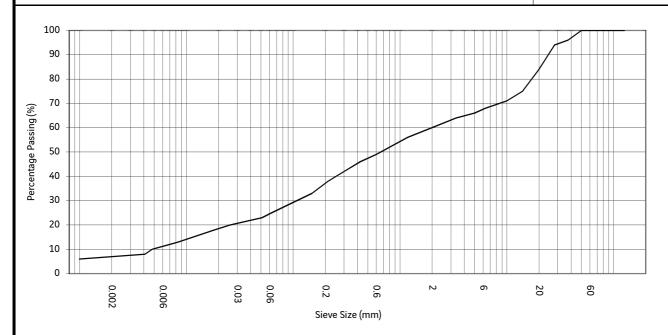
Sample size was insufficient to be representative of particle size

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 36         |
|               |            | 10.0          | 28         |
|               |            | 6.3           | 22         |
| 125.0         | 100        | 5.0           | 19         |
| 90.0          | 100        | 3.35          | 17         |
| 75.0          | 100        | 2.00          | 14         |
| 63.0          | 81         | 1.18          | 12         |
| 50.0          | 77         | 0.600         | 10         |
| 37.5          | 70         | 0.425         | 10         |
| 28.0          | 62         | 0.300         | 9          |
| 20.0          | 47         | 0.212         | 6          |
|               |            | 0.150         | 3          |
|               |            | 0.063         | 2          |

| Approved by: | Leeds Labora | atory |            |            |            |   |     |
|--------------|--------------|-------|------------|------------|------------|---|-----|
| Stuart Kirk  |              |       | <u>.</u>   | Print date | 28/11/2013 |   | S   |
|              | Revision No. | 3.03  | Issue Date | 19/11/     | ′2012      | 1 | Par |



| Project Name | Bay of Nigg Harbour Development Ground              | Particle Size                    | Hole ID        |
|--------------|---|----------------------------------|----------------|
|              | Investigation                                       | Distribution                     | TP02           |
| Project No.  | TA7148  | Distribution                     | Sample Depth   |
|              |   |                                  | 0.50m          |
| Engineer     | Arch Henderson LLP                                  |                                  | Sample Number  |
|              |   |                                  | 003            |
| Employer     | Aberdeen Harbour Board                              | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| ' '          |   | BS 1377: Part 2: 1990: 9.2, 9.5  | В              |
| Description  | Brown sandy gravelly CLAY. Gravel is fine to coarse | angular.                         | Specimen Depth |
|              |   |                                  | 0.50m          |
|              |   |                                  | Specimen No.   |
|              |   |                                  | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium |         | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|---------|
| CLAY |      | SILT   |        | SAND |        | GRAVEL |      |        | COBBLES |         |

 PARTICLE SIZE
 %

 Clay:
 6

 Silt:
 18

 Sand:
 35

 Gravel:
 40

 Cobbles:
 0

General remarks

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | SEDIMENTAT    | ION DATA   |             |            |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 75         | diameter mm |            |
|               |            | 10.0          | 71         | 0.0510      | 23         |
|               |            | 6.3           | 68         | 0.0258      | 20         |
| 125.0         | 100        | 5.0           | 66         | 0.0184      | 18         |
| 90.0          | 100        | 3.35          | 64         | 0.0084      | 13         |
| 75.0          | 100        | 2.00          | 60         | 0.0048      | 10         |
| 63.0          | 100        | 1.18          | 56         | 0.0041      | 8          |
| 50.0          | 100        | 0.600         | 49         | 0.0010      | 6          |
| 37.5          | 96         | 0.425         | 46         |             |            |
| 28.0          | 94         | 0.300         | 42         |             |            |
| 20.0          | 84         | 0.212         | 38         |             |            |
|               |            | 0.150         | 33         |             |            |
|               |            | 0.063         | 25         |             |            |

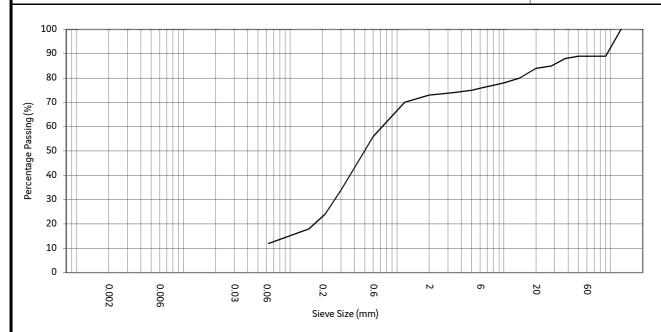
 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground               | Particle Size              | Hole ID        |
|--------------|--|----------------------------|----------------|
|              | Investigation  | Distribution               | TP03           |
| Project No.  | TA7148   | Distribution               | Sample Depth   |
|              |  |                            | 0.00m          |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number  |
|              |  |                            | 001            |
| Employer     | Aberdeen Harbour Board                               | DC 1277, Dowt 2, 1000, 0.2 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brown gravelly SAND. Gravel is fine to coarse with o | cobbles.                   | Specimen Depth |
|              |  |                            | 0.00m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium |         | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|---------|
|      |      | SILT   |        | SAND |        | GRAVEL |      |        | COBBLES |         |

General remarks Sample size was insufficient to be representative of particle size

Silt and clay: 12
Sand: 61
Gravel: 16

Gravel: 16 Cobbles: 11

|               | WET SIEV     |               |            |  |
|---------------|--------------|---------------|------------|--|
| Sieve size mm | Cumulative   | Sieve size mm | Cumulative |  |
|               | % passing    |               | % passing  |  |
|               |              | 14.0          | 80         |  |
|               |              | 10.0          | 78         |  |
|               |              | 6.3           | 76         |  |
| 125.0         | 100          | 5.0           | 75         |  |
| 90.0          | 89           | 3.35          | 74         |  |
| 75.0          | 89           | 2.00          | 73         |  |
| 63.0          | 89           | 1.18          | 70         |  |
| 50.0          | 89           | 0.600         | 56         |  |
| 37.5          | 88           | 0.425         | 45         |  |
| 28.0          | 85           | 0.300         | 34         |  |
| 20.0          | 84           | 0.212         | 24         |  |
|               |              | 0.150         | 18         |  |
|               |              | 0.063         | 12         |  |
| avarrad bru   | مام المام ما | a rata ri     |            |  |

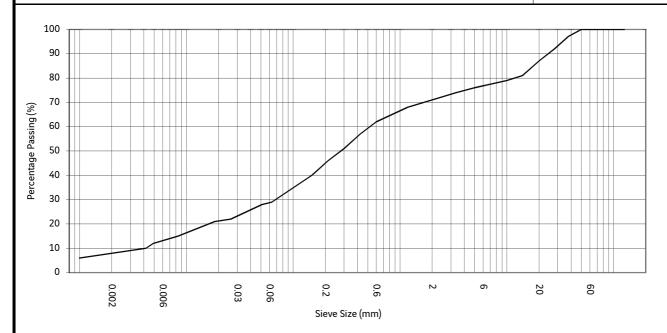
 Approved by:
 Leeds Laboratory

 Sushil Sharda
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground             | Particle Size                    | Hole ID        |
|--------------|--|----------------------------------|----------------|
|              | Investigation                                      |                                  | TP04           |
| Project No.  | TA7148   | Distribution                     | Sample Depth   |
| '            |  |                                  | 2.00m          |
| Engineer     | Arch Henderson LLP                                 |                                  | Sample Number  |
|              |  |                                  | 005            |
| Employer     | Aberdeen Harbour Board                             | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2, 9.5  | В              |
| Description  | Orangish brown slightly gravelly sandy CLAY. Grave | l is fine to coarse.             | Specimen Depth |
|              |  |                                  | 2.00m          |
|              |  |                                  | Specimen No.   |
|              |  |                                  | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 7

 Silt:
 21

 Sand:
 43

 Gravel:
 29

 Cobbles:
 0

General remarks

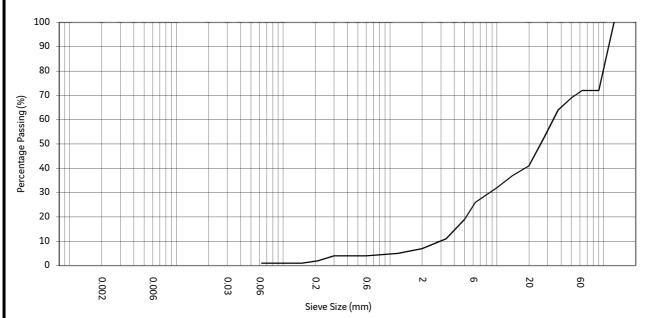
Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | SEDIMENTATION DATA |            |             |            |
|---------------|------------|--------------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm      | Cumulative | Equivalent  | Cumulative |
|               | % passing  |                    | % passing  | particle    | % passing  |
|               |            | 14.0               | 81         | diameter mm |            |
|               |            | 10.0               | 79         | 0.0510      | 28         |
|               |            | 6.3                | 77         | 0.0260      | 22         |
| 125.0         | 100        | 5.0                | 76         | 0.0185      | 21         |
| 90.0          | 100        | 3.35               | 74         | 0.0084      | 15         |
| 75.0          | 100        | 2.00               | 71         | 0.0049      | 12         |
| 63.0          | 100        | 1.18               | 68         | 0.0042      | 10         |
| 50.0          | 100        | 0.600              | 62         | 0.0010      | 6          |
| 37.5          | 97         | 0.425              | 57         |             |            |
| 28.0          | 92         | 0.300              | 51         |             |            |
| 20.0          | 87         | 0.212              | 46         |             |            |
|               |            | 0.150              | 40         |             |            |
|               |            | 0.063              | 29         |             |            |

| Approved by: | Leeds Laborato | ory  |            |            |            |
|--------------|----------------|------|------------|------------|------------|
| Stuart Kirk  |                |      |            | Print date | 28/11/2013 |
|              | Revision No    | 3.03 | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>TP05                              |  |  |
|--------------|--|----------------------------|--|--|--|
| Project No.  | TA7148   | Distribution               | Sample Depth<br>0.50m                        |  |  |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number<br>003                         |  |  |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B                             |  |  |
| Description  | Brown slightly sandy GRAVEL with occasional cobbl    | es.                        | Specimen Depth<br>0.50m<br>Specimen No.<br>2 |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

General remarks #N/A

Silt and clay: 0
Sand: 6
Gravel: 65
Cobbles: 29

Revision No.

3.03

Sushil Sharda

|               | WET SIEV   |               |            |  |
|---------------|------------|---------------|------------|--|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |  |
|               | % passing  |               | % passing  |  |
|               |            | 14.0          | 37         |  |
|               |            | 10.0          | 32         |  |
|               |            | 6.3           | 26         |  |
| 125.0         | 100        | 5.0           | 19         |  |
| 90.0          | 72         | 3.35          | 11         |  |
| 75.0          | 72         | 2.00          | 7          |  |
| 63.0          | 72         | 1.18          | 5          |  |
| 50.0          | 69         | 0.600         | 4          |  |
| 37.5          | 64         | 0.425         | 4          |  |
| 28.0          | 53         | 0.300         | 4          |  |
| 20.0          | 41         | 0.212         | 2          |  |
|               |            | 0.150         | 1          |  |
|               |            | 0.063         | 1          |  |
| proved by:    | Leeds Lab  | oratory       |            |  |

Print date

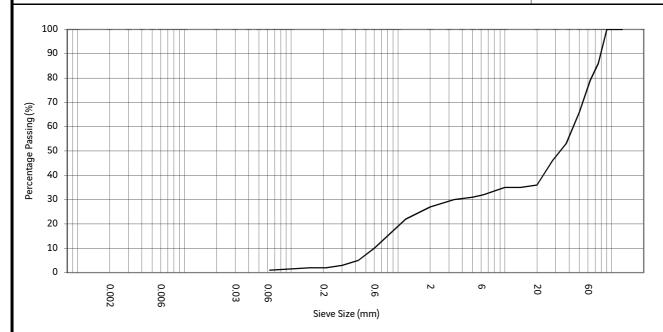
19/11/2012

Issue Date

28/11/2013

SOIL ENGINEERING

| Project Name | Bay of Nigg Harbour Development Ground           | Particle Size              | Hole ID        |
|--------------|--|----------------------------|----------------|
|              | Investigation                                    | Dietribution               | TP06           |
| Project No.  | TA7148   | Distribution               | Sample Depth   |
| Í            |  |                            | 2.50m          |
| Engineer     | Arch Henderson LLP                               |                            | Sample Number  |
|              |  |                            | 006            |
| Employer     | Aberdeen Harbour Board                           | DC 1277: Dovt 2: 1000: 0.2 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2 | В              |
| Description  | Brown sandy fine to coarse GRAVEL with occasiona | l cobbles.                 | Specimen Depth |
|              |  |                            | 2.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine   | Medium |  | COBBLES |
|------|------|--------|--------|------|--------|--------|--------|--------|--|---------|
|      |      | SILT   |        | SAND |        |        | GRAVEL |        |  | COBBLES |

24

Silt and clay: 1 Sand: 26 Gravel: 49 Cobbles:

General remarks

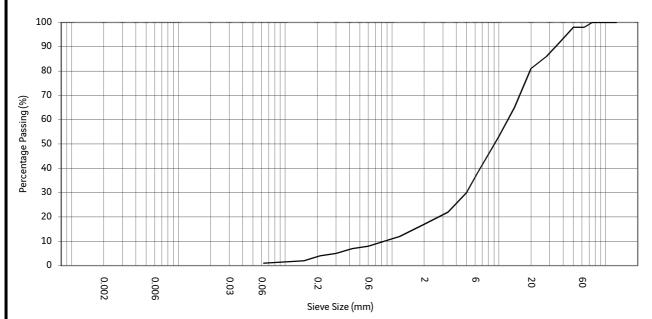
Sample size was insufficient to be representative of particle size

|               | WET SIEV   | 'E DATA       |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 35         |
|               |            | 10.0          | 35         |
|               |            | 6.3           | 32         |
| 125.0         | 100        | 5.0           | 31         |
| 90.0          | 100        | 3.35          | 30         |
| 75.0          | 86         | 2.00          | 27         |
| 63.0          | 79         | 1.18          | 22         |
| 50.0          | 66         | 0.600         | 10         |
| 37.5          | 53         | 0.425         | 5          |
| 28.0          | 46         | 0.300         | 3          |
| 20.0          | 36         | 0.212         | 2          |
|               |            | 0.150         | 2          |
|               |            | 0.063         | 1          |

| Approved by: | Leeds Labora | atory |            |            |            |             |
|--------------|--------------|-------|------------|------------|------------|-------------|
| Stuart Kirk  |              |       |            | Print date | 28/11/2013 | SOIL 6      |
|              | Revision No. | 3.03  | Issue Date | 19/11/     | 2012       | Part of the |



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size                       | Hole ID<br>TP07                              |
|--------------|--|-------------------------------------|--|
| Project No.  | TA7148   | Distribution                        | Sample Depth                                 |
| Engineer     | Arch Henderson LLP                                   |                                     | 1.00m<br>Sample Number<br>002                |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2          | Sample type<br>B                             |
| Description  | Brown slightly sandy GRAVEL. Gravel is fine to coars | se rounded with occasional cobbles. | Specimen Depth<br>1.00m<br>Specimen No.<br>1 |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | L      | COBBLES |

Silt and clay: 1
Sand: 15
Gravel: 82
Cobbles: 2

General remarks

|               | WET SIEV   | E DATA       |              |
|---------------|------------|--------------|--------------|
| Sieve size mm | Cumulative | Sieve size m | m Cumulative |
|               | % passing  |              | % passing    |
|               |            | 14.0         | 65           |
|               |            | 10.0         | 53           |
|               |            | 6.3          | 38           |
| 125.0         | 100        | 5.0          | 30           |
| 90.0          | 100        | 3.35         | 22           |
| 75.0          | 100        | 2.00         | 17           |
| 63.0          | 98         | 1.18         | 12           |
| 50.0          | 98         | 0.600        | 8            |
| 37.5          | 92         | 0.425        | 7            |
| 28.0          | 86         | 0.300        | 5            |
| 20.0          | 81         | 0.212        | 4            |
|               |            | 0.150        | 2            |
|               |            | 0.063        | 1            |

Approved by:

Sushil Sharda

Revision No. 3.03

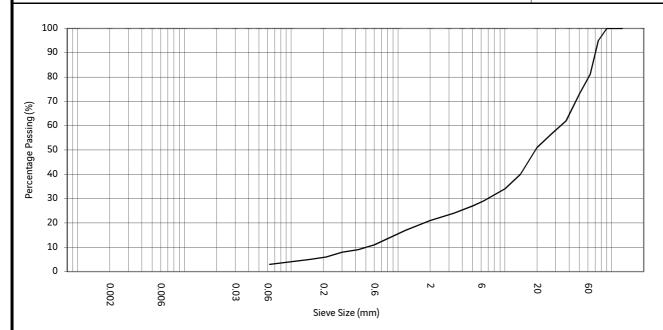
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Revision No. 1 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>TP08  |
|--------------|--|----------------------------|------------------|
| Project No.  | TA7148   | Distribution               | Sample Depth     |
|              |  |                            | 1.50m            |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number    |
|              |  |                            | 003              |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type<br>B |
| Description  | Dark brown sandy fine to coarse well rounded to rou  | unded GRAVEL with cobbles  | Specimen Depth   |
| ·            |  |                            | 1.50m            |
|              |  |                            | Specimen No.     |
|              |  |                            | 1                |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

General remarks

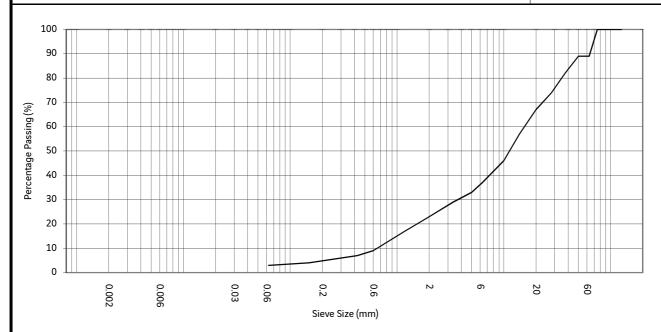
Silt and clay: 3 Sand: 18 Gravel: 58 Cobbles: 21 Sample size was insufficient to be representative of particle size

|               | WET SIEV   | E DATA     |    |            |
|---------------|------------|------------|----|------------|
| Sieve size mm | Cumulative | Sieve size | mm | Cumulative |
|               | % passing  |            |    | % passing  |
|               |            | 14.0       |    | 40         |
|               |            | 10.0       |    | 34         |
|               |            | 6.3        |    | 29         |
| 125.0         | 100        | 5.0        |    | 27         |
| 90.0          | 100        | 3.35       |    | 24         |
| 75.0          | 95         | 2.00       |    | 21         |
| 63.0          | 81         | 1.18       |    | 17         |
| 50.0          | 73         | 0.600      |    | 11         |
| 37.5          | 62         | 0.425      |    | 9          |
| 28.0          | 57         | 0.300      |    | 8          |
| 20.0          | 51         | 0.212      |    | 6          |
|               |            | 0.150      |    | 5          |
|               |            | 0.063      |    | 3          |

Approved by: Leeds Laboratory Stuart Kirk Print date 28/11/2013 Revision No. 3.03 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size               | Hole ID<br>TP09 |
|--------------|--|-----------------------------|-----------------|
| Project No.  | TA7148   | Distribution                | Sample Depth    |
|              |  |                             | 0.60m           |
| Engineer     | Arch Henderson LLP                                   |                             | Sample Number   |
|              |  |                             | 003             |
| Employer     | Aberdeen Harbour Board                               | DC 1277, David 2, 1000, 0.2 | Sample type     |
| ' '          |  | BS 1377: Part 2: 1990: 9.2  | В               |
| Description  | Brown sandy fine to coarse GRAVEL with cobbles.      |                             | Specimen Depth  |
| ·            |  |                             | 0.60m           |
|              |  |                             | Specimen No.    |
|              |  |                             | 1               |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

PARTICLE SIZE % Sampl

3 21

66

11

Sand: Gravel: Cobbles:

Silt and clay:

General remarks

Sample size was insufficient to be representative of particle size

|               | WET SIEV   | E DATA        |              |
|---------------|------------|---------------|--------------|
| Sieve size mm | Cumulative | Sieve size mr | n Cumulative |
|               | % passing  |               | % passing    |
|               |            | 14.0          | 57           |
|               |            | 10.0          | 46           |
|               |            | 6.3           | 37           |
| 125.0         | 100        | 5.0           | 33           |
| 90.0          | 100        | 3.35          | 29           |
| 75.0          | 100        | 2.00          | 23           |
| 63.0          | 89         | 1.18          | 17           |
| 50.0          | 89         | 0.600         | 9            |
| 37.5          | 82         | 0.425         | 7            |
| 28.0          | 74         | 0.300         | 6            |
| 20.0          | 67         | 0.212         | 5            |
|               |            | 0.150         | 4            |
|               |            | 0.063         | 3            |

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 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

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| Project Name |  | Particle Size                   | Hole ID              |
|--------------|--|---------------------------------|----------------------|
| Project No.  | Investigation<br>TA7148                          | Distribution                    | TP10<br>Sample Depth |
| 1.10,000.110 |  |                                 | 0.50m                |
| Engineer     | Arch Henderson LLP                               |                                 | Sample Number        |
|              |  |                                 | 001                  |
| Employer     | Aberdeen Harbour Board                           | BS 1377: Part 2: 1990: 9.2      | Sample type<br>B     |
| Description  | Brown slightly sandy GRAVEL. Gravel is medium to | coarse subangular with cobbles. | Specimen Depth       |
| -            |  |                                 | 0.50m                |
|              |  |                                 | Specimen No.         |
|              |  |                                 | 1                    |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

Silt and clay: 2 Sand: 26 62

Gravel: Cobbles: 10 General remarks

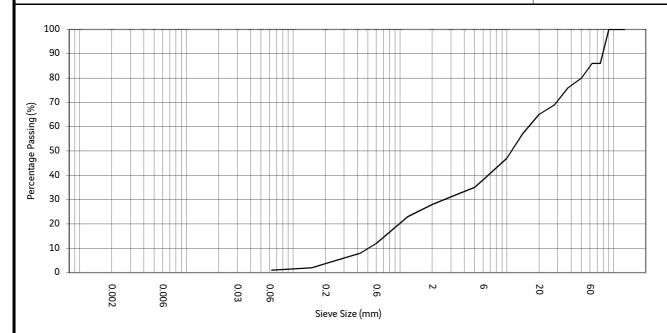
Sample size was insufficient to be representative of particle size

|               | WET SIEV   | E DATA        |              |
|---------------|------------|---------------|--------------|
| Sieve size mm | Cumulative | Sieve size mr | n Cumulative |
|               | % passing  |               | % passing    |
|               |            | 14.0          | 55           |
|               |            | 10.0          | 49           |
|               |            | 6.3           | 41           |
| 125.0         | 100        | 5.0           | 37           |
| 90.0          | 100        | 3.35          | 33           |
| 75.0          | 100        | 2.00          | 28           |
| 63.0          | 92         | 1.18          | 22           |
| 50.0          | 84         | 0.600         | 12           |
| 37.5          | 78         | 0.425         | 8            |
| 28.0          | 72         | 0.300         | 6            |
| 20.0          | 67         | 0.212         | 5            |
|               |            | 0.150         | 4            |
|               |            | 0.063         | 2            |

| Approved by:  | Leeds Labora | atory |       |               |            |      |
|---------------|--------------|-------|-------|---------------|------------|------|
| Sushil Sharda |              |       | ·     | Print date    | 28/11/2013 | sc   |
|               | Revision No. | 3.03  | Issue | e Date 19/11/ | ′2012      | Part |



| Project Name | Bay of Nigg Harbour Development Ground | Particle Size              | Hole ID        |
|--------------|--|----------------------------|----------------|
|              | Investigation                          |                            | TP11           |
| Project No.  | TA7148                                 | Distribution               | Sample Depth   |
| '            |  |                            | 1.50m          |
| Engineer     | Arch Henderson LLP                     |                            | Sample Number  |
|              |  |                            | 003            |
| Employer     | Aberdeen Harbour Board                 | BS 1377: Part 2: 1990: 9.2 | Sample type    |
| ' '          |  | BS 1377. Part 2. 1990. 9.2 | В              |
| Description  | Brown sandy GRAVEL with cobbles.       |                            | Specimen Depth |
|              |  |                            | 1.50m          |
|              |  |                            | Specimen No.   |
|              |  |                            | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

General remarks
Sample size was insufficient to be representative of particle size

Silt and clay: 1
Sand: 27
Gravel: 57

Cobbles:

1 27

15

|               | WET SIEV   | E DATA        |            |  |
|---------------|------------|---------------|------------|--|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |  |
|               | % passing  |               | % passing  |  |
|               |            | 14.0          | 57         |  |
|               |            | 10.0          | 47         |  |
|               |            | 6.3           | 39         |  |
| 125.0         | 100        | 5.0           | 35         |  |
| 90.0          | 100        | 3.35          | 32         |  |
| 75.0          | 86         | 2.00          | 28         |  |
| 63.0          | 86         | 1.18          | 23         |  |
| 50.0          | 80         | 0.600         | 12         |  |
| 37.5          | 76         | 0.425         | 8          |  |
| 28.0          | 69         | 0.300         | 6          |  |
| 20.0          | 65         | 0.212         | 4          |  |
|               |            | 0.150         | 2          |  |
|               |            | 0.063         | 1          |  |

Approved by:

Sushil Sharda

Revision No. 3.03

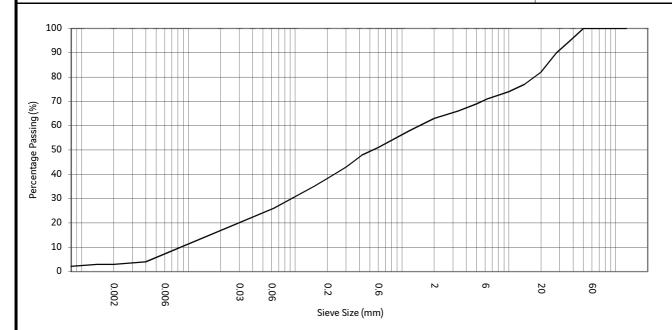
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| Project Name | Bay of Nigg Harbour Development Ground<br>Investigation | Particle Size                   | Hole ID<br>TP11 |
|--------------|---|---------------------------------|-----------------|
| Project No.  | TA7148  | Distribution                    | Sample Depth    |
|              |   |                                 | 2.80m           |
| Engineer     | Arch Henderson LLP                                      |                                 | Sample Number   |
|              |   |                                 | 007             |
| Employer     | Aberdeen Harbour Board                                  | BS 1377: Part 2: 1990: 9.2, 9.5 | Sample type     |
|              |   | B3 1377. Part 2. 1990. 9.2, 9.3 | В               |
| Description  | Brown sandy gravelly CLAY. Gravel is fine to coarse     | angular.                        | Specimen Depth  |
| -            |   |                                 | 2.80m           |
|              |   |                                 | Specimen No.    |
|              |   |                                 | 2               |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 3

 Silt:
 21

 Sand:
 38

 Gravel:
 37

 Cobbles:
 0

General remarks

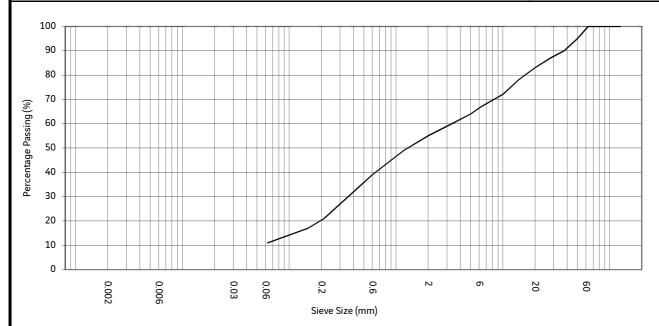
Particle density: 265Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | TON DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 77         | diameter mm |            |
|               |            | 10.0          | 74         | 0.0040      | 4          |
|               |            | 6.3           | 71         | 0.0020      | 3          |
| 125.0         | 100        | 5.0           | 69         | 0.0014      | 3          |
| 90.0          | 100        | 3.35          | 66         | 0.0007      | 2          |
| 75.0          | 100        | 2.00          | 63         | 0.0004      | 2          |
| 63.0          | 100        | 1.18          | 58         | 0.0003      | 2          |
| 50.0          | 100        | 0.600         | 51         | 0.0001      | 1          |
| 37.5          | 95         | 0.425         | 48         |             |            |
| 28.0          | 90         | 0.300         | 43         |             |            |
| 20.0          | 82         | 0.212         | 39         |             |            |
|               |            | 0.150         | 35         |             |            |
|               |            | 0.063         | 26         |             |            |

| Approved by: | Leeds Laborato | ry   |            |            |            |
|--------------|----------------|------|------------|------------|------------|
| Stuart Kirk  |                |      |            | Print date | 28/11/2013 |
|              | Revision No    | 3.03 | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground<br>Investigation | Particle Size                    | Hole ID<br>TP12 |
|--------------|---|----------------------------------|-----------------|
| Project No.  | TA7148  | Distribution                     | Sample Depth    |
|              |   |                                  | 1.50m           |
| Engineer     | Arch Henderson LLP                                      |                                  | Sample Number   |
|              |   |                                  | 004             |
| Employer     | Aberdeen Harbour Board                                  | BS 1377: Part 2: 1990: 9.2       | Sample type     |
|              |   | B3 1377. Part 2. 1990. 9.2       | В               |
| Description  | MADE GROUND: Dark brown slightly clayey sand ar         | nd gravel with some concrete and | Specimen Depth  |
|              | tarmac fragments. Gravel is angular.                    |                                  | 1.50m           |
|              |   |                                  | Specimen No.    |
|              |   |                                  | 1               |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

 Silt and clay:
 11

 Sand:
 44

 Gravel:
 44

 Cobbles:
 1

| T          |           |
|------------|-----------|
| C          | remarks   |
| ICaenera I | ı remarks |

|               | WET SIEV   | E DATA        |              |
|---------------|------------|---------------|--------------|
| Sieve size mm | Cumulative | Sieve size mr | n Cumulative |
|               | % passing  |               | % passing    |
|               |            | 14.0          | 78           |
|               |            | 10.0          | 72           |
|               |            | 6.3           | 67           |
| 125.0         | 100        | 5.0           | 64           |
| 90.0          | 100        | 3.35          | 60           |
| 75.0          | 100        | 2.00          | 55           |
| 63.0          | 100        | 1.18          | 49           |
| 50.0          | 95         | 0.600         | 39           |
| 37.5          | 90         | 0.425         | 33           |
| 28.0          | 87         | 0.300         | 27           |
| 20.0          | 83         | 0.212         | 21           |
|               |            | 0.150         | 17           |
|               |            | 0.063         | 11           |

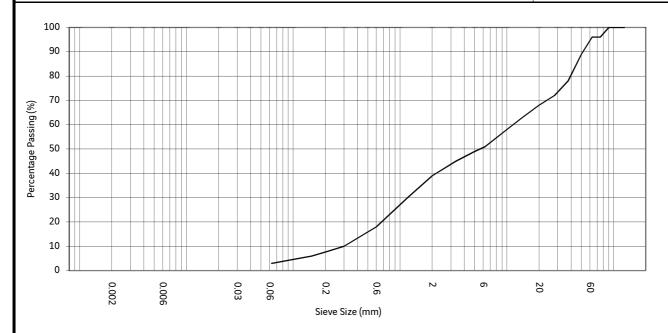
 Approved by:
 Leeds Laboratory

 Stuart Kirk
 Print date 28/11/2013

 Revision No. 3.03
 Issue Date 19/11/2012



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size                       | Hole ID<br>TP13 |  |  |
|--------------|--|-------------------------------------|-----------------|--|--|
| Project No.  | TA7148   | Distribution                        | Sample Depth    |  |  |
|              |  |                                     | 1.50m           |  |  |
| Engineer     | Arch Henderson LLP                                   |                                     | Sample Number   |  |  |
|              |  |                                     | 003             |  |  |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2          | Sample type     |  |  |
|              |  | B3 1377. Part 2. 1990. 9.2          | В               |  |  |
| Description  | Brown sandy GRAVEL with occasional cobbles. Grav     | vel is fine to coarse subangular to | Specimen Depth  |  |  |
|              | angular.   |                                     | 1.50m           |  |  |
|              |  |                                     | Specimen No.    |  |  |
|              |  |                                     | 1               |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

PARTICLE SIZE % Sample size

56

6

Silt and clay: 3
Sand: 36

Gravel: Cobbles: General remarks

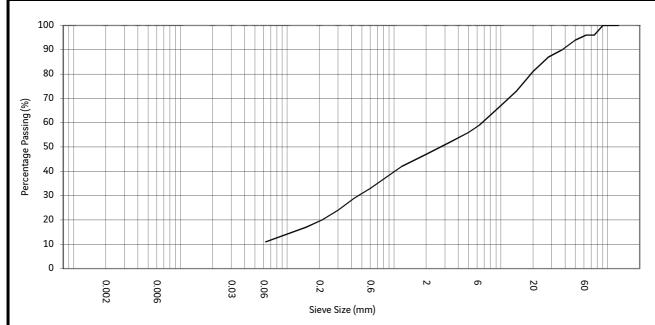
Sample size was insufficient to be representative of particle size

|               | WET SIEV   | 'E DATA       |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 63         |
|               |            | 10.0          | 58         |
|               |            | 6.3           | 51         |
| 125.0         | 100        | 5.0           | 49         |
| 90.0          | 100        | 3.35          | 45         |
| 75.0          | 96         | 2.00          | 39         |
| 63.0          | 96         | 1.18          | 30         |
| 50.0          | 89         | 0.600         | 18         |
| 37.5          | 78         | 0.425         | 14         |
| 28.0          | 72         | 0.300         | 10         |
| 20.0          | 68         | 0.212         | 8          |
|               |            | 0.150         | 6          |
|               |            | 0.063         | 3          |

| Approved by:  | Leeds Laborato | ry   |            |            |            |
|---------------|----------------|------|------------|------------|------------|
| Sushil Sharda |                |      |            | Print date | 28/11/2013 |
|               | Revision No.   | 3.03 | Issue Date | 19/11/2    | 2012       |



| Project Name | Bay of Nigg Harbour Development Ground         | Development Ground Particle Size |                      |  |  |  |
|--------------|--|----------------------------------|----------------------|--|--|--|
| Project No.  | Investigation<br>TA7148                        | Distribution                     | TP14 Sample Depth    |  |  |  |
|              |  |                                  | 0.50m                |  |  |  |
| Engineer     | Arch Henderson LLP                             |                                  | Sample Number<br>002 |  |  |  |
| Employer     | Aberdeen Harbour Board                         | BS 1377: Part 2: 1990: 9.2       | Sample type<br>B     |  |  |  |
| Description  | MADE GROUND: Brown gravelly sand with occasion | nal cobbles, concrete and tar    | Specimen Depth       |  |  |  |
|              | fragments.                                     |                                  | 0.50m                |  |  |  |
|              |  |                                  | Specimen No.         |  |  |  |
|              |  |                                  | 1                    |  |  |  |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAT |      | SILT   |        | 5    | SAND   |        | G    | RAVE   | COBBLES |

Silt and clay: 11
Sand: 37
Gravel: 48
Cobbles: 4

General remarks

|               | WET SIEV   | E DATA       |               |
|---------------|------------|--------------|---------------|
| Sieve size mm | Cumulative | Sieve size n | nm Cumulative |
|               | % passing  |              | % passing     |
|               |            | 14.0         | 73            |
|               |            | 10.0         | 67            |
|               |            | 6.3          | 59            |
| 125.0         | 100        | 5.0          | 56            |
| 90.0          | 100        | 3.35         | 52            |
| 75.0          | 96         | 2.00         | 47            |
| 63.0          | 96         | 1.18         | 42            |
| 50.0          | 94         | 0.600        | 33            |
| 37.5          | 90         | 0.425        | 29            |
| 28.0          | 87         | 0.300        | 24            |
| 20.0          | 81         | 0.212        | 20            |
|               |            | 0.150        | 17            |
|               |            | 0.063        | 11            |

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Sushil Sharda

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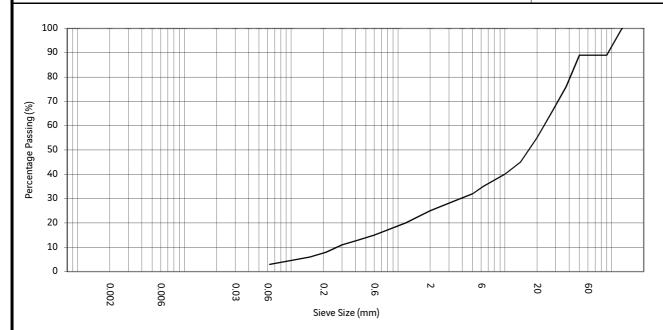
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| Project Name | Bay of Nigg Harbour Development Ground<br>Investigation | Particle Size              | Hole ID<br>TP15 |
|--------------|---|----------------------------|-----------------|
| Project No.  | TA7148  | Distribution               | Sample Depth    |
|              |   |                            | 1.80m           |
| Engineer     | Arch Henderson LLP                                      |                            | Sample Number   |
|              |   |                            | 003             |
| Employer     | Aberdeen Harbour Board                                  | BS 1377: Part 2: 1990: 9.2 | Sample type     |
|              |   | B3 1377. Part 2. 1990. 9.2 | В               |
| Description  | Brown sandy fine to coarse subrounded GRAVEL wi         | ith some cobbles           | Specimen Depth  |
|              |   |                            | 1.80m           |
|              |   |                            | Specimen No.    |
|              |   |                            | 1               |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

 Silt and clay:
 3

 Sand:
 22

 Gravel:
 64

 Cobbles:
 11

General remarks

Sample size was insufficient to be representative of particle size

|               | WET SIEV   | E DATA        |            |
|---------------|------------|---------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |
|               | % passing  |               | % passing  |
|               |            | 14.0          | 45         |
|               |            | 10.0          | 40         |
|               |            | 6.3           | 35         |
| 125.0         | 100        | 5.0           | 32         |
| 90.0          | 89         | 3.35          | 29         |
| 75.0          | 89         | 2.00          | 25         |
| 63.0          | 89         | 1.18          | 20         |
| 50.0          | 89         | 0.600         | 15         |
| 37.5          | 76         | 0.425         | 13         |
| 28.0          | 66         | 0.300         | 11         |
| 20.0          | 55         | 0.212         | 8          |
|               |            | 0.150         | 6          |
|               |            | 0.063         | 3          |

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| Project Name | Bay of Nigg Harbour Development Ground            | Particle Size                         | Hole ID        |
|--------------|---|---------------------------------------|----------------|
|              | Investigation                                     |                                       | TP16           |
| Project No.  | TA7148  | Distribution                          | Sample Depth   |
| <b>'</b>     |   |                                       | 0.00m          |
| Engineer     | Arch Henderson LLP                                |                                       | Sample Number  |
|              |   |                                       | 001            |
| Employer     | Aberdeen Harbour Board                            | BS 1377: Part 2: 1990: 9.2, 9.5       | Sample type    |
| ' '          |   | BS 1377. Part 2. 1990. 9.2, 9.5       | В              |
| Description  | Brown gravelly sandy CLAY with occasional cobbles | . Gravel is fine to coarse subangular | Specimen Depth |
|              |   |                                       | 0.00m          |
|              |   |                                       | Specimen No.   |
|              |   |                                       | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

 PARTICLE SIZE
 %

 Clay:
 6

 Silt:
 19

 Sand:
 39

 Gravel:
 32

 Cobbles:
 4

General remarks

Particle density: 2.65Mg/m³ Assumed

|               | WET SIEV   | E DATA        |            | SEDIMENTAT  | TON DATA   |
|---------------|------------|---------------|------------|-------------|------------|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative | Equivalent  | Cumulative |
|               | % passing  |               | % passing  | particle    | % passing  |
|               |            | 14.0          | 79         | diameter mm |            |
|               |            | 10.0          | 77         | 0.0507      | 24         |
|               |            | 6.3           | 74         | 0.0258      | 20         |
| 125.0         | 100        | 5.0           | 72         | 0.0183      | 19         |
| 90.0          | 100        | 3.35          | 69         | 0.0083      | 15         |
| 75.0          | 100        | 2.00          | 64         | 0.0053      | 11         |
| 63.0          | 96         | 1.18          | 58         | 0.0045      | 7          |
| 50.0          | 95         | 0.600         | 50         | 0.0010      | 6          |
| 37.5          | 91         | 0.425         | 47         |             |            |
| 28.0          | 87         | 0.300         | 43         |             |            |
| 20.0          | 84         | 0.212         | 38         |             |            |
|               |            | 0.150         | 34         |             |            |
|               |            | 0.063         | 26         |             |            |

| Approved by: | Leeds Laborato | ory  |            |            |            |
|--------------|----------------|------|------------|------------|------------|
| Stuart Kirk  |                |      |            | Print date | 28/11/2013 |
|              | Revision No.   | 3.03 | Issue Date | 19/11/2    | 012        |



| Project Name | Bay of Nigg Harbour Development Ground Investigation | Particle Size              | Hole ID<br>TP17 |
|--------------|--|----------------------------|-----------------|
| Project No.  | TA7148   | Distribution               | Sample Depth    |
| <b>'</b>     |  |                            | 3.00m           |
| Engineer     | Arch Henderson LLP                                   |                            | Sample Number   |
|              |  |                            | 006             |
| Employer     | Aberdeen Harbour Board                               | BS 1377: Part 2: 1990: 9.2 | Sample type     |
| . ,          |  | B3 1377. Part 2. 1990. 9.2 | В               |
| Description  | Brown slightly gravelly SAND with occasional cobble  | s.                         | Specimen Depth  |
|              |  |                            | 3.00m           |
|              |  |                            | Specimen No.    |
|              |  |                            | 1               |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        | 5    | SAND   |        | Ü    | RAVE   | COBBLES |

10 46

11

33

Gravel: Cobbles:

Silt and clay:

Sand:

General remarks

Sample size was insufficient to be representative of particle size

|               | WET SIEV   | E DATA        |            |  |
|---------------|------------|---------------|------------|--|
| Sieve size mm | Cumulative | Sieve size mm | Cumulative |  |
|               | % passing  |               | % passing  |  |
|               |            | 14.0          | 64         |  |
|               |            | 10.0          | 63         |  |
|               |            | 6.3           | 62         |  |
| 125.0         | 100        | 5.0           | 61         |  |
| 90.0          | 100        | 3.35          | 60         |  |
| 75.0          | 67         | 2.00          | 56         |  |
| 63.0          | 67         | 1.18          | 51         |  |
| 50.0          | 67         | 0.600         | 42         |  |
| 37.5          | 67         | 0.425         | 37         |  |
| 28.0          | 65         | 0.300         | 31         |  |
| 20.0          | 64         | 0.212         | 25         |  |
|               |            | 0.150         | 18         |  |
|               |            | 0.063         | 10         |  |

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Sushil Sharda

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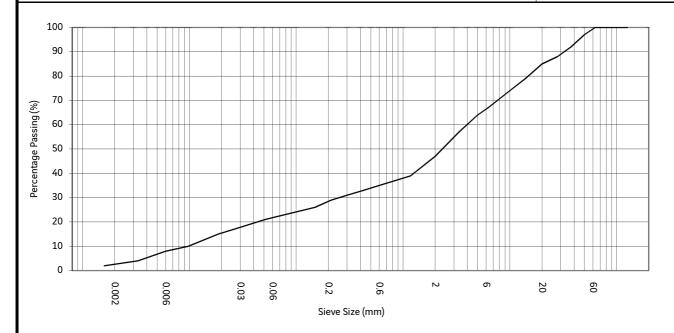
Print date 28/11/2013

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Revision No. 2.03



| Project Name | Bay of Nigg Harbour Development Ground               | Particle Size                    | Hole ID        |
|--------------|--|----------------------------------|----------------|
|              | Investigation  | D:-4-:14:                        | TP18           |
| Project No.  | TA7148   | Distribution                     | Sample Depth   |
|              |  |                                  | 0.50m          |
| Engineer     | Arch Henderson LLP                                   |                                  | Sample Number  |
|              |  |                                  | 001            |
| Employer     | Aberdeen Harbour Board                               | DC 1277, David 2, 1000, 0.2, 0.5 | Sample type    |
| ' '          |  | BS 1377: Part 2: 1990: 9.2, 9.5  | В              |
| Description  | Brownish grey slightly clayey sandy fine to coarse G | RAVEL                            | Specimen Depth |
|              |  |                                  | 0.50m          |
|              |  |                                  | Specimen No.   |
|              |  |                                  | 1              |



| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|---------|
| CLAY |      | SILT   |        |      | SAND   |        | G    | RAVE   | COBBLES |

General remarks

Sample size was insufficient to be representative of particle size

Particle density: 2.65Mg/m³ Assumed

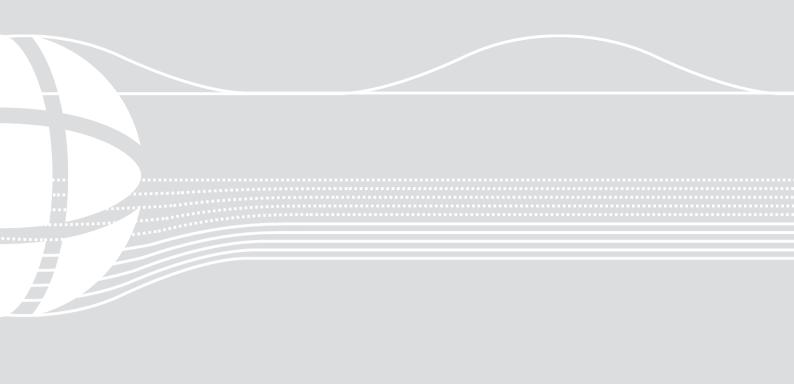
| WET SIEV   | SEDIMENTAT  | ION DATA   |   |   |
|------------|---|--|---|---|
| Cumulative | Sieve size mm   | Cumulative   | Equivalent  | Cumulative  |
| % passing  |   | % passing  | particle  | % passing   |
|            | 14.0  | 79   | diameter mm   |   |
|            | 10.0  | 74   | 0.0513  | 21  |
|            | 6.3   | 67   | 0.0261  | 17  |
| 100        | 5.0   | 64   | 0.0186  | 15  |
| 100        | 3.35  | 57   | 0.0098  | 10  |
| 100        | 2.00  | 47   | 0.0060  | 8   |
| 100        | 1.18  | 39   | 0.0033  | 4   |
| 97         | 0.600   | 35   | 0.0016  | 2   |
| 92         | 0.425   | 33   |   |   |
| 88         | 0.300   | 31   |   |   |
| 85         | 0.212   | 29   |   |   |
|            | 0.150   | 26   |   |   |
|            | 0.063   | 22   |   |   |
|            | Cumulative<br>% passing<br>100<br>100<br>100<br>100<br>97<br>92<br>88 | WET SIEVE DATA  Cumulative Sieve size mm % passing  14.0 10.0 6.3 100 5.0 100 3.35 100 2.00 100 1.18 97 0.600 92 0.425 88 0.300 85 0.212 0.150 | WET SIEVE DATA           Cumulative % passing         Sieve size mm         Cumulative % passing           14.0         79           10.0         74           6.3         67           100         5.0         64           100         3.35         57           100         2.00         47           100         1.18         39           97         0.600         35           92         0.425         33           88         0.300         31           85         0.212         29           0.150         26 | WET SIEVE DATA         SEDIMENTAT           Cumulative % passing         Sieve size mm         Cumulative % passing         Equivalent particle           14.0         79         diameter mm           10.0         74         0.0513           6.3         67         0.0261           100         5.0         64         0.0186           100         3.35         57         0.0098           100         2.00         47         0.0060           100         1.18         39         0.0033           97         0.600         35         0.0016           92         0.425         33           88         0.300         31           85         0.212         29           0.150         26 |

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