

Nigg East Quay Construction Works Screening Request



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Nigg East Quay Construction Works Screening Request

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1 INTRODUCTION

1.1 Terms of Reference

EnviroCentre Ltd has been appointed by Global Energy Nigg Ltd to submit an Environmental Impact Assessment (EIA) Screening Request to Marine Scotland in relation to the application to vary the volumes for dredge disposal from those associated with the original Marine License MS-00009031 (Dredging) granted in December 2020 for the Nigg East Quay construction works (see site location plan within Appendix A: Drawing No SL06904-HBPW-00-ZZ-DR-C-002).

1.2 Scope of Report

The EIA screening request has been prepared in accordance with the requirements of the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (hereafter referred to as 'the Marine EIA Regulations'). Regulation 10 (2), (3) and (4) of the Marine EIA Regulations stipulate that a request for a screening opinion must be accompanied by:

- (2) A request for a screening opinion under paragraph (1) must include
 - a) a description of the location of the proposed works, including a plan sufficient to identify the area in which the works are proposed to be sited;
 - b) a description of the proposed works, including in particular—
 - (i) a list of all of the regulated activities which are proposed;
 - (ii) a description of the physical characteristics of the proposed works and, where relevant, works to be decommissioned; and
 - (iii) a description of the location of the proposed works, with particular regard to the environmental sensitivity of geographical areas likely to be affected;
 - c) a description of the aspects of the environment likely to be significantly affected by the proposed works; and
 - d) a description of any likely significant effects, to the extent of the information available on such effects, of the proposed works on the environment resulting from either, or both, of the following:
 - (i) the expected residues and emissions and the production of waste, where relevant;
 - (ii) the use of natural resources, in particular soil, land, water and biodiversity.
- (3) A request for a screening opinion may, in addition to the information required in accordance with paragraph (2), also be accompanied by a description of any features of the proposed works or proposed measures envisaged to avoid or prevent significant adverse effects on the environment.
- (4) The information referred to in paragraph (2) is to be compiled taking into account, where
 - a) the selection criteria set out in schedule 3; and
 - b) the available results of any relevant assessment.

The purpose of this EIA screening report is therefore to provide the above information to aid Marine Scotland in reaching a screening opinion. The document presents environmental information and considers the potential for the proposed revisions to have effects on the site and surrounding environment.

1.3 Report Usage

The information and recommendations contained within this report have been prepared in the specific context stated above and should not be utilised in any other context without prior written permission from EnviroCentre.

If this report is to be submitted for regulatory approval more than 12 months following the report date, it is recommended that it is referred to EnviroCentre for review to ensure that any relevant changes in data, best practice, guidance or legislation in the intervening period are integrated into an updated version of the report.

Whilst the Client has a right to use the information as appropriate, EnviroCentre do not accept liability to any third party for the contents of this report unless written agreement is secured in advance, stating the intended use of the information. EnviroCentre accept no liability for use of the report for purposes other than those for which it was originally provided, or where EnviroCentre have confirmed it is appropriate for the new context.

2 SITE SETTING AND PROPOSALS

2.1 Site Location

The site is situated south east of Nigg Energy Park at an elevation of 5m above sea level and is centred at Ordnance Survey Grid Reference (OSGR) NH 79527 69016. The proposed entirety of the site boundary is approximately 11.27ha and is comprised of coastal waters and land of the former Dunskeath House. For the site location refer to Drawing Number SL06904-HBPW-00-ZZ-DR-C-0002, Appendix A.

The Nigg Oil Terminal is located to the immediate north of Nigg Energy Park, with the B9175 and Fearn Peninsula to the east, the area where the Cromarty Firth meets the Moray Firth to the south (known as 'The Sutors') and Nigg Bay to the west (also part of the Cromarty Firth). Adjacent to the south-east of the site, the Cromarty Ferry crosses the entrance to the firth to the west of The Sutors in the summer season from May to September. Access to the facility can be gained via the B9715.

2.2 Background

An Environmental Impact Assessment Report (reference 671906/001, hereafter referred to as the EIAR) was prepared under the Marine EIA Regulations to accompany marine licence applications for construction and dredging/disposal. The applications were submitted to Marine Scotland in June 2019.

The EIAR referred to the formation of a new East Quay at Nigg Energy Park comprising the construction of a perimeter-piled quay combi-wall, capital dredging, demolition of existing outbuildings associated with the former Dunskeath House and subsequent construction of an onshore laydown area with associated lighting, fencing and access. At this time the construction of the quay combi-wall was envisaged to be installed by plant located on a barge and a single temporary bund extending into the Firth.

Dredging was to be completed in 2 stages; the initial stage to remove unsuitable sediment and thereby create a stable base for formation of the temporary bund and a second larger dredging campaign to remove sediment to final berthing depths. A component of the dredged sediment was to be re-used on land with the remaining fraction disposed of at a licensed marine disposal ground at Sutor's Point located at the mouth of the Cromarty Firth.

The Marine License MS-00009031 (Dredging) was granted in December 2020. Condition 2.4 of the license authorised the dredging of a maximum of 165,000m³ of predominantly sandy material of which 150,000m³ was to be disposed of at Sutor's Point and 30,000m³ of dredged material to be used on site as guay infill or to reclaimed land.

2.3 Current Dredging Proposals

The contract for design and build of the East Quay at Nigg was awarded to Farrans towards the end of 2020. Farran's construction method comprised the creation of a temporary platform covering the whole of the working area instead of the envisaged single temporary bund. Amongst other things, this allowed a 'Drive-drill-drive approach' through the temporary platform to be used for pile installation instead of the open-water impact hammer technique originally proposed and assessed in the EIAR. This alteration in construction methodology resulted in greatly reducing the potential of underwater

noise impacting marine mammals, (Refer to Letter (ref no 673123/ec/004), dated 28/01/2021, addressed to Marine Scotland).

However, conversely the change in construction methodology resulted in an increase in the volume to be dredged during the 1st phase of work to create a stable base for the temporary platform by 0.434 Ha (Refer to Figure 1). The location of this additional dredge area remains within the originally planned and consented construction footprint and as such within the area of the current dredge license.

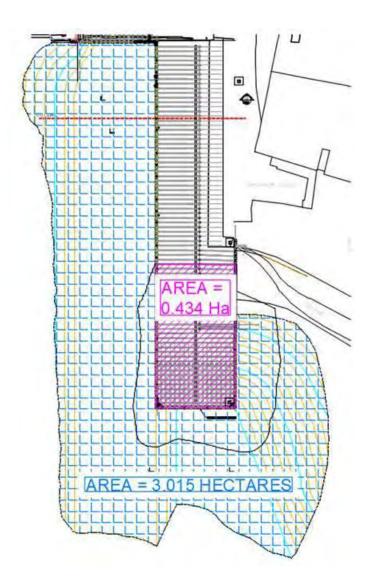


Figure 2-1: Plan of area where additional dredge volume was required (Purple Highlighted Area)

The initial dredging phase was originally estimated to generate circa 20,000 m³. It has subsequently been calculated that approximately 70,000m³ was dredged as a result of the volume increasing to accommodate a stable temporary platform. This change in dredge volume requirement was wholly because of the alternative method for construction (piling through a temporary bund) which had the benefit of greatly reducing underwater noise during piling for quay construction.

Following updated pre- and post-dredge bathymetric surveys it is currently estimated that to achieve the required berth depth it will be necessary to dispose of an additional 50,000m³ of dredge material in

the second dredging phase. Therefore, it is proposed to increase the consented disposal volume limit from 150,000m³ to a maximum of 200,000m³.

Note: Crushed rock used for temporary bund construction (30,000m³) will be recovered by dredging to be reused in quay construction.

2.4 Local Sensitivities

The surrounding area contains several designations within a 5km radius, as illustrated within Drawing No 673123-GIS001, Appendix A. These include the following:

- Cromarty Firth Site of Special Scientific Interest (SSSI), situated approximately 0.59km to the west of the site, designated for intertidal mudflats and sandflats;
- Cromarty Firth Special Protection Area (SPA), situated approximately 0.59km west of the site, designated for a range of non-breeding birds;
- Cromarty Firth Ramsar Site, situated approximately 0.59km west of the site, designated for intertidal mudflats and sandflats and waterfowl assemblage;
- Rosemarkle to Shandwick Coast SSSI, situated approximately 0.76km east of the site, designated for maritime cliffs, geological features and breeding birds;
- Moray Firth Special Area of Conservation (SAC), situated adjacent to the east of the site and designated for bottlenose dolphin;

There are other designations at greater distance, for example the Dornoch Firth and Morrich More SAC, which are relevant to the marine ecology assessment but not in the immediate vicinity of the site.

2.5 Causes of Concern

The main concerns in relation to dredging operations are:

- Sediment quality is suitable for disposal;
- Spread of Invasive Non-Native Species (INNS) and impacts on marine ecology;
- Increase in underwater noise and potential impacts on marine mammals;
- Increases in vessel movements and potential impacts on marine mammals;
- Contamination of coastal water and sediments and impacts on water quality and marine mammals; and
- Alterations to coastal processes and impacts on sediment transport.

These concerns were assessed in the EIAR report (refer to Chapter 10 of the EIAR) and Nigg East Quay - Best Practicable Environmental Option (BPEO) Report (Report Ref 8691, dated 31/05/2019, submitted to support the Marine License Dredging Application). A summary of the assessment outcomes specifically related to dredging operations are provided below. The 2019 BPEO report is included in Appendix B for information.

2.5.1 Sediment Quality Suitability

Sediment quality was characterised through Site Investigation (SI) works conducted by Fugro in May 2019. (Note: The additional dredge area is within the footprint of the original SI). The site investigation comprised 8 boreholes progressed to depths between 2.5 to 13m below seabed level with 4 of those boreholes progressed further into rock. It was noted the sediments overlying the bedrock where generally described as mixtures of sand and gravel, with sandy clay horizons also noted.

The relevant laboratory analytical data from the marine boreholes was reviewed in line with the current Action Levels for disposing of sediment at sea. The outcomes of the review are summarised as follows:

- Samples were dominated in general by the presence of the sand sized fractions;
- No samples recorded metal concentrations greater than their respective Revised Action Level1 (RAL 1)
- No samples recorded tributyltin (TBT) levels above RAL1;
- 1 of 24 samples recorded an exceedance of RAL 1 for Dibenz(ah)anthracene in sample BH2 2.50-3.00m, no other exceedances were recorded;
- No samples recorded polychlorinated biphenyl (PCB) levels above RAL1;
- No samples recorded Total Hydrocarbon levels above RAL1.

In conclusion all 24 samples recorded contaminants of concern below RAL 1 with the exception of a single sample which recorded Dibenz(ah)anthracene in exceedance of RAL 1. There were no exceedances of RAL 2 where they were available. The sediment was considered suitable for sea disposal where no land use option was available.

2.5.2 Invasive Non- Native Species

Dredging and an increase in vessel movement for disposal may cause the spread of the INNS wireweed, known to be present in the Cromarty Firth. It should be noted that a precautionary approach to the assessment of effects related to INNS gives a level of uncertainty regarding the dispersion of INNS across the Cromarty Firth. However, with biosecurity measures in place during construction and operation no adverse significant effects are anticipated

2.5.3 Marine Ecology

As detailed within Chapter 4 (of the EIAR): Marine Ecology, no significant effects were predicted upon marine mammal species or receptors identified. These are subject to the mitigation measures identified throughout the Chapter being applied, primarily through the Marine Mammal Mitigation Protocol outlined within Technical Appendix 4.1 and noted in full within Chapter 9: Schedule of Mitigation (both references within the original EIAR).

The proposed mitigation measures in relation to marine mammals were devised with reference to academic literature, best practice and further supporting evidence from similar developments, in addition to liaison and consultation with Dr Paul Thomson of the University of Aberdeen Lighthouse Field Station. Following all mitigation outlined, adverse effects were not considered significant.

2.5.4 Water Environment and Coastal Processes

Chapter 5 (of the EIAR) considered the potential of the water environment and coastal processes to be impacted by the proposed development taking into consideration climate change.

Overall, the effects of the proposed development on the water environment and coastal processes are not significant. The post-mitigation magnitude of any residual effects on the water environment and coastal processes are detailed within Chapter 5 and are considered either minor or negligible in this respect. Accordingly, no significant adverse effects have been identified. The current proposals are not considered to change this initial assessment conclusion.

2.6 Schedule of Mitigation

The schedule of mitigation in Chapter 9 of the EIAR presents a summary of the mitigation and enhancement measures identified in the specialist environmental studies throughout the EIA process. (Note: The Schedule of Mitigation and associated Construction Environmental Management Plan (CEMP) were subsequently approved by Marine Scotland)

The mitigation measures identified within the EIAR specifically for dredging are provided in Table 2-1.

Table 2-1: EIAR Schedule of Mitigation Associated with Dredging Activities

Feature / Topic	Mitigation	Timing	
Chapter 4: Marin	e Ecology		
Standard Mitigation	The following standard mitigation practices will be followed during the construction and operational phase of the proposed development:		
	 Pollution of the marine environment should be prevented in order to safeguard water quality and marine life which marine mammals rely on within these habitats; A Construction Environmental Management Plan (CEMP) detailing pollution prevention measures will be agreed with the regulatory authority prior to works commencing (Note: The CEMP has been compiled and approved); The CEMP will incorporate a marine INNS biosecurity protocol for both construction and operational phases; The following good practice guidelines shall be adhered to and incorporated into the CEMP: GGP 5: Works and maintenance in or near water; PPG 6: Working at construction and demolition sites; PPG 7: Safe Storage – The safe operation of refuelling facilities; GPP 21: Pollution and incident response planning; GPP 22: Dealing with spills; The Water Environment (Controlled Activities) (Scotland) Regulations 2011¹; Code of Practice on Non-Native Species Made by the Scottish Ministers under section 14C of the Wildlife and Countryside Act 1981²; SEPA Guidance to prevent the introduction or spread of INNS when undertaking controlled activities³; and The Firth of Clyde Biosecurity Plan (2012-2016)⁴. 		
Dredging Mitigation Protocol	The requirement of an MMO for dredging is not considered necessary due to the small TTS zones associated with the noise generated. Instead, contractors should be made aware that marine mammals may be present within the working area, and suggested vessel movement mitigation (Technical Appendix 4.1) should be implemented.	Construction	

¹ https://www.sepa.org.uk/media/34761/car_a_practical_guide.pdf

² https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2012/08/non-native-species-code-practice/documents/00398608-pdf/00398608-pdf/govscot/3Adocument

 $^{^3\ \}underline{\text{https://www.sepa.org.uk/media/163480/biosecurity-and-management-of-invasive-non-native-species-construction-sites.pdf}$

 $^{^4\,\}underline{\text{http://www.clydemarineplan.scot/wp-content/uploads/2016/05/FoCF-Biosecurity-plan.pdf}}$

Feature / Topic	Mitigation	Timing		
Dredge	An MMO will be present on the dredge vessel during disposal at The Sutors site. A scan of the water within an approximate			
Disposal	250m radius shall be undertaken prior to dredge material being disposed of to ensure there are no marine mammals,			
Protocol	particularly bottlenose dolphin which frequently utilise this habitat, are in proximity to the vessel. The search will be			
	conducted for a minimum of ten minutes.			
Vessel	Speed restrictions shall be implemented on vessels travelling to and from the proposed development and will continue	Construction/		
Movement	throughout construction and operation. Chapter 8: Other Issues includes further information regarding vessel movements	Operation		
	and mitigation; and Technical Appendix 4.2 includes detailed mitigation. Good practice measures that will be followed			
	include:			
	 Keep a safe distance. Never get closer than 100m (200m if another boat is present) if within 100m, switch the engine to neutral; 			
	Never drive head on to, or move between, scatter or separate marine mammals or sharks. If unsure of their			
	movements, simply stop and put the engine into neutral;			
	Spend no longer than 15 minutes near the animals;			
	Special care must be taken with mothers and young;			
	Maintain a steady direction and a slow 'no wake' speed; and			
	Avoid sudden changes in speed.			
Chapter 5: Wat	er Environment and Coastal Processes			
Construction	A Construction Environmental Management Plan (CEMP) will be developed to ensure that the mitigation measures outlined	Construction		
Environmental	in the EIAR are followed during the proposed construction works. The CEMP includes surface water management and			
Management	pollution prevention measures (e.g. Pollution Prevention Plan), and will be in place during construction and operation. The			
Plan (CEMP)	CEMP will remain a live document and will be continually updated as the work progresses. The CEMP is a practical tool to			
	facilitate the management of environmental mitigation measures and to provide a clear roadmap of the key roles and			
	responsibilities during construction. (Note: The CEMP has been compiled and approved)			
	A suitably qualified Environmental Clerk of Works (EnvCoW) will monitor the construction works to ensure that the CEMP and associated mitigation measures are being implemented effectively.	Construction		
	Best practice will be adopted throughout all phases of development, following current guidance. The programme of works,	Construction		
	including timing, direction and method of capital dredge, will be planned, monitored and managed to minimise the potential negative environmental impacts.			

Feature / Topic	Mitigation	Timing
	A Pollution Incident Response Plan has been developed relating to the construction of the proposed development, statutory requirements and identification of areas of highest sensitivity. This will provide site spill response procedures, emergency contact details and equipment inventories and their location. All staff will be made aware of this document and its content during site induction. A copy will be available in the site office at all times.	Construction
	All activities above Mean High Water Springs (MHWS) with potential to affect the water environment require to be authorised under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR). The level of authorisation required is dependent on the anticipated environmental risk posed by the activity to be carried out. These activities could include construction drainage. Construction activities below MHWS with potential to affect the water environment require to be authorised under a Marine Licence.	Construction
Dredged Material	Mitigation measures will be delivered by the principal contractor through detailed Construction Environment Management Plans (CEMPs) that will be produced following appointment. (Note: The CEMP has been compiled and approved). The contractor has produced a site specific Pollution Prevention Plan (PPP) which applies the principles of the agreed mitigation and shows how the mitigation is implemented effectively down to the specific site.	Construction
Chapter 8: Oth	er Issues	
Navigation	Use of propulsion thrusters will be minimised wherever possible, ducted thrusters being preferred to nozzle thrusters; Dredge vessels will avoid interactions with marine mammals wherever safe/possible; Generally, maintain a steady direction and a slow 'no wake' speed (<10 knots); Avoid sudden changes in speed or direction; and Never drive head on to, or move between, scatter or separate marine mammals or sharks.	Construction/ Operation

3 EIA SCREENING

Global Energy Ltd seek a formal Screening Opinion from Marine Scotland as the Consenting Authority under Regulation 10(1) of the Marine EIA Regulations in respect of the proposal to revise Condition 2.4 of Dredging License MS-00009031. The approximate National Grid Reference (NGR) for the centre of the site is NH 79527 69016 with the site boundary shown in Appendix A Drawing No SL06904-HBPW-00-ZZ-DR-C-0002.

Under the Marine EIA Regulations, proposals are screened to determine whether they fall within one of the types or scales of development which would require an EIA. In screening an application, consideration is given to whether the proposal would fall into any of the categories set out in Schedules 1 or 2 of the Regulations.

The EIA Regulations do not attempt to define 'significant effects' as each development must be dealt with in its own merits. Schedule 1 of the Regulations lists types and scales of development for which an EIA will always be required. Schedule 2 of the Regulations lists types and scales of development for which an EIA might be required, subject to assessment under Schedule 3.

3.1 Assessment in Relation to Schedule 1

The proposed alteration to the works is not of a type/scale listed in Schedule 1 of the Regulations; it is therefore necessary to assess the proposal in terms of Schedule 2.

3.2 Assessment in Relation to Schedule 2

The proposed development was originally identified as being a Schedule 2 development as it fell under

Paragraph 10 (g) - Trading ports, piers for loading and unloading connected to land and outside ports (excluding ferry piers) which can take vessels of over 1,350 tonnes.

The applicable threshold and criteria related to this paragraph is the area of works exceeds 1 Ha.

There is potential the extension to the dredging activity may be classed as a Schedule 2 development under the EIA Regulations. The Schedule 2 classes in which the proposed alteration to the works could fall under are:

Paragraph 13 - Any change to or extension of works of a description mentioned in paragraphs 1 to 12 of Column 1 of this table where those works are already authorised, executed or in the process of being executed.

The applicable threshold and criteria in relation to this Paragraph are that the thresholds and criteria in the corresponding part of Column 2 of Schedule 2 applied to the works as changed or extended are met or exceeded and in such a case the change or extension may have significant adverse effects on the environment.

The area within which additional dredging took place in the initial (Phase 1) of dredging is 0.434 Ha. This area is within the 1 Ha applicable threshold, and also within the initially consented approximately 3Ha dredge footprint. It is acknowledged that the site is in an environmentally sensitive area. It is

considered necessary to assess the proposed alterations to the dredging activity against the criteria contained in Schedule 3 in order to establish whether or not an EIA will be necessary.

3.3 Assessment in Relation to Schedule 3

Schedule 3 of the Regulations provides selection criteria for the screening of Schedule 2 developments. It must be noted that there are no rigid thresholds providing a universal test of whether or not an EIA is required. The proposal must be considered on a case-by case basis by virtue of factors such as its nature, size or location. The fundamental test to be applied in each case is whether that particular type of development proposed, and its specific impacts are likely, in that particular location, to result in significant effects on the environment.

3.4 Climate Change

Climate change has taken a prominent position within policy and legislation at a national level, with the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019⁵ amending the Climate Change (Scotland) Act 2009⁶. The 2019 Act sets a target date of 2045 for Scotland reaching net-zero emissions.

In addition, under Schedule 4(4), the Marine EIA Regulations require:

"A description of the factors specified in Regulation 5(3) likely to be significant affected by the works... (Including) climate (for example greenhouse gas emissions, impacts relevant to adaption)"

Note: Climate change was considered in the EIAR in Chapter 5 Water Environment and Coastal Processes specifically in relation to its impact on flooding. As this topic is not directly relevant to dredging activities it has not been considered further.

⁵ Climate Change (Emission Reduction Targets) (Scotland) Act 2019 (asp 15). Available at: https://www.legislation.gov.uk/asp/2019/15/enacted

⁶ Climate Change (Scotland) Act 2009 (asp 12). Available at: https://legislation.gov.uk/asp/2009/12/contents

4 ASPECTS OF ENVIRONMENT POTENTIALLY AFFECTED AND POTENTIAL MITIGATION MEASURES

Section 2.5 above identified the main concerns in relation to dredging activities as being as listed below and the EIAR considered the potential impacts of these within individual specialist assessments the outcomes of which were summarised within the Schedule of Mitigation.

- Sediment quality is suitable for disposal;
- Spread of Invasive Non-Native Species (INNS) and impacts on marine ecology;
- Increase in underwater noise and potential impacts on marine mammals;
- Increases in vessel movements and potential impacts on marine mammals;
- Contamination of coastal water and sediments and impacts on water quality and marine mammals; and
- Alterations to coastal processes and impacts on sediment transport.

In relation to sediment quality, the existing chemical data (which incorporated 8 borehole locations and 24 sediment samples) is considered to be representative of marine deposits within the locale. It is noted that the additional dredge area remains within the construction footprint. Based on the consistency of the sediment recovered by the SI, we are of the opinion that these samples are also representative of sediments within the additional dredge area. We therefore are of the opinion that the original conclusions of the review against current Action Levels for disposing of sediment at sea remain valid. As such there is no requirement to re-assess Sediment Quality.

The current dredging activities are undertaken with cognisance to the Schedule of Mitigation therefore the EIAR conclusions relating to alterations to coastal processes and impacts on sediment transport remain valid. Consequently, there is in our opinion no requirement to re-assess the proposed increase in dredging and disposal volumes against this topic area.

As the increase in dredging and disposal volumes will increase the dredge duration the other concerns listed need to be considered in order to identify if there is potential for environmental impacts.

The potential environmental impacts associated with the proposal to increase the total volume to be dredged and the volume to be disposed of at Sutor's are identified in Table 4-1.

Table 4-1: Potential Environmental Impacts Specifically Relating to an Increase in Dredging Duration

Topic	Potential Effects		
Morov Eirth	Habitat loss or degradation which may alter the integrity of designated areas		
Moray Firth SAC	Spread of marine Non- Native Invasive Species through dredging and increased vessel movements		
	Potential impacts on marine mammals from underwater noise		
Marine mammal	Potential impacts to marine mammals through contamination of the water environment		
(Cetaceans and seals)	Potential impacts to marine mammals through increased turbidity or sedimentation		
	Potential impacts to marine mammals through increased vessel movements		
	Increased turbidity and sedimentation during disposal of dredged materials		

Migratory Fish (Salmonids: Atlantic Salmon and Sea Trout)	Pollution of coastal water during disposal of dredged materials
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The Table 4.2 provides commentary on each of the environmental topics identified in Table 4.1 with information on:

- · Local setting and any key known features;
- Potential effects of the proposed revisions to the dredging campaign; and
- Any additional mitigation, avoidance or enhancement measures that could be implemented in addition to those originally proposed.

Table 4-2: Aspects of Environment Potentially Affected and Potential Mitigation Measures

Topic	Potential Effects	Context and Observations	Additional Mitigation Recommended
Ecology: Moray Firth SAC	Habitat loss or degradation which may alter the integrity of designated areas	The increase in turbidity and sedimentation may alter coastal processes, which could cause loss or damage to subtidal sandbanks. Modelling indicated that dredging deposition depths will be insignificant, generally less than 1mm. It is not considered the increase in deposited materials (200,000m³ rather than 150,000m³) will significantly change modelling findings as the final layout and depths are not materially changed. The magnitude of the impact of sedimentation on the subtidal sandbanks feature of the SAC is considered to be negligible.	No
Ecology: Moray Firth SAC Spread of marine Invasive Non- Native Species (INNS) through dredging and increased vessel		Dredging and an increase in vessel movement for disposal may cause the spread of the INNS wireweed, known to be present in the Cromarty Firth, as well as other species that are becoming widespread in Scotland. All dredged material will be deposited directly within the The Sutors licensed disposal site; therefore, there is a risk of spreading the INNS wireweed or other non-native marine species. The increase in vessels associated with construction works has the potential to increase the risk of the spread of INNS, as INNS can also be spread via hull fouling and transfer in ballast water. Biosecurity measures will be included in the Construction Environmental Management Plan (CEMP). The magnitude of the impact of INNS on the surrounding area is considered to be low (provided previously agreed mitigation is applied).	No
Ecology: Marine Mammals (Cetaceans and seals)	Potential impacts on marine mammals from underwater noise	Because the noise source from dredging is mainly from the vessel, a familiar noise in the Cromarty Firth, it is considered marine mammals in the locale would continue using the strait, largely unaffected by the noise resulting from the additional dredging activities. The works are also scheduled for the winter months, during which dolphins are observed using the SAC less than during the summer months. Therefore, the magnitude of the impact of underwater noise from increased disposal of dredged materials is negligible on marine mammals in the locale (provided previously agreed mitigation is applied).	No

Topic	Potential Effects	Context and Observations	Additional Mitigation Recommended
Ecology: Marine Mammals (Cetaceans and seals)	mammals) material to be dredged has been assessed as being clean sand and therefore there should be		No
Ecology: Marine Mammals(Cetaceans and seals)	Potential impacts to marine mammals through increased turbidity or sedimentation	Increased dredging operations are likely to increase turbidity and sedimentation, which could alter the behaviour of fish, the prey of marine mammals. Sand transport modelling results indicate that the majority of sand and silt lost to the water column during dredging will remain within the dredge area, therefore increased sedimentation during the dredging will be very localised and short term and therefore it is assessed turbidity would not impact marine mammals or their prey. As the sediment is predominantly sand with a very small level of fines (silt or clay), turbidity impacts will be small and very local. Marine mammals resident to the UK often reside in turbid waters and the increased disposal amount of 50,000m³ is not considered to significantly effect marine mammals in the locale. The magnitude of the impact from increased turbidity from the increased dredging disposal on marine mammals is considered negligible.	No
Ecology: Marine Mammals (Cetaceans and seals)	Potential impacts to marine mammals through increased vessel movement	The increase in vessel movements, as a result of disposing an additional 50,000m³, has the potential to increase the risk of collisions with marine mammals, which could result in injury or death. Dredge vessels move slowly and dolphins travel at an average speed of approximately 1.7-2.3 m/s, therefore this is unlikely. The magnitude of the impact of collision from increased vessel movement for additional dredging disposal on marine mammals is negligible (provided previously agreed mitigation is applied).	No

Topic Potential Context and Observations		Context and Observations	Additional Mitigation Recommended
Ecology: Migratory Fish (Salmonids: Atlantic Salmon and Sea Trout) Increased turbidity and sedimentation during disposal of dredged materials		Increased disposal of dredged materials is likely to increase turbidity and sedimentation; which may alter the behaviour of salmonids, and/or their prey species. As the sediment is predominantly sand with a very small level of fines (silt or clay), the localised turbidity impacts will be small. Fish species resident to the UK often reside in turbid waters and as the area affected will be minimal, it is considered that the magnitude of the impact from increased turbidity on salmonids is negligible.	No
Pollution of coastal water during disposal of dredged materials The dredged material has been assessed as being clean sand and therefore there should be no chemical pollution risks with the material. Pollution from events such as oil spills will be managed via the CEMP good practice. The magnitude of the impact of water pollution on salmonids as a result of increasing the disposal or dredged materials is considered to be negligible.		No	

5 CONCLUSIONS

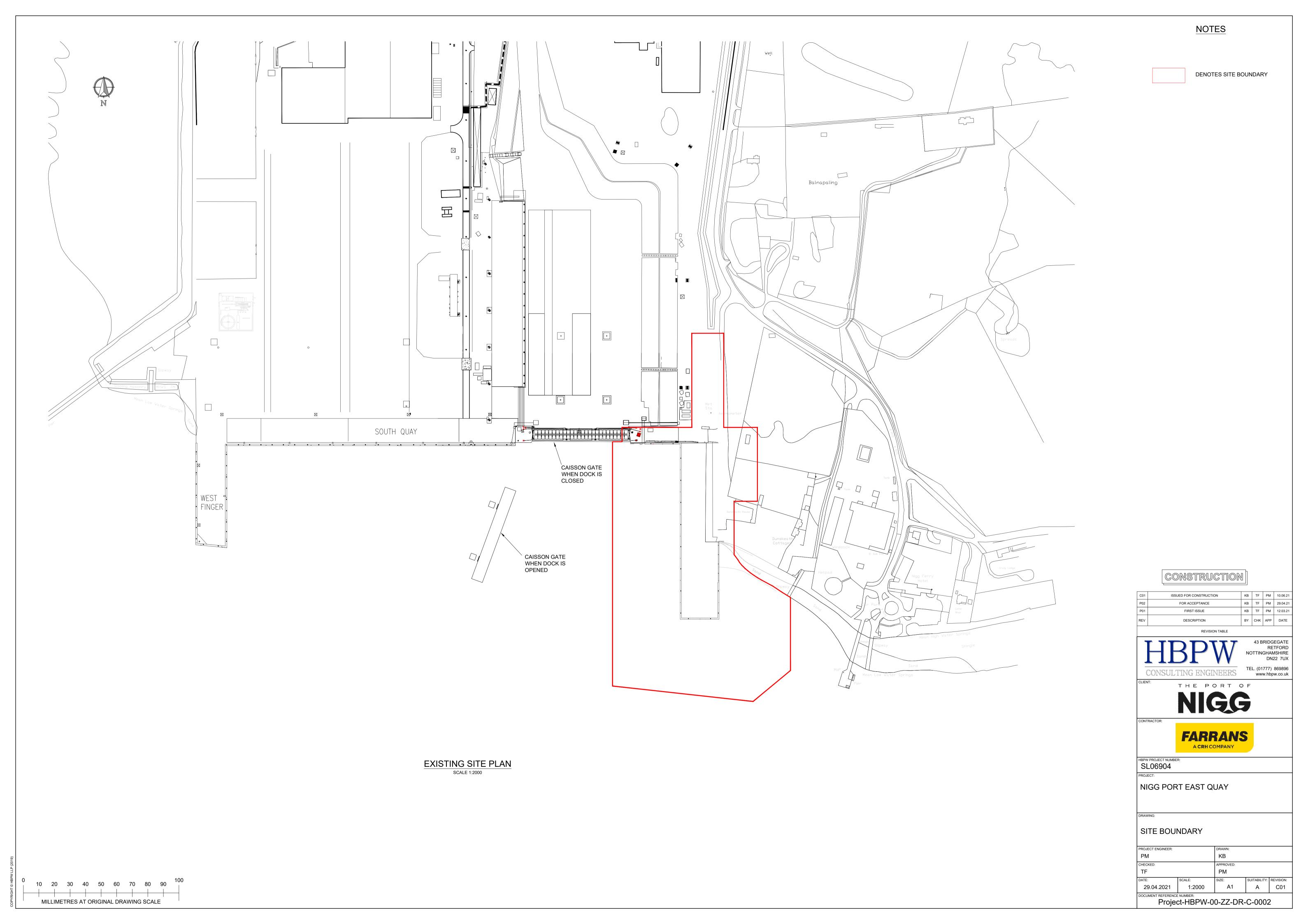
The planned construction methodology for the new quay of piling through a temporary bund, as opposed to piling in open water resulted in the following:

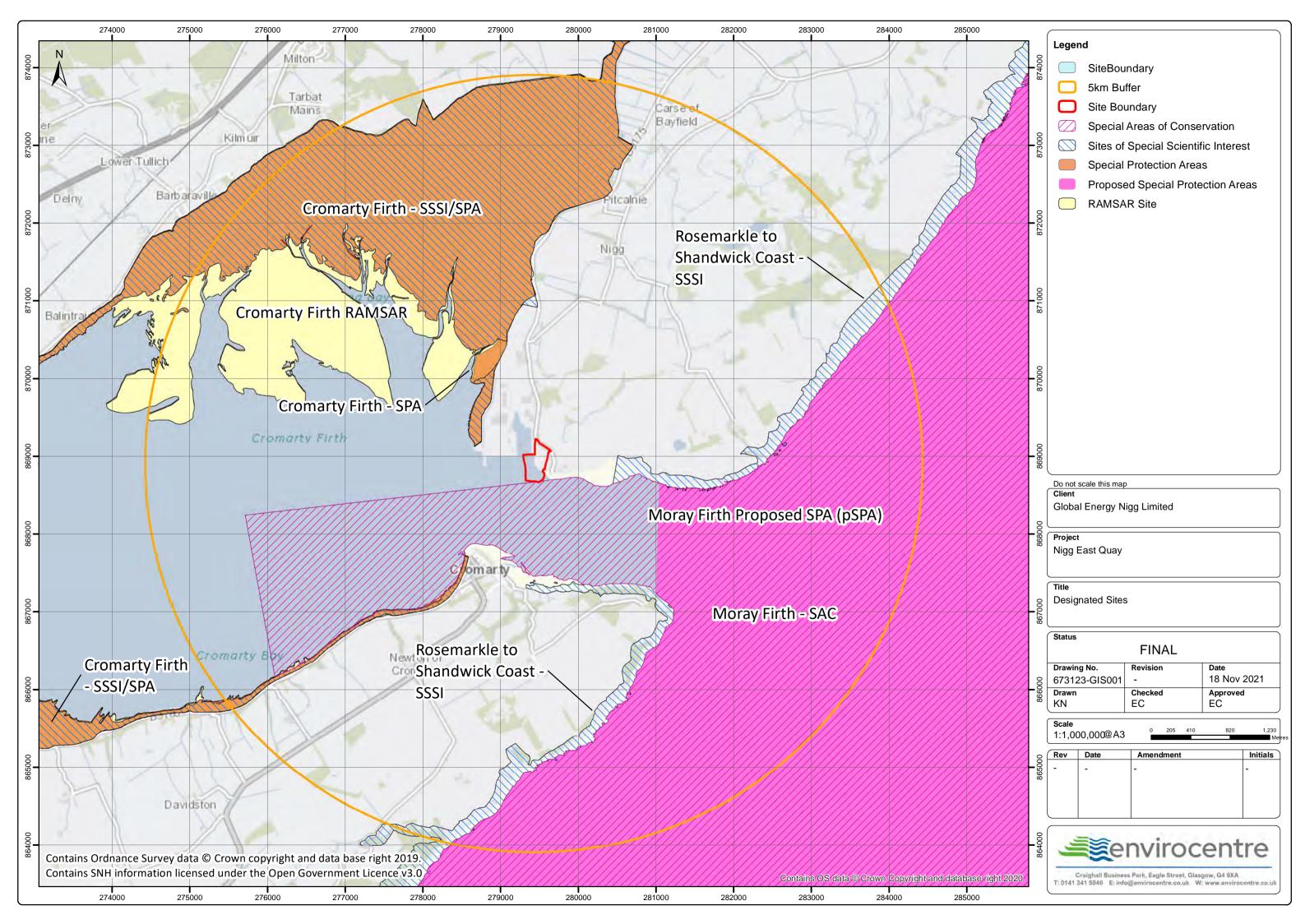
- The requirement to dredge and dispose of an additional 50,000m³ of material during Phase 1 of dredging between the lines of the proposed quay walls (as shown in Figure 1); and
- The benefit of avoidance of open water piling to create the new quay.

Having considered the additional volume and trips required to the disposal ground, the previously agreed dredging mitigation of MMO use at the disposal ground, vessel speed restrictions, and pollution prevention measures within the existing CEMP are considered sufficient to avoid any significant impacts on the site or surrounding area and its notable environmental features.

APPENDICES

A DRAWINGS





B NIGG EAST QUAY – BEST PRACTICAL ENVIRONMENTAL OPTION



Nigg East Quay -Best Practicable Environmental Option Report



May 2019

Nigg East Quay Best Practicable Environmental Option Report

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1 INTRODUCTION

1.1 Scope of Report

Global Energy Nigg Ltd are required to undertake a Best Practicable Environmental Option (BPEO) assessment for the dredging and disposal or reuse of material from the proposed development of Nigg East Quay ('the proposed development').

Site investigation works were undertaken by Fugro Ltd. and the results are provided in Fugro Report G191005U, May 2019 which is provided in Appendix A of this report. Borehole locations are detailed within Figure B.1 within Appendix B of the Fugro report. The relevant laboratory analytical data from the marine boreholes is included in Appendix F of the Fugro report, and this data has been reviewed in line with the current Action Levels for disposing of sediment at sea.

The site investigation comprised 8 boreholes progressed to depths between 2.5 to 13m below seabed level with 4 of those boreholes progressed further into rock. The sediments overlying bedrock can be generally described as mixtures of sand and gravel, with sandy clay horizons also noted. Borehole logs are provided within Appendix C of the Fugro report.

The dredge for the development will remove 165,000m³ of material from the seabed. Of this total dredge volume, 15,000 to 30,000 m³ is intended to be reused as fill within the development and a maximum of 150,000 m³ to be considered for an alternate use or sea based disposal.

The following report considers the available options for reuse and disposal of material in the context of the project.

1.2 Chemical Assessment

Review of the data provided by Fugro is summarised as follows:

- 24 samples collected from 8 boreholes between surface and 13.0m below surface;
- Samples were dominated in general by the presence of the sand sized fractions;
- No samples recorded metal concentrations greater than their respective Revised Action Level1 (RAL 1)
- No samples recorded tributyltin (TBT) levels above RAL1;
- 1 of 24 samples recorded an exceedance of RAL 1 for Dibenz(ah)anthracene in sample BH2 2.50-3.00m, no other exceedances were recorded;
- No samples recorded polychlorinated biphenyl (PCB) levels above RAL1;
- No samples recorded Total Hydrocarbon levels above RAL1.

In conclusion all 24 samples recorded contaminants of concern below RAL 1 with the exception of a single sample which recorded Dibenz(ah)anthracene in exceedance of RAL 1. There were no exceedances of RAL 2 where they are available.

2 DISCUSSION OF AVAILABLE DISPOSAL OPTIONS

The BPEO process is geared towards identifying a preferred overall strategy from the perspective of the environment as a whole, as opposed to detailed optimisation of any one selected scheme. It is a structured and systematic process to identify and compare strategic options in a transparent manner. Alternatives are evaluated in terms of their projected implications for the environment together with consideration of practicability, social and economic issues as well as within a wider strategic context.

The key stages of a BPEO are:

- Identification of options;
- Screening of options;
- Selection of assessment criteria;
- Analysis and evaluation of criteria; and
- Evaluation of BPEO.

2.1 Identification and screening of Available Disposal Options

A number of options are available for disposal of dredged sediments. The options considered are provided in Table 2.1 along with justification for screening out those options which have not been taken forward for further consideration.

Table 2.1: Initial Best Practicable Available Options

Location	Options	Screening Assessment	Carry forward?
Coast /	Do nothing Scenario/ Leave	Not an option due to the intentions to develop the quay facility.	No
Harbour	in situ		
	Infilling of an existing dry dock/harbour facility	There are no suitable dry dock or harbour facilities requiring infill in the vicinity of the project and on this basis this option is not considered viable.	No
	Beach Nourishment	Specific beach nourishment projects would require to be supported by Environmental Assessments as a minimum to inform how the project could affect the environment as a result of disturbance to the intertidal area, changes to the sediment levels, the variable composition and quality of the material and measures devised from the assessment outcomes to minimise impacts on the environment. There are no known beach nourishment projects in proximity to the proposed project.	No
Land	Landfill Disposal	This is possible but it is unlikely that this option will offer long term solution due to lack of space at landfills. Landfill space is currently at a premium and does not offer a sustainable solution either financially or environmentally for the disposal of dredged arisings. Dredged material is likely to require treatment first in a dewatering facility. There is significant cost associated with set up of dewatering facility at the quayside plus transportation and additional costs associated with gaining the necessary planning and regulatory consents.	Yes
	Recycling/Re-use	Up to 30,000 m ³ of the dredged material is proposed to be utilised within the proposed development.	Yes
	Land Incineration	The dredged material consists of non-combustible material (silts) with a low combustible component and very high water content.	No

Location	Options	Screening Assessment	Carry forward?
	Application to Agricultural Land	The dredged material would need to be treated to reduce salt concentrations to acceptable levels. There would be a requirement for a detailed chemical analysis and assessment as well as a Waste Management License Exemption. Special precautions would be required during spreading in relation to the risk of odour and watercourses / aquifers. The availability of land for this option will be limited within a reasonable haulage distance of the dredge arisings.	No
Sea	Aquatic disposal direct to seabed.	150,000m ³ of the total 165,000m ³ dredge works is ear marked for sea disposal at CR019 – Sutors. Further consideration of this route is provided in Section 3.	Yes

2.2 Summary of Identified BPEO Options

Three options were identified for further assessment as follows:

- Landfill;
- Recycling/Re-use; and
- Sea Disposal.

2.2.1 Landfill Disposal

Dredged material is considered to be controlled waste for the purpose of transport, storage and disposal as per Section 34 (7) of the Environmental Protection Act 1990. The Landfill (Scotland) Regulations 2003 require the classification and characterisation (i.e. inert, non-hazardous or hazardous) of the dredged material to be determined prior to landfill acceptance.

Disposal to landfill would require several stages in material handling operations:

- Dredging and transport to shore;
- Transfer to shore to a dewatering facility;
- Dewatering;
- Transfer of dewatered material to storage area for stockpiling;
- Loading of lorries and transport to landfill site; and
- Disposal at Landfill site.

Transport to the shore would require the identification of an available jetty facility suitable for receiving material directly to the dewatering facility. Two options are available for off-loading; namely grabbing the spoil from the barge or hopper or pumping directly ashore.

The dewatering facility would require being purpose built and capable of receiving large quantities of bulk material. Currently no facility exists in proximity to the site in the Cromarty Firth. Settlement tanks, with the aid of sluices and rotational management, would allow solids to settle out and the water element drain off and return to the Cromarty Firth. Temporary mobilisation of bespoke mechanical dewatering equipment could also be utilised but at greater cost. The dewatered dredged sediment would then be removed from the facility and stockpiled for transfer via lorry to a suitably licensed landfill.

We understand that the type of vehicle most suitable for transporting the dewatered dredged material is either a rigid bodied tipper or an articulated tanker both with a 16 tonne load capacity. It is estimated that the dredge volume which cannot be utilised within the development equates to c. 270,000 tonnes of material and would require approximately 16,875 return trips would typically be required to transport the dewatered dredged material to landfill.

The number of landfills within a viable distance of the site at Nigg is considered to be low. In addition the available capacity of each site is limited by the amount of material it can receive per annum. Due to the proposed quantity of material to be dredged it is therefore unlikely that any landfill within viable distance of the site will have the capacity to receive the dredged material.

2.2.2 Recycling/Re-use

As outlined previously, up to 30,000m³ of dredged material is earmarked for reuse as engineering fill as part of the development which is understood to be the maximum capacity within the development design for fill material.

2.2.3 Sea Disposal

This option handles material in a single stage namely transport to the disposal site. The existing licensed disposal site is approximately 0.9 nautical miles north-west of CR019 – Sutors disposal site. It is located in naturally deep water with ease of access, has capacity and is anticipated to be active for the foreseeable future.

3 FURTHER CONSIDERATION OF REMAINING DISPOSAL OPTIONS

3.1 Detailed BPEO Assessment

Each of the identified options was assessed against the criteria detailed in Table 3.1 below.

Table3.1: BPEO Detailed Assessment Criteria

Primary Criteria	Description and Attributes
Strategic	Operational aspects, including handling, transport etc.
	Availability of suitable sites/facilities
	General Public/local acceptability
	Legislative Implications
	Summary of the outcome of consultation with third parties
Environmental	Safety Implications
	Public Health Implications
	Pollution/ Contamination Implications
	General Ecological Implications
	Interference with other legitimate activities e.g. fishing
	Amenity/Aesthetic Implications
Costs	Operating costs e.g. labour, site operations, environmental monitoring
	Capital e.g. Transport, equipment hire

3.1.1 BPEO Strategic Assessment

Table 3.2 below provides details of the strategic assessment for each option taken forward for the detailed BPEO assessment:

Table 3.2: BPEO Strategic Assessment

Criteria	Landfill	Recycling/Re-use	Sea Disposal
Operational Aspects (inc. handling and transport)	Would involve double handling of material through dewatering and transportation to landfill. A facility would need to be built for dewatering purposes. Would also increase the number of HGVs on the road network.	Would require unloading of dredged material either from dredge hopper/barge by excavator or pumped ashore. Can be done in close proximity to the reuse site.	There would be no double handling of the dredged material. Transportation to the disposal site would be by dredger or barge(s) depending on methodology.
Availability of suitable sites/facilities	The geotechnical composition of the dewatered dredged material is considered to be suitable for disposal via this route. However, there is typically a limit to the amount of waste that can be accepted both on a daily and annual basis at a landfill. The landfill capacity will therefore not be able to accommodate the quantity of material generated by the East Quay dredging activities and another disposal option will be required for the surplus material.	Identified as part of the project design to incorporate up to 30,000m³ of suitable dredged material within the proposed development.	The marine disposal site has been designed to accommodate the quantities typically generated by dredging operations. The geotechnical composition of the proposed dredged material is suitable for disposal via this route.
General Public /Local acceptability	Increase traffic on haul routes therefore potential for increase in public complaints.	Beneficial reuse of dredged material is not considered to be viewed in a negative light as it saves quarrying and transportation of virgin material for this purpose and reuses material which would otherwise be surplus for the project.	Traditionally accepted disposal route for dredged material and limited public impact.
Legislative Implications	Contravenes the principles of minimising waste and long term commitments by the government to reduce land filling.	A commonly used means for minimising importation of materials to a construction project where applicable. Needs to follow appropriate processes and re-use licences where applicable.	This is an accepted disposal route as long as a licence is obtained.

3.1.2 BPEO Environmental Assessment

Table 3.3 details the environmental assessment for each option taken forward for detailed BPEO assessment.

Table 3.3: BPEO Environmental Assessment

Criteria	Landfill	Recycling/Re-use	Sea Disposal
Safety Implications	Double handling of material increases the potential for accidents to occur. Work would be undertaken in accordance with H&S legislation.	Double handling of material increases the potential for accidents to occur. Work would be undertaken in accordance with H&S legislation.	Minimal handling of material required as it is directly placed at the disposal site. Work would be undertaken in accordance with H&S legislation.
Public Health	Measures will be required to limit human contact during transfer of material from dredger to dewatering facility and transportation to landfill. Security measures typically employed at licensed landfills which will minimise human contact once accepted and placed at site.	Measures will be required to limit human contact during transfer of material from dredger to site for reuse. Materials, assuming they are not stockpiled for a long time are unlikely to become a dust nuisance. The potential for dust production can also be managed through wetting down of stockpiles as required prior to re-use.	Low potential for human contact during dredging and disposal operations. Once deposited at disposal site pathways for human contact greatly reduced.
Pollution/contamination	Pumping /loading ashore to dewatering facility and transportation to landfill will all require energy. Road transport increases the carbon footprint of this disposal option. Potential for spillages to occur.	Pumping /loading ashore to dewatering facility and transportation to landfill will all require energy. Reuse of material will minimise fuel/pollution use assuming that the material is placed in close proximity to site for its use.	Pollutant concentrations limited to acceptable levels through regulatory licensing processes. Low disturbance of sediments by natural processes limits spread in existing disposal ground, although it is acknowledge some dispersal will occur.

Criteria	Landfill	Recycling/Re-use	Sea Disposal
General Ecological Implications	Licensed landfill would be away from protected species and habitats with measures in place to prevent or minimise pollution of the surrounding environment.	Unlikely to have any significant ecological implications if placed in a controlled manner behind retaining structures and steps are taken to minimise the potential for the	Disposal at Sutors disposal site has historically been used and is the closest licensed disposal site.
Interference with other legitimate activities	Potential from limited short term local impact to commercial operations in the area of the dredged material handling and road hauling principally related to noise and dust potential.	Potential from limited short term local impact to commercial operations in the area of the dredged material handling/unloading.	Designated disposal site, as such there is considered no significant impact to commercial vessels or commercial fishing.
Amenity / Aesthetic Implications	Odour release from dewatering facility. Increase traffic noise during transportation from dewatering facility to landfill facility. Potential for spillages on haul route. No significant additional visual/ odour/noise effects as using existing landfill site.	Limited short term visual / odour / noise effects as dredged material is transported by dredger/barge to shoreside facility for storage/placement.	Limited short term visual / odour / noise effects as dredged material is transported by dredger and disposed of below sea level.

3.1.3 BPEO Cost Assessment

Costs were assessed for each of the options taken forward for detailed BPEO assessment. The BPEO assessment considered the typical costs associated with dredging, transportation to the disposal site, construction of treatment facilities (where applicable) and methods employed to protect the environment for each of the identified options. As costs are generally "Commercially Sensitive" the rates are based on experience within industry (as opposed to formal quotations).

For the purposes of comparing costs associated with each option a benchmark of 100,000 tonnes (approximately 50,500m³) of dredged material has been set.

The assumptions to calculate the costs are as follows:-

- Dredging costs are estimated to be £3.21 per m³;
- Ship transportation costs from the dredged area to disposal / transfer site have been calculated based on £1.85 per tonne;
- Costs associated with construction and operation of a dewatering facility are estimated to be in the order of £1,000,000 or greater;
- Cost associated with transfer of dewatered material to lorry are based on a wheeled shovel (costing £47 per hour) operating 2 hours per day for 6 days per week for ten weeks;
- It is assumed that handling of material for placement within the construction project is £3 per tonne;
- Transportation costs from a dewatering facility to landfill are estimated to be £4.85 per tonne; and
- Landfill gate fees are estimated to be £30 per tonne for a non-hazardous landfill (Note Maintenance dredgings are currently exempt from landfill tax as defined in HM Customs and Excise Notice LFT1, A general guide to landfill tax, November 2018, Section 8¹).

Table 3.4 provides details on the Cost assessment for each option taken forward for detailed BPEO assessment.

¹ https://www.gov.uk/government/publications/excise-notice-lft1-a-general-guide-to-landfill-tax/excise-not

Table 3.4: BPEO Cost Analysis (based on 100,000 tonnes only)

Activity	Landfill Disposal	Recycling/Re-use	Sea Disposal
	(£)		(£)
Dredging	160,500	160,500	160,500
Transport by vessel to disposal site	185,000	185,000	185,000
Reception facility	70,000	-	-
Harbour / Dock Closure	-	-	-
Dewatering Facility	1,000,000	-	-
Onshore handling and Placement	-	300,000	-
Transfer of material to lorry	5,640	5,640	-
Transportation Cost	485,000	-	-
Landfill Gate Fee	3,000,000	-	-
Total Costs	4,906,140	651,140	345,500

Note: The above costs do not take into account the cost required to gain planning or licensing consents or potentially to purchase land (where applicable). They also do not take account of the influence volumes will have on costs (economies of scale).

3.2 BPEO Assessment Discussion

For each of the above assessment criteria the options were qualitatively and semi-quantitatively (for costs) assessed against feasibility/preference and awarded a ranking ranging from 1-4; 1 being the most acceptable and 4 being the least acceptable option. The assignment of rank was on the basis of professional judgement.

The individual assessment criteria rankings for each option were added up to give an overall hierarchy of preference. Table 3.5 below provides a summary of the BPEO assessment.

Table 3.5: BPEO Summary

Criteria	Landfill Disposal	Recycling/Re-use	Sea Disposal
Environment	4	1	2
Strategic	4	1	2
Costs	4	2	1
TOTAL SCORE	12	4	5

Disposal to landfill is considered to be the least suitable option for the dredged material. It contravenes the principles of minimising waste and reducing landfilling. Several stages in material handling operations would be required to dispose of the material by this route. The cost associated with setting up a suitable treatment facility to dewater the dredged material is significant. Transportation of material by road is also undesirable as a result of increased traffic and the potential for accidental spillages. Landfill capacity is also typically limited and potentially unable to accommodate the quantities of material typically generated by this project. Any surplus dredged material would likely therefore require to be considered for disposal via an alternative route.

Up to 30,000m³ of material is intended to be utilised within the construction of the proposed development. This falls within the realms of beneficial re-use and is considered a positive means of utilising dredged arisings. However there is a limit to the total amount which can be incorporated into the overall development.

Deposition of the dredged material at a licensed marine disposal site is traditionally acceptable. The licensed marine disposal site has been designed to allow easy access as well as being capable of accommodating the quantities of material typically generated by dredging activities. Material handling is limited to transportation thereby reducing the risk for pollution incidences occurring. Pollutant concentrations are also limited to acceptable levels through regulatory requirements. On comparison with other disposal options the cost associated with sea disposal of the dredged material is considered to be the most financially viable.

3.3 Conclusions

The Best Practicable Environmental Option, based on those reviewed for disposal of the East Quay dredge area has therefore been assessed as a combination of beneficial re-use and sea based disposal. As identified in the sediment chemical quality section, further assessment is deemed necessary to confirm the suitability of the sediment for sea disposal. The following section details this assessment.

4 SEDIMENT FURTHER ASSESSMENT

4.1 Dredge Material Characteristics

Chemical analysis of the sediments to be dredged have shown key contaminants of concern below revised Action Level 1 in all cases with the exception of a single sample BH2 2.50-3.00m which recorded Dibenz(ah)anthracene at a concentration of $18\mu g/kg$. RAL 1 for Dibenz(ah)anthracene is $10\mu g/kg$.

Average concentrations of Dibenz(ah)anthracene are 2.2µg/kg which are well below RAL1.

The individual sample concentration and average concentration is considered to be well below the Canadian Probable Effects level (PEL) of $135\mu g/kg$. PELs (Marine) have been adopted from the Canadian Environmental Quality Guidelines²If a concentration is recorded above the PEL this is the probable effect range within which adverse effects frequently occur.

4.2 Chemical Assessment Conclusions

Analytical data for the proposed dredge material concludes that the material has little in the way of contamination with only 1 sample recording a single exceedance of RAL1. Average concentrations for all contaminants of concern are below RAL1 in all instances and it is considered that the material is suitable for sea based disposal.

² http://www.ccme.ca/en/resources/canadian_environmental_quality_guidelines/

5 WATER FRAMEWORK DIRECTIVE ASSESSMENT

This section details the assessment the dredge and disposal sites within the context of the Water Framework Directive as required by Marine Scotland.

As outlined in the Water Framework Directive Assessment: estuarine and coastal waters, there are several key receptors which can be impacted upon including the following:

- Hydromorphology;
- Biology habitats;
- Biology fish;
- Water quality; and
- Protected areas

Each of these points are considered in Table 5.1 below:

Table 5.1: Receptor Risk Assessment

Key Receptor	Brief Summary of Potential Effects on Receptor	Further Consideration Required?	Comment
Hydromorphology	Morphological conditions, for example depth variation, the seabed and intertidal zone structure tidal patterns, for example dominant currents, freshwater flow and wave exposure.	Yes	Hydromorphology is discussed within Chapter 5: Water Environment, Soils and Coastal Processes in the supporting EIA Report.
Biology - habitats	Included to assess potential impacts to sensitive/high value habitats.	Yes	Habitats and fish are covered in Chapter 4: Marine Ecology in the supporting EIA Report.
Biology - fish	Consideration of fish both within the estuary and also potential effects on migratory fish in transit through the estuary.	Yes	
Water Quality	Consideration must be given to water quality when contaminants are present in exceedance of CEFAS RAL1.	No	Contaminants noted to be below CEFAS RAL1 within all sediment samples with the exception of one minor low level exceedance for a single PAH species. Organic contaminants like PAHs have a greater affinity for the organic materials which they are bound to, and are more likely to remain strongly bound to the sediment, or if become dissolved, quickly adsorbed onto organic matter. It is considered unlikely that there would be any water quality impact at the dredge or disposal site from the contaminant levels recorded within the sediments.

Key Receptor	Brief Summary of Potential Effects on Receptor	Further Consideration Required?	Comment
Protected Areas	If your activity is within 2km of any WFD protected area, include each identified area in your impact assessment. • special areas of conservation (SAC) • special protection areas (SPA) • shellfish waters • bathing waters • nutrient sensitive areas	Yes	Protected areas can be viewed within Figure 1.3 of Volume 2 of the EIA – there are no protected areas within the site boundary. Further consideration of key protected areas is provided in section 5.1 below.

Source: Taken from https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters

5.1 Protected Areas

The development site is not within a protected area. The Moray Firth SAC is located just to the south of the proposed development and the disposal site is located within the SAC.

There are no designated bathing waters in close proximity to the development site or disposal site with the closest being noted at Rosemarkie³.

Shellfish protected waters are located at Udale and Cromarty Bay south of Invergordon and approximately 2.6 Km south west from the development site⁴.

The key potential risk to the sensitive features are considered to be attributed to the transport of suspended material from the dredge site during dredging and disposal operations. Sample results have indicated that there are very low levels of key contaminants of concern within the dredge material and on this basis the risks to protected areas from fugitive contamination are considered to be low.

³ https://apps.sepa.org.uk/bathingwaters/Locations.aspx

⁴ https://www.gov.scot/binaries/content/documents/govscot/publications/map/2016/09/shellfish-water-protected-areas-maps/documents/323d3324-f111-4fe0-a702-59ac4bf28953/323d3324-f111-4fe0-a702-59ac4bf28953/govscot%3Adocument/Cromarty%2BBay%2B-%2Bshellfish%2Bwater%2Bprotected%2Barea%2Bmap.pdf

6 CONCLUSIONS

In summary, 165,000m³ of material is proposed to be dredged to facilitate the proposed development. Up to 30,000m³ of the dredge material is intended to be utilised within the construction of the quay.

A maximum of 150,000m³ has been identified for sea based disposal at Sutors Disposal Site for the BPEO in the absence of any alternative identified reuse routes.

Chemical analysis of the dredge material recorded 1 minor exceedance of Action Level 1 in a single sample from a total of 24 samples. None of the samples recorded exceedances of adopted Probable Effect Levels (where considered) or Action Level 2. On this basis there is not considered to be a significant risk associated with dredging or sea based disposal of the material.

Following the review the potential risks associated with dredging, sea based disposal and re-use options are considered to be Low. The BPEO, as previously identified, is considered to be a combination of beneficial reuse and traditional sea based disposal for surplus material.

REFERENCES

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APPENDICES

A FUGRO REPORT



FUGRO

Ground Investigation without Geotechnical Evaluation Report East Quay Development - Marine Ground Investigation Nigg Bay, Scotland

Contact No.: G191005U Issue Date 1 May 2019

Global Energy Nigg Limited





Draft for Comment





FUGRO

Ground Investigation without Geotechnical Evaluation Report East Quay Development - Marine Ground Investigation Nigg Bay, Scotland

Contract No.: G191005U

1 May 2019

Draft for Comment

Prepared for: Arch Henderson LLP

142 St Vincent Street

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United Kingdom





01	Draft for Comment	BAM	NHA		1 May 2019
Issue	Document Status	Prepared	Checked	Approved	Date



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Our ref: G191005U(01) Date: 1 May 2019

Arch Henderson LLP 142 St Vincent Street

Glasgow G2 5LA United Kingdom

J. 1

Attention: Mr Michael Shuttleworth

Dear Sir,

Ground Investigation without Geotechnical Evaluation Report: East Quay Development - Marine Ground Investigation, Nigg Bay, Scotland.

We have the pleasure of submitting our draft report on the above. This report was prepared by B Marsden under the supervision of N H Armstrong. This report contains all testing completed to date.

We hope that you find this report to your satisfaction; should you have any queries, please do not hesitate to contact us.

Yours faithfully,

B Marsden

Reporting Engineer

N H Armstrong

Engineering and Reporting Manager

Distribution: One electronic copy to Mr Michael Shuttleworth



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ABBREVIATIONS

ATN Abortive Test Notice
BS British Standard
bsl Below seabed level
bgl Below ground level
bml Below mud level
CD Chart Datum
CM Central Meridian

GRS Geodetic Reference System
LAT Lowest Astronomical Tide

MSL Mean Sea Level

OD Ordnance Datum Newyln
OpCo Operating Companies
RQD Rock Quality Designation
SCR Solid Core Recovery
TCR Total Core Recovery

UKAS United Kingdom Accreditation Service
UKHO United Kingdom Hydrographic Office

UTM Universal Transverse Mercator WGS84 World Geodetic System 1984

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1. INTRODUCTION

On the instructions and under the supervision of Arch Henderson LLP (the Investigation Supervisor) acting on behalf of Global Energy Nigg Limited (the Employer), a site investigation has been carried out by Fugro GeoServices Limited (FGSL) at Nigg Bay, Scotland.

It is proposed to construct a quay on the southern border of Global Energy Nigg Limited's Energy Park. The objective of the investigation was to determine the geotechnical and geoenvironmental conditions at the site and to provide information that would assist the Investigation Supervisor in the design of the proposed works. The scope of the investigation was determined by the Investigation Supervisor.

A ground investigation without geotechnical evaluation report, was requested including exploratory hole and field-testing records, laboratory test results, photographs and site plan. The report has been provided in .pdf format.

The nearshore site work was undertaken from the FGSL jack-up barge Skate 3A from 2 March to 18 March 2019, and comprised eight light cable tool percussion boreholes four of which were extended by rotary core drilling techniques to a maximum depth below seabed level (bsl) of 23.35 m.



2. THE SITE AND GEOLOGY

2.1 Site Location and Description

The proposed quay is to be located on the southern border of Global Energy Nigg Limited's Energy Park, Nigg Nay, Cromarty Firth, 8km east of Invergordon, Highland, Scotland.

2.2 Geology

The records of the British Geological Survey (BGS 1997), BGS Online (BGS 2018) and information provided by the Client indicate that the site is underlain by Marine Beach Deposits, comprising clays, silts, and sands, resting on the Raddery Sandstone Formation, consisting of reddish brown sandstone interbedded with marl.

Further background research such as a desk study was not required within the terms of reference for the work.



3. MARINE GEOTECHNICAL INVESTIGATION

3.1 Scope of Work

The original scope of works required eight boreholes to be constructed to depths up to 25 m bsl. On the instructions of the Investigation Supervisor the depths of the boreholes were reduced during the course of the site work. Five boreholes were constructed using light cable tool percussion boring techniques to depths ranging between 9.40 mbsl (BH02) and 22.10 mbsl (BH04) and three boreholes (BH01, BH03 and BH05) were constructed using a combination of light cable tool percussion boring and rotary coring techniques to depths between 17.50 m bsl (BH05) and 23.35 m bsl (BH01).

A site plan showing the location of the exploratory positions is given in Figure B.1 in Appendix B. A schedule of exploratory holes is presented in Table 3.1.

3.2 Vessels, Plant and Equipment

The site work was conducted using the Fugro jack-up barge Skate 3A which was specifically developed for performing nearshore, high quality geotechnical site investigations and construction works. The barge includes a four-leg jack-up system allowing works in the intertidal zone up to 30 m water depth. Drilling, testing and sampling equipment on the Skate 3A comprised:

- Comacchio MC-S 1200 hydraulic drill rig capable of both rotary and percussive drilling operations;
- Dando 2000 cable percussion winch;
- Mud mixing system used to mix and hold the drill flush used during drilling operations to stabilise the borehole;
- Heavy duty 7" diameter thick-walled casing used as a conductor casing from the barge to mudline;
- Terracore S-Geobor wireline triple barrel rotary coring system, with semi-rigid core liner and seawater, which produces a hole diameter of 146 mm and a core sample of 102 mm diameter (nominal) and, when deployed with a non-coring bit, produces an open hole of 146 mm diameter;
- Sliding hammers to drive thin-walled or thick-walled samples of 450 mm or 1000 mm nominal length into the ground in advance of the borehole;
- Trip hammers used to carry out standard penetration tests.

Equipment data sheets are presented in Appendix I.

Table 3.1: Schedule of Exploratory Boreholes

Exploratory Position Reference	Eastings (m)	Northings (m)	Seabed Elevation (m OD) [m CD]	Depth to Base of Exploratory Position (m bsl)		
BH1	279383.70	868963.58	-1.37 [0.85]	23.35		
BH2	279342.91	868934.75	-11.32 [-9.10]	9.40		
ВН3	279380.53	868920.31	-2.97 [-0.75]	22.50		
BH4	279380.77	868871.12	-4.24 [-2.02]	22.10		
BH5	279379.79	868819.21	-8.97 [-6.75]	17.50		
BH6	279381.64	868746.75	-11.82 [-9.60]	15.00		
BH7	279451.07	868746.87	-6.23 [-4.01]	19.61		
BH8	279448.06	868803.00	-3.04 [-0.82]	19.00		
Note. Chart Datum at N	Note. Chart Datum at Moray Firth is 2.22m below OD (NTSLF, 2019)					



3.3 Marine Activities

3.3.1 Site Activities

The field operations were carried out twenty-four hours a day in two twelve-hour shifts. A breakdown of the site activities is given in Table 3.2.

Table 3.2: Summary of Activities

Activity	Duration (hrs)
Mobilisation	3.50
Drilling/General Operations	195
Fugro Standby	0
Standby (Other)	164
Note: Refer to DPRs for details and breakdown of Standby (Other)	

Daily Progress Records (DPR) were completed for each 24-hour period during the site work, defined from midnight to midnight, and include information on the field operations and activities together with summary information relating to progress. The DPRs are presented in Appendix I.

3.3.2 Health, Safety and Environment

A Hazard Observation Card (HOC) system was operated on board allowing crew to report Unsafe Acts, Unsafe Conditions, Safe Acts, or make HSE suggestions. HOCs are uploaded to the Fugro IMPACT system which allow them to be tracked, monitored and responsibilities relating to their close out to be assigned with an automated follow-up system in place.

In addition to the HOC system, Fugro IMPACT is also used to report on more serious incidents. An incident includes any accident, near miss or dangerous occurrence and any accidents in which any employee was injured or any damage to equipment was suffered.

The health, safety and environment statistics for the site work period are summarised in Table 3.3.

Table 3.3: Health and Safety Statistics

Activity	Duration (hrs) / Number
Contractors total exposure (hours)	1860
HOCs	20
HSE Meetings	1
Safety Drills	7
Tool Box Talks	18
Incidents/Near Misses	0

3.3.3 Grouting Operations

All boreholes were grouted from the base of the borehole to rock head with a 2:1 Bentonite /cement grout, mixed at a solid to water ratio of 5:2 by weight. The grout was pumped bottom up in the borehole via a tremie pipe. This was process was conducted in 10 m increments and the borehole was dipped immediately afterwards before proceeding with the next interval.



3.4 Navigation and Positioning Survey

During primary positioning of the Skate 3A Jack Up Barge (JUB), Starfix HP/XP/G2 Systems were used. The heading was determined using a Meridian Gyrocompass with a ProTrack GNSS system providing a backup. Antenna position data was combined with the gyro compass data in StarFix.NG navigation software to compute the vessel position.

The JUB's positioning systems were configured to record all navigation data which enables the replay of barge movements and review offline. A mean position report was configured to the Client's specification to provide the positional information for each exploratory location. The mean position reports are reproduced in Appendix F.

3.5 Geodetic and Projection Parameters and Vertical Datum

3.5.1 Project Coordinate Reference System

Table 3.5 provides details of the geodetic datum and map projection adopted for the project.

Table 3.5: Project Geodetic and Projection Parameters

Project Geodetic Datum		
Geodetic Datum:	WGS84	
Ellipsoid:	WGS84	
Semi major axis:	6337563.396	
Inverse Flattening:	299.3249646	
Project Projection Parameters		
Projection:	OSGB36	
Grid:	British National Grid	
Longitude of Origin:	2°00'00.0000"W	
Latitude of Origin:	49°00'00.0000"N	
False Easting:	400000.000 m	
False Northing:	-100000.000 m	
Scale factor on Central Meridian:	0.9996	
Units:	Metre	
Vertical Datum		
Datum:	Chart Datum (CD)	

3.5.2 Vertical Datum

The vertical datum for this project is Chart Datum (CD).

3.5.3 Depth Measurement

The depth to seabed was measured by a sounding lead within the drill string prior to the commencement of boring. The depths stated on the borehole records are referenced as metres below seabed. The elevation of the seabed is also stated on the exploratory hole records.



4. GEOTECHNICAL ACTIVITIES

4.1.1 General

The investigation was carried out in accordance with BS 5930:2015, BS EN ISO 14688-1:2018, BS EN ISO 14689-1:2018 and BS EN ISO 10175:2011, as appropriate.

Details of the sampling and in situ testing carried out, together with the descriptions of the strata encountered, are given on the exploratory hole records in AppendixC.2.

An explanation of the symbols and abbreviations used on the borehole records, together with the method of strata description utilised is given in the Notes on Exploratory Hole Records in Appendix C.1.

Geotechnical and geoenvironmental samples were transported to the laboratories of Professional Soils Limited for examination and testing as scheduled by the Investigation Supervisor.

4.1.2 Boreholes

Eight, 178 mm minimum diameter, boreholes were sunk to depths between 4.45 m bsl (BH03 and BH05) and 22.10 m bsl (BH04) using light cable tool percussion boring techniques. On reaching bedrock, boreholes BH01, BH03 and BH05 were extended using rotary coring drilling techniques, to depths ranging between 17.25 m bsl (BH03) and 23.35 m bsl (BH01). The rotary coring was carried out using a deck mounted Comacchio MC-S1200 drill, a Terracore S-Geobor wireline system, triple tube core barrels and seawater flush. During core runs the driller constantly monitored and adjusted drill fluid circulation pressure, applied hydraulic pulldown pressure, rotation speed and feed rates to maintain a constant and efficient rate of penetration for the given formation, and to ensure the maximum core recovery possible. Where core recoveries were less than could reasonably have been expected, core run lengths were reduced to 50% of the previous length, unless otherwise directed by the Investigation Supervisor, to a minimum length of 0.5 m. On completion the boreholes were backfilled with cement to bentonite (2:1) grout as directed by the Investigation Supervisor.

The borehole records are given in Appendix C.2.

4.1.3 Sampling and Core Subsampling

The sample categories and achievable quality classes are defined in EN ISO 22475-1:2006 for each sample/sampler system.

In boreholes advanced by cable tool percussion boring techniques, disturbed samples were taken at each change in soil type and at regular vertical intervals during boring to identify and give a record of the strata encountered. Disturbed samples of soil were placed in a plastic tub or double sealed in plastic bags.

General purpose driven open tube (UT100) thin wall samples (100mm diameter thin walled OS-T/W, achievable quality Class 1) were taken of the cohesive strata where appropriate, and subsequently sealed to preserve their natural moisture contents. Thin wall push samples (100mm diameter thin walled OS-T/W, achievable quality Class 1) were taken where ground conditions permitted.



4.1.4 Photographic Records

Photographs of the rock core recovered are presented in Appendix D. The photographs are also presented as digital data in .jpeg format.

4.1.5 Standard Penetration Tests

Standard penetration tests (SPT) using a split spoon (S) or a solid 60° cone (C) were carried out in the granular and cohesive deposits and weathered rock at intervals stipulated by the Investigation Supervisor. The results are shown as S(N) and C(N) values on the borehole records at the relevant depths and tabulated in Appendix E together with the relevant SPT Calibration Report. The tests were carried out in accordance with BS EN ISO 22476-1:2005+A1:2011 'Geotechnical investigation and testing – Field testing. Part 3 Standard Penetration Testing'.

4.1.6 Groundwater Observations during Boring and Drilling

During the construction of boreholes in the marine environment the water level in the borehole is maintained at or above seawater level. Consequently, it was not possible to identify the inflow of groundwater into the borehole.



5. BOREHOLE RECORDS AND DESCRIPTION OF STRATA

An explanation of the symbols and abbreviations used on the borehole records, together with the method of strata description utilised, is given in the Notes on Exploratory Hole Records, in Appendix C.1

Details of the in situ sampling and testing carried out, together with the descriptions of the strata encountered are given on the borehole records, in Appendix C.2

The strata descriptions given in the borehole records, unless otherwise noted, are compiled from an examination of "disturbed" samples, "undisturbed" samples and rotary core samples, together with the results of any field testing and laboratory tests. Where there is a degree of uncertainty regarding the character of the soil or rock, the terms "probably" or "possibly" have been used and the descriptions should be treated with caution.

The consistency of cohesive strata is based on visual assessment alone; the identification and description of consistency is outlined in the Notes on Exploratory Hole Records, in Appendix C.1.

The Solid Core Recovery (SCR) and Rock Quality Designation (RQD) have been determined using the modified proposal, as given in Norbury et al (1986); that a "solid cylinder" should be defined as having a full diameter (but not necessarily a full circumference) without discontinuities and should be measured axially along the core. In a number of instances, the logging geologist assessed that some core from one run was recovered with the core from the next run. In these cases, the Total Core Recovery (TCR), SCR and RQD have been determined assuming that the core had been recovered from the core run in which it had first been drilled, and details are given in the remarks section of the borehole record. The description of rock is based on BS EN ISO 14689-1 (2003).

In his original work on the use of RQD in rock classification schemes, Deere (1968; 1989) advised that pieces of core which are not 'hard and sound' (ISRM 1978) should not be counted for the RQD even though they possess the requisite 4 in, (100 mm) length." Subsequently, 'sound core' was defined as any core which is fresh to moderately weathered and which has sufficient strength to resist hand breakage." This approached to RQD assessment is adopted by some international standards such as ASTM D6032.

In its current form BS5930 allows for the inclusion of both sound and weathered rock provided that it exhibits strength greater than 600 kPa. Thus, it may be expected that BS5930 RQD values will be much higher than that computed based on the Deere's original definition, particularly in "weak"/weathered rock sequences. Caution should therefore be exercised in using the BS5930 RQD values in rock mass classification systems which assume that RQD will be computed using Deere's original methodology.



6. GEOENVIRONMENTAL TESTING

Chemical analyses were scheduled by the Investigation Supervisor and carried out by RPS Bedford Ltd (RPS). A Schedule of Contamination Tests, presented in Table F.2 (Appendix F), gives details the number of tests undertaken. Information on sample collection, preservation, and deviating samples is given in Figure F.1.1 in Appendix F. The results are given in the RPS Certificate of Analysis Ref. No. 19-81762

The results, including details of any deviating samples and the reasons for any deviations and RPS UKAS accreditation certificates are presented in Appendix F.



7. DIGITAL DATA DELIVERABLES

Digital data to accompany the information presented within this report are listed in Table 7.1.

Table 7.1: Digital Data Deliverables

Digital Data	Folder Reference	
Exploratory Position Records, Field and Laboratory Tests:		
■ Association of Geotechnical Specialists (AGS) Version 4.0.4	AGS Data	
Photographic Records (cores):		
■ Photographic records of core in .jpeg format	Photography	
Geoenvironmental Laboratory Tests:		
 Geoenvironmental data as cross-tab tables in MS Excel Pre-dispersal Sampling Results Form in MS Excel 	Geoenvironmental Data	



8. REFERENCES

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APPENDICES

- A. LIMITATIONS ON USE OF DATA
- B. DRAWINGS
- C. EXPLORATORY HOLE RECORDS
- C.1 Keysheets
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- D. CORE PHOTOGRAPHS
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- E.2 Standard Penetration Test Results
- F. GEOENVIRONMENTAL TESTING
- G. SURVEY
- H. MARINE ACTIVITIES
- I. VESSEL AND PLANT DATA SHEETS



A. LIMITATIONS ON USE OF DATA

The scope of the investigation was determined by Arch Henderson LLP for the particular project requirements set out in the Specification for the Contract. The data presented in this report reflects the site conditions encountered at the time the investigation was performed. The investigation has disclosed evidence of conditions at point locations across the site which provides information about discrete volumes of soil or rock. Accordingly, there may be ground conditions at the site which may not have been revealed by the investigation, and the passage of time may give rise to changes in the conditions encountered. Any interpolation or extrapolation of strata from the exploratory boreholes is subject to the interpretation of the reader. Any cross-sections or plots are generalised by necessity and have been based on information found at the exploratory boreholes and depths sampled and tested. The exploratory borehole records should be read in conjunction with the Notes on Exploratory Hole Records presented in this report.

The investigation has been carried out by Fugro GeoServices Limited and the report has been prepared for the sole internal use of Global Energy Nigg Limited. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Fugro GeoServices Limited. If an unauthorised third party comes into possession of this report they rely upon it at their peril and the authors owe them no duty of care and skill.

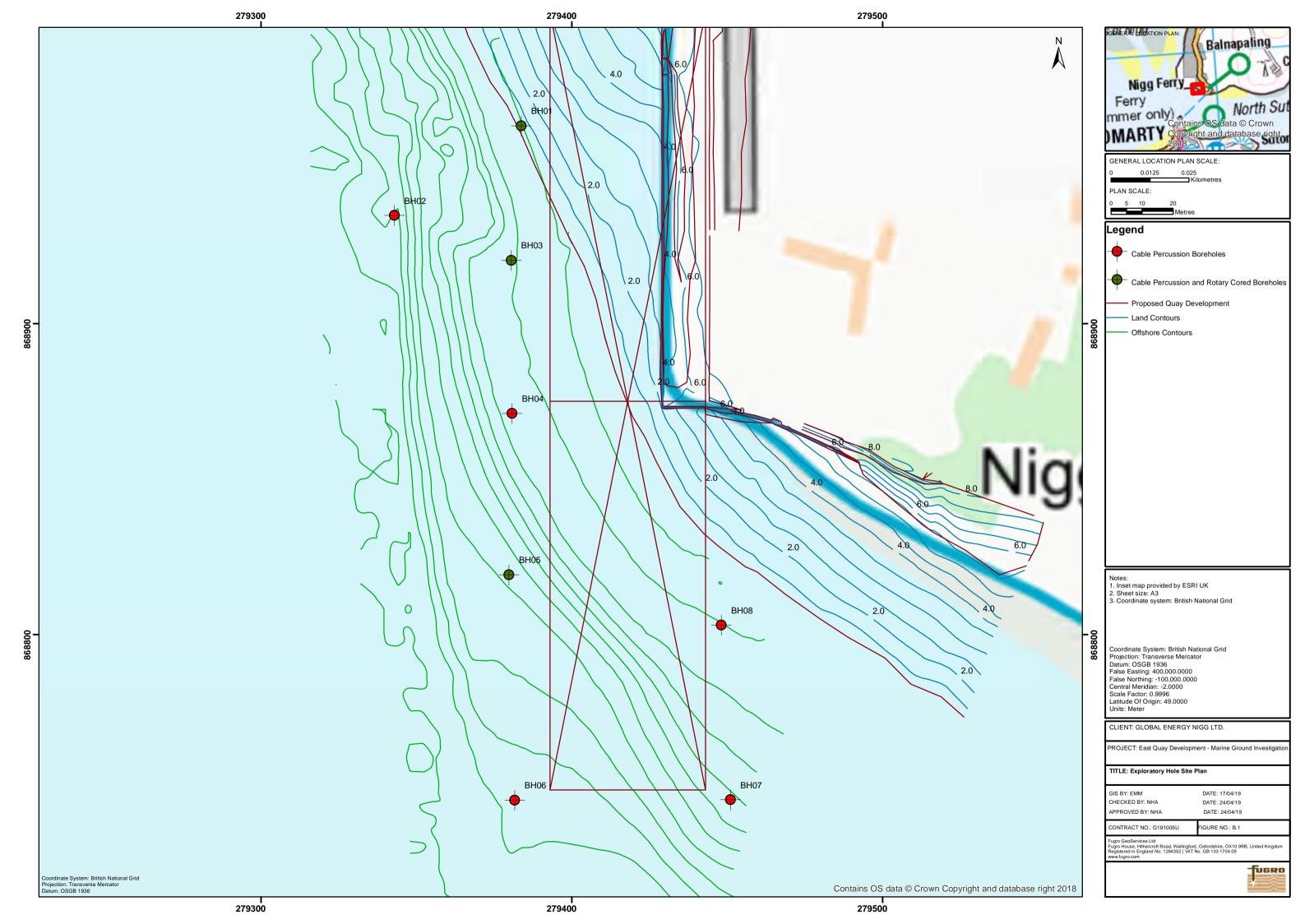
It is Fugro GeoServices Limited's understanding that this report is to be used for the purposes as described in the Specification for the investigation and as summarised in the text of the report. Should the purpose for which the report is used or the proposed use of the site change, this report may no longer be valid. Any further use or reliance upon the report in these circumstances by Global Energy Nigg Limited further review by and advice from Fugro GeoServices Limited shall be at their sole and own risk.



B. DRAWINGS

Exploratory Hole Site Plan

Figure B.1





C. EXPLORATORY HOLE RECORDS

C.1 Keysheets

General Notes on Exploratory Hole Records Figure C.1

C.2 Borehole Records

Borehole Records Figures BH01 to BH08



GENERAL NOTES

1 OPERATING PROCEDURES

The procedure used for cable percussion boring, rotary drilling, trial pitting, sampling, in situ and laboratory testing and sample descriptions are generally in accordance with BS5930:2015 'Code of practice for site investigations', BS EN ISO 14688-1:2002 'Geotechnical investigation and testing – Identification and classification of soil – Part 1 Identification and description', BS EN ISO 14689-1:2003 'Geotechnical investigation and testing – Identification and classification of rock – Part 1 Identification and description' as appropriate, and BS1377:1990 'Methods of test for soils for civil engineering purposes', unless stated otherwise. Sampling is carried out in general accordance with EN ISO 22475-1 and Standard Penetration Testing (SPT) is carried out to EN ISO 22476-3:2005.

2 GROUNDWATER

Exploratory hole water levels are recorded together with the depths at which seepages or inflows of water are detected. These observations are noted on the Records, but may be misleading for the following reasons:

- a) The exploratory hole is rarely left open at the relevant depth for a sufficient time for the water level to reach equilibrium.
- b) A permeable stratum may have been sealed off by the borehole casing.
- c) Water may have been added to the borehole to facilitate progress.
- The permeability may have been altered by the excavation/boring/drilling process.

Standpipes or piezometers should be installed when an accurate record of groundwater level is required, however, it should be noted that groundwater levels may vary significantly due to seasonal, climatic or man made effects. Water levels recorded during the investigation and any advice or comment made accordingly may, therefore, not be appropriate to particular foundation, geotechnical design, or temporary works solutions. Long term monitoring of standpipes or piezometers is always recommended when water levels are likely to have a significant effect on design.

3 CHISELLING

The remarks in the Borehole Records contain information on the time spent advancing the borehole by 'Chiselling Techniques', and the depth of borehole over which it was required. Such information may be affected by a wide range of variable factors, unrelated to the geotechnical properties of the strata. Such factors include, but are not restricted to: plant, equipment and operator. The data should, therefore, only be used subjectively and with extreme caution.

4 IDENTIFICATION AND DESCRIPTION OF SOILS - SEE SEPARATE SHEET

The identification system follows the Company's Engineering: Geotechnical Procedures Manual which is based on BS EN ISO 14688-1:2002 and appropriate clarifications in the National Foreword, BS 5930:1999 and BS EN ISO 14689-1:2003

Relative density terms are given where supported by SPT N values, with the exception of Made Ground. The field assessment of compactness or relative density for coarse grained soils is only given on trial pit records where appropriate assessment of the soils has been undertaken.

Where the terms 'soft to firm', 'firm to stiff' etc. are used they indicate a strength which is close to the borderline between the two terms and cannot be precisely defined by inspection only, and/or which is indicated as borderline or ranging between the two terms after consideration also of in situ and laboratory test results. Consistencies may have been amended in the light of test results

Where 'to' links two terms, as in 'slightly sandy to sandy' this again represents a borderline case or a range, where the precise proportions cannot be determined as outlined previously.

The name of the geological formation is only given where this has been requested and can be determined with confidence (see Clause 41.5 of BS 5930:1999).

5 INTERPRETATION OF THE RESULTS OF THE INVESTIGATION

The description of ground conditions encountered and any engineering interpretation included in the report are based on the results of the boreholes and trial pits and the field and laboratory testing carried out. There may be ground conditions at the site which have not been revealed by the investigation and consequently have not been taken into account.

Any interpolation or extrapolation of strata between exploratory holes shown on any cross sections or site plans is an estimate only of the likely stratification based on general experience of the ground conditions and is subject to the interpretation of the reader.

The term "TOPSOIL" is used in this report to describe the surface, usually organic rich, layer including turf, subsoil and weathered material with roots. The use of this term may not imply that the soil satisfies the requirements of Clause 3 of BS 3882:1994, 'Specification for topsoil', or is suitable for general horticultural and agricultural purposes.

Laboratory test results in this report give the soil properties of individual specimens tested under specified conditions. Individual results or groups of results may not be appropriate for use as design parameters for some geotechnical analyses. The samples may be non-representative, disturbed internally, or prepared and tested under conditions suited for different geotechnical applications. Unless the selection of design parameters is discussed in this report, it is recommended that the advice of a Geotechnical Specialist is sought.

GLOBAL ENERGY NIGG LIMITED EAST QUAY DEVELOPMENT - MARINE GROUND INVESTIGATION



IN SITU TESTING AND SAMPLING

STANDARD PENETRATION TESTS

S()&C() Standard Penetration Test (SPT). S() denotes a 50mm diameter split barrel sampler, normally undertaken in cohesive and mixed soils and C() indicates the test was carried out using a 50mm diameter, 60 degree apex, solid cone normally used in coarse granular soils and weak rock. The tests are carried out in accordance with EN ISO 22476-3:2005

The distance that the SPT assembly sinks into the ground prior to the start of the test is measured and reported as Static Weight Penetration (SWP). The sampler or cone is driven up to 450mm into the soil using a 63.6kg hammer with a 760mm drop. An initial seating drive of 150mm (or 25 blows whichever is less) is undertaken to penetrate through any ground which may be disturbed at the base of the borehole. For the test drive, the number of blows required to obtain an additional 300mm penetration (or penetration for 50 / 100 blows) is recorded as the penetration resistance (also known as the 'N' value). The test is usually completed when the test drive attains the 300mm penetration or the number of blows recorded during the 'test drive' only reaches 50 in soils or 100 in weak rock.

If the sampler advances below the bottom of the borehole under the static weight of the drive rods with the hammer assembly on top, the corresponding penetration is not included as seating drive but the information is reported separately as SWP. The test is terminated in all cases before the non return valve reaches the level of the material at the base of the borehole, in effect about 600mm total penetration. If SWP (Static Weight Penetration) is greater than 150mm then test increments of 75mm are undertaken with the final increment being completed at less than 600mm total penetration including SWP.

If a sample is not recovered in the sampler, or the cone is used, a disturbed sample of appropriate size for the material is taken on completion of the test over the depth of the test zone. The sample is given the same depth as the top of the Standard Penetration Test drive.

The depth on the Borehole Record at the left hand side of the 'Depth' column is that at the start of the test Where full penetration of the test drive is obtained, the penetration resistance ('N' value) is reported in the 'SPT Blows/N' column. If full penetration in the test drive is not obtained, then the length of drive (test length in mm) and the penetration resistance (number of blows) are both reported. Full results, including the cone or barrel type, static weight penetration, blows and penetration of each of the Seating Drive and Test Drive increments, the calibration reference number for the SPT hammer assembly, the energy ratio and the 'N' value, as well as start and end depths and water and casing levels are given on the separate Standard Penetration Test Summary

* in the 'Test Length' column denotes that the blows and penetration include the initial Seating Drive blows.

OTHER IN SITU TESTS

The following in situ tests are reported on the **Exploratory Hole Records**, in the 'Test' or 'Type' and 'Results' columns where appropriate.

- k In situ Permeability Test refer to detailed test results for permeability values
- PMT Pressuremeter Test refer to detailed test results for modulus values, etc.
- FVN/R Borehole Shear Vane Test (undrained shear strength c_u in kPa) refer also to detailed test results, N 'Natural' or peak shear strength, R Remoulded shear strength
- HVN/R Hand Shear Vane Test (Direct reading of undrained shear strength in kPa). 'N' and 'R' as above. The values are indicative and should not be taken as being equivalent to laboratory test results. The Pilcon vane results have a factor varying from about a sixth for the 33mm vane to a third for the 19mm vane which reduces the BS1377 shear vane value. The values presented are therefore approximate and should be treated with great caution if used for design purposes
- PP Pocket Penetrometer. Unconfined Strength (UCS) reported in kg/cm² to the nearest 0.25 kg/cm² or kPa with the same accuracy. Equivalent c_u in kPa is very approximately UCS x 50. Pocket Penetrometers are an aid to logging of cohesive soils, the results are indicative and should not be relied upon. The equipment used is not calibrated
- TV Tor Shear Vane (direct reading of undrained shear strength in kPa). Tor vanes are an aid to logging of cohesive soils, the results are indicative and should not be relied upon. The equipment used is not calibrated
- CBR California Bearing Ratio Test (CBR%) refer also to detailed test results
- PID Photo-Ionisation Detector Readings in headspace of small disturbed chemical samples. Result given in ppm by volume

GLOBAL ENERGY NIGG LIMITED EAST QUAY DEVELOPMENT - MARINE GROUND INVESTIGATION



IN SITU TESTING AND SAMPLING

UNDISTURBED SAMPLES

All samples recovered are recorded and handled in accordance with EN ISO 22475-1.

U/UT General purpose open tube sample. Sample normally taken with open tube sampler approximately 0.1m diameter and 0.45m long and driven with an 80kg sinker bar and 56kg sliding hammer, unless noted otherwise. "XX" in U100 blows column denotes the number of hammer blows. The height of hammer drop can be variable depending on operator technique. Depths are given of the top of the sample if full penetration and recovery are achieved, otherwise actual lengths of penetration and recovery are given in the appropriate columns.

'U' denotes steel or plastic liner sample in general use up to year 2010 designated OS/TKW in accordance with BS EN ISO 22475-1 with an area ratio greater than 25%. 'UT' denotes thin wall open tube sampler designated OS/TW with an area ratio less than 15%, available from 2010.

U/UT(X) General purpose open tube sample (X) mm diameter

TW(X) Thin wall (push) sample (X) mm diameter

P(X) Piston sample (X) mm diameter

DISTURBED AND CORE SAMPLES

CBR Sample taken in CBR Mould

D Small disturbed sample (plastic tub or jar with air tight lid)

B Bulk disturbed sample (polythene bag, tied at neck - size dependent on purpose)

LB Large Bulk disturbed sample (normally several bulk samples of the same material - size dependent on purpose)

W Water sampleC Core sample

CS Short core, generally about 100mm
CL Long core, generally 250mm to 300mm

Sample not recovered

ENVIRONMENTAL SAMPLES

CD Sample for chemical analysis in a plastic tub

K Sample for chemical analysis in an amber glass jar

V Sample for chemical analysis in a glass vial

CDKV Set of samples for chemical analysis as above

WAC Sample for Waste Acceptance Criteria

EC Environmental Soil Sample
EW Environmental Water Sample

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KEY TO BOREHOLE AND TRIAL PIT RECORDS

Soil Types Coarse grained, Non cohesive Boulders	Fine grained, Cohesive	Other Soil Types Topsoil
Cobbles	Clay	the dec. the
Gravel		Made Ground
Sand	Note: Composite soil types may be signified by combined symbols.	
Rock Types Sedimentary Sandstone	Triprit	Coal
Siltstone	Limestone	Mudstone/Claystone/Shale
Conglomerate	Breccia	
Metamorphic Coarse/Medium grained	Igneous + + + + + + Coarse grained	
Fine grained	++++ ++++ Medium grained	
	Fine grained	
KEY TO	O SITE PLANS AND CROSS SECTIONS	Borehole Position
Length of piezometer/s (Tip Depth) Highest recorded water	r level in piezometer or standpipe standpipe response zone r level in hole	Trial Pit Position A Line of Section
© V water strike Standard Penetration to	est (SPT) "N" value using split spoon	

Standard Penetration test (SPT) "N" value using solid 60° cone

Undrained cohesion in kPa

_ cu()

GLOBAL ENERGY NIGG LIMITED EAST QUAY DEVELOPMENT - MARINE GROUND INVESTIGATION



DESCRIPTION OF ROCK CORES

DESCRIPTIVE ORDER

Strength, Structure, Colour, Texture, Grain Size, ROCK NAME. Minor constituents and additional information. (Geological formation - see comments under identification and description of soils). Mass characteristics - factual description of weathering state (if appropriate) and description of discontinuities and fracture state (if appropriate).

Term	Field identification	Strength (MPa)
Extremely weak	Can be indented by thumbnail. Gravel sized lumps crush between finger and thumb.	<1.0
Very weak	Crumbles under firm blows with point of geological hammer. Can be peeled by a pocket knife.	1 – 5
Weak	Peeled by a pocket knife with difficulty. Shallow indentations made by firm blow with point of geological hammer.	5 – 25
Medium strong	Cannot be scraped with pocket knife. Can be fractured with a single firm blow of geological hammer.	25 – 50
Strong	Requires more than one blow of geological hammer to fracture.	50 – 100
Very strong	Requires many blows of geological hammer to fracture.	100 – 250
Extremely strong	Can only be chipped with geological hammer.	> 250

DISCONTINUITIES

Bedding Spacing & Planar Structures *	Spacing (mm)	Discontinuity Spacing
	>6000	Extremely widely spaced
Very thickly bedded	>2000 2000-6000	Very widely spaced
Thickly bedded	600 - 2000	Widely spaced
Medium bedded	200 - 600	Medium spaced
Thinly bedded	60 - 200	Closely spaced
Very thinly bedded	20 - 60	Very closely spaced
Thickly laminated (Sedimentary) narrow (Metamorphic & Igneous)	6 – 20 <20	Extremely closely spaced
Thinly laminated (Sedimentary) Very narrow (Metamorphic & Igneous)	<6	

For igneous and metamorphic rocks the appropriate descriptive term for planar structure should be used e.g. medium foliated gneiss, very narrowly cleaved slate, very thickly flow banded diorite.

WEATHERING

Standard descriptions of weathered rocks for engineering purposes should always include comments on the degree, extent and nature of any weathering effects at material or mass scales. This may allow subsequent classification and provide information for separating rock into zones of like character. Indications of weathering include changes in colour changes in fracture state reduction in strength presence, character and extent of weathering products

If a systematic classification following the guidelines given in the Standard can be applied unambiguously, this is described in the text of the report. Otherwise, the rocks are not classified in terms of weathering beyond the approach described above.

Weathering terms that may be used for description of rock material and these terms may be qualified or combined. Discoloured - The degree and type of colour change from original is described, and if for mass or particular mineral constituents Disintegrated - Fragmentation by physical weathering, bonding lost but material fabric intact. Material friable, not decomposed Decomposed - Chemical alteration of mineral grains so material fabric is intact but some or all grains are decomposed

For rock mass weathering the following terms may be used

Slightly - Discolouration on surfaces and / or of material
Partially - Slightly reduced strength, slightly closer fracture spacing, weathering extending in from fractures.

Moderately - Less than half of mass decomposed/disintegrated. Fresh/discoloured rock as continuous material or corestones Highly - More than half decomposed/disintegrated. Fresh/discoloured rock as discontinuous framework or corestones

Completely - All rock material decomposed and/or disintegrated. Original mass structure largely intact

Residual Soil - All material converted to soil, structure and fabric destroyed, may be volume change but material not moved The term 'Fresh' is used to indicate that there is no visible weathering or alteration, except possibly slight discolouration on major surfaces

Appendix C Contract No. G191005U Figure C.1 (Page 5 of 7)

GLOBAL ENERGY NIGG LIMITED EAST QUAY DEVELOPMENT - MARINE GROUND INVESTIGATION



ROCK CORES

ROCK CORE SIZES

The core barrels commonly used by the Company in site investigations are as follows:

Core Barrel	Borehole	Standard Core	Core Size using	Casing Size	Casing O.D	Casing I.D
Type	Diameter	Size	Rigid Plastic Liner	or Type	(mm)	(mm)
,	(mm)	(mm)	(mm)	7.	, ,	, ,
STA	NDARD BRITISH	SIZES	, ,			
NWM	75.7	54.7	51	NX	88.9	76.2
HWF	98.8	76.2	72	HX	114.3	100.0
HWAF	99.5	70.9	-	HX	114.3	100.0
PWF	120.0	92.1	87	PX	139.7	122.3
SWF	145.4	112.8	107	SX	168.3	147.7
UWF	173.7	139.8	132	UX	193.7	176.2
	WIRELINE SIZE					
BQ	59.9	36.4	35			
NQ	75.7	47.6	45			
HQ	96.1	63.5	61			
PQ	122.7	85.0	82			
GEOBOR S	146.0	102.0	102	SX	168.3	147.7
	THINWALL SIZE					
TNX	75.7	60.8	-	NX	88.9	76.2
T2 66	66.1	51.9	-	74	74.3	67.3
T2 76	76.1	61.9	-	84	84.3	77.3
T2 86	86.1	71.9	68	98	98.0	89.0
T2 101	101.1	83.9	80	113	113.0	104.0
T6 116	116.1	92.9	89	128	128.0	118.0
T6 131	131.1	107.9	104	143	143.0	133.3
	N STANDARD BAI		70	DV	400.7	400.0
4.12F	105.2	74.7	72	PX	139.7	122.3
TRIEFUS	400.7	404.0		CV	400.0	4 4 7 7
5.5x4C	139.7	101.6	-	SX	168.3	147.7
SINGLE						
TUBE	440	400		DV	400.7	400.0
B116	116	102	-	PX	139.7	122.3
B146	146	132	-	SX	168.3	147.7

Note: Core diameters may vary when different lining systems are in use.

NCB Non coring bit for GEOBOR S.

ROCK CORE CHARACTERISTICS

- TCR **Total Core Recovery.** The length of the total amount of core sample recovered, expressed as a percentage of the length of the core run.
- SCR Solid Core Recovery. The length of solid core recovered, expressed as a percentage of the length of the core run. Solid core is defined as that length of core which has a full diameter, but not necessarily a full circumference. Only natural fractures are considered. Drilling or handling induced fractures are ignored.
- RQD Rock Quality Designation. The length of solid core recovered in pieces each more than 100mm long as a percentage of the core run length.
- I_f **Fracture Index.** The number of discontinuities expressed as 'fractures per metre', measured over any convenient length of consistent fracture characteristics. Fracture index is normally measured axial along the core.
- Fs Fracture Spacing. The minimum, average and maximum spacing of discontinuities in mm, measured over any convenient length of consistent fracture characteristics. Fracture spacing is normally measured perpendicular to the discontinuity plane unless indicated otherwise.
- AZCL Assumed Zone of Core Loss

Zones of atypical fracturing of restricted extent which occur within a rock unit of uniform fracture characteristics are identified within the Description of Strata, but not given a separate I_f / F_s .

NI - Not Intact NR - No Recovery NA - Not Applicable DI – Drilling Induced

 I_s Corrected **Point Load Strength Index** $I_{s(50)}$ which is given in MPa



IDENTIFICATION AND DESCRIPTION OF SOILS

	Basic Soil Ty	ре	Particle Siz	œ.	Visual Identification	Composite Soil Ty (Mixtures of basic s		es)			Density / Cor	t Condition		
KSE S	BOULDE	ERS			Large Boulders >630mm. These soils only seen complete in pits	Scale of secondary coarse soils. Term							ative description	
VERY COAR SOILS	COBBL	.ES		200	or exposures. Often difficult to recover from boreholes.	Term before (term in '[]' may				Approx % 2 nd ry	by inspection packaging.	on of voids	and particle	
			coarse	63	Easily visible to naked eye; particle	be used for 2 nd ry parts, matrix etc)	Principal Soil Type	Descrip	tion after	soil	Standard Penetration Test in Boreh for Coarse Soils			
Sizes)		-	medium	20	shape can be described, grading can be described.	Slightly (sandy*)	ES P	Used to	describe	type	No of blows	Relative Dens	sity	
ravel	GRAVE	=1	modium	6.3	Well graded: wide range of grain sizes, well distributed. Poorly graded:	[occasional / little]	BBL	second		<5	<4	Very Loose		
nd G	OKAVI				not well graded. (May be uniform: size of most particles lies between	(sandy*)	S 6	e.g. Gra	avel is		4-10	Loose		
SOILS over 65% Sand and Gravel			fine		narrow limits; or gap graded; an intermediate size of particle is	[some]	ფ	fine and	d medium ular fine	5 – 20	10-30	Medium Dense		
% %				2	markedly under represented). Visible to naked eye; no cohesion	Very (sandy*)	SAND, GRAVEL or BOULDERS	sandsto mudsto	ne and ne.	20 to	30-50	Dense		
COARSE SOILS (Typically over 65			coarse	0.63	when dry; grading can be described. Well graded and poorly graded: as	[much / many]		and (an		40†	>50	Very Dense		
SE SC IJy ov	SAND		medium		above			and (sa and (co	bbles+)	50†	Slightly	Visual Examin		
DAR8 ypica			fine	0.2		Fine or coarseVery coarse so	oil type	- see No	otes		cemented	can be abrade	in lumps which ed.	
ŏE				0.063	Only coarse silt visible with hand lens;	† described as fi Scale of secondary					Silty CLAY or	clayey SILT – ı	ise prefix only	
			coarse	0.02	exhibits little plasticity and marked dilatancy; slightly granular or silky to	before, description	after p	rincipal c	onstituent.		when seconda	ary constituent lerial characteris	has significant	
	SILT		medium	0.0063	touch. Disintegrates in water; lumps dry quickly; possesses cohesion but	Term before	efore ad Des			Approx % 2 nd ry		ry' not applicab		
			fine		powders easily between fingers.	Tellii belole	Principal Soil Type	Descrip	tion arter	soil type	Consistency			
Sizes)		-		0.002	Term "SILT" or "CLAY" must be used, "SILT/CLAY" not allowed.	Slightly (sandy*)		Used to	describe nents of arv	<35	Very soft		pushed in up to udes between	
d Clay					Dry lumps can be broken but not powdered between the fingers; they	(sandy*)	r SILT	constitu	ents	35 to 65†	Soft		ed in up to ed by fingers	
Siltano	CLAY				also disintegrate under water but more slowly than silt; smooth to the	Very (sandy*)	CLAY or	Gravel	CLAY. is coarse d quartzite	>65†	Firm		es impression	
FINE SOILS (Typically over 35% Silt and Clay Sizes)	2000			touch; exhibits plasticity but no dilatancy; sticks to the fingers and dries slowly; shrinks appreciably on drying usually showing cracks.	* Coarse soil type a † or described as o behaviour			nding on m	ass	Stiff	thumb. Crumi			
SOIL sally o					Intermediate and high plasticity clays show these properties to a moderate	EXAMPLES OF CO					Very Stiff	Indented b Cannot be mo	by thumbnail. Dulded	
Typic					and high degree, respectively.	(indicating preferre				·D 4\/EI			ched by thumb	
	ORGAI	NIC			Contains varying amounts of organic	Loose brown very s with many pockets					Firm Peat	Fibres compre	essible, open	
N NC	CLAY, SILT	or	Varies		vegetable matter - defined by colour: grey - slightly organic;	Firm thinly interlam	inated	brown S	LT and CL	AY.	Spongy Peat	Very compres		
ORGANIC SOILS	SAND	0.			dark grey – organic; black – very organic.	Dense light brown	clayey	fine and	medium SA	ND.	Plastic Peat	Moulded in ha	and, smears	
Structur	е												Particle Nature	
Term		Field I	dentification			Interval Scales							Particle	
Homo-		Depos	sit consists e	ssentially o	of one type	0 1 (0 1) 0			Mean Sp	acing	Scale of Space	ing of Other	Shape & Form	
geneous						Scale of Bedding S	pacing	1	(mm)		Discontinuitie		Very angular	
Interbede interlami	nated i	n equ		s. Otherw	types. Pre-qualified by thickness term if rise thickness of, and spacing between,	Very thickly bedded	t		over 200	0	Very widely sp large]	oaced / [Very	(Sub) angular (Sub) rounded Well rounded	
Hetero- geneous		A mixt	ture of types			Thickly bedded			2000-600)	Widely space	d / [Large]	Low Sphericity	
Weather (granula)		Particl	les may be w	eakened a	and may show concentric layering	Medium bedded			600-200		Medium space	ed / [Medium]	Flat or Elongate	
Weather (cohesive	ed	Usuall	ly has crumb	or column	nar structure	Thinly bedded			200-60		Closely space	ed / [Small]	High	
Fissured		Break	s into blocks	along unp	olished discontinuities	Very thinly bedded		60-20		Very closely /	[Very small]	Sphericity Cubic		
Sheared				along poli	shed discontinuities	Thickly laminated			20-6		Extremely clo	selv spaced		
Intact		No fiss Plant i		ognisable a	and retain some strength. When	Thinly laminated			under 6		•	- '	Particle Surface	
Fibrous I Pseudo-	eat	squee	zed only wat	er, no soli		Spacing terms may laminae, desiccation	n crac	ks, rootle	ts etc. Teri	ns such a	s partings or du	Texture		
fibrous P	eat .	Turbid	water when	squeezed	l, <50% solids	used for laminae less than 2mm and less than					spectively.		Rough	
Amorpho Peat		squee	zed only pas	ste with >5		Discontinuity Shape Small scale (mm's) rough						Smooth		
Gyttja					remains, maybe inorganic constituents	Persistence/Openness) Large scale (m's) wavy, curved, straig						uating	Polished	
Humus					ns & inorganic constituents in topsoil	Persistence/Openness) Large scale (m s) wavy, o					DE EN ICO 446			

NOTES Identification and descriptive method, and descriptions, generally in accordance with BS5930:1999 Section 6 clauses 41 and 43 and BS EN ISO 14688-1:2002
Additional notes relating to BS EN ISO 14688-2:2004 – modified terms for content of secondary fraction given in Annex B Table B1 are not comparable to 5930 and are not be used.

Organic Content :- Low – 2 to 6%; Medium - 6 to 20%; High - >20%. Terms not used on borehole records

Carbonate content :- Only noted if field test with dilute HCI undertaken – Carbonate free if no effervescence; Calcareous if slight effervescence; Highly calcareous if strong reaction

Carbonate content: - Only noted if field test with dilute HCI undertaken – Carbonate free if no entervescence; Calcareous if slight entervescence; Highly calcareous if strong reaction Undrained shear strength: - terms from laboratory or in situ tests not given on borehole records.

Very Coarse Soils – described by initially removing very coarse materials and describing residue before adding back the very coarse soils. If residue is cohesive then described as '......(COBBLES / BOULDERS) with low (cobble / boulder) content with (some / much etc) matrix of' If residue is granular then described as ' with matrix of ' or as a coarse soil.

Cobbles: -<10% - low cobble content; 10 to 20% - medium content; >20% - high content;

Boulders <5% - low boulder content; 5 to 20% - medium content; >20% - high content



Contract Name	Nigg Energy Park, East Qu	ay Development		Location ID	
Client	Global Energy Nigg Ltd			∣B⊦	4
Fugro Reference	G191005U				
Coordinates (m)	E279383.70 N868963.58	Ground Elevation (m Datum)	0.85	Sheet 1 of 3	
			•		Т.

		Hole	Туре	Cabl	e Per	cuss	ion a	nd Ro	otary Coring	Status		Draft		
Depth	Samp	ling an	d In Situ Testing	Co	ore R	ecove	ery		Strata Details				Grour	ndwater
(m)	Туре	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.00 - 0.50 - 0.00 - 0.50 - 0.50 - 1.00 - 0.50 - 1.00	D ES D ES	2 1 4 3						-	Brown slightly gravelly, locally gravelly, SAND with frequent shell fragments (<1 x 1mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies.	(1.00)				
- 1.00 - 1.50 1.00 - 1.50	D ES	6 5						1 -	Greyish brown SAND with occasional shell fragments (<1 x 1 mm) and occasional mica flakes (<2 x 2mm).	1.00	-0.15			
- 1.50 - 2.00 - 1.50 - 2.00 2.00 - 2.50	D ES D	8 7 10						2-						
2.00 - 2.50 - - 2.50 - 3.00 - 2.50 - 3.00	ES D ES	9 12 11						- - - - -		(2.80)				
3.00 - 3.50 3.00 - 3.50	D ES	14 13						3 —						
3.80 - 4.00 3.80 - 4.00 4.00 - 4.50 4.00 - 4.50	D ES D ES	16 15 18 17						4 —	Soft dark brownish grey sandy CLAY with abundant mica flakes (<2 x 2mm) and sulphureous odour. Sand is fine and medium. Brown SAND with frequent mica flakes (<2 x	3.80 (0.20) 4.00	-2.95 -3.15			
- 4.50 - 5.00 - 4.50 - 5.00	D ES	20 19						-	2mm).	(1.00)				
- 5.00 - 5.50 5.00 - 5.50	D ES D	22 21						5 —	Brown SAND with occasional angular fragments (<60 x 60 x 40mm) of cemented sand (possible lens), frequent mica flakes (<2 x 2mm) and rare gravel and cobbles. Sand is fine		-4.15			
- 5.50 - 6.00 - 5.50 - 6.00 	ES D ES	24 23 26 25						6-	to coarse. Becomes gravelly with depth. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone. Cobbles (<120 x 100 x 80mm) are subangular of gneiss. Below 6.00m; becoming gravelly.	(1.70)				
- 6.70 - 6.80 - 6.80 - 7.00 - 7.00 - 7.50 - 7.00 - 7.50	D ES D ES	27 28 30 29						7 —	Brown slightly gravelly SAND. Sand is mainly fine and medium, gravel is subangular and subrounded fine to coarse of mixed lithologies. With frequent mica flakes (<1 x 1mm) and	6.70 (0.80)	-5.85			
7.50 - 8.00 7.50 - 8.00	D ES	32 31						-	occasional locally frequent pockets or beds of very stiff grey silty clay with occasional lenses (<10 x 1mm) of brown fine and medium sand.	7.50	-6.65			
- 8.00 - 8.50 - 8.00 - 8.50	D ES	34 33						8	Between 6.70m and 6.80m; clay pockets, soft. Brown slightly gravelly, locally gravelly, SAND with frequent mica flakes (<2 x 2mm). Sand is predominantly medium and coarse. Gravel is subangular and subrounded fine to coarse of					
- 8.50 - 9.00 8.50 - 9.00	D ES	36 35						-	mixed lithologies. Between 7.50m and 8.00m; sand is fine to coarse.					
- 9.00 - 9.50 - 9.00 - 9.50 - - - 9.50 - 10.00	D ES D	38 37 40						9 —						
9.50 - 10.00 9.50 - 10.00	ES D	39 42						-	Continued					
10.00 - 10.50	ES	41							Continued next page					

Notes

TUGRO

Contract Name	Nigg Energy Park, East Qua	y Development		Location ID	
Client	Global Energy Nigg Ltd			BH	101
Fugro Reference	G191005U				
Coordinates (m)	E279383.70 N868963.58	Ground Elevation (m Datum)	0.85	Sheet 2 of 3	
	0 11 0 1 10 1	0 1		0	D (1

		Hole	Туре	Cabl	e Per	cuss	ion a	nd Ro	otary Coring	Status		Draft	i	
Depth	Samp	ling an	d In Situ Testing	Co	ore R	ecove	ery		Strata Details				Grour	ndwater
(m)	Туре	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installatio
- 10.50 - 11.00 10.50 - 11.00	D ES	44 43						- - - -	Between 10.00m and 12.50m; sand is fine to coarse. Rare to occasional gravel.	(5.50)				
-11.00 - 11.50 11.00 - 11.50	D ES	46 45						11 —						
- - 11.50 - 12.00 - 11.50 - 12.00	D ES	48 47						- - - -						
-12.00 - 12.50 - 12.00 - 12.50	D ES	50 49						12						
- - 12.50 - 13.00 - 12.50 - 13.00	D ES	52 51						- - - -	Between 12.50m and 13.00m; slightly gravelly. Gravel is subangular and subrounded fine and medium of mixed lithologies.					
13.00 - 13.50	D	53						13 —	Brown SAND with abundant mica flakes (<2 x 1mm). Sand is fine to coarse.	13.00	-12.15			
- 13.50 - 13.85 -	D	54						-						
14.00 - 14.50 -	D	55						14 —		(2.50)				
- 14.50 - 15.00 - -	D	56						-						
-15.00 - 15.50 - -	D	57						15 — - -						
- 15.50 - 16.00 - 16.00 - 16.50	D D	58 59						16 —	Brown slightly gravelly SAND with frequent mica flakes (<2 x 1mm). Sand is medium and coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies.	15.50	-14.65			
- - - 16.50 - 17.00	D	60						-	Below 16.00m; gravelly. At 16.50m; 1 No. cobble (90 x 100 x 110mm) of	(1.10)				
_ 17.00 - 17.35	D	61						17 —	dark grey psammite? Reddish-brown SANDSTONE. Recovered as slightly gravelly sand.	(0.75)	-15.75			
17.35 - 17.45 - 17.45 - 17.75							NR 0	- - - -	Assessed zone of core loss. Extremely weak reddish brown SANDSTONE. Slightly to moderately weathered.	17.35 (0.10) 17.45 (0.30)	-16.50 -16.60			
- - 17.35 - 18.85 - -				93	93	93		18 —	Signify to moderately weathered. Discontinuities not observed. Very weak, medium bedded, locally very thinly to thinly bedded (inclined 20°), reddish-brown locally light greenish grey SANDSTONE. Slightly weathered. With occasional subrounded clasts (<10 x 20mm) of quartz and occasional subangular to subrounded clasts (<20 x 10mm) of very stiff red clay.	17.75	-16.90			
17.75 - 20.35 - - - 18.85 - 20.35				100	100	95	1	19 — - - - - -	Discontinuities - see depth related remarks. Between 17.85m and 17.92m; occasional light greenish grey pockets (<20 x 50mm). At 17.92m; joint, subvertical (80°), undulating, rough, very tight, clean. At 18.11m; bedding plane discontinuity, inclined (20°), planar, rough, very tight, micaceous. Between 18.15m and 18.30m; irregular light	(2.60)				
[-								-	greenish grey bed inclined (20°). Continued next page	-				
			I .		L	_								

Notes

		Contract Name	Nigg Energy Park, E	ast Qua	ay Development		Location ID
-fuci	RO	Client	Global Energy Nigg	Ltd			B
	\geq	Fugro Reference	G191005U				
	\equiv	Coordinates (m)	E279383.70 N86896	3.58	Ground Elevation (m Datum)	0.85	Sheet 3 of 3
		Hole Type	Cable Percussion ar	nd Rotar	y Coring		Status
	Sampli	ng and In Situ Testing	Core Recovery		Strata De	tails	

	\approx	Fugro Reference G1910050 Coordinates (m) E279383.70 N868963.58 Ground Elevation (m Datum) 0.85						Cround Flouration (no Datum) 0.05	Sheet 3 of 3						
	\sim		. , ,	E279383.70 N868963.58 Ground Elevation (m Datum) 0.85 Cable Percussion and Rotary Coring							Dref				
			Туре					na Ro		Status		Draf			
Depth	Samp	ling an	d In Situ Testing	Co	ore R	ecove	ery		Strata Details			1	Grou	ndwate	
(m)	Туре	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickne (m)	Level (m Datum	Legend	Water Strike	Backfil Installat	
									Between 18.85m and 19.25m; thinly laminated. Between 19.04m and 19.10m; light greenish grey						
									irregular lens. Between 19.90m and 20.00m; light reddish grey. At 20.19m; bedding plane discontinuity, inclined	20.3	-19.50				
									(20°), planar, rough, very tight, clean. At 20.19m, bedding plane discontinuity, inclined	1					
								21 —	(20°), planar, rough, very tight, clean. Very weak thickly laminated locally very thinly]					
20.35 - 21.85				100	100	100			to thickly bedded, reddish brown locally light						
									grey and light greenish grey, SANDSTONE. Slightly weathered. Discontinuities - see depth						
									related remarks. Between 20.70m and 20.80m; cross bedded.						
20.35 - 23.35							1	22 -	Between 20.95m and 21.12m; occasional pockets (<30 x 50mm) and laminae (<15mm thick) of light	(3.00)				
									greenish grey sandstone. Between 21.45m and 21.57m; cross bedded. Below 21.85m; medium bedded with frequent						
								:	subangular and subrounded clasts (<6mm) of mixed lithologies.						
1.85 - 23.35				100	100	100		-	Between 22.55m and 22.65m; angular clast (100 x 80mm) of very stiff red clay. Becoming reddish						
								23 -	brown mottled light greenish grey with frequent clay clasts (<10 x 10mm).						
								23 -	Between 20.65m and 22.81m; light greenish grey sandstone with frequent subrounded and						
								:	subangular clasts (<20 x 30mm) of very stiff red clay.	23.3	-22.50		1		
									At 23.18m; bedding plane discontinuity, inclined (20°), planar, rough, very tight, clean. Between 23.18m and 23.24m; laminae (10 to 15	1					
								24 -	mm thick) of light greenish grey sandstone. End of Borehole at 23.35 m]					
								24	Life of Borelioe at 25.55 III						
								25 —							
								:							
								26 -							
								27 -							
								28 -							
								29 —							
								-3 -							
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								-	1			1			

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

BH01

								igg Energy Park, East Quay Development Location ID														
				Cor	ntract Nar	me I	Nigg E	nergy P	ark, Eas	t Qua	y De	velo	pment					LUC				_
恒	JGR	0]	Clie				I Energy	Nigg Ltd	i								1	E	3H	10	1
	$= \stackrel{\hat{\wedge}}{\hat{\sim}}$			\vdash	ro Refere		G1910		222000		2	-1		- /	′ D-1	1	2.05					
	=		į	_	ordinates e Type	` /		83.70 N8 Percuss					Elevation	on ((M Dai	um)	0.85	She	et 1 c	of 2	Draft	
				1.0	0 1) 2			10.5		Equi		_									D	
Depth From (m)	Depth To (r	n) F	Hole 1	- 1	Date From	Date To		quipment	Core Ba	irrel	Core E	Bit	Drilling Cr	- 1	Logged E	By Rem	arks					
0.00 10.00 17.35	10.00 17.35 23.35		CF CF RC	-	03/03/2019 04/03/2019 04/03/2019	04/03/2019 04/03/2019 04/03/2019	Da	ando 2000 ando 2000 acchio MC-S	Terracor	e S-			JS/AC JL/SN JS/AC		BK BK BK							
								1200	Geob													
					Progr		1				1 -			Rot	tary De						ore De	etails
Date (dd/mm/yyyy 03/03/2019		m:ss))	Hole Dep (m) 0.00	pth Casing De (m) 0.50	pth Water Depth (m) 3.30	Weathe Dry	er		Depth From (n 0.00	n) (r	th To n) .35	Flush	n Type W	e F	lush Retu (%) 0	rn Flush Cold	our (t	un Time hh:mm) 00:10	Depth From (m) 17.35	Depth To (m) 18.85	Diameter (mm)
04/03/2019 04/03/2019	00:0	0:00 0:00		0.50 1.00	0.50 0.50	3.30 3.30	Dry Dry			17.35 18.85	18 20	.85 .35	\ \	W		100 100	Red Red		00:15 00:15	18.85 20.35	20.35 21.85	102 102
04/03/2019 04/03/2019 04/03/2019	01:3	0:00		1.50 2.00 2.50		3.50 3.50 3.70				20.35 21.85		.85 .35		W		100 100	Red Red	'	00:12	21.85	23.35	102
04/03/2019	02:3	0:00		3.00 3.50	0.50 0.50	3.70 3.80																
04/03/2019 04/03/2019	04/03/2019 03:40:00 4.50 0.50 4.10																					
	04/03/2019 04:20:00 5.50 5.00 5.50																					
04/03/2019 04/03/2019	05:0 05:2		6.50 7.00	5.00 5.00																		
04/03/2019	06:0		7.50 8.00	5.00																		
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04/03/2019 04/03/2019	07:4	5:00 0:00		10.00 10.50	10.50	5.20 5.20																
04/03/2019																						
04/03/2019 11:05:00 12:00 12:50 5.20 04/03/2019 12:15:00 12.50 13.00 5.20 04/03/2019 12:46:00 13.00 13.50 5.20																						
04/03/2019 04/03/2019	04/03/2019																					
04/03/2019 04/03/2019				15.00 15.50		5.20 5.20																
Depth	To (m)	1	Hole		Hole and	Casing Depth To (m)	Casing Diar	meter (mm)													
5.0 10.	00	+	TIOIC	220 220)	0.50 5.00	,	20 20	00													
13. 17.	.00			220 175)	12.50 13.00		17	74													
17. 23.	.35			175 146	5	13.50 17.00		17 17	75													
				hise	Ilina / Sla	17.35 w Progres	ee	17														
Depth F	rom (m)			Depth T		Duration (hh:		Tool / F	Remark													
			Wa	ater \$	Strike			Water	Added													
Strike At (m)	Rise To (r	n)	Time E (m	Elapsed iins)	Casing Dept	n (m) Depth Se	ealed (m)	Depth From (m)	Depth To (m)													
		١	Nat	er St	trike Rem	arks									Gen	eral F	Remarks			1		
Groundwate	r not obse	rved	in ma	arine e	nvironment.			lev	vel was mair	tained a	t or abo	ove se	eabed level	i. All c	depths ar	nd depth	e 3A. Deck to related remar					
								Gı	roundwater r	not obse	rved as	borel	hole condu	icted	in marine	enviror	iment.					
		stalla ponse Z					ipe								Bac							
Туре	ID		IXCS	Top (m)	Base (i	n) Installation	n Date	ID T	op Depth (m)	Base De	pth (m)	Diam	neter (mm)	7	Туре	Depth F	1 .	n To (m) 3.35) B	Backfill Mat Bentonit		Date 05/03/2019
Notes						1																
	ations a	nd	resu	ults da	ata defined	d on 'Notes	on Ex	ploratory I	Position F	Record	s'											
Charles				ILI A				loveties D.:	m	0	+ D=+:					C-1-1 C	nordin-t- O	om	0000	,		
Checked By			IN	IHA			EI	levation Datu	111	Uha	t Datur	11				rud C	oordinate Syst	em	OSGB			

Print Date

25/04/2019

Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS

Contract Name Nigg Energy Park, East Quay Development Location ID																						
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▎▗▋Ĕ	$\stackrel{\sim}{\sim}$		-	gro Refe	erenc		G1910		99 =									1	L	JI	IU	
	\Rightarrow			ordinate					1868963	.58	Gro	und	Elevation	ı (m E	atu	m) 0.	.85	Shee	et 2 o	f 2		
_			_	le Type			Cable	Percus	sion and	Rota	_							Statu			Draft	
				7.							uipme											
Depth From (m)	Depth To (m)	Hole	Туре	Date From	n	Date To	E	quipment	Core E	Barrel	Core	Bit	Drilling Crev	Logge	ed By	Remark	(S					
. ,																						
				Pro	gress	;							R	otary	Det	ails				(Core De	etails
Date (dd/mm/yyyy	Time (hh:mm	ss)	Hole De	epth Casing	Depth \	Water Depth (m)	Weathe	er		Dep	oth De	pth To (m)	Flush T	уре	Flus	h Return (%)	Flush Colo	ur Rur (hh	n Time n:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
04/03/2019 04/03/2019	17:16		16.5 17.0	0 17.	00	5.20 5.50																
04/03/2019			0.00		35	Not ecognised																
04/03/2019	21:30:	00	17.3	5 17.	35	Not ecognised																
04/03/2019	22:00:	00	18.8	5 17.	35	Not recognised																
04/03/2019	22:30	00	20.3	5 17.	35	Not																
04/03/2019	23:00	00	21.8	5 17.	35	ecognised Not																
05/03/2019	00:00	00	23.3	5 17.	35	ecognised Not																
					r	ecognised																
				Hole an	d Ca	sina																
Depth	To (m)		eter (mm)	1	Depth To (r	m)	Casing Di	ameter (mm)													
	. ,					17.35			146													
			Chise	elling / S	Slow	Progres	SS															
Depth F	rom (m)		Depth			ration (hh:		Tool /	Remark													
· ·	. ,					•																
		W	/ater	Strike				Water	r Added													
Strike At (m)	Rise To (m)	Time	Elapsed		epth (m)	Depth Sea	aled (m)	Depth From	Depth To	1												
	(1)	mins)		, ()		- (-17)	(m)	(m)	1												
		Wa	iter S	trike Re	mark	(S								G	ene	ral Re	marks			<u> </u>	<u> </u>	
Groundwate	r not observ												water from ja	ck-up pla	atform	Skate 3	A. Deck to r					
								Į.	evel was ma	intaine	d at or al	ove se	eabed level. A hole conducte	III depth:	s and	depth re	lated remark					
		In	stalla	ation							Pipe				Т				Back	kfill		
Type	Type							ID	Top Depth (m	_	Depth (m) Diam	neter (mm)	Туре		epth Fron	n (m) Depth	To (m)		ackfill Mat	erial	Date
7.			iob (m	, Bas	ic (III)		+					+			-			. ,				
Notes						1						1			!_							
	ations an	d res	ults d	lata defir	ed or	n 'Notes	on Fy	oloratory	Position	Reco	rds'											
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Checked By	,	- I	NHA				-	evation Dat	tum	CH	nart Datu	ım			1	arid Coor	dinate Syste	em	OSGB			
				mary http	onfic F	aro Por F			will	Icr	iait Däll					J. 10 COOF	umate Systi				25/04/20	10
Template: F	GSL/HBSI/F	GSL B	rı Sum	ımary.nbt/C	ontig Fu	igro Rev5/1	12/03/20	19/15										Print D	ate		25/04/20	เล

Contract Name	Nigg Energy Park, East Qua	Nigg Energy Park, East Quay Development											
Client	Global Energy Nigg Ltd			B									
Fugro Reference	G191005U												
Coordinates (m)	E279342.91 N868934.75	Ground Elevation (m Datum)	-9.10	Sheet 1	of 1								
Hala Tama	O-bl- D	•		04-4									

Sheet 1 of 1

		HOIC	Туре	Cabi	e Percussion	Status		Draf		
Samp	oling an	d In Si	tu Testing		Strata Details				Grou	ndwa
Depth (m)	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backt Installa
0.00 - 0.50 0.00 - 0.50	D ES	2		-	Dark brownish grey SAND with rare pockets (<100 x 30 x 30mm) of very soft dark grey sandy clay and rare shell fragments (<5 x 10mm). Sand is fine to coarse.	(0.50)				
0.50 - 1.00 0.50 - 1.00	D ES	4 3		-	Dark greenish grey SAND with occasional pockets (<30 x 50mm) of very soft dark grey sandy clay and occasional shell fragments (<1 x 1mm).	0.50	-9.60			
1.00 - 1.50	ES	5		1 —	(
1.20 - 1.30 1.50 - 2.00	D D	6 8		-	Between 1.20m and 1.30m; very soft dark grey sandy clay. Sand is fine to coarse. Slight organic odour.	(1.70)				
1.50 - 2.00	ES	7								
2.20 - 2.50	D	10		2 -	Soft dark brownish grey sandy CLAY with abundant mica flakes	2.20	-11.30			
2.20 - 2.50 2.50 - 3.00 2.50 - 3.00	ES D ES	9 12 11		-	(<1 x 1mm) and sulphureous odour. Sand is predominantly fine and medium. Between 2.50m and 3.00m; 1 No. decomposing wood fragment (15 x					
3.00 - 3.50 3.00 - 3.50	D ES	14 13		3 -	50mm).	(1.30)				
3.50 - 4.00	D	16			Soft dark grey slightly gravelly sandy CLAY with abundant mica	3.50	-12.60			
3.50 - 4.00 4.00 - 4.50	ES D	15 17		4-	flakes, sulphureous odour and 1 No. wood fragment (80 x 60 x 50mm).	(0.50)	-13.10			
4.00 - 4.50		17		-	Greyish brown slightly gravelly SAND with low cobble content, and abundant mica flakes(<1 x 1mm). Sand is fine to coarse. Gravel is subangular and subrounded mainly medium and coarse of mixed	(0.50)	-13.10			
4.50 - 5.00	D	18		-	lithologies. Cobbles (<80 x 60 x 80mm) are subangular possibly of gneiss. Greyish brown SAND with abundant mica flakes (<2 x 1mm). Sand	4.50	-13.60			
5.00 - 5.50	D	19		5 —	is fine to coarse. Between 5.00m and 6.00m; with occasional gravel. Gravel is subangular and subrounded fine to coarse of mixed lithologies (gneiss, pegmatite and sandstone).					
5.50 - 6.00	D	20		-						
6.00 - 6.50	D	21		6 -	Between 6.00m and 8.00m; with rare to occasional gravel. Gravel is subangular and subrounded fine to coarse of mixed lithologies.	(3.50)				
6.50 - 7.00	D	22								
7.00 - 7.50	D	23		7 -						
7.50 - 8.00	D	24		-						
8.00 - 8.50	D	25		8 —	Greyish brown slightly gravelly SAND with abundant mica flakes (<2 x 1mm). Sand is fine to coarse. Gravel is subangular and	8.00	-17.10			
8.50 - 9.00	D	26			subrounded fine to coarse of mixed lithologies, predominantly grey and red sandstone.	(0.70)	-17.80			
9.00 - 9.40	D	27		9 —	Probably red, grey and reddish brown SANDSTONE. Recovered as gravelly sand. At 8.90 m; 1 No. cobble (120 x 80 x 60mm) sized fragments.	(0.70)				
					End of Borehole at 9.40 m	9.40	-18.50			

	Contract Name Nigg Energy Park, East Quay Development																					
l −fic	JGRO		Client	t		0	Global	l Energ	y Ni	gg Ltd	i									Rŀ	10	2
│ ┋ ╿≣	$= \stackrel{\sim}{\gg}$	F	ugro	Refer	ence	. 0	31910	05U													10	_
	$=$ \approx	= -		dinates	(m)			42.91			75 (Grou	ınd	Elevation	(m Da	tum)	-9.10	5	Sheet '	1 of 1	1	
		_ F	lole	Туре		C	Cable	Percus	ssion)			_					9	Status		Draft	
Depth From		11.1. 7		F		T				O D	Equip		-	D.:::: 0		p. p						
(m) 0.00	Depth To (m) 9.40	Hole Typ		2/03/2019		ate To 03/2019		quipment ando 2000		Core Ba	irrei	Core B	sit	Drilling Crew JS/AC	BK/RL	By Rema	arks					
				Progr	ess		1							R	otary D	etails					Core D	etails
Date (dd/mm/yyyy		is)	e Depth (m)	(m)		(m)	Weathe	er			Depth From (m	Dept (n	th To n)	Flush T	ype F	lush Retur (%)	n Flusi	h Colour	Run Tin (hh:mn		n Depth To m) (m)	Diameter (mm)
02/03/2019 02/03/2019	20:00:0	0 (0.00 0.50	0.50 1.00		2.30 2.20	Dry															
02/03/2019 02/03/2019	20:50:0	0 '	1.00 1.50	1.50 2.00		2.20 2.10																
02/03/2019	21:30:0	0 2	2.00	2.50 3.00		2.10																
02/03/2019	21:55:0	0 3	3.00 3.50	3.50 4.00		2.00 1.90																
02/03/2019 02/03/2019 02/03/2019	22:15:0	10 4	1.00 1.50 5.00	4.00 4.00 4.00		1.80 1.70 1.60																
02/03/2019	22:30:0	0 5	5.50 5.00	4.00		1.50 4.00																
03/03/2019	15:38:0	0 6	5.50 7.00	7.00 7.50		4.00 4.00																
03/03/2019 03/03/2019	16:20:0	0 7	7.50 3.00	8.00 8.50		4.00 4.00																
03/03/2019	17:00:0	0 0	3.50 9.00	9.00 9.40		4.00 4.00																
				ole and																		
	Depth To (m) Hole Diameter (mm) Depth To (m) 6.00 220 4.00					n)	Casing [200	er (mm)													
9.4			220			9.40			200													
		Ch	المءا	ing / Slo	ow P	roares																
Depth F	rom (m)		oth To (ation (hh:		Tool	/ Rema	ark												
	(,			()			,															
		Wate		trike				Wate														
Strike At (m)	Rise To (m)	Time Elap (mins	osed)	Casing Dep	th (m)	Depth Sea	aled (m)	Depth Fro (m)	m D	epth To (m)												
		147 :							\perp													
Groundwate	r not observe			ke Ren	narks	5			The h	orehole	was carri	ed out	OVer 1	water from iso		eral R			dline = 14	1.60m· decl	(level = 5.50	m CD. Water
J. Janawale	0036146	mail	01141	oraniont.					level v	vas mair	tained at	or abo	ove se	eabed level. A hole conducte	II depths a	nd depth	related					
												_ 43	_, 01									
		Insta	allatio	on							Pi	pe							В	ackfill		
Туре	D 7 D 7					Date	ID	Top D	epth (m)	Base Dep	oth (m)	Diam	neter (mm)	Туре	Depth Fr		Depth To		Backfill I		Date	
																0.0	10	9.40)	Bento	onite	03/03/2019
Notes		1																				
l	ations and	l recult	s det	a defino	d on '	'Notes	on Ev	nlorator	v Pos	sition [[]	Secord	s'										
- ADDIEVI	auviio aili	a roouil	Juali	a acilile	u UII	. 10103	SII EX	PioratOl	y 1 US	JIGOIT F	.coord:	-										
Checked By	,	NHA	4				E	levation D	atum		Chart	Datun	n			Grid Co	ordinate	e System	os	SGB		
	GSL/HBSI/F0			ıry.hbt/Con	fig Fugi	ro Rev5/1	12/03/20	119/TS								1			rint Date		25/04/20)19

Contract Name	Nigg Energy Park, East Qua	Nigg Energy Park, East Quay Development										
Client	Global Energy Nigg Ltd	B										
Fugro Reference	G191005U											
Coordinates (m)	E279380.53 N868920.31 Ground Elevation (m Datum) -0.75 S											
		•										

heet 1 of 3

	Hole Type			Cabl	e Per	cuss	ion a	nd Ro	otary Coring	Status		Draft	i	
Depth	Samp	ling an	d In Situ Testing	Co	re R	ecove	ery		Strata Details				Groui	ndwater
(m)	Туре	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.00 - 0.50 0.00 - 0.50	D ES	2 1						-	Loose dark brownish grey SAND with frequent shells and shell fragments (<10 x 30mm).					
- 0.50 - 1.00 0.50 - 1.00 0.50 - 1.00 0.50 - 0.95	B D ES SPT	5 4 3	N = 9 (S)					- - - -	Below 0.50m; slightly gravelly. Gravel is subangular to rounded fine to coarse of mixed lithologies.	(1.00)				
- 1.00 - 1.50 1.00 - 1.50 - 1.50 - 2.00	D ES B	7 6 9						1 —	Dense dark grey slightly gravelly, becoming gravelly, with depth, SAND with occasional wood and possible reed fragments (<10 x 10mm). Sand is fine to coarse. Gravel is	1.00	-1.75			
1.50 - 2.00	ES	8						-	subangular and subrounded fine to coarse of mixed lithologies.					
- 2.00 - 2.45 2.00 - 2.50 2.00 - 2.45	D ES SPT	10 11	N = 31 (S)					2	Below 2.00m; sand is predominantly medium and coarse.	(2.00)				
- 2.50 - 3.00 2.50 - 3.00	B ES	13 12						-						
- 3.00 - 3.50 - 3.00 - 3.50	D ES	15 14						3	Medium dense dark grey gravelly SAND with abundant to frequent shells and shell fragments (<20 x 30mm). Sand is fine to coarse. Gravel subangular to rounded fine to coarse of mixed	3.00	-3.75			
- 3.50 - 4.00 - 3.50 - 4.00	B ES	17 16						-	lithologies. At 3.50m; 1 No. subrounded cobble of dark grey possible psammite (<70 x 70 x 70mm).	(0.00)				
- 4.00 - 4.45 4.00 - 4.50 4.00 - 4.45	D ES SPT	18 19	N = 17 (S)					4	Below 4.00m; slightly gravelly. Gravel is subangular and subrounded fine to coarse of mixed lithologies.	(2.00)				
- 4.50 - 5.00 - 4.50 - 5.00	B ES	21 20						-						
- 5.00 - 5.29 5.00 - 5.50 5.00 - 5.50	D D ES	24 23 22						5	Dark brownish grey sandy GRAVEL. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies.	(0.74)	-5.75			
5.50 - 6.00 5.50 - 6.00 5.50 - 5.79	B ES SPT	26 25	50/140 mm (S)					-	Very dense brown SAND. Sand is fine to	5.74	-6.49			
- 6.00 - 6.50 - 6.00 - 6.50	D ES	28 27						6	coarse.	(0.76)				
- 6.50 - 7.00 - 6.50 - 7.00	B ES	30 29						-	Firm and stiff slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies.	6.50	-7.25			
7.00 - 7.45 7.00 - 7.50 7.00 - 7.45	D ES SPT	31 32	N = 37 (S)					7-	Below 6.50m; with occasional pockets or lenses of brown sandy clay (<80 x 80 x 100mm) and occasional angular to subrounded fine and medium gravel of mixed lithologies.	7.29	-8.04	× ^ ×		
7.50 - 8.00 7.50 - 8.00	B ES	34 33						-	Dense brown silty SAND with occasional lenses or bands (<100mm thick) of brown stiff clay. Sand is fine to coarse.	(0.71)		× × × × × × ×		
8.00 - 8.50 8.00 - 8.50	D ES	36 35						8 —	Very dense brown gravelly SAND with frequent mica flakes (<2 x 2mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to	8.00	-8.75	× ^		
8.50 - 9.00 8.50 - 9.00	B ES	38 37						=	coarse of pelite and sandstone. Between 8.00m and 9.00m; rare subrounded cobbles (<100 x 100 x 120mm) of pelite.					
9.00 - 9.33 9.00 - 9.50 9.00 - 9.33	D ES SPT	39 40	50/180 mm (S)					9	Between 9.00m and 9.50m; occasional lenses or bands of stiff brown slightly gravelly slightly sandy clay. Sand is fine to coarse, gravel is subangular and subrounded of pegmatite.	(2.00)				
9.50 - 10.00 9.50 - 10.00	B ES	42 41						- - -	Below 9.50m; occasional subangular and subrounded fine and medium gravel of mixed lithologies.					
-10.00 - 10.50 10.00 - 10.50	D ES	44 43						_	Continued next page	10.00	-10.75	14.31.21.		

Notes



Contract Name	Nigg Energy Park, East Qua	Nigg Energy Park, East Quay Development										
Client	Global Energy Nigg Ltd	B										
Fugro Reference	G191005U	G191005U										
Coordinates (m)	E279380.53 N868920.31	Sheet 2 of 3										
Hala Toma	Cable Developing and Dates: Caring											

eet 2 of 3

	Cabl	e Pei	cuss	ion a	nd Ro	otary Coring	Status		Draft					
Depth	n) Test			Co	ore R	ecove	ery		Strata Details				Grour	ndwater
(m)	Туре	No.	Test Results	TCR (%)	SCR (%)		FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installatio
- 10.50 - 11.00 - 10.50 - 11.00	B ES	46 45						- - - - - -	Dense reddish-brown, locally slightly gravelly SAND with frequent mica flakes (<2 x 2mm). Sand is fine to coarse. Gravel is subangular and subrounded fine and medium of mixed lithologies including pelite, quartzite and sandstone.					
- 	D SPT	47						11 —						
- - 11.50 - 12.00 -	В	48						-						
	D	49						12 —						
- - 12.50 - 13.00	В	50						- - -		(4.60)				
-13.00 - 13.45 -13.00 - 13.45	D SPT	51	N = 33 (S)					13 —						
- - 13.50 - 14.00	В	52						-						
13.70 - 13.75	D	53						-	Between 13.70m and 13.75m; band or lens (<50 mm thick) of very stiff dark brown organic silt.					
14.00 - 14.50 	D	54						14 —	, , ,					
- - 14.50 - 15.00 - -	В	55						-	Very dense brown slightly gravelly, locally gravelly, SAND with high cobble content and	14.60	-15.35			
-15.00 - 15.25 - 15.00 - 15.26	D SPT	56	50/105 mm (S)					15 — - -	frequent mica flakes (<2 x 2mm). Sand is fine to coarse, gravel is subangular and subrounded fine to coarse of pelite, quartzite and sandstone. Cobbles (<150 x 120 x 120mm) are	(1.60)				
- 15.50 - 16.00 - - - - -	В	57						16 —	of pelite, quartzite and sandstone.					
- 16.20 - 16.50 -	D	58						-	Brown SAND with frequent mica flakes (1 x 1mm). Sand is predominantly fine and medium.	16.20 (0.55)	-16.95			
16.75 - 16.85	D	59						-	Extremely weak locally very weak reddish	16.75	-17.50			
- -17.00 - 17.18 - 17.25	SPT D	60	50/30 mm (S)					17 —	brown SANDSTONE. Slightly to moderately weathered. Discontinuities not observed.					
17.00 - 17.65 - 17.00 - 18.00				65	65	65	0	-	Between 17.25m and 17.30m; light grey. Between 17.25m and 17.40m; very weak. Between 17.65m and 18.10m; assessed zone of	(1.35)				
. 17.65 - 18.10 							NR	18 —	core loss.					
18.00 - 19.50 18.10 - 19.50				93	93	93	1	- 19 —	Extremely weak thickly laminated to thinly bedded (inclined 20°), reddish brown SANDSTONE. Slightly to moderately weathered. With rare clasts (<10 x 15mm) of dark grey igneous? rock. Discontinuities. See depth related remarks.	(1.40)	-18.85			
- - -								- - - -	At 19.13m; joint, inclined (40°), planar, rough, very tight, clean. Weak, locally thinly bedded to thickly laminated (inclined 10 to 20°), raddish brown	19.50	-20.25			
- -									(inclined 10 to 20°), reddish-brown SANDSTONE locally grading into sandstone Continued next page					
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Contract Name	Nigg Energy Park, East Qua	Nigg Energy Park, East Quay Development										
Client	Global Energy Nigg Ltd	B										
Fugro Reference	G191005U	G191005U										
Coordinates (m)	E279380.53 N868920.31	Sheet 3 of 3										

Sheet 3 of 3

	\sim		Type	_					otary Coring	Status	013	Draf	t	
Depth	Samp		d In Situ Testing		ore R				Strata Details			I.	Grou	ndwate
(m)	Туре	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill Installati
19.50 - 21.00 19.50 - 22.12				100	100	100	1	-	conglomerate. Slightly weathered. Between 19.50m and 19.60m; sandstone conglomerate. Clasts are rounded (<30 x 20mm). Between 19.65m and 19.70m; sandstone conglomerate. Clasts are subrounded and rounded (<10 x 10mm). Between 20.10m and 20.48m; light grey sandstone conglomerate. Clasts are subangular					
21.00 - 22.50				100	96	96		21 —	and subrounded (<30 x 20mm). Between 20.52m and 20.55 m; occasional flat clasts (60 x 5 mm inclined 30°) of reddish brown siltstone. Between 21.00m and 21.10m; occasional subrounded to subangular clasts (<10 x 20mm). Between 21.26m and 21.37m; greenish grey sandstone.	(3.00)				
22.12 - 22.18 22.18 - 22.50							3	22	Between 22.12m and 22.18m; non intact, recovered as fragments, possibly drilling affected, possibly extremely weak, very closely fractured. Between 22.35m and 22.41m; greenish grey coarse grained with occasional subangular clasts. Between 22.42m and 22.50m; extremely weak.	22.50	-23.25			
								23	End of Borehole at 22.50 m					
								24 —						
								25 —						
								26						
								27 —						
								28 —						
								29 —						
								-						

Location ID Contract Name Nigg Energy Park, East Quay Development **BH03** UGRO Client Global Energy Nigg Ltd Fugro Reference G191005U E279380.53 N868920.31 Ground Elevation (m Datum) -0.75 Coordinates (m) Sheet 1 of 2 Hole Type Cable Percussion and Rotary Coring Draft Status Equipment Hole Type Date From Date To Core Bit Drilling Crew epth To (m) Equipment Core Barrel Logged By Remarks 0.00 08/03/2019 08/03/2019 Dando 2000 4.45 JL/CA 4.45 8.50 17.25 8.50 CP CP 08/03/2019 08/03/2019 Dando 2000 JL/SN Dando 2000 Dando 2000 Comacchio MC-S 1200 08/03/2019 09/03/2019 JS/AC Terracore S-Geobor RC 09/03/2019 09/03/2019 JS/AC **Progress** Rotary Details Core Details Weather Depth To (m) 17.00 18.00 19.50 21.00 22.50 Flush Type Flush Colour (m) 1.70 1.80 1.90 2.00 2.20 2.20 2.40 2.50 2.60 00:03 00:05 00:07 00:10 17.00 18.00 19.50 21.00 08/03/2019 13:00:00 0.00 0.50 1.00 1.50 2.00 2.50 3.00 4.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.45 W W W W 100 100 100 100 100 13:00:00 13:40:00 13:49:00 14:00:00 14:30:00 14:40:00 14:50:00 15:10:00 08/03/2019 08/03/2019 08/03/2019 08/03/2019 08/03/2019 08/03/2019 08/03/2019 08/03/2019 08/03/2019 08/03/2019 08/03/2019 15:20:00 15:30:00 4.00 4.50 4.45 5.00 2.00 2.10 08/03/2019 08/03/2019 15:50:00 16:50:00 5.00 5.50 5.50 2.20 16:50:00 17:00:00 17:45:00 18:10:00 18:38:00 19:45:00 20:00:00 21:30:00 22:10:00 22:40:00 08/03/2019 08/03/2019 08/03/2019 08/03/2019 08/03/2019 08/03/2019 08/03/2019 6.00 6.50 7.00 7.50 8.00 8.50 9.00 9.50 10.00 6.50 7.00 7.50 8.00 8.50 9.00 9.50 10.00 10.50 2.60 3.10 3.20 3.30 5.90 5.80 5.10 4.60 4.00 3.80 08/03/2019 08/03/2019 08/03/2019 08/03/2019 22:40:00 22:50:00 10.50 11.00 11.00 11.50 08/03/2019 08/03/2019 23:00:00 23:20:00 11.50 12.00 11.50 11.50 3.70 3.30 23:20:00 23:50:00 00:00:00 00:30:00 01:00:00 02:00:00 08/03/2019 09/03/2019 09/03/2019 09/03/2019 12.50 13.00 13.50 14.00 14.50 11.50 14.50 11.50 14.50 15.00 3.10 3.00 2.70 2.40 09/03/2019 Hole and Casing Hole Diameter (mm) Depth To (m) Depth To (m) Casing Diameter (mm) 220 4.45 220 220 220 220 220 146 220 220 220 146 220 8.50 14.00 8.00 11.50 17.00 17.25 17.25 22.50 Chiselling / Slow Progress Depth From (m) Depth To (m) Duration (hh:mm) Tool / Remark 6.00 9.00 01:00 01:30 Water Strike Water Added Strike At (m) Rise To (m) Casing Depth (m) Water Strike Remarks General Remarks The borehole was carried out over water from jack-up platform Skate 3A. Deck to mudline = 6.90m; deck level = 6.15m CD. Water level was maintained at or above seabed level. All depths and depth related remarks refer to depths below seabed level. Groundwater not observed as borehole conducted in marine environment. Groundwater not observed in marine environment Installation Backfill Pipe Response Zone Response Zone Top (m) Response Zone Base (m) Туре ID nstallation Dat Base Depth (m) Backfill Material ID Top Depth (m) Diameter (mm) Type Depth From (m) Depth To (m) Date 09/03/2019 0.00 22.50 Bentonite Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Checked By

NHA

Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS

Elevation Datum

Chart Datum

Grid Coordinate System

OSGB

25/04/2019

Print Date

	Contract Name Nigg Energy Park, East Quay Development													_				
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▎▐▋▋	$= \approx$	_	_	ro Refer		G191	005U											
	=	= ⊦		rdinates	(m)			N868920.			d Elevatio	n (m Da	itum) -0).75		2 of 2	1	
<u> </u>			Hole	е Туре		Cable	Percus	ssion and	Rotary Equip						Status	S	Draft	
Depth From	Depth To (m)	Hole Ty	ре	Date From	Date T	,	Equipment	Core B		Core Bit		w Logged	By Remark	(S				
(m)	1 (7	,	+								3 -	33	1					
Date	Time	Ho	le Dep	Progr	epth Water D	epth NA/41			Depth	Depth	T	Rotary D	etails Flush Return	Flush Cala	Run 1	Time Depth	Core D	
(dd/mm/yyyy 09/03/2019	(hh:mm: 02:30:0	ss) 00	(m) 15.00	(m) 15.50	(m) 2.40)	ner		From (m)	(m)	Flush	Туре	(%)	Flush Colou	ur (hh:n	mm) From (r	n) (m)	Diameter (mm)
09/03/2019	9 03:30:0	00	15.50 16.00	16.50	3.00)												
09/03/2019 09/03/2019 09/03/2019	9 04:30:0	00	16.50 0.00	17.00	3.80)												
09/03/2019	9 05:15:0	00	17.00 18.00 19.50	17.00	4.60)												
09/03/2019	9 05:50:0	00	21.00 22.50	17.00	5.10)												
		1	H	lole and	Casing													
Depth	To (m)	Hole [Diame	ter (mm)	Depth	To (m)	Casing [Diameter (mm)										
		CI	nise	lling / Slo	ow Prog	ress												
Depth F	rom (m)	De	pth To	o (m)	Duration	(hh:mm)	Tool	/ Remark										
		10/-		D4!!			10/-4-	۸ -۱ -۱۱	-									
Strike At (m)	Pice To (m)	Time Ela (min		Strike Casing Dept	th (m) Dont	h Sealed (m)	Depth Fro		-									
Stilke At (III)	ruse to (III)	(min	s)	Casing Dep	iii (iii) Depi	ii Sealeu (III)	(m)	(m)										
							1											
		Wate	r St	rike Ren	narks			Ľ				Ger	neral Re	marks		'		
Groundwate	r not observe	ed in mar	ine er	nvironment.				level was mai	ntained at	or abov	er water from ja	All depths a	and depth re	lated remark				
								Groundwater	not observ	ed as b	orehole conduc	ted in marin	e environme	ent.				
-		Inet	alla	tion		T			Pir)e			1			Backfill		
Туре	D 7 P 7							Top Depth (m)	Base Dep		Diameter (mm)	Туре	Depth Fron	n (m) Depth	To (m)	Backfill N	laterial	Date
			~ (III)	Dase (9				1	\top				<u> </u>				
Nat-																		
Notes	ations on	d recul	te da	ata defino	d on 'No	es on E	vnlorator	y Position	Records									
- Unnigal	auviis dil	a resul	ıo Uć	ata uellile	u on MO	os UII E	ייטו פוטו	y i USIUUII	, vecolus									
Checked By	,	NH	IA.			ı	Elevation D	atum	Chart	Datum			Grid Coor	dinate Syste	em C	OSGB		
	GSL/HBSI/F			nary.hbt/Cont	fig Fugro Re	v5/12/03/2	019/TS						1	-	Print Dat	te	25/04/20	19

TUGRO

Contract Name	Nigg Energy Park, East Qua	Location ID								
Client	Global Energy Nigg Ltd] B								
Fugro Reference	G191005U									
Coordinates (m)	E279380.77 N868871.12	Ground Elevation (m Datum)	-2.02	Sheet 1 of 3						
Fugro Reference	G191005U	G191005U								

BH04

D110-1

	\gtrsim	_	rdinates (m) Type		9380.77 N868871.12 Ground Elevation (m Datum) -2.02 e Percussion	Sheet		Draf	<u> </u>	
Samp	oling and	_	tu Testing	Cubi	Strata Details	Otatao	<u> </u>	Dian		ndwate
Depth (m)	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfil Installat
0.00 - 0.50 0.00 - 0.50	B ES	2		-	Medium dense dark brownish grey slightly gravelly to gravelly SAND. Sand is fine to coarse. Gravel is subrounded and rounded fine and medium of mixed lithelesies condetens, politic graphic	(m)				
0.50 - 0.95 0.50 - 1.00 0.50	D ES SPT	3 4		-	fine and medium of mixed lithologies (sandstone, pelite, granite, quartzite, diorite and pegmatite). With frequent possible black wood fragments (<5 x 5 mm), frequent mica flakes (<2 x 2 mm) and occasional shell fragments (<2 x 1 mm).					
- 1.00 - 1.50 1.00 - 1.50	B ES	6 5		1-	Between 1.00m and 1.50 m; with low cobble content. Cobbles (<80 x 60 x 80mm) are subrounded and rounded dark grey possible pelite.	(2.50)				
1.50 - 2.00 1.50 - 2.00	D ES	8 7		-						
- 2.00 - 2.45 2.00 - 2.50 2.00 - 2.45	D ES SPT	9 10	N = 16 (S)	2 -						
2.50 - 3.00 2.50 - 3.00	B ES	11 12			Medium dense dark brownish grey slightly gravelly SAND with frequent mica flakes (<2 x 2mm) and black decomposing wood fragments (<5 x 5mm). Sand is predominantly fine and medium.	2.50	-4.52			
- 3.00 - 3.50 3.00 - 3.50	D ES	13 14		3 —	Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone.					
3.50 - 4.00 3.50 - 4.00	B ES	16 15		-						
- 4.00 - 4.45 4.00 - 4.50 4.00 - 4.45	D ES SPT	17 18	N = 29 (S)	4-		(3.70)				
4.50 - 5.00 4.50 - 5.00	D ES	20 19			Between 4.50m and 5.00m; with low cobble content. Cobbles (<100 x 80 x 100 mm) are subrounded of sandstone.					
5.00 - 5.50 5.00 - 5.50	B ES	22 21		5						
5.50 - 6.00 5.50 - 6.00	D ES	24 23								
- 6.00 - 6.34 6.00 - 6.50 6.00 - 6.34 6.20 - 7.00 6.50 - 7.00	D ES SPT B ES	25 26 27 28	50/190 mm (S)	6	Medium dense brownish grey and black sandy GRAVEL with low, becoming high with depth, cobble content. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies. Cobbles (<100 x 100 x 120mm) are subrounded of sandstone and	6.20	-8.22	× × × × × × × ×		
- 7.00 - 7.50 7.00 - 7.50	D ES	30 29		7-	pelite. At 7.20m; 2 No. pockets (<30 x 20mm) of very soft greyish brown sandy	(1.90)		× × × × × × × × ×		
7.50 - 8.00 7.50 - 8.00	B ES	32 31		-	clay. Sand is fine and medium.			× × × × × × × × × × × × × × × × × × ×		
8.00 - 8.20 8.00 - 8.35 8.20 - 8.50 8.35 8.50 - 9.00 8.50 - 9.00	ES SPT D D B	34 35 33 37 36	50/200 mm (S)	8 —	Very dense brownish grey gravelly SAND with low to medium cobble content. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies. Cobbles (<80 x 100 x 140mm) are subangular and subrounded of mixed lithologies	8.10 (0.40) 8.50	-10.12 -10.52	`		
- 9.00 - 9.50 9.00 - 9.50	D ES	39 38		9—	\text{predominantly pelite and psammite.} Dense dark brownish grey slightly sandy GRAVEL with medium to high cobble content. Sand is fine and medium. Gravel is angular and subrounded fine to coarse of mixed lithologies. Sand is fine to coarse.					
9.50 - 10.00 9.50 - 10.00	B ES	41 40		-	coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies. Cobbles (<100 x 100 x 100mm) are subangular and subrounded of mixed lithologies probably pelite and psammite. With rare shells and shell fragments (<10 x 30mm) and	(2.10)				
-10.00 - 10.25 10.00 - 10.45	ES D	43 42			occasional becoming frequent with depth lenses and pockets (<80 Continued next page	_				

Notes

FUGRO

Contract Name	Nigg Energy Park, East Qua	Nigg Energy Park, East Quay Development									
Client	Global Energy Nigg Ltd			1 B							
Fugro Reference	G191005U										
Coordinates (m)	E279380.77 N868871.12	Ground Elevation (m Datum)	-2.02	Sheet 2 of 3							
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BH04

	\approx		ordinates (m)		9380.77 N868871.12 Ground Elevation (m Datum) -2.02	Sheet	2 of 3			
			e Type		e Percussion	Status		Draf	t	
Samp	ling an		itu Testing		Strata Details					ndwate
Depth (m)	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill Installation
- 10.50 - 11.00	SPT B	44	N = 42 (S)	-	Dense dark brownish grey slightly sandy GRAVEL with medium to high cobble content. Sand is fine and medium. Gravel is angular and subrounded fine to coarse of mixed lithologies. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies. Cobbles (<100 x 100 x 100mm) are subangular and subrounded of mixed lithologies probably pelite and psammite. With rare shells and shell fragments (<10 x 30mm) and	10.60	-12.62			
11.00 - 11.50 11.50 - 12.00	D B	45 46		11 —	occasional becoming frequent with depth lenses and pockets (<80 x 100 x 120mm) of soft brown slightly gravelly sandy clay. Very dense brown slightly gravelly SAND. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse predominantly fine and medium of mixed lithologies. Below 11.00m; gravelly.	(1.90)				
-12.00 - 12.23 12.00 - 12.50 12.00 - 12.24	D D SPT	47 48	50/85 mm (S)	12 -	Below 12.00m; with low cobble content. Cobbles (<90 x 90 x 100mm) are subangular and subrounded of pelite and gneiss.					
- 12.50 - 12.80	В	49		-	Medium dense becoming very dense with depth brown slightly gravelly SAND with frequent mica flakes (<1 x 1 mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of pelite, gneiss and psammite.	12.50	-14.52			
-13.00 - 13.50 - - - 13.50 - 14.00	D B	50 51		13 —	Between 12.50m and 13.00m; with rare to occasional gravel. Gravel is angular to subrounded medium and coarse. Sand is predominately fine and medium.					
- - -14.00 - 14.45 - 14.00 - 14.45	D SPT	52	N = 20 (S)	14 —						
- - 14.50 - 15.00	В	53		-						
_ 15.00 - 15.50 -	D	54		15 —						
- 15.50 - 16.00	В	55		-						
-16.00 - 16.45 - 16.00 - 16.45 - - - 16.50 - 17.00	D SPT B	56 57	N = 34 (S)	16 —						
- - - - -17.00 - 17.50	D	58		17 —						
- - - - 17.50 - 18.00 -	В	59		-		(9.60)				
- -18.00 - 18.25 - 18.00 - 18.25	D SPT	60	50/100 mm (S)	18 —						
- - 18.50 - 19.00 - - -	В	61		-						
-19.00 - 19.50 - - - - 19.50 - 20.00	D B	62		19 —						
-20.00 - 20.25 20.00 - 20.25	D SPT	64	50/100 mm (S)	-	Continued next page					
Notes	J1 1		100/100 11111 (0)	1		1	I .	l		

Notes

Location ID Nigg Energy Park, East Quay Development Contract Name **BH04** UGRO Client Global Energy Nigg Ltd Fugro Reference G191005U E279380.77 N868871.12 Coordinates (m) Ground Elevation (m Datum) -2.02 Sheet 3 of 3 Hole Type Draft Cable Percussion Status Groundwater Sampling and In Situ Testing Strata Details Depth (Thickness (m) Depth Depth (m) Strata Descriptions Water Test Results Level (m Datum) Backfill / Type No. (m) Strike Medium dense becoming very dense with depth brown slightly gravelly SAND with frequent mica flakes (<1 x 1 mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of 20.25 - 21.00 В 65 pelite, gneiss and psammite. -21.00 - 22.00 В 67 21 Below 21.00m; rare subangular cobbles (<120 x 120 x 80mm) of sandstone.

Between 21.20m and 21.25m; possible lenticular band of firm brown sandy clay. Sand is fine. 21.20 - 21.25 D 66 -22.00 - 22.08 SPT 50/20 mm (S) 22.10 -24.12 End of Borehole at 22.10 m 23 24 25 26 27 28 29

Print Date

25/04/2019

-Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Template: FGSL/HBSI/FGSL Cable Percussion.hbt/Config Fugro Rev5/21/02/2019/TS

		C	Contra	act Nan	ne	Nigg Energy Park, East Quay Development Location ID													
l −fi	JGRO		Client	t		Globa	I Energ	y Nigg Lto	d							Bh	1N	4	
	\Rightarrow			Refere	nce	G191		9 33							1		IU	┱	
	$= \infty$		Coord	dinates	(m)	E2793	880.77	N868871.	12 (Grour	nd Elevation	ı (m Da	tum) -	2.02		t 1 of 1			
		_	lole	Туре		Cable	Percus	ssion							Status	S	Draft		
Depth From	Depth To (m)	Hole Typ	D D	ate From	Date To		Equipment	Core B	Equip	men Core Bit		v Logged	By Remai	-ke					
(m) 0.00	22.10	CP	- 1	0/03/2019	11/03/201		ando 2000		allei	Joie Di	JL/CA	BK/RI		N3					
									\perp										
Date	Time	Hol	e Depth	Progre		ath I			Depth	Depth	Τ.	otary D		1	Run 1		etails		
(dd/mm/yyyy 10/03/2019) (hh:mm:s	ss)	(m) 4.00	(m) 4.50	(m) 4.40	Weath	er		From (m)	(m)	Flush T	ype	lush Return (%)	Flush Colo	ur (hh:n	nm) From (m	Depth To (m)	Diameter (mm)	
11/03/2019 11/03/2019	09:20:0	00	8.50 1.50	9.00 16.00	6.00 4.00														
			Но	le and (_⊥ Casing				1										
Depth	To (m)	Hole D			Depth To	o (m)	Casing E	Diameter (mm)											
22	.10		220		16.0	0		220											
					w Progr														
Depth F		Dep	7.00	m)	Duration (h 01:0		Tool	/ Remark											
7.1 7.1	00		7.50 8.00		01:3 01:0	0													
9.	50		10.00 12.00		01:0 01:0	0													
12	.00		12.50		01:0	3													
		Wat	er Stı	rike			Wate	er Added											
Strike At (m)	Rise To (m)	Time Ela		Casing Depth	(m) Depth	Sealed (m)	Depth Fro	m Depth To	1										
	. /	(illiil)					(m)	(m)	1										
		Water	Stril	ke Rem	arks								neral Re						
								level was mai	ntained at	or abov	ver water from jac re seabed level. A	All depths a	nd depth re	elated remark					
								Groundwater	not obser	ed as b	orehole conducte	ed in marin	e environm	ent.					
		Inet	allatio	n .					Pi	20					-	Backfill			
Туре	ID	Respor	se Zone	Response	Zone Installa	tion Date	ID	Top Depth (m)	Base Dep		Diameter (mm)	Туре	Depth Fro	m (m) Depth	Depth To (m) Backfill Material Da				
· ·		100	(m)	Base (n	"				<u> </u>			•	0.00		.10	12/03/2019			
													1						
Notes	_4! _			1. 6		-			n										
- Abbrevi	ations and	result	s data	a defined	on 'Note	s on Ex	piorator	y Position I	Records	S'									
Checked By	,	NHA	Δ			-	Elevation Da	atum	Chart	Datum			Grid Coo	rdinate Syste	em C	OSGB			
	GSL/HBSI/F0			ry.hbt/Confi	g Fuaro Rev				Jonatt	Jacum			10/10/000	. aa.c Oyali	Print Dat		25/04/20	19	
						50,2											1 2.2 20		

Contract Name	Nigg Energy Park, East Qua	Nigg Energy Park, East Quay Development									
Client	Global Energy Nigg Ltd	Global Energy Nigg Ltd									
Fugro Reference	G191005U			B							
Coordinates (m)	E279379.79 N868819.21	Ground Elevation (m Datum)	-6.75	Sheet 1 of 2							
		•	•								

Sheet 1 of 2

	Hole Type			Cab'	le Pe	rcuss	ion ع	and R	otary Coring	Status [Draft	
Depth	Samp	ling arد	nd In Situ Testing	Cr	ore R	Recove	ery		Strata Details				Grour	ındwateı
(m)	Туре	No.	Test Results	TCR (%)	SCR (%)				Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	
0.00 - 0.50 0.00 - 0.50	D ES	2							Possibly very loose becoming medium dense with depth black silty SAND with slight sulphureous odour.			× × ×	*	
0.50 - 0.95 0.50 - 1.00 0.50 - 1.00	ES D B SPT		0/450 (S)						Below 0.50m; strong sulphureous odour.			x	, , , ,	
- 1.00 - 1.50 1.00 - 1.50 - 1.50 - 2.00	D ES B	7 6 9						17	Between 1.00m and 2.00m; rare subangular to rounded medium and coarse gravel of mixed lithologies.	(2.50)		× × × × × × × × × × × × × × × × × × ×		
1.50 - 2.00 - 2.00 - 2.45	ES D	10						2 —		!		x		
2.00 - 2.50 2.00 - 2.45 - 2.50 - 3.00 2.50 - 3.00	ES SPT B ES	11 13 12	N = 10 (S)					-	Dark grey SAND with frequent black organic	2.50	-9.25	× × × × × × × × × × × × × × × × × × ×	÷	
- 3.00 - 3.50 3.00 - 3.50	D ES	15 14						3 —	debris (<1 x 1mm), frequent mica flakes (<1 x 1mm) and frequent shell fragments (<1 x 1mm).	(1.30)				
-								- -						
3.80 - 4.00 3.80 - 4.00 4.00 - 4.50 4.00 - 4.50 4.00 - 4.49	B ES D ES SPT	17 16 18 19	50/335 mm (S)					4-	Very dense dark grey SAND. Sand is fine and medium. Possibly interbedded with very soft and soft dark grey sandy clay. With rare rounded and subrounded cobbles (<80 x 100 x	(0.70)	-10.55			
- 4.50 - 5.00 4.50 - 5.00	B ES	21 20						-	100mm) of gneiss. Grey slightly gravelly SAND with low cobble content. Sand is mainly fine and medium. Gravel is angular to subrounded fine to coarse	4.50 (0.50)	-11.25			
5.00 - 5.50 5.00 - 5.50	D ES	23 22						5 —	of mixed lithologies. Cobbles (<100 x 80 x \ 60mm) are subrounded and rounded of pelite. Very dense slightly sandy, becoming sandy with depth, GRAVEL. Sand is fine to coarse. Gravel	5.00	-11.75			
- 5.50 - 6.00 6.00 - 6.45	В	24						1	is subangular to rounded fine to coarse of mixed lithologies (pelite, granite, sandstone, gneiss, pegmatite).	(1.50)				
- 6.00 - 6.45 - 6.00 - 6.40 6.50 - 7.00	SPT D	25	50/245 mm (S)					6	- Later all the condu	6.50	-13.25			
- 7.00 - 7.50	В	27						7-	Very stiff locally laminated brown slightly sandy to sandy CLAY with frequent pockets or bands of sand and gravel and occasional cobbles. Sand is mainly fine and medium. Gravel is subaggular and outbrounded fine to express of					
								4 - -	subangular and subrounded fine to coarse of mixed lithologies. Cobbles ((<120 x 80 x 80mm) are as gravel.	(1.20)				
7.70 - 8.00 - 8.00 - 8.45 - 8.00 - 8.40	D D SPT	28	50/250 mm (S)					8 —	Very dense brown slightly gravelly SAND with rare possible lenses (<15mm) of soft sandy clay. Sand is fine to coarse. Gravel is subangular and subrounded fine and medium	(0.80)	-14.45			
- 8.50 - 9.00	В	30						-	of mixed lithologies. Very dense multicoloured sandy, locally slightly sandy, GRAVEL with medium cobble content.	8.50	-15.25			
9.00 - 9.50	D	31						9 —	Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies (sandstone, pelite, psammite, quartz, and pegmatite). Cobbles (<150 x 120 x 100mm)					
- - 9.50 - 10.00 - - -	В	32						1	are of mixed lithologies.					
-10.00 - 10.45 10.00 - 10.38		33	50/270 mm (S)						Continued next page	'			'	

Notes

Contract Name	Nigg Energy Park, East Qu	Location ID									
Client	Global Energy Nigg Ltd	Global Energy Nigg Ltd									
Fugro Reference	G191005U			B							
Coordinates (m)	E279379.79 N868819.21	Ground Elevation (m Datum)	-6.75	Sheet 2 of 2							
Hala Tura	Cable Developies and Deta	m. Carina		Ctatus							

Sheet 2 of 2

			Type	, , ,						Status	Draf	raft		
Depth	Samp	ling an	nd In Situ Testing	Co	ore R	ecove	ery		Strata Details				Groui	ndwate
(m)	Туре	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill Installation
								-	Between 10.50m and 11.00m; slightly gravelly sand. Sand is fine to coarse.					
- - 10.50 - 11.00	В	34						-		(4.00)				
- 	D	35						11 — - - -	Below 11.00m; slightly sandy.					
- 11.50 - 12.00	В	36						-						
-12.00 - 12.50 12.00 - 12.35	D SPT	37	50/245 mm (S)					12 — - - -						
- 12.50 - 13.00 - - - - -13.00 - 13.50	B D	38						13 —	Brown becoming reddish-brown with depth slightly gravelly SAND. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies. With occasional possible	12.50	-19.25			
- - 13.50 - 14.00	В	40						- - - -	pockets or lenses of firm thickly laminated brown sandy silt (Possible destructured sandstone).	(1.20)				
- -14.00 - 14.18 - 14.00 - 14.18	D SPT	41	50/35 mm (S)					14 —	Extremely weak red and greenish grey SANDSTONE. Recovered as fragments.	(0.80)	-20.45			
- - - - 14.50 - 14.90							NR	- - - -	Assessed zone of core loss.	14.50 (0.40)	-21.25			
. 14.90 - 15.25 . 14.50 - 16.00				73	73	63	NI	15 —	Extremely weak and weak red SANDSTONE. Possibly moderately weathered. Non intact (Drilling affected) recovered as sandy gravel	(0.35) (5.25)	-21.65 -22.00			
- - 15.25 - 15.70 - -							9	- - - -	\sized fragments (<50 x 60 x 60mm). Weak thinly laminated to thinly bedded red and greenish grey SANDSTONE with rare to occasional greenish grey reduction spots (<10 x	(0.45) 15.70	-22.45			
							2	16 —	10mm). Slightly to moderately weathered. Discontinuities. Set # 1, bedding plane discontinuities - very closely to medium spaced, inclined (15°) planar, rough, very tight, clean. Set #2, joints - closely spaced, inclined (60°), planar, rough, very tight and clean or open and	(1.80)				
16.00 - 17.50				100	100	100		17 —	infilled with sand. Weak becoming moderately weak with depth,					
-								- - -	Fresh to slightly weathered. Discontinuities. Set #1, bedding plane discontinuities - closely to widely spaced subhorizontal (<10°), planar,	17.50	-24.25	:::::		
-								- 18 — - - - - -	rough, very tight, clean. Between 16.07m and 16.48m; red with frequent greenish grey reduction spots (<10 x 10mm) medium to coarse grained sandstone. Between 17.10m to 17.42m; rudaceous medium to coarse sandstone. Clasts are subangular and subrounded of mixed lithologies (<10 x 10 x 10mm).					
_ _								19 — - - - - -	End of Borehole at 17.50 m					
- - - - -								-						

		С	ontract N	lame	ı	Nigg E	Energy	Park,	, Eas	t Qua	y De	velo	opment				Location	on ID		
- fi	JGRO		lient			Globa	l Energ	y Niạ	ıg Ltd]							1	Bh	10	5
 	=		ugro Ref	erence		G1910]		I U	
	$= \infty$	С	oordinat	es (m)			79.79 N						Elevation	(m Dat	um) -6	3.75	Sheet	1 of 1		
		_ H	ole Type		(Cable	Percus	sion				ŭ					Status		Draft	
Depth From	Denth To ()	Hole Type	Data E-	nm L	ate To	-	auipment		Core Ba	Equi	pme Core E		Drilling Cross	Logged	By Pamer	ke				
0.00	Depth To (m) 4.45	CP	13/03/20	19 13/0	03/2019	D:	quipment ando 2000		ore Ba	itel	Core E	oil .	Drilling Crew JW/CA	BK/RL		ns .				
4.00	11.00	CP	13/03/20		03/2019		acchio MC 1200						MB/AC	BK/RL						
11.00 14.18	14.18 17.50	CP RC	14/03/20		03/2019		acchio MC 1200 acchio MC		erracor				MB/AC JW/CA	BK/RL BK/RL						
14.16	17.50	KC	14/03/20	19 14/	03/2019	Com	1200	5	Geobo				JW/CA	BR/KL						
				gress				·					Ro	otary De					Core D	etails
Date (dd/mm/yyyy 13/03/2019		ss) (m) (g Depth Warn) .00	ater Depth (m)	¹ Weath	er			Depth From (n 0.00	n) (r	th To m) .50	Flush Ty	pe F	ush Return (%) 100	Flush Cold	our Run Tii (hh:mi	m) From (n	n) (m)	Diameter (mm)
13/03/2019	9 23:59:0	00 4	.00 4	.00 I.18						14.50 16.00	16	.00	W W W		100 100 100	Red Red	00:0	6 16.00	17.50	102
14/03/2019	9 13:45:0	00 17	7.50 14	1.18						10.00		.00				1100				
			Hole a	nd Cas	ing															
	To (m) 45		ameter (mm) 220	D	epth To ((m)	Casing D	iameter 220	r (mm)											
11	.00 .00		200 200 220		11.00 13.00			200 200 220												
14	.18		175 146		13.50 14.50			175 146												
1 "	.50		140		14.50			140												
		Chi	selling /	Slow B	Progra	00														
Depth F	rom (m)		th To (m)		ation (hh		Tool	/ Rema	rk											
	2.00		12.50	Duit	01:30	,	1001	7 1 101110												
			r Strike				Wate													
Strike At (m)	Rise To (m)	Time Elap (mins)	sed Casing	Depth (m)	Depth Se	ealed (m)	Depth From (m)		pth To (m)											
1																				
		10/ /	Ot-'' -				L ,													
Groundwate	er not encoun		Strike R		3			The ho	rehole v	vas carr	ied out	over	water from jacl		eral Re		mudline = 1	2.50m: deck	level = 5.75	m CD. Water
	5.100411	4 111111	5					level wa	as main	tained a	t or abo	ove s	eabed level. Al	I depths an	d depth re	elated reman				

		Insta	llation				'			Р	ipe						В	ackfill		
Туре	ID	Respons Top	se Zone Resp (m) Ba	onse Zone ase (m)	Installatio	n Date	ID	Top De	pth (m)	Base De	epth (m)	Dian	meter (mm)	Туре	Depth From		To (m)	Backfill M		Date
															0.00	17	7.50	Bento	nite	14/03/2019
1																				
1																				
1																				
1																				
Notes																				
Notes	iations and	reculte	data defi	ned on	'Notes	on Ev	nlorator	v Posi	ition F	Second	ls'									
- VIDDLE AL	iduonio and	. เบอนแร	auta UCII	nou OII	110168	OII EX	pioratul)	, i USI	.aoii r											
Checked By	y	NHA				E	levation Da	atum		Chai	t Datur	n			Grid Coo	rdinate Syst	em OS	SGB		
<u> </u>	GSL/HBSI/F			Config Fug	 gro Rev5/										1	-,-,	Print Date		25/04/20	19

FUGRO

Contract Name	Nigg Energy Park, East Qu	ay Development		Location II
Client	Global Energy Nigg Ltd			1 F
Fugro Reference	G191005U			1
Coordinates (m)	E279381.64 N868746.75	Ground Elevation (m Datum)	-9.60	Sheet 1 of

BH06

Sheet 1 of 2

			Type	_	le Percussion	Status		Draf	t	
Samp	oling an	d In Si	tu Testing		Strata Details	·			Grour	ndwate
Depth (m)	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill Installati
0.00 - 0.50 0.00 - 0.50	D ES	2 1		-	Very soft and soft black sandy CLAY probably interbedded with black clayey SAND. With rare shell fragments (<10 x 10 x 10mm) and slight sulphurous odour. Sand is fine to coarse.					
0.50 - 1.00 0.50 - 1.00 0.50 - 0.95	B ES SPT	4 3	0/450 (S)		and digit sulphaloas seeds. Sand to line to escrete.					
1.00 - 1.50 1.00 - 1.50	D ES	6 5		1-						
1.50 - 2.00 1.50 - 2.00	B ES	8 7		-		(3.00)				
2.00 - 2.50 2.00 - 2.50 2.00 - 2.45	D ES SPT	10 9	0/450 (S)	2 -						
2.50 - 3.00	В	11		-						
3.00 - 3.50	D	12		3 —	Soft dark grey sandy CLAY possibly interbedded with dark grey clayey SAND. With frequent wood fragments (<10 x 20mm) and	3.00	-12.60			
3.50 - 4.00	В	13		-	rare shell fragments (<5 x 10mm). Organic and slight sulphurous odour. Sand is fine to coarse.					
4.00 - 4.45 4.00 - 4.45	D SPT	14	0/450 (S)	4-		(2.50)				
4.40 - 5.00	В	15		-						
5.00 - 5.50	D	16		5 —						
5.50 - 6.00	В	17		-	Loose dark grey slightly clayey SAND with occasional wood and shell fragments (<5 x 10mm). Slight organic odour. Sand is fine to	5.50	-15.10			
6.00 - 6.45 6.00 - 6.45	D SPT	18	N = 8 (S)	6 -	coarse.	(1.00)				
6.50 - 7.00	В	19		-	Loose dark grey SAND with occasional wood fragments (<5 x 10mm). Sand is fine to coarse.	6.50	-16.10			
7.00 - 7.50	D	20		7 -						
7.50 - 8.00	В	21		-		(2.00)				
8.00 - 8.50 8.00 - 8.45	D SPT	22	N = 5 (S)	8 —	Below 8.00m; 1 No. wood fragment (<5 x 10mm).					
8.50 - 9.00	В	23		-	Loose becoming medium dense with depth, dark grey SAND with occasional bands or lenses (<60 mm thick) of soft grey sandy clay, occasional wood fragments (<5 x 10mm) and occasional shell	8.50	-18.10			
9.00 - 9.50	D	24		9 —	fragments (>5 x 5mm). Sand is fine to coarse.					
9.50 - 10.00	В	25		-						
10.00 - 10.45 10.00 - 10.45	D SPT	26	N = 6 (S)	-	Continued next page	+				

Notes

TUGRO

Contract Name	Nigg Energy Park, East Qua	Nigg Energy Park, East Quay Development									
Client	Global Energy Nigg Ltd			1 B							
Fugro Reference	G191005U										
Coordinates (m)	E279381.64 N868746.75	Ground Elevation (m Datum)	-9.60	Sheet 2 of 2							
	0 11 0	•		01.1							

BH06

	\sim	Coo	rdinates (m)	E270	9381.64 N868746.75 Ground Elevation (m Datum) -9.60	Chast	2 of 2			
	\sim		Type	_	9381.64 N868746.75 Ground Elevation (m Datum) -9.60 e Percussion	Sheet Status		Draf	+	
		ПОІС	: туре	Cabi	e reicussion	Status		Diai	<u> </u>	
	ling an	d In Si	tu Testing		Strata Details		Т	1	Grou	ndwat
Depth (m)	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfi Installa
10.50 - 11.00	В	27		- - - -	Loose becoming medium dense with depth, dark grey SAND with occasional bands or lenses (<60 mm thick) of soft grey sandy clay, occasional wood fragments (<5 x 10mm) and occasional shell fragments (>5 x 5mm). Sand is fine to coarse.					
11.00 - 11.50	D	28		11 —	Below 11.00m; 1 No. shell fragment (<5 x 20mm).					
11.50 - 12.00	В	29		- - -		(6.50)				
12.00 - 12.45 12.00 - 12.45	D SPT	30	N = 11 (S)	12 -						
12.50 - 13.00	В	31		-						
13.00 - 13.50	D	32		13 —	Below 13.00m; sand is predominantly fine and medium. Occasional plant fibres.					
13.50 - 14.00 14.00 - 14.45	B D	33		- - - - 14 —						
14.00 - 14.43 14.00 - 14.60 14.50 - 15.00	SPT B	35	N = 22 (S)	-	Delay 44 50-y 4 No. shall for recent (45 y 200-yr). Count is substanted					
				15 —	Below 14.50m; 1 No. shell fragment (<5 x 20mm). Gravel is subrounded fine and medium. End of Borehole at 15.00 m	15.00	-24.60			
				-						
				16 -						
				-						
				17						
				18 —						
				-						
				19 —						
				-						
				-						

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Template: FGSL/HBSI/FGSL Cable Percussion.hbt/Config Fugro Rev5/21/02/2019/TS

Print Date

25/04/2019

		C	Conti	ract Nar	ne	Nigg I	Energy	Park, Ea	st Qua	ay De	velopm	ent				Loc	cation			
l −fi	JGRO		Clien	t		Globa	al Energ	y Nigg L	id								F	3H	M	6
│ ┋ ╿≣	$= \approx$	F	ugro	Refere	ence	G191														
	$= \approx$		Coor	dinates	(m)	E2793	381.64	N868746	.75	Grou	und Elev	/ation	(m Da	tum) -	9.60	_	eet 1 c	of 1		
		_ F	lole	Туре		Cable	Percus	ssion								Sta	itus		Draft	
Depth From			Τ.	=		Τ.				ipme			Τ	- -						
(m) 0.00	Depth To (m) 13.00	Hole Typ	- 1	Oate From 6/03/2019	Date To 16/03/201		Equipment ando 2000	Core I	Barrel	Core E	- 0	ng Crew A/JS	Logged	By Rema	rks					
13.00	15.00	CP	1	6/03/2019	16/03/201		nacchio MC 1200				М	IB/AC	RL							
				Progre	ess				Τ'			Ro	otary D	etails					Core De	etails
Date (dd/mm/yyyy	Time (hh:mm:s	ss)	e Depth (m)	(m)	oth Water Dep	oth Weath	ier		Dept From (h Dep	th To m)	Flush Ty	уре	lush Returr (%)	Flush Co	olour F	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
16/03/2019 16/03/2019	9 08:00:0 9 21:35:0	00 (0.00 4.50	0.50 15.00	2.10 Not															
					recognis	ed														
		I	Н	ole and	Casing															
	To (m)	Hole D	iamete		Depth To		Casing D	Diameter (mm)											
13.	.00 .00		220 220		6.00 13.0)		220 220												
15	.00		200		15.0)		200												
					w Progr															
Depth F	rom (m)	Dep	oth To	(m)	Duration (h	ıh:mm)	Tool	/ Remark												
		Wat	or St	triko			\Mate	er Added	-											
Strike At (m)	Rise To (m)	Time Elar (mins		Casing Depti	n (m) Depth	Sealed (m)	Depth Fro	m Depth To	-											
	. ,	(mins)			. ,	(m)	(m)												
	·	Water	Stri	ike Rem	arks			Ľ			'		Gen	eral R	emarks					
Groundwate	r not observe	ed in mari	ne env	rironment.				The borehole level was ma												m CD. Water
								Groundwate	not obs	erved as	borehole o	onducte	ed in marine	e environr	nent.	1010	-560	2.5 0		
<u> </u>			H							· ·				_						
-	ie.	Respor	allationse Zon		Zone I	i D:	15	T 0	_	Pipe	Diamon		Trees	D	(-) -	4L T: 1	Bac			D. t.
Туре	ID	Top	(m)	Base (r	n) Installa	tion Date	ID	Top Depth (m) Base E	Depth (m)	Diameter (r	ıım)	Туре	Depth Fro	ən (m) Dep	pth To (m	') E	Backfill Mat	епаі	Date
Notes	i							<u> </u>						1			1			
I	ations and	d result	s dat	a defined	on 'Note	s on Ex	plorator	y Position	Recor	ds'										
Checked By	<u></u>	NHA	Α			E	Elevation D	atum	Cha	art Datur	m			Grid Co	ordinate Sy	/stem	OSGB	B		
Template: F	GSL/HBSI/F	GSL BH S	umma	ry.hbt/Confi	g Fugro Rev	5/12/03/2	019/TS		•							Print	Date		25/04/20	19

FUGRO

Contract Name	Nigg Energy Park, East Qua	ay Development		Location ID
Client	Global Energy Nigg Ltd			B
Fugro Reference	G191005U			
Coordinates (m)	E279451.07 N868746.87	Ground Elevation (m Datum)	-4.01	Sheet 1 of 2

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Sampling and In Situ Testing Strata Details Depth Depth		Draft		Sheet Status	9451.07 N868746.87 Ground Elevation (m Datum) -4.01 le Percussion	_	rdinates (m)	_	\sim	
Depth (m) Type No. Test Results Depth (m) Strata Descriptions Depth (m) De	Groundwate		S	Status		Cabi	7.		olina an	Samr
(m) Type No. lest Results (m) Stata Descriptions (1 no. 1 no			Τ, ,	Depth		Societa			Jilly an	
0.00 - 0.50 ES 1	Water Backfill Installati	Legend	(m Datum)	(Thickness)	Strata Descriptions	(m)	Test Results			(m)
0.50 - 1.00		× × × × × ×			Loose dark brownish grey silty SAND with abundant snell fragments (<1 x 1mm). Sand is fine to coarse.] =		2 1		
0.50 - 1.00		* *				-				
- 1.00 - 1.50		××××			clay. Sand is fine to coarse. Strong sulphureous odour.	-	21 0 (0)	4	ES	0.50 - 1.00
- 1.50 - 2.00		*				1-	N = 9 (S)	7	D	- 1.00 - 1.50
1.50 - 2.00 ES 9		$\begin{bmatrix} \times & \wedge \\ \times & \times \end{bmatrix}$				-		ь	Eo	ີ 1.00 - 1.ວບ -
Continue		$\times \times \times$				-				
2.00 - 2.50 ES 11 N = 6 (S)		××××		(3.50)		=		5	EU	1.50 - 2.00
2.00 - 2.45 SPT N = 6 (S) - 2.50 - 3.00 B 13 12 - 3.00 - 3.50 ES 14 - 3.50 - 4.00 ES 16 - 4.00 - 4.45 ES 19 4.00 SPT - 4.50 - 5.00 B 21 - 4.50 - 5.00 - 4.50 - 5.00 B 21 -		× × ×				2 -				
2.50 - 3.00 ES 12 3 - 3.00 - 3.50 D 15 3.00 - 3.50 ES 14 -						-	N = 6 (S)	• • •		
3.00 - 3.50 D 15 3.00 - 3.50 ES 14		×××				-				
3.50 - 3.50 ES 14		×××,×				-		1,5		2.00 0.02
3.50 - 4.00 B 17 16		××、×				3 —				
3.50 - 4.00 ES 16 - Very soft dark brownish grey sandy CLAY with bands (possible <80mm) of clayey sand. Strong sulphureous odour. Sand is fine to coarse.		××××				-				0.00 0.2
 - 4.00 - 4.45 D I8		* ×	-7.51	3.50	Very soft dark brownish grey sandy CLAY with bands (possible	-				
- 4.00 - 4.45					<80mm) of clayey sand. Strong sulphureous odour. Sand is fine to					0.00
4.00 SPT (1.50)						4 -				
				(1.50)				• •		
						-				
5.00 - 5.50 D 23 5 Medium dense greyish brown SAND with frequent shell fragments 5.00 - 9.01 (4.14 Medium dense greyish brown SAND with frequent shell fragments)			-9.01	5.00		5 —				
(<1 x 1mm) and frequent mica flakes (<1 x 1mm). Sand is predominantly fine and medium.										t L
- 5.50 - 6.00 B 25 5.50 - 6.00 ES 24						-				
						-				
- 6.00 - 6.45 D 26 6 - (2.00)				(2.00)		6-			ES	6.00 - 6.50
6.00 - 6.45 SPT N = 19 (S)						-	N = 19 (S)			-
- 6.50 - 7.00 B 29						-				
						-				<u> </u>
7.00 - 7.50 D 31 S Nedium dense greyish brown SAND interbedded with soft dark greyish brown sandy clay. With frequent mica flakes (<1 x 1mm)			-11.01	7.00		7 -				
and slight sulphureous odour. Sand is fine and medium.						-				
7.50 - 8.00 B 33										
						-				<u> </u>
- 8.00 - 8.45 D 34 N = 17 (S) 8 -						8 —	N = 17 (S)	34		
						-		35		
8.50 - 9.00 B 35								35	В	- 8.50 - 9.00 -
				11.00)		_ =		20		
P 9.00 - 9.50 D 36 Below 9.00m; slightly gravelly with occasional shell fragments (<20 x 20mm) and rare to occasional gravel. Gravel is subangular to				(4.00)	20mm) and rare to occasional gravel. Gravel is subangular to	9 -		36	ט	— 9.00 - 9.50 - -
subrounded fine and medium of mixed lithologies.						-		27		3.50 40.00
9.50 - 10.00 B 37						-		31	Ь	- 9.50 - 10.00 - -
-10.00 - 10.45 D 38								38	_ n	10.00 - 10.45
10.00 - 10.45 SPT N = 20 (S) Continued next page					Continued next page		N = 20 (S)	55		10.00 - 10.45

Notes

Contract Name	Nigg Energy Park, East Qua	Location ID		
Client	Global Energy Nigg Ltd			B
Fugro Reference	G191005U			
Coordinates (m)	E279451.07 N868746.87	Ground Elevation (m Datum)	-4.01	Sheet 2 of 2
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Status	Draft	

	\sim	_	rdinates (m)		9451.07 N868746.87 Ground Elevation (m Datum) -4.01	Sheet				
		Hole	: Туре	Cab	le Percussion	Status		Draf	<u> </u>	
Samp	ling an	d In Si	tu Testing		Strata Details				Grour	ndwate
Depth (m)	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill Installation
- - - - 10.50 - 11.00	В	39		- - - -	Medium dense greyish brown SAND interbedded with soft dark greyish brown sandy clay. With frequent mica flakes (<1 x 1mm) and slight sulphureous odour. Sand is fine and medium.					
-11.00 - 11.30 -11.30 - 11.70	D B	40 41		11 -	Medium dense brownish grey slightly gravelly SAND with low cobble content and frequent mica flakes (<1 x 1mm). Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mixed	- 11.00	-15.01			
- - - 11.70 - 12.15 - 11.70 - 12.40 _ 11.70 - 12.15	D B SPT	42 43	N = 23 (S)	12 —	lithologies. Cobbles (<80 x 80 x 60mm) are of pelite.	(2.00)				
12.40 - 13.00 - 12.40 - 13.00	D	44		- - -						
-13.00 - 13.50	В	45		13 —	Dense brownish grey SAND with frequent mica flakes (1 x 1mm) and occasional thin beds (<60mm) of soft brownish grey sandy clay. Sand is fine to coarse.	- 13.00	-17.01			
- 13.50 - 14.00	В	46		-	olay. Cand is line to coarse.					
-14.00 - 14.45 - 14.00 - 14.45 14.50 - 15.00	D SPT B	47 48	N = 34 (S)	14 —		(3.00)				
-15.00 - 15.50	D	49		15 —		(3.00)				
- - - 15.50 - 16.00	В	50		-	Below 15.50m; occasional gravel and frequent wood fragments (<5 x 5mm). Gravel is subangular and subrounded fine to coarse of mixed lithologies.					
-16.00 - 16.45 16.00 - 16.45	D SPT	51	N = 17 (S)	16	Medium dense greyish brown SAND with frequent mica flakes (<1 x 1mm), occasional to frequent shell fragments and occasional wood fragments (<5 x 5mm).	- 16.00	-20.01			
- 16.50 - 17.00 - - - - -17.00 - 17.50	B D	52 53		17 —	Between 17.00m and 17.50m; rare very thin clay bands or lenses					
- 17.50 - 18.00	В	54		-	(<50mm).					
-18.00 - 18.45 18.00 - 18.45	D SPT	55	N = 12 (S)	18 —		(3.61)				
18.50 - 19.00	В	56		-						
-19.00 - 19.50	D	57		19 —						
- 19.50 - 19.60	SPT		50/60 mm (S)	-	Below 19.50m; probable boulder (no recovery from SPT). End of Borehole at 19.61 m	- 19.61	-23.62			

		(Cont	ract Na	me	N	ligg E	nergy	Park,	Eas	t Quay	Dev	velo	pment					Locat				
l −fi	JGRO		Clien	nt		G	Global	Energ	y Nigg	g Ltd	I									E	łН	10	7
l ≣V≣	$= \approx$		ugr	o Refer	ence		31910		, ,											٢	/	U	•
	$= \infty$	(Coor	dinates	(m)	E	27945	51.07	N8687	746.8	37 C	Grou	nd E	Elevation	(m Da	tum)	-4.01	;	Sheet	t 1 of	2		
			Hole	Type		С	able l	Percus	ssion										Status	s		Draft	
Depth From			Τ.				_				Equip			- · · · · ·	Τ	- -							
(m) 0.00	Depth To (m) 19.61	Hole Ty	- 1	Date From 07/03/2019		0ate To 03/2019	l	uipment ndo 2000		ore Ba	irrel (Core B	iit	Drilling Crew JS/AC	Logged BK	By Ren	narks						
				Progr	ress									R	otary D	etails					С	ore De	etails
Date (dd/mm/yyyy	Time (hh:mm:s	Ho s)	le Depth (m)	h Casing Do	epth W	/ater Depth (m)	Weather	r			Depth From (m)	Dept (m	h To n)	Flush Ty	ype F	Flush Reti (%)	urn Flus	sh Colour	Run (hh:r		Depth From (m)	Depth To (m)	Diameter (mm)
07/03/2019 07/03/2019	9 00:00:0 9 00:30:0	0	9.00 9.50	9.50 10.00)	3.30 3.15																	
07/03/2019 07/03/2019	01:30:0	0	10.00 10.50	10.50 11.00)	3.00 3.00																	
07/03/2019 07/03/2019	9 02:15:0	0	11.00 11.50	11.50 12.00)	3.10 3.20																	
07/03/2019	9 02:45:0	0	12.00	12.50)	3.40 3.50																	
07/03/2019 07/03/2019 07/03/2019	03:15:0	0	13.00	13.50 14.00 14.50)	3.60 3.80 4.10																	
07/03/2019 07/03/2019 07/03/2019	03:45:0	0	14.00 14.50 15.00	15.00 15.50)	4.30 4.50																	
07/03/2019 07/03/2019	9 04:30:0	0	15.50 16.00	16.00 16.00)	5.00 5.20																	
07/03/2019 07/03/2019	20:00:0	0	0.00 0.50	0.50 1.00		6.40 6.30																	
07/03/2019 07/03/2019	20:30:0 20:45:0	0	1.00 1.50	1.50 2.00		6.20 6.10																	
07/03/2019 07/03/2019	21:00:0 21:10:0	0	2.00 2.50	2.50 3.00		5.90 5.70																	
07/03/2019 07/03/2019	21:30:0	0	3.00 3.50	3.50 4.00		5.60 5.50																	
07/03/2019 07/03/2019	22:00:0	0	4.00 4.50	4.50 5.00		5.30 5.10																	
07/03/2019	22:20:0	0	5.00 5.50	5.50 6.00		4.90 4.70																	
07/03/2019	22:40:0	0	6.00 6.50 7.00	6.50 7.00 7.50		4.60 4.40 4.30																	
07/03/2019 07/03/2019			7.50	8.00		4.20																	
				ole and																			
Depth 19.		Hole D	iamete 220	er (mm)	D	epth To (m 19.50	n)	Casing E	Diameter 220	(mm)													
		Cł	nisell	ling / Sl	ow F	rogres	ss																
Depth F	rom (m)		pth To			ation (hh:n		Tool	/ Remark	k													
19.	.00		19.50			01:00																	
	II	Wat Time Ela	er S			ı		Wate Depth Fro	er Add	ed th To													
Strike At (m)	Rise To (m)	(min:	s)	Casing Dep	oth (m)	Depth Sea	aled (m)	(m)		m)													
	<u> </u>	Wate	r Stri	ike Ren	nark	 S					l	1			Ger	neral F	Rema	rks	1				
Groundwate	r not observe													ater from jac	k-up platfo	orm Skat	te 3A. De	eck to mu					
														abed level. A ole conducte				remarks	reier to	ueptns	DEIOW SE	aueu ieve	zi.
		, .	-11 -11																	D. 1	£:11		
T	ID		allati nse Zon		e Zone	Inot-II.	Dat-	ID	Te- D	#b /= `	Pip		D:-	otor (m-m)	Tv	D"	From ()	De=#: =		Back	fill ckfill Mate	orio!	D-t-
Туре	חו	То	p (m)	Base		Installation	Date	טו	Top Dept	rai (ifi)	Base Dep	ar (m)	⊳ıame	eter (mm)	Туре		From (m)	Depth T 19.6			Bentonite		Date 07/03/2019
Notes																							
- Abbrevi	ations and	l result	s dat	ta define	d on	'Notes	on Exp	lorator	y Posit	tion F	Records	;'											
Che else 4 F	,	k.17 -	^					wotie: F	ntur-		Ch	Det				C-110	`aa-di	. C		2000			
Checked By	GSL/HBSI/FO	NH		an/ bbt/0-	fig E	aro Poveria		evation Da	atum		Chart	Datum	1			Grid C	oordinat	te Systen	n C Print Dat	DSGB		25/04/20	10
remplate: F	OOL/HD3I/F(OF DU (-uniiiiia	ary.ribi/Con	my rug	jio izevo/T	21031201	3/13										''	mit Dal	i.c		20/04/20	10

			Cor	ntract Nai	me	Nigg E	Energy F	Park, Eas	t Qua	y De\	velop	ment				Loc	cation	ID		
-6	JGRI		Clie					y Nigg Ltd										2	10	7
	\Rightarrow			ro Refere		G1910		11199								\dashv	L		IU	•
V	$\Rightarrow \hat{\otimes}$			ordinates				N868746.8	87	Grou	ınd El	levation ((m Dat	tum)	-4.01	Sh	eet 2 c	of 2		
		<u> </u>	Hole	е Туре		Cable	Percus									Sta	atus		Draft	
Depth From	T	Ι.,,	—						Equip				·							
(m)	Depth To (m)	Hole	Гуре	Date From	Date To		Equipment	Core Ba	arrel	Core B	it D	Orilling Crew	Logged E	By Rem	narks					
											\perp									
				Progr	ress epth Water Depth								tary De						Core De	
Date (dd/mm/yyyy 07/03/2019	Time (hh:mm: 9 23:30:0	:ss)	Hole Dep (m) 8.00	(m)	(m)	Weathe	er		Depth From (m	n) (m	th To n)	Flush Typ	pe FI	lush Retu (%)	Flush C	olour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
08/03/2019 08/03/2019	9 00:00:0	00	8.50 16.50	8.00	3.30															
08/03/2019 08/03/2019	9 05:45:0 9 06:15:0	00	17.00 17.50	0 17.50 0 18.00	5.70															
08/03/2019 08/03/2019	9 08:09:0	00	18.00 18.50	19.00	5.70															
08/03/2019 08/03/2019	9 08:30:0 9 09:55:0	00	19.00 19.50	19.50 19.50	5.60 5.40															
				Hole and					1											
Depth	To (m)	Hole	Diame	eter (mm)	Depth To	(m)	Casing Dia	iameter (mm)	4											
						ļ														
						ļ														
						ļ														
			 Chise	elling / Sl	ow Progre	ess			†											
Depth F	From (m)		Depth To		Duration (hh		Tool /	/ Remark	1											
									1											
İ						ļ														
İ						ļ														
		\^/	otor	Strike			Moto	r Added	-											
Strike At (m)	Rise To (m)	Time I	Elapsed		oth (m) Depth S	iealed (m)	Depth From	n Depth To	1											
Guillo / L (III)	1 400 10 (111)	(m	nins)	- Cuomig Bopt	ar (iii) Bopar or	Zalod (III)	(m)	(m)	-											
İ						ļ														
						ļ														
				trike Rem	narks										Remarks					
Groundwate	er not observe	ed in m	arine er	avironment.			le	The borehole value of the second of the seco	ntained a	at or abo	ove seab	bed level. All	depths an	nd depth	n related ren	to mudlin narks refe	ne = 11.20 er to depth	m; deck le ns below s	vel = 7.19r eabed leve	n CD. Water el.
								Groundwater r	not obser	rved as	borehol	le conducted	in marine	enviror	nment.					
İ																				
İ																				
		Ins	stalla			$\neg \tau$			—	ipe							Bac	kfill		
Туре	ID	Res	sponse Zo	one Response	e Zone Installatio	on Date	ID	Top Depth (m)	т —		Diamete	ter (mm)	Туре	Depth F	From (m) De	pth To (n		ackfill Mat	erial	Date
			(···)																	
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Notes																				
	iations an	d resi	ults d	ata define	ed on 'Notes	on Ex	oloratory	/ Position F	Record	ls'										
71001011	ationo an	u 1000	anto ut	ata domino	4 011 110100	OH EX	pioratory	1 COMOTT	100014											
İ																				
Checked By	<u> </u>	N	NHA			Е	levation Dat	tum	Char	rt Datum	n			Grid C	oordinate S	ystem	OSGB			
Template: F	GSL/HBSI/F	GSL BI	H Sumr	nary.hbt/Con	fig Fugro Rev5	/12/03/20	J19/TS			-	-					Print	t Date		25/04/201	19

Contract Name	Nigg Energy Park, East Qua	ay Development		Location ID
Client	Global Energy Nigg Ltd			B
Fugro Reference	G191005U			
Coordinates (m)	E279448.06 N868803.00	Ground Elevation (m Datum)	-0.82	Sheet 1 of 2
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Sheet 1 of 2

	\geq	_	rdinates (m)	_	9448.06 N868803.00 Ground Elevation (m Datum) -0.82	Sheet				
		Hole	Туре	Cab	le Percussion	Status	5	Draf	ī.	
Samp	ling an	d In Si	tu Testing		Strata Details	1	ı	T	Grour	ndwater
Depth (m)	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.00 - 0.50 0.00 - 0.50 - 0.50 - 1.00	D ES B	2 1 4		-	Brown slightly gravelly SAND with occasional shell fragments (<5 x 10mm) and frequent mica flakes (<1 x 1mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies	(0.50)	-1.32			
0.50 - 1.00 - - - 1.00 - 1.50	ES D	3 6		- - - 1-	Brown SAND with frequent mica flakes (<1 x 1mm). Sand is fine to coarse.	(1.00)				
1.00 - 1.50 -	ES B	5		' -		1.50	-2.32			
- 1.50 - 2.00 1.50 - 2.00	ES	8 7		-	Greyish brown SAND with frequent mica flakes (1 x 1mm). Sand is fine to coarse.	1.50	-2.32			
- 2.00 - 2.50 2.00 - 2.50	D ES	10 9		2		(1.50)				
- 2.50 - 3.00 - 2.50 - 3.00	B ES	12 11		-						
- 3.00 - 3.50 3.00 - 3.50	D ES	14 13		3	Brownish grey clayey SAND with frequent mica flakes (<1 x 1mm) and slight organic odour. Sand is fine to coarse	3.00	-3.82			
- 3.50 - 4.00 3.50 - 4.00	B ES	16 15		-		(1.00)				
- 4.00 - 4.50 - 4.00 - 4.50	D ES	18 17		4	Soft dark brownish grey sandy CLAY with abundant mica flakes (<1 x 1mm) and organic odour. Sand is fine to coarse.	4.00	-4.82			
- 4.50 - 5.00 - 4.50 - 5.00 -	B ES	20 19		-						
- 5.00 - 5.50 5.00 - 5.50	D ES	22 21		5 —						
- 5.50 - 6.00 5.50 - 6.00	B ES	24 23		-	Below 5.50m; occasional to frequent decomposing wood fragments (<10 x 20mm).	(3.00)				
- 6.00 - 6.50 - 6.00 - 6.50	D ES	26 25		6						
- 6.50 - 7.00 - 6.50 - 7.00	B ES	28 27		-		7.00	7.00			
- 7.00 - 7.50 7.00 - 7.50	D ES	30 29		7	Greenish brown clayey SAND interbedded with very soft sandy clay. Sand is fine and medium.	7.00	-7.82			
- 7.50 - 8.00 - 7.50 - 8.00	D ES	32 31		-						
- 8.00 - 8.50 8.00 - 8.50	D ES	34 33		8	Between 8.00m and 9.00m; bands (<50mm) of brown fibrous peat.					
- 8.50 - 9.00 8.50 - 9.00	D ES	36 35		-						
9.00 - 9.50 9.00 - 9.50	D ES	38 37		9 —						
9.50 - 10.00 9.50 - 10.00	D ES	40 39		-		(5.50)				
-10.00 - 10.50 10.00 - 10.50	D ES	42 41			Continued next page					

Notes

TUGRO

Contract Name	Nigg Energy Park, East Qua	ay Development		Location ID
Client	Global Energy Nigg Ltd			\mathbf{B}
Fugro Reference	G191005U			
Coordinates (m)	E279448.06 N868803.00	Ground Elevation (m Datum)	-0.82	Sheet 2 of 2
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eet 2 of 2		
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	\sim		Type	_	Cable Percussion Ground Elevation (m Datum) -0.82 Sheet 2 of 2										
Samp	ling an	d In Si	tu Testing		Strata Details	·	Groundwat								
Depth	Туре	No.	Test Results	Depth	Strata Descriptions	Depth (Thickness)	Level (m Datum)	Legend	Water Strike	Backfill .					
(m)	,,			(m)	Greenish brown clayey SAND interbedded with very soft sandy	(m)	(iii bataiii)		Strike	matalla					
					clay. Sand is fine and medium.										
10.50 - 11.00 10.50 - 11.00	D ES	44 43		-											
11.00 - 11.50 11.00 - 11.50	D ES	46 45		11 —											
11.50 - 12.00	В	47		-											
12.00 - 12.50	D	48		12 -											
	_														
12.50 - 13.00	В	49		-	Greyish brown clayey SAND with rare subangular and subrounded fine to coarse gravel of mixed lithologies. Sand is	12.50 (0.50)	-13.32								
-13.00 - 13.50	D	50		13 —	mainly fine and medium. Greyish brown clayey SAND with occasional bands of soft greyish brown sandy clay and occasional oyster shell fragments (<50 x 6 x	13.00	-13.82								
13.50 - 14.00	В	51		-	8mm). Sand is fine and medium.										
-14.00 - 14.50	D	52		14 —		(2.00)									
14.00 - 14.30		52		"		(2.00)									
14.50 - 15.00	В	53		-											
-15.00 - 15.50	D	54		15 —	Greyish brown gravelly SAND with rare bands of soft sandy clay. Sand is mainly fine and medium. Gravel is subangular and	15.00	-15.82								
				-	subrounded fine to coarse of mixed lithologies.	(0.80)									
15.80 - 16.00	D	55		-	COBBLES (<100 x 120 x 100mm) , subrounded of quartzite.	15.80	-16.62								
16.00 - 16.40	В	56		16 -	Grey and dark grey sandy GRAVEL with occasional shell	(0.20) 16.00	-16.82								
16.50 - 17.00	В	57			fragments (<10 x 10mm). Sand is fine to coarse, gravel is angular to subrounded fine to coarse of mixed lithologies.	(0.50)	-17.32								
		01		-	Recovered as sandy GRAVEL with high cobble content and possible boulders. Sand is fine to coarse, gravel is subangular and subrounded fine to coarse of mixed lithologies.	10.00	17.02								
17.00 - 17.50	В	58		17 -		(1.20)									
17.70 - 18.00	D	59		-		17.70	-18.52								
18.00 - 18.50	В	60		18 —	Extremely weak reddish brown SANDSTONE. Recovered as fragments. Between 17.70m to 18.00m; grey.		10.02								
				-		(1.30)									
40.00 40.00		•													
18.90 - 19.00	D	61		19 —	End of Borehole at 19.00 m	19.00	-19.82								
				-											

Notes

			Cor	ntract Na	ıme	Nigg	Energy F	Park, Eas	t Quay	Lo	Location ID										
-fi	JGRI	0	Clie	nt		Globa	al Energy	y Nigg Ltd	 L							\dashv	F	3H	10	R	
Í ≢I≡		Ĭ		ro Refer	ence	G1910						_				\exists		JI I			
	$\Rightarrow $		Coc	ordinates	; (m)	E2794	148.06 N	N868803.0	00 G	rounc	d Elevatio	on ((m Datı	um) -	0.82	S	Sheet 1 of 2				
		<u> </u>	Hole	е Туре		Cable	Percuss									S	tatus		Draft		
Depth From	T()	T	Ŧ, T	Data From	T Date T	 ,			Equip				d B	- Demo	•						
(m) 0.00	Depth To (m) 10.00	Hole C	P	Date From 05/03/2019	05/03/20	19 D	Equipment Dando 2000	Core Ba	irrel	Core Bit	Drilling Cre JL/SN		Logged B BK/RL	-	ks						
10.00 18.50	18.50 19.00	CF RC	P	05/03/2019 06/03/2019	06/03/201	19 D	Dando 2000 Comacchio :			racore S	JS/AC	;	BK/RL BK/RL								
						;	Skate_3A		"	Geobor											
													I								
				Prog								Rot	tary De						Core De	etails	
Date (dd/mm/yyyy	y) (hh:mm:	:ss)	Hole Dep (m)	(m)		vveaui	er		Depth From (m)	Depth To (m)	Flush	п Туре	e Flu	ush Return (%)	Flush C	Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)	
05/03/2019 05/03/2019	9 12:45:0	00	0.00 0.50	1.00	1.60												I				
05/03/2019 05/03/2019 05/03/2019	9 14:20:0	00	1.00 1.50 2.00	2.00	2.20												I				
05/03/2019 05/03/2019	9 15:22:0	00	2.50 3.00	3.00	2.80												l				
05/03/2019 05/03/2019	9 16:28:0	00	3.50 4.00	4.00	3.10												İ		'		
05/03/2019 05/03/2019	9 17:00:0	00	4.50 5.00	5.00	3.30												İ		'		
05/03/2019 05/03/2019	9 18:15:0 9 18:30:0	00	5.50 6.00	6.00	3.90												I		'		
05/03/2019 05/03/2019	9 19:00:0 9 20:10:0	00	6.50 7.00	7.00 7.50	4.30 4.30	1											İ		'		
05/03/2019 05/03/2019	9 20:40:0 9 21:10:0	00	7.50 8.00	8.00 8.50	4.30 4.30	1											İ		'		
05/03/2019 05/03/2019	9 21:30:0	00	8.50 9.00	9.50	4.30												I		'		
05/03/2019 05/03/2019	9 22:00:0	00	9.50 10.00	10.50	0 3.10												İ		'		
05/03/2019	9 22:30:0	00	10.50 11.00	11.50	0 2.80												İ		'		
05/03/2019	9 23:00:0	00	11.50 12.00	12.50	0 2.50												İ		'		
05/03/2019	9 23:40:0	00	12.50 13.00	13.50	0 2.30												İ		'		
06/03/2019 06/03/2019	9 00:20:0	00	13.50 14.00 14.50	14.50	0 2.10												l				
06/03/2019 06/03/2019			15.00	15.50	0 2.30	Ш			_								I				
Denth	T- (m)	T Hole		Hole and		F- (-n)	T _{Casing Di}		-								I				
Depth 5.0	.00	ПОІС	220		Depth To (m) 5.00		220		-								l				
10. 17.	0.00 '.00	220 220		0)0)0	1	220 146									l				
18. 19.			146 146		17.00		2	220									l				
																	l				
		(Chise	lling / S	low Progi	ess											l				
Depth F		r	Depth To		Duration (Tool /	/ Remark									l				
15.	5.50		16.0	0	01:0	0			1								I		"		
İ																	l				
İ																	l				
		10/	(20.31.5			Mate	^ .l -ld	-								I				
~···· *4 ()	T _D : - T _D (m)	Time E	later S			- 1.1(-)	Danth Franc	r Added Depth To	-								l				
Strike At (III)	Rise To (m)	(m	mins)	Casing Dep	th (m) Deput	n Sealed (m)	(m)	(m)	-								l				
																	I				
																	l				
		Wa	ter St	⊥ trike Rer	narks		1						Gene	eral Re	⊥ emark:	 S		1			
Groundwate	er not observe	ed in m	arine er	nvironment.			Ţ	The borehole v	was carried	ovo tuo t	er water from	jack-	-up platfor	m Skate :	3A. Deck	to mudi	lline = 6.00n	n; deck lev	el = 5.18m	CD. Water	
							G	Groundwater r sandstone by I	not observe												
							1		999												
							1														
								Pino											.cu		
T		Res	stallat sponse Zo	one Respons	e Zone	ation Date		======================================	Pip		· · · · · · · · · · · · · · · · · · ·			D -th Ero	· (=) D			ckfill		Deta	
Туре	ID	+	Top (m)	Base	(m) Instant	tion Date	ID .	Top Depth (m)	Base Depti	1 (m) D	iameter (mm)		Туре	Depth Fro		19.00		Backfill Mat Bentonit		Date 06/03/2019	
																			ľ		
																			ľ		
		\perp				\perp				\perp					\perp						
Notes												_									
- Abbrevi	ations and	d resi	ults da	ata define	ed on 'Note	es on Ex	ploratory	/ Position F	Records'	1											
														T							
Checked By			NHA		f . F D		Elevation Date	ıum	Chart [)atum				Grid Coo	ordinate S	-	OSGE	3	05/04/00	40	
Template: F	GSL/HBSI/F	GSL Br	a Summ	nary.hbt/Cor	ifig Fugro Re	v5/12/03/2 ⁱ	J19/TS									Pri	rint Date		25/04/201	19	

Contract Name							Nigg Energy Park, East Quay Development												Location ID				
-6	JGR	•		Clier			Global Energy Nigg Ltd											BH08				Q	
 					o Refere	ence	G191		y ivigg L.	u									L		U	O	
Y	$\equiv \hat{\hat{}}$				dinates				1868803	00	Grou	und	Elevation	(m Da	atur	m) -0.8	32	Shee	et 2 o	f 2			
				Hole	Туре		Cable	Percus	sion		'					'		Status Draft					
											ıipme												
Depth From (m)	Depth To (n) F	Hole Ty	ype	Date From	Date To	E	Equipment	Core B	arrel	Core I	Bit	Drilling Crew	Logged	д Ву	Remarks							
Progress									Τ	Rotary D			 Details						Core Details				
Date (dd/mm/yyyy	Date Time dd/mm/yyyy) (hh:mm:ss)		H	ole Dept (m)		epth Water Dep (m)	th Weath	er		Dep	oth Dep	oth To m)	Flush Ty		Flush		lush Colou	r Run	n Time n:mm)	Depth From (m)	Depth To (m)	Diameter (mm)	
06/03/2019 06/03/2019	9 01:0	0:00 0:00		15.50 16.00	16.00 16.50	2.60 2.80													,		. ,		
06/03/2019				16.50	17.00	recognise	d																
06/03/2019				17.00	17.00	recognise	ed																
06/03/2019				17.50 18.00	17.00 17.00	recognise	d																
06/03/2019				18.50	17.00	recognise	ed																
00/00/2011	0	0.00		10.00		recognise	ed																
				Hole and Casing																			
Depth	To (m)		Hole I	Diameter (mm)		Depth To	(m)	Casing D	iameter (mm)	-													
			С	hisel	ling / Sla	ow Progre	ess			1													
Depth F	rom (m)			epth To		Duration (h		Tool	/ Remark	1													
			2																				
	1			ter S	trike				r Added														
Strike At (m)	Rise To (ı	n)	Time El (mir	apsed ns)	Casing Dept	th (m) Depth S	Sealed (m)	Depth From (m)	n Depth To (m)	_													
		1	Nota	ar Ctr	ike Rem	narke		l		1				Ger	ner	al Rem	arke			<u> </u>			
Groundwate	er not obse					iai ito			The borehole	was ca	arried out	over	water from jacl	k-up platf	form	Skate 3A.	Deck to m	udline =	= 6.00m	ı; deck lev	el = 5.18m	CD. Water	
									level was ma Groundwater	ntained not obs	d at or ab served as	ove se	eabed level. Al hole conducted	depths a	and o	depth relate	ed remarks	s refer to	o depth	s below s	eabed leve	el.	
									sandstone by	iogger													
Installation											Pipe								Back	ckfill			
Туре	Type ID		Respo To	onse Zor op (m)	ne Response Base (Zone Installat	on Date	ID	Top Depth (m)	Base	Depth (m)	Diam	neter (mm)	Туре	De	epth From (r	n) Depth 1	To (m)	В	ackfill Mat	erial	Date	
Notes	<u> </u>											1											
	iations a	nd i	resul	lts da	ta define	d on 'Note	s on Ex	ploratory	/ Position	Reco	rds'												
Checked By			NH	HA			E	levation Da	tum	Ch	nart Datur	m			G	rid Coordir	nate Syster	m_	OSGB				
Template: F	GSL/HBS	/FGS	SL BH	Summa	ary.hbt/Conf	fig Fugro Rev	5/12/03/20	019/TS										Print Da	ate		25/04/20	19	



D. CORE PHOTOGRAPHS

Rotary Core Photographs

BH01 Plate BH01/1

BH03 Plates BH03/1 and BH03/2

BH05 Plate BH05/1







BH01; 17.35m to 18.85m



BH01; 20.35m to 21.85m



BH01; 21.85m to 23.35m







BH03; 17.00m to 18.00m



BH03; 18.00m to 19.50m



BH03; 19.50m to 21.00m





BH03; 21.00m to 22.50







BH05; 14.50m to 16.00m



BH05; 16.50m to 17.00m



E. FIELD TEST RECORDS

E.1 CALIBRATION CERTIFICATES

SPT Hammer Calibration Certificate SPT08

E.2 STANDARD PENETRATION TEST RESULTS

Standard Penetration Test Results Figures BH01 to BH08

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD AINLEYS INDUSTRIAL ESTATE ELLAND

WEST YORKSHIRE

HX5 9JP

SPT Hammer Ref: SPT08

Test Date:

19/09/2018

Report Date:

19/09/2018

File Name:

SPT08.spt

Test Operator:

SH

Instrumented Rod Data

Diameter d_r (mm):

54

Wall Thickness t_r (mm):

6.3

Assumed Modulus Ea (GPa): 200

Accelerometer No.1:

7080

Accelerometer No.2:

11609

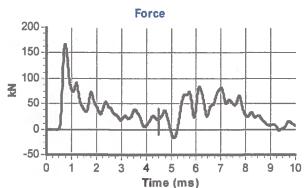
SPT Hammer Information

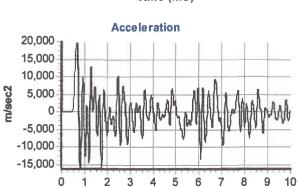
Hammer Mass m (kg):

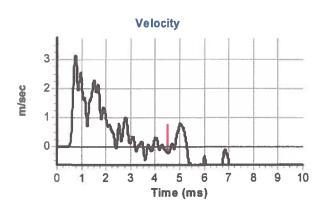
Falling Height h (mm): 760

SPT String Length L (m): 10.0

Comments / Location









Calculations

Area of Rod A (mm2):

944

Time (ms)

Theoretical Energy E_{theor} (J):

473

Measured Energy E_{meas}

242

Energy Ratio E_r (%):

51

The recommended calibration interval is 12 months

S.HOWARTH Signed:

Title:

FITTER



Contract Name	Nigg Energy Park, East Qua	Location ID						
Client	Global Energy Nigg Ltd	Global Energy Nigg Ltd						
Fugro Reference	G191005U							
Coordinates (m)	E279383.70 N868963.58	Ground Elevation (m Datum)	0.85	Sheet 1 of 1				
Hole Type	Cable Percussion and Rota	ry Coring		Status	Draft			

			Hol	le Type	. ,		le Percussion and Rotar			,		Status		aft
							Standard Penetr	ration Te	est Results					
Test Depti	h (m)	Test	Туре	Self Wei	ght (mm)	Test Result			Total Penetration (mm)	Hammer Seri Number	al Ene	ergy Ratio (%)	Casing Depth (m)	Water Depth (m)
Test D		Situ \	Vane T	Test Res	ults	hallbaketer	In Situ Hand Per	netrome	ter Results	Vola			ng by Photoionis	
Test Depth (m)	Test T	ype	Shear Str	ed Undrained ength (kPa)	Shear	lual Undrained Strength (kPa)	Test Depth (m)	Undisturbe	d Undrained Shear St (kPa)	rength	Test De	pth (m)	PID Res	sult (ppm)
Notes														

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Template: FGSL/HBSI/FGSL SPT Summary.hbt/Config Fugro Rev5/18/02/2019/TS

Print Date



Contract Name	Nigg Energy Park, East Qua	Location ID					
Client	Global Energy Nigg Ltd	BH	102				
Fugro Reference	G191005U	G191005U					
Coordinates (m)	E279342.91 N868934.75	Ground Elevation (m Datum)	-9.10	Sheet 1 of 1			
Hala Tima	Cable Developies			Ctatus	Droft		

		oordinate	s (m)			Ground	d Elevation (n	n Dati	ım) -9.			-ft
	ŀ	lole Type		Cabl	le Percussion	ation T	act Paculto			Status	Dra	art
Test Denth (m)	Test Tyne	Self Wei	ight	Test Result		allon	Total Penetration	Hamn	ner Serial	Energy Ratio (%)	Casing Denth (m)	Water Denth (m)
Test Depth (m)	Test Type		ight (mm)	Test Result	Standard Penetr	ration T	est Results Total Penetration (mm)	Hamm	ner Serial umber	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)
In Test Depth (m) Test 7	Situ Vane	e Test Res	ults Residu	ual Undrained Strength (kPa)	In Situ Hand Per Test Depth (m)	netrome Undisturb	eter Results ed Undrained Shear S (kPa)	trength		Headspace Test t Depth (m)	ing by Photoionis	ation Detector
Notes		,										

-Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Template: FGSL/HBSI/FGSL SPT Summary.hbt/Config Fugro Rev5/18/02/2019/TS

Print Date



Contract Name	Nigg Energy Park, East Qua	Location ID					
Client	Global Energy Nigg Ltd	Global Energy Nigg Ltd					
Fugro Reference	G191005U						
Coordinates (m)	E279380.53 N868920.31	Ground Elevation (m Datum)	-0.75	Sheet 1 of 1			

BH03

neet 1 of 1

25/04/2019

Print Date

H	ole Type	Cable Percussion and Rotary		,	Status	Dra	aft
			ation Test Results				
Test Depth (m) Test Type		Result	(mm)	Hammer Serial Number		Casing Depth (m)	
Test Depth (m) Test Type 0.50 S 2.00 S 4.00 S 5.50 S 7.00 S 9.00 S 11.00 S 13.00 S 17.00 S 17.00 S	0 N=9 (0 N=31 0 N=17 0 50 (7 0 N=37 0 50 (2 450 N=0 (0 0 N=33 0 50 (3 0 50 (3 0 N=0 (4 0	Result (3,2/2,2,2,3) 1 (3,4/4,5,10,12) 7 (2,3/3,3,6,5) 7,11/50 for 140mm) 7 (1,3/6,10,9,12) 2,8/50 for 180mm) (0 for 0mm/0 for 0mm) 3 (2,1/3,4,9,17) 3,11/50 for 105mm) 3,17/50 for 30mm)	Total Penetration (mm) 450 450 450 290 450 330 0 450 255 180	Hammer Serial Number	Energy Ratio (%) 51 51 51 51 51 51 51 51 51 51 51 51 51	Casing Depth (m) 1.00 2.50 4.45 6.00 7.50 9.50 11.50 11.50 17.25	Water Depth (m) 1.80 2.20 2.60 2.40 3.20 5.10 3.80 3.00 2.40 3.80
In Situ Vane	Test Results bed Undrained Residual Undr	dealmod	etrometer Results Undisturbed Undrained Shear Stren			ng by Photoionis	
Test Depth (m) Test Type Undistur	Strength (kPa) Residual Undi Shear Strength	Test Depth (m)	(kPa)	Tes	t Depth (m)	PID Res	sult (ppm)
Notes							

Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Template: FGSL/HBSI/FGSL SPT Summary.hbt/Config Fugro Rev5/18/02/2019/TS



Contract Name	Nigg Energy Park, East Qua	Location ID					
Client	Global Energy Nigg Ltd	Global Energy Nigg Ltd					
Fugro Reference	G191005U						
Coordinates (m)	E279380.77 N868871.12	Ground Elevation (m Datum)	-2.02	Sheet 1 of 1			

BH04

neet 1 of 1

	Hole Type	Cabl	e Percussion		,	,	Status	Dra	aft
			Standard Penetr	ration T					
Test Depth (m) Test Ty		Test Result			Total Penetration (mm)	Hammer Serial Number		Casing Depth (m)	
Test Depth (m) Test Ty 0.50 S 2.00 S 4.00 S 6.00 S 8.00 S 10.00 S 12.00 S 14.00 S 12.00 S 22.00 S 22.00 S	450 0 0 0 0 0 0 0 0	N=0 (0 for 0 N=16 (4,4/4 N=29 (2,4/7 50 (1,0/50 f 50 (4,11/50 N=42 (7,9/8 50 (7,18/50 N=20 (2,3/3 N=34 (2,4/6 50 (2,9/50 f 50 (4,9/50 f	Omm/0 for 0mm) 4,4,4,4) 7,6,8,8) for 190mm) for 200mm) 3,11,10,13) for 85mm) 3,5,5,7) 3,9,8,11) for 100mm)		Total Penetration (mm)	Number Num	51 51 51 51 51 51 51 51 51 51 51 51 51 5	Casing Depth (m) 1.00 2.50 4.50 6.50 8.00 10.50 12.50 14.50 16.00 16.00 16.00	Water Depth (m) 7.80 7.30 5.80 5.30 6.40 4.10 1.80 2.80 3.40 4.00 4.30 4.00
	ane Test Results		In Situ Hand Per					ing by Photoionis	ation Detector
Test Depth (m) Test Type Sh	disturbed Undrained Residence Strength (kPa) Shear	dual Undrained r Strength (kPa)	Test Depth (m)	Undisturbe	ed Undrained Shear Str (kPa)	Tes Tes	t Depth (m)	PID Res	sult (ppm)
Notes									

Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Template: FGSL/HBSI/FGSL SPT Summary.hbt/Config Fugro Rev5/18/02/2019/TS

Print Date



Hole Type

Contract Name	Nigg Energy Park, East Qua	Location ID					
Client	Global Energy Nigg Ltd	Global Energy Nigg Ltd					
Fugro Reference	G191005U						
Coordinates (m)	E279379.79 N868819.21	Ground Elevation (m Datum)	-6.75	Sheet 1 of 1			

Cable Percussion and Rotary Coring

BH05

eet 1 of 1 Status Draft

Standard Penetration T	est Results	
	Total Penetration	Hai

				Standard	d Penetration I					
Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result			Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)
0.50	S	150	N=0 (0,0/0,			450	08	51	1.00	3.40
2.00	S	0	N=10 (2,1/			450	08	51	2.00	3.70
4.00	S	0	50 (5,8/50 1			485	08	51	4.00	3.70
6.00	S	0		for 245mm)		395	08	51	6.00	DRY
8.00	S	0		for 250mm)		400	08	51	8.00	DRY
10.00	S	0		15mm/50 for 270		385	08	51	10.00	DRY
12.00	S	0		05mm/50 for 245	mm)	350	08	51	12.50	3.10
14.00	S	0	50 (7,15/50	for 35mm)		185	08	51	13.50	3.20
In	Situ Vane	Leet Reculte		In Situ H	and Penetrome	ter Results	Volatile	Headenace Testi	ing by Photoionis	ation Detector

	In Situ	Vane Test Resi	ults	In Situ Hand Per	netrometer Results	Volatile Headspace Testing by Photoionisatio	
Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)	Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)	Test Depth (m)	PID Result (ppm)

Notes

-Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Template: FGSL/HBSI/FGSL SPT Summary.hbt/Config Fugro Rev5/18/02/2019/TS

Print Date



Contract Name	Nigg Energy Park, East Qua	ay Development		Location ID	
				DI	
Client	Global Energy Nigg Ltd			Bŀ	1
Fugro Reference	G191005U				•
Coordinates (m)	E279381.64 N868746.75	Ground Elevation (m Datum)	-9.60	Sheet 1 of 1	
Hole Type	Cable Percussion			Status	

		Hole	е Туре		Cable	e Perc	ussion			Stat				IS	Draft		
							Standard	d Penetr	ation Te	est Results							
Test Depth (m)	Test	Туре	Self Weig Penetration	ht (mm) Te	est Result					Total Penetration (mm)	Ham N	mer Serial lumber	Energy Ratio (%) Casing	Depth (m)	Water Depth (m)	
Test Depth (m) 0.50 2.00 4.00 6.00 8.00 10.00 12.00 14.00	sst Result =0 (0,0/0, =0 (0,0/0, =0 (0,0/0, =8 (1,2/1, =5 (0,1/1, =6 (2,1/1, =11 (2,2/3 =22 (3,3/2	0,0,0) 0,0,0) 0,0,0) 2,3,2) 1,1,2) 2,2,1) 3,2,3,3)	50mm)			450 450 450 450 450 450 450 450 450 450	N	Very serial lumber	Energy Ratio (%	1 2 4 6 8 11	Depth (m) .00 .50 .50 .50 .50 .50 .50 .50 .4.50	2.20 2.50 3.00 3.30 3.20 3.10 2.20 DRY					
			est Resu				In Situ H	and Per		ter Results		Volatile	Headspace Te	sting by F	Photoionis	ation Detector	
Test Depth (m) Test	Туре	Undisturbed Shear Stre	d Undrained ngth (kPa)	Residual Shear Stre	Undrained ength (kPa)	Te	est Depth ((m)	Undisturbe	ed Undrained Shear S (kPa)	Strength	Tes	t Depth (m)		PID Res	sult (ppm)	

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Template: FGSL/HBSI/FGSL SPT Summary.hbt/Config Fugro Rev5/18/02/2019/TS

Print Date



Contract Name	Nigg Energy Park, East Qua	ay Development		Location ID							
Client	Global Energy Nigg Ltd	lobal Energy Nigg Ltd									
Fugro Reference	G191005U										
Coordinates (m)	E279451.07 N868746.87	Ground Elevation (m Datum)	-4.01	Sheet 1 of 1							

BH07

Sheet 1 of 1

Note Popular Status St	Coordinates (m)					E279	9451.07	7 N868746.	87	Ground	d Elevation (r	n Datı	um) -4.	01	Sheet	1 of 1	
Test Depth (m) Test Type Seri Warpin Test Result			Но	le Type											Status	S Dra	aft
0.50								Standard F	Penetr	ation T							
0.50	Test Depth (m)			Self Weig Penetration	ht Test	Result					Total Penetration (mm)	Hami	mer Serial lumber	Energy I	Ratio (%)	Casing Depth (m)	Water Depth (m)
Test Depth Test Type Undisturbed Undrained Residual Undrained Test Depth (m) Undisturbed Undrained Shear Strength Test Depth (m) DID Deput (npm)	0.50 2.00 4.00 6.00 8.00 10.00 11.70 14.00 16.00	S S S S S S S S S S S		150 0 450 0 0 0 0 0	N=9 N=6 N=0 N=15 N=17 N=20 N=20 N=34 N=17	(0,0/2, (1,1/1, (0 for (9 (2,3/4) 7 (2,3/4) 0 (3,3/4) 3 (4,4/6) 4 (4,4/6) 7 (3,4/3) 2 (3,2/3)	2,2,3) ,0,1,4) 0mm/0 f 4,3,5,7) 4,4,4,5) 4,4,5,7) 6,6,5,6) 6,7,10,1 3,3,4,7) 3,3,3,3,3)	1)			(mm) 450 450 0 450 450 450 450 450 450 450	N	Umber 08 08 08 08 08 08 08 08 08 08 08 08 08	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.00 2.50 4.50 6.50 8.00 10.50 12.00 14.50 16.00 18.50	6.30 5.90 5.30 4.60 3.70 3.00 3.20 4.10 5.20 5.80
Test Depth Test Tune Undisturbed Undrained Residual Undrained Test Depth (m) Undisturbed Undrained Shear Strength Test Depth (m) DID Deput (no.m.)		0:1)	,					. 0:: 11						<u>. </u>		=	
	Total Double	- 11				Irained						Strenath					
		Туре	Shear Str	kPa)	Shear Strengt	h (kPa)	16	зы р ебіц (ш	,				IES	st Depth	(m)	PID Ke	ьші (ррт)

Notes

-Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Template: FGSL/HBSI/FGSL SPT Summary.hbt/Config Fugro Rev5/18/02/2019/TS

Print Date



Contract Name	Nigg Energy Park, East Qu	ay Development		Location ID	
Client	Global Energy Nigg Ltd			BH	INR
Fugro Reference	G191005U				
Coordinates (m)	E279448.06 N868803.00	Ground Elevation (m Datum)	-0.82	Sheet 1 of 1	
Holo Typo	Cable Persussion			Status	Droft

			Hol	е Туре		Cabl	e Percı						·	St	atus	D	raft
								Standard	d Peneti	ration T	est Results						
Test Dept	h (m)	Test	Туре	Self Weig Penetration	ght (mm)	Test Result					Total Penetration (mm)	Hamn No	ner Serial umber	Energy Ratio	(%)	Casing Depth (m) Water Depth (m)
		Citu	Vana T	oot Door	ulto			In Citu L	and Dar	actromo	tor Doculto		Valatila	Llaadanaaa	Tantin	as by Dhataiani	ination Detector
Test Depth (m)	Test	Type	Undisturbe	est Resi d Undrained ength (kPa)	Resid	ual Undrained Strength (kPa)		st Depth (Undisturb	eter Results ed Undrained Shear S (kPa)	Strength		t Depth (m			esult (ppm)
(m)		. 71	Snear Stre	engtn (kPa)	Snear	Strength (kPa)			,		(кРа)				,		(FF)
Notes	1									1							

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Template: FGSL/HBSI/FGSL SPT Summary.hbt/Config Fugro Rev5/18/02/2019/TS

Print Date



F. GEOENVIRONMENTAL TESTING

General Notes on Laboratory Test Results	Figure F.1
Schedule of Contamination Testing	Table F.2
RPS Bedford Ltd (RPS), Certificates of Analysis Number:	19-81762



GUIDANCE NOTES

NOTES ON CHEMICAL ANALYSIS FOR CONTAMINATED LAND ASSESSMENT

Sampling, Sample Preservation, Transport and Storage

Sampling of soils for environmental chemical analysis is undertaken to the standards set out in BS 10175:2011+A1:2013, sampling of groundwater is undertaken as per BS EN ISO 22475–1:2006 and BS ISO 5667–11:2009, sampling of surface waters as per BS EN ISO 5667–1:2006 and BS ISO 5667–6:2014, and sampling of ground gases for environmental testing as per CIRIA Guidance C665.

The sample container types used are dictated by the requirements of chemical testing as set out in the project specification and as provided by the selected environmental testing laboratory. Sample containers are filled as instructed by laboratory guidelines, ensuring minimisation of sample headspace.

Where sample volumes are limited by the sampling technique (e.g. dynamic sampling) certain sample container types may be prioritised to achieve the most comprehensive testing possible.

Samples on site are preserved by control of temperature to between 2 and 4 degrees Celsius unless otherwise stated. Samples are despatched to the analytical laboratory on the day of sampling under Chain of Custody (CoC) in temperature controlled cool-boxes. Sample temperature is measured on receipt at the designated analytical laboratory. Temperature control is maintained at the analytical laboratory prior to receipt of testing instructions, preparation and analysis.

Where testing instructions are to be provided by the Investigation Supervisor, blank testing schedules are provided as standard within 1 to 2 working days of sampling.

Scheduled Testing

The requested chemical analyses scheduled on available samples given on the relevant CoC.

The schedule lists the date of sampling, CoC number under which the samples were transported, tests requested and laboratory certificate reference for all samples.

Laboratory Analytical Methodologies and Accreditation

Analytical laboratories used by FGSL are accredited by UKAS (United Kingdom Accreditation Service). Dependent on Limits of Detection being achievable as requested at the time of scheduling, chemical analyses on soils, waters and gases will, where possible, be accredited by MCERTS (Monitoring Certification Scheme). MCERTS is the Environment Agency's performance standard for laboratories undertaking chemical testing. The accreditation applicable for individual tests is presented on the analytical laboratory test certificates in this report.

A summary of the methodologies used by the analytical laboratory in carrying out the requested analyses is presented on the summary pages of the analytical laboratory test certificates. Further information may be obtained on the test methodologies by contacting the laboratory concerned.

Where marine sediment samples are tested, principally as part of a dredging licence application, specific laboratory accreditation testing is required, as detailed in the relevant guidance documents from the



licensing agency. Details of these tests are given in relevant guidance documents reproduced in the appendix with the results.

Deviating Samples

UKAS is the accreditation body responsible for auditing laboratories to both ISO 17025 and MCERTS in the UK. All UKAS accredited laboratories are required to operate appropriate procedures for the handling of deviating samples.

Deviating (or non-conforming) samples are defined as those which may have been compromised in some way during sampling, transportation, storage or analysis, and which may cause the integrity of the analytical data to be in doubt.

Examples of deviating samples that can occur from sampling, transportation and storage issues include:

- Incorrect sample containers for analyses requested, for example, no separate volatile container supplied or samples for organics analysis supplied in plastic containers;
- Headspace present in containers for volatile compounds or Biological Oxygen Demand (BOD) analyses;
- No sampling date supplied (mandatory for MCERTS);
- No sampling time supplied (applicable for certain water parameters);
- Temperature exceeded;
- Holding time for the analysis exceeded.

Where deviating samples are subsequently analysed, UKAS requires that the competent laboratory "shall include a disclaimer in the report, clearly stating that the sample was deviating and that, as a result, the test result(s) may be invalid". It is also a condition of MCERTS that the whole results certificate is included in reports sent to Global Energy Nigg Limited, including all supporting information. and not just the results sheets. Each analytical report therefore contains a page detailing the deviating samples and the reasons for the non-conformity.

FGSL undertakes to sample, record, transport and store samples in such a way that deviating samples should not occur unless for reasons outside of FGSL's control.

Waste Acceptance Criteria Testing

Where samples have been scheduled for Waste Acceptance Criteria (WAC) testing to BS EN 12457, Part 3, analysis is undertaken for one of the Full, Hazardous or Inert WAC suites, as specified and as detailed below.

Full WAC Suite: The solid material from each sample is tested for: total organic carbon (TOC); loss on ignition (LOI); benzene, toluene, ethylbenzene and xylene (BTEX): Polychlorinated biphenyls (PCB's); Total petroleum hydrocarbons (TPH (C10 – C40)); Polycyclic aromatic hydrocarbons (PAHs); pH value; and acid neutralisation capacity. Two leachate specimens for each sample are prepared at liquid to solid ratios of 2:1 and then 8:1 and both are analysed for arsenic, barium, cadmium, chromium, copper, mercury, molybdenum, nickel, lead, antimony, selenium, zinc, chloride, fluoride, sulphate, total dissolved solids, phenol index and dissolved organic carbon.



Hazardous WAC Suite: The solid material from each sample is tested for total organic carbon, loss on ignition and acid neutralisation capacity. Two leachate specimens for each sample are prepared at liquid to solid ratios of 2:1 and then 8:1 and both are analysed for arsenic, barium, cadmium, chromium, copper, mercury, molybdenum, nickel, lead, antimony, selenium, zinc, chloride, fluoride, sulphate, total dissolved solids and dissolved organic carbon.

Inert WAC Suite: The solid material from each sample for total organic carbon, BTEX, PCB's, TPH (C10 – C40) and PAH. Two leachate specimens for each sample are prepared at liquid to solid ratios of 2:1 and then 8:1 and both analysed for arsenic, barium, cadmium, chromium, copper, mercury, molybdenum, nickel, lead, antimony, selenium, zinc, chloride, fluoride, sulphate, total dissolved solids, phenol index and dissolved organic carbon.

Results – calculation: The results of the testing of the 2:1 and 8:1 leachate specimens are then calculated to give a liquid to solid ratio of 10:1 result in mg/kg. These 10:1 results, and the results of the solid determinations, can be compared to the values set out in the guidance produced by the Environment Agency (2005) to assist with appropriate disposal to landfill, under Landfill Directive (1999/31/EC).

Chemical Analysis on Leachates Prepared from Soil Samples

Where artificially produced leachate specimens are requested from soil samples the leachate preparation technique is in accordance with British Standard BS EN 12457, as detailed on the Schedules.

The following is a summary of the different leaching preparations available:

- BS EN 12457–1: One stage test carried out at a liquid to solid ratio of 2:1;
- BS EN 12457–2: One stage test carried out at a liquid to solid ratio of 10:1;
- BS EN 12457–3: Two stage test carried out at a liquid to solid ratio of 2:1 followed by 8:1, giving a cumulative liquid to solid ratio of 10:1.

The resultant leachate specimens are then tested for the list of parameters as scheduled.

AGS Data for Chemistry Testing

Chemical testing results are provided in AGS 4.0 format where requested. It should be noted that where laboratory methodologies differ, or determinants tested do not appear on the AGS code list for chemical test names, a new and unique code may be used for an individual test.



Table F.2 Schedule of Contamination Testing

BH Ref.	ES	Depth (m)	Matrix Type	Sampling Date	Marine Scotland Suite (exc. PSA) testing	RPS Report Number
BH1	1	0.00-0.50	Sediment	04/03/2019	1	19-81762
BH1	3	0.50-1.00	Sediment	04/03/2019		
BH1	5	1.00-1.50	Sediment	04/03/2019		
BH1	7	1.50-2.00	Sediment	04/03/2019		
BH1	9	2.00-2.50	Sediment	04/03/2019		
BH1	11	2.50-3.00	Sediment	04/03/2019		
BH1	13	3.00-3.50	Sediment	04/03/2019		
BH1	15	3.80-4.00	Sediment	04/03/2019		
BH1	17	4.00-4.50	Sediment	04/03/2019		
BH1	19	4.50-5.00	Sediment	04/03/2019		
BH1	21	5.00-5.50	Sediment	04/03/2019		
BH1	23	5.50-6.00	Sediment	04/03/2019		
BH1	25	6.00-6.50	Sediment	04/03/2019	1	19-81762
BH1	28	6.80-7.00	Sediment	04/03/2019		
BH1	29	7.00-7.50	Sediment	04/03/2019		
BH1	31	7.50-8.00	Sediment	04/03/2019		
BH1	33	8.00-8.50	Sediment	04/03/2019		
BH1	35	8.50-9.00	Sediment	04/03/2019		
BH1	37	9.00-9.50	Sediment	04/03/2019		
BH1	39	9.50-10.00	Sediment	04/03/2019		
BH1	41	10.00-10.50	Sediment	04/03/2019		
BH1	43	10.50-11.00	Sediment	04/03/2019		
BH1	45	11.00-11.50	Sediment	04/03/2019		
BH1	47	11.50-12.00	Sediment	04/03/2019		
BH1	49	12.00-12.50	Sediment	04/03/2019		
BH1	51	12.50-13.00	Sediment	04/03/2019	1	19-81762
BH2	1	0.00-0.50	Sediment	02/03/2019	1	19-81762
BH2	3	0.50-1.00	Sediment	02/03/2019		
BH2	5	1.00-1.50	Sediment	02/03/2019	1	19-81762
BH2	7	1.50-2.00	Sediment	02/03/2019		
BH2	9	2.20-2.50	Sediment	02/03/2019		
BH2	11	2.50-3.00	Sediment	02/03/2019	1	19-81762
BH2	13	3.00-3.50	Sediment	02/03/2019		
BH2	15	3.50-4.00	Sediment	02/03/2019		
BH3	1	0.00-0.50	Sediment	08/03/2019	1	19-81762
ВН3	3	0.50-1.00	Sediment	08/03/2019		
ВН3	6	1.00-1.50	Sediment	08/03/2019		
ВН3	8	1.50-2.00	Sediment	08/03/2019		
ВН3	11	2.00-2.50	Sediment	08/03/2019		
ВН3	12	2.50-3.00	Sediment	08/03/2019		
ВН3	14	3.00-3.50	Sediment	08/03/2019		
ВН3	16	3.80-4.00	Sediment	08/03/2019		
ВН3	19	4.00-4.50	Sediment	08/03/2019		
ВН3	20	4.50-5.00	Sediment	08/03/2019		
ВН3	22	5.00-5.50	Sediment	08/03/2019		



BH Ref.	ES	Depth (m)	Matrix Type	Sampling Date	Marine Scotland Suite	RPS Report Number
BH3	25	5.50-6.00	Sediment	08/03/2019	(exc. PSA) testing	19-81762
BH3	27	6.00-6.50	Sediment	08/03/2019		13 01702
BH3	29	6.80-7.00	Sediment	08/03/2019		
BH3	32	7.00-7.50	Sediment	08/03/2019		
BH3	33	7.50-7.50	Sediment	08/03/2019		
BH3	35	8.00-8.50	Sediment	08/03/2019		
BH3	37	8.50-9.00	Sediment	08/03/2019		
BH3	40	9.00-9.50	Sediment	08/03/2019		
BH3	41	9.50-9.50	Sediment	08/03/2019		
BH3	43	10.00-10.50	Sediment	08/03/2019		
ВН3	45	10.50-10.50	Sediment	08/03/2019	4	19-81762
					1	-
BH4	1	0.00-0.50	Sediment	11/03/2019	1	19-81762
BH4	4	0.50-1.00	Sediment	11/03/2019		
BH4	5	1.00-1.50	Sediment	11/03/2019		
BH4	7	1.50-2.00	Sediment	11/03/2019		
BH4	10	2.00-2.50	Sediment	11/03/2019		
BH4	12	2.50-3.00	Sediment	11/03/2019		
BH4	14	3.00-3.50	Sediment	11/03/2019		
BH4	15	3.50-4.00	Sediment	11/03/2019		
BH4	18	4.00-4.50	Sediment	11/03/2019		
BH4	19	4.50-5.00	Sediment	11/03/2019	1	19-81762
BH4	21	5.00-5.50	Sediment	11/03/2019		
BH4	23	5.50-6.00	Sediment	11/03/2019		
BH4	26	6.00-6.50	Sediment	11/03/2019		
BH4	28	6.50-7.00	Sediment	11/03/2019		
BH4	29	7.00-7.50	Sediment	11/03/2019		
BH4	31	7.50-8.00	Sediment	11/03/2019		
BH4	34	8.00-8.20	Sediment	11/03/2019		
BH4	36	8.50-9.00	Sediment	11/03/2019		
BH4	38	9.00-9.50	Sediment	11/03/2019		
BH4	40	9.50-10.00	Sediment	11/03/2019	1	19-81762
BH4	43	10.00-10.25	Sediment	11/03/2019		
BH5	1	0.00-0.50	Sediment	13/03/2019	1	19-81762
BH5	4	0.50-1.00	Sediment	13/03/2019		
BH5	6	1.00-1.50	Sediment	13/03/2019		
BH5	8	1.50-2.00	Sediment	13/03/2019		
BH5	11	2.00-2.50	Sediment	13/03/2019		
BH5	12	2.50-3.00	Sediment	13/03/2019	1	19-81762
BH5	14	3.00-3.50	Sediment	13/03/2019	<u> </u>	
BH5	16	3.50-4.00	Sediment	13/03/2019		
BH5	19	4.00-4.50	Sediment	13/03/2019		
BH5	20	4.50-5.00	Sediment	13/03/2019		
BH5	22	5.00-5.50	Sediment	13/03/2019	1	19-81762
BH6	1	0.00-0.50	Sediment	16/03/2018	1	19-81762
BH6	3	0.50-0.30	Sediment	16/03/2018	ı	13 31702
ВН6	5	1.00-1.50	Sediment	16/03/2018	1	19-81762



BH Ref.	ES	Depth (m)	Matrix Type	Sampling Date	Marine Scotland Suite (exc. PSA) testing	RPS Report Number
BH6	7	1.50-2.00	Sediment	16/03/2018		
BH6	9	2.00-2.50	Sediment	16/03/2018	1	19-81762
BH7	1	0.00-0.50	Sediment	07/03/2019	1	19-81762
BH7	4	0.50-1.00	Sediment	07/03/2019		
BH7	6	1.00-1.50	Sediment	07/03/2019		
BH7	9	1.50-2.00	Sediment	07/03/2019		
BH7	11	2.00-2.50	Sediment	07/03/2019		
BH7	12	2.50-3.00	Sediment	07/03/2019		
BH7	14	3.00-3.50	Sediment	07/03/2019	1	19-81762
BH7	16	3.50-4.00	Sediment	07/03/2019		
BH7	19	4.00-4.50	Sediment	07/03/2019		
BH7	20	4.50-5.00	Sediment	07/03/2019		
BH7	22	5.00-5.50	Sediment	07/03/2019		
BH7	24	5.50-6.00	Sediment	07/03/2019		
BH7	27	6.00-6.50	Sediment	07/03/2019	1	19-81762
BH7	28	6.50-7.00	Sediment	07/03/2019		
BH7	30	7.00-7.50	Sediment	07/03/2019		
BH7	32	7.50-8.00	Sediment	07/03/2019		
BH8	1	0.00-0.50	Sediment	05/03/2019	1	19-81762
BH8	3	0.50-1.00	Sediment	05/03/2019		
BH8	5	1.00-1.50	Sediment	05/03/2019		
BH8	7	1.50-2.00	Sediment	05/03/2019		
BH8	9	2.00-2.50	Sediment	05/03/2019		
BH8	11	2.50-3.00	Sediment	05/03/2019	1	19-81762
BH8	13	3.00-3.50	Sediment	05/03/2019		
BH8	15	3.50-4.00	Sediment	05/03/2019		
BH8	17	4.00-4.50	Sediment	05/03/2019		
BH8	19	4.50-5.00	Sediment	05/03/2019		
BH8	21	5.00-5.50	Sediment	05/03/2019	1	19-81762



Certificate of Analysis

Report No.: 19-81762

Issue No.: 2

Date of Issue 17/04/2019

Customer Details: Fugro GeoServices Ltd, Fugro House, Hithercroft Road, Wallingford,

Oxfordshire OX10 9RB.

Customer Contact: Karen Blackmore

Customer Order No.: 78367KB-WAL

Customer Reference: G191005U

Quotation Reference: 190318/04

Description: 24 sediment samples

Date Received: 19/03/2019

Date Started: 25/03/2019

Date Completed: 12/04/2019

Test Methods: Details available on request (refer to SOP code against relevant result/s)

Notes: Issue 2 replaces Issue 1 in its entirety

Approved By: Matthew Hickson, Laboratory Manager

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service.

This certificate shall not be reproduced except in full without the prior written approval of the laboratory.

Observations and interpretations are outside of the scope of UKAS accreditation.

Results reported herein relate only to the items supplied to the laboratory for testing.

Results on an Interim Report are not dry-weight corrected.



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Results Summary - Dry Weights, Moisture, Total Organic Carbon, TPH, Organotins & Density

			Cust	omer Sam	ole No							BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11
			Cı	ustomer San	nple ID	Certific	ed Reference	e Material	AQC spike			0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m
				RPS Sam	ple No							398220	398221	398222	398223	398224	398225
				Sample	Туре		SEDIMEN	Т		SEDIME	TV	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Lo	ocation												
				Sample Dep	oth (m)		CDM DCD 6	46					6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m
				Samplin	g Date		CRM BCR-6 CRM NIST 19	-	Spik	e on clean s	ediment	04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019
				Samplin	g Time		CKM MIST IS	744									
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %						
dry solids (at 105°C)		N	397	%		n/a	n/a	n/a	n/a	n/a	n/a	82.5	81.2	79.7	79.7	77.7	66.0
total organic carbon		UO	404	%	0.3	4.4	4.52	102.7%	1.5	1.47	98.0%	0.6	< 0.3	< 0.3	0.5	0.7	1.7
total petroleum hydrocarbons by GCFID (C10 - C40)		N	In house	μg/kg	n/a	n/a n/a n/a			n/a	n/a	n/a	844	1320	1190	4590	8070	49800
dibutyltin (DBT)	1002-53-5	UO		ug/kg DW	5	770 547.88 71.2%			40	37.18	92.9%	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00
tributyltin (TBT)	56573-85-4	UO	395	ug/kg DW	2	480	373.02	77.7%	40	40.34	100.9%	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	57.8



tributyltin (TBT)

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Results Summary - Dry Weights, Moisture, Total Organic Carbon, TPH, Organotins & Density

 Report No.:
 19-81762

 Customer Reference:
 G191005U

 Customer Order No:
 78367KB-WAL

Determinand

total organic carbon total petroleum hydrocarbons by GCFID (C10 - C40) dibutyltin (DBT)

		Cust	omer Samp	le No							BH3 ES1	BH3 ES25	BH3 ES45	BH4 ES1	BH4 ES19	BH4 ES40
		Cı	ustomer Sam	ple ID	Certifie	ed Reference	Material		AQC spike	e	0.00-0.50m	5.50-6.00m	10.50-11.00m	0.00-0.50m	4.50-5.00m	9.50-10.0m
			RPS Sam	ple No							398226	398227	398228	398229	398230	398231
			Sample	Туре		SEDIMENT	Г		SEDIMEN	IT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
			Sample Lo	cation												
			Sample Dep	th (m)		CDM DCD C					0.00-0.50m	5.50-6.00m	10.5-11.0m	0.00-0.50m	4.50-5.00m	9.50-10.0m
Sampling Date				g Date		CRM BCR-64 CRM NIST 19		Spike	e on clean s	ediment	08/03/2019	08/03/2019	08/03/2019	11/03/2019	11/03/2019	11/03/2019
			Sampling	g Time	•	KM 14131 13										
CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %						
	N	397	%		n/a	n/a	n/a	n/a	n/a	n/a	79.2	81.8	82.5	86.0	86.0	79.5
	UO 404 % 0.3			0.3	4.4	4.52	102.7%	1.5	1.47	98.0%	1.1	< 0.3	< 0.3	0.5	< 0.3	0.6
N In house μg/kg n/a n/a				n/a	n/a	n/a	n/a	n/a	n/a	2340	1570	1360	2160	1600	4270	
1002-53-5 UO 395 ug/kg DW 5 770 547.88 71.2%					40	37.18	92.9%	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00			
56573-85-4	UO 395 ug/kg DW 2 480 373.02 77.7%				77.7%	40	40.34	100.9%	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00		



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Results Summary - Dry Weights, Moisture, Total Organic Carbon, TPH, Organotins & Density

Report No.: 19-81762 Customer Reference: G191005U Customer Order No: 78367KB-WAL

			Cust	omer Samp	le No							BH5 ES1	BH5 ES12	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9
			Cı	ustomer Sam	ple ID	Certific	ed Reference	Material		AQC spik	e	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
				RPS Sam	ple No							398232	398233	398234	398235	398236	398237
				Sample	Туре		SEDIMEN'	Т		SEDIMEN	NT .	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Lo	cation												
				Sample Dep	th (m)		CDM DCD C	4.5				0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
				Samplin	g Date		CRM BCR-6 CRM NIST 19		Spik	e on clean s	ediment	13/03/2019	13/03/2019	13/03/2019	16/03/0320	16/03/2019	16/03/2019
				Samplin	g Time	,	CKM NIST IS	744								i	
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %						ı
dry solids (at 105°C)		N	397	%		n/a	n/a	n/a	n/a	n/a	n/a	64.8	80.1	81.2	68.2	76.1	76.1
total organic carbon		UO	404	%	0.3	4.4	4.52	102.7%	1.5	1.47	98.0%	1.0	0.7	0.5	0.6	0.5	0.6
total petroleum hydrocarbons by GCFID (C10 - C40)		N	In house	μg/kg	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8050	2110	2240	6400	3230	2590
dibutyltin (DBT)	1002-53-5	UO	395	ug/kg DW	5	770	547.88	71.2%	40	37.18	92.9%	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00
tributyltin (TBT)	56573-85-4	UO	395	ug/kg DW	2	480	373.02	77.7%	40	40.34	100.9%	< 2.00	< 2.00	< 2.00	11.2	< 2.00	< 2.00



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Results Summary - Dry Weights, Moisture, Total Organic Carbon, TPH, Organotins & Density

Report No.: 19-81762 Customer Reference: G191005U Customer Order No: 78367KB-WAL

			Cust	omer Samp	le No							BH7 ES1	BH7 ES14	BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
			Cı	ustomer Sam	ple ID	Certific	ed Reference	e Material		AQC spik	e	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				RPS Sam	ple No							398238	398239	398240	398241	398242	398243
				Sample	Туре		SEDIMEN'	Т		SEDIMEN	NT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Lo	cation												
				Sample Dep	th (m)		CDM DCD C	46				0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				Samplin	g Date		CRM BCR-6 CRM NIST 19		Spik	e on clean s	ediment	07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
				Samplin	g Time	,	CKI-I NISI II	744								,	
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %						
dry solids (at 105°C)		N	397	%		n/a	n/a	n/a	n/a	n/a	n/a	74.0	71.6	80.8	80.2	78.0	75.2
total organic carbon		UO	404	%	0.3	4.4	4.52	102.7%	1.5	1.47	98.0%	0.8	0.9	0.5	0.5	0.6	0.9
total petroleum hydrocarbons by GCFID (C10 - C40)		N	In house	μg/kg	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1750	7860	2630	2690	2200	2770
dibutyltin (DBT)	1002-53-5	UO	395	ug/kg DW	5	770	547.88	71.2%	40	37.18	92.9%	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00
tributyltin (TBT)	56573-85-4	UO	395	ug/kg DW	2	480	373.02	77.7%	40	40.34	100.9%	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00



arsenic (HF digest) cadmium (HF digest) chromium (HF digest)

copper (HF digest)
lead (HF digest)
mercury (HF digest)
nickel (HF digest)

zinc (HF digest)

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Results Summary - Metals

No:	78367KB-W	/AL												
			Cus	stomer Sam	ple No				BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11
				Customer San	nple ID	Standa	ard Reference	Material	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m
				RPS Sam	nple No				398220	398221	398222	398223	398224	398225
				Sample			SEDIMENT	<u> </u>		SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT
				Sample Lo										
				Sample Dep					0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m
				Samplin	٠,		SRM-2702		04/03/2019		04/03/2019	02/03/2019	02/03/2019	02/03/2019
				Samplin	-								52,55,252	
				oup	9									
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %						
	7440-38-2	USI	M-129	mg/kg DW	0.5	45.3	48.5	107.1%	1.65	1.43	0.88	2.34	1.56	9.41
	7440-43-9	USI	M-129	mg/kg DW	0.1	0.817	0.94	115.1%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.16
t)	7440-47-3	USI	M-129	mg/kg DW	0.5	352	326	92.6%	2.87	7.03	6.58	4.08	4.27	41.1
	7440-50-8	USI	M-129	mg/kg DW	0.5	117.7	114	96.9%	1.66	2.22	2.21	1.69	1.85	13.9
	7439-92-1	USI	M-129	mg/kg DW	0.5	132.8	132	99.4%	3.61	6.69	8.57	4.42	4.29	25.8
·	7439-97-6	USI	M-129	mg/kg DW	0.01	0.4474	0.41	91.6%	0.02	0.02	0.02	0.03	0.02	0.19
	7440-02-0	USI	M-129	mg/kg DW	0.5	75.4	72.6	96.3%	0.77	2.79	3.04	1.23	1.44	17.2
	7440-66-6	USI	M-129	mg/kg DW	2	485.3	497	102.4%	7.50	9.06	9.67	9.77	8.15	83.4



arsenic (HF digest)
cadmium (HF digest)
chromium (HF digest)
copper (HF digest)
lead (HF digest)
mercury (HF digest)
nickel (HF digest)

zinc (HF digest)

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Results Summary - Metals

Determinand

78367KB-W	'AL												
		Cus	stomer Sam	ple No				BH3 ES1	BH3 ES25	BH3 ES45	BH4 ES1	BH4 ES19	BH4 ES40
			Customer San	nple ID	Standa	rd Reference	Material	0.00-0.50m	5.50-6.00m	10.50-11.00m	0.00-0.50m	4.50-5.00m	9.50-10.0m
			RPS Sam	nple No				398226	398227	398228	398229	398230	398231
			Sample	е Туре		SEDIMENT	Г	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
			Sample L	ocation									
			Sample Dep	oth (m)				0.00-0.50m	5.50-6.00m	10.5-11.0m	0.00-0.50m	4.50-5.00m	9.50-10.0m
			Samplin	g Date		SRM-2702		08/03/2019	08/03/2019	08/03/2019	11/03/2019	11/03/2019	11/03/2019
			Samplin	g Time									
1			ı				1						
CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %						
7440-38-2	USI	M-129	mg/kg DW	0.5	45.3	48.5	107.1%	1.87	1.13	0.61	1.84	2.42	1.43
7440-43-9	USI	M-129	mg/kg DW	0.1	0.817	0.94	115.1%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
7440-47-3	USI	M-129	mg/kg DW	0.5	352	326	92.6%	4.12	7.11	6.26	3.08	25.4	3.38
7440-50-8	USI	M-129	mg/kg DW	0.5	117.7	114	96.9%	1.35	2.18	2.82	6.72	8.54	1.46
7439-92-1	USI	M-129	mg/kg DW	0.5	132.8	132	99.4%	4.63	8.40	8.41	3.47	12.5	3.98
7439-97-6	USI	M-129	mg/kg DW	0.01	0.4474	0.41	91.6%	0.03	0.02	0.02	0.02	0.03	0.03
7440-02-0	USI	M-129	mg/kg DW	0.5	75.4	72.6	96.3%	1.17	2.80	2.89	0.94	14.2	1.12
7440-66-6	USI	M-129	mg/kg DW	2	485.3	497	102.4%	6.71	9.56	8.65	7.61	32.5	8.37



arsenic (HF digest)
cadmium (HF digest)
chromium (HF digest)
copper (HF digest)
lead (HF digest)
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zinc (HF digest)

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Results Summary - Metals

Determinand

	78367KB-W	/AL												
			Cus	stomer Sam	ple No				BH5 ES1	BH5 ES12	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9
				Customer San	nple ID	Standa	rd Reference	Material	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
				RPS Sam	nple No				398232	398233	398234	398235	398236	398237
				Sample			SEDIMENT	Г	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Lo										
				Sample Dep					0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
				Samplin	. ,		SRM-2702		13/03/2019	13/03/2019	13/03/2019	16/03/0320	16/03/2019	16/03/2019
				Samplin	_							.,,		.,,
				oup	9									
i	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %						
	7440-38-2	USI	M-129	mg/kg DW	0.5	45.3	48.5	107.1%	5.85	1.79	1.62	3.68	1.73	2.63
	7440-43-9	USI	M-129	mg/kg DW	0.1	0.817	0.94	115.1%	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
	7440-47-3	USI	M-129	mg/kg DW	0.5	352	326	92.6%	24.7	5.93	5.20	17.1	7.86	13.4
	7440-50-8	USI	M-129	mg/kg DW	0.5	117.7	114	96.9%	6.79	2.10	1.24	5.65	2.46	2.98
·	7439-92-1	USI	M-129	mg/kg DW	0.5	132.8	132	99.4%	15.2	5.57	4.55	13.9	7.45	8.18
·	7439-97-6	USI	M-129	mg/kg DW	0.01	0.4474	0.41	91.6%	0.08	0.04	0.03	0.06	0.03	0.03
	7440-02-0	USI	M-129	mg/kg DW	0.5	75.4	72.6	96.3%	10.2	1.94	1.66	6.97	2.56	5.15
•	7440-66-6	USI	M-129	mg/kg DW	2	485.3	497	102.4%	38.1	20.2	7.71	34.8	12.7	16.2



arsenic (HF digest) cadmium (HF digest) chromium (HF digest)

copper (HF digest)
lead (HF digest)
mercury (HF digest)
nickel (HF digest)

zinc (HF digest)

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Results Summary - Metals

Determinand

	78367KB-W	/AL												
			Cus	stomer Samı	ole No				BH7 ES1	BH7 ES14	BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
				Customer Sam	nple ID	Standa	rd Reference	e Material	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				RPS Sam	ple No				398238	398239	398240	398241	398242	398243
				Sample	Туре		SEDIMENT	Γ	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Lo	ocation									
				Sample Dep	th (m)				0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				Samplin	g Date		SRM-2702	!	07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
				Samplin	g Time									
	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %						
	7440-38-2	USI	M-129	mg/kg DW	0.5	45.3	48.5	107.1%	1.72	3.44	0.93	0.98	1.16	2.51
	7440-43-9	USI	M-129	mg/kg DW	0.1	0.817	0.94	115.1%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
	7440-47-3	USI	M-129	mg/kg DW	0.5	352	326	92.6%	6.91	13.4	2.68	3.45	3.40	13.4
	7440-50-8	USI	M-129	mg/kg DW	0.5	117.7	114	96.9%	1.64	2.28	< 0.50	1.61	1.59	3.06
	7439-92-1	USI	M-129	mg/kg DW	0.5	132.8	132	99.4%	6.34	3.18	0.65	3.57	3.15	7.03
	7439-97-6	USI	M-129	mg/kg DW	0.01	0.4474	0.41	91.6%	0.03	0.03	0.02	0.02	0.02	0.03
	7440-02-0	USI	M-129	mg/kg DW	0.5	75.4	72.6	96.3%	2.46	6.36	1.10	0.88	1.10	5.14
·	7440-66-6	USI	M-129	mg/kg DW	2	485.3	497	102.4%	8.69	17.4	4.51	4.68	5.90	16.1



Results Summary - Polycyclic Aromatic Hydrocarbons

			Cus	stomer Sam	ple No							BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5
				Customer Sar	nple ID	Certif	ied Reference	Material		AQC spike		0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m
				RPS San	nple No							398220	398221	398222	398223	398224
				Sample	е Туре		SEDIMENT	Γ		SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample L												
				Sample De								0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m
				Samplir			IAEA-459		Spil	ce on clean se	diment	04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019
				Samplin	ng Time											
								1								
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %				ĺ '	
naphthalene	91-20-3	U	396	ug/kg DW	2.6	n/a	n/a	N/A	25	27.67	110.7%	< 2.6	< 2.6	< 2.6	< 2.6	5.51
acenaphthylene	208-96-8	Ü	396	ug/kg DW	2	3.06	3.71	121.2%	25	23.21	92.8%	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
acenaphthene	83-32-9	Ü	396	ug/kg DW	1.7	2.33	2.3172	99.5%	25	23.89	95.6%	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7
fluorene	86-73-7	Ü	396	ug/kg DW		5.02	5.89	117.3%	25	25.63	102.5%	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
phenanthrene	85-01-8	Ü	396	ug/kg DW	3.9	27.54	33.63	122.1%	25	23.16	92.6%	< 3.9	< 3.9	< 3.9	< 3.9	10.5
anthracene	120-12-7	U	396	ug/kg DW	2.4	7.55	7.91	n/a	25	25.93	103.7%	< 2.4	< 2.4	< 2.4	< 2.4	3.53
fluoranthene	206-44-0	U	396	ug/kg DW	2.4	36.78	43.69	118.8%	25	24.94	99.8%	< 2.4	< 2.4	< 2.4	6.50	22.1
pyrene	129-00-0	U	396	ug/kg DW	2.8	41.5	49.39	119.0%	25	24.34	97.4%	< 2.8	< 2.8	< 2.8	5.57	20.2
benzo(a)anthracene	56-55-3	U	396	ug/kg DW	1.6	17.53	19.8	112.9%	25	26.24	105.0%	< 1.6	< 1.6	< 1.6	4.47	10.3
chrysene	218-01-9	U	396	ug/kg DW	1.7	N/A	N/A	N/A	25	23.66	94.6%	< 1.7	< 1.7	< 1.7	3.27	6.81
benzo(b+j)fluoranthene	205-99-2	U	396	ug/kg DW	1.6	52.02	55.32	106.3%	25	23.53	94.1%	< 1.6	< 1.6	< 1.6	6.77	17.5
benzo(k)fluoranthene	207-08-9	U	396	ug/kg DW	2	14.29	15	105.0%	25	23.11	92.4%	< 2.0	< 2.0	< 2.0	< 2.0	5.71
benzo(a)pyrene	50-32-8	U	396	ug/kg DW	0.9	18.58	20.16	108.5%	25	23.8	95.2%	< 0.9	< 0.9	< 0.9	5.18	9.77
indeno(1,2,3-c,d)pyrene	193-39-5	Ū	396	ug/kg DW	2.2	23.18	25.75	111.1%	25	25.7	102.8%	< 2.2	< 2.2	< 2.2	3.34	8.66
dibenzo(a,h)anthracene	53-70-3	Ū	396	ug/kg DW	1.6	N/A	N/A	N/A	25	22.52	90.1%	< 1.6	< 1.6	< 1.6	< 1.6	2.75
benzo(g,h,i)perylene	191-24-2	U	396	ug/kg DW	1.4	28.36	31.23	110.1%	25	22.1	88.4%	< 1.4	< 1.4	< 1.4	3.56	8.36



Results Summary - Polycyclic Aromatic Hydrocarbons

												1		•		
			Cus	tomer Sam	ple No							BH2 ES11	BH3 ES1	BH3 ES25	BH3 ES45	BH4 ES1
				Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		2.50-3.00m	0.00-0.50m	5.50-6.00m	10.50-11.00m	0.00-0.50m
				RPS Sam	nple No							398225	398226	398227	398228	398229
				Sample	е Туре		SEDIMENT	•		SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample L												
				Sample Dep								2.50-3.00m		5.50-6.00m		0.00-0.50m
				Samplin			IAEA-459		Spik	e on clean se	diment	02/03/2019	08/03/2019	08/03/2019	08/03/2019	11/03/2019
				Samplin	g Time											
	1	1 1						1	A 1	Management						
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %					
naphthalene	91-20-3	U	396	ug/kg DW	2.6	n/a	n/a	N/A	25	27.67	110.7%	18.1	< 2.6	< 2.6	< 2.6	< 2.6
acenaphthylene	208-96-8	U	396	ug/kg DW	2	3.06	3.71	121.2%	25	23.21	92.8%	12.3	< 2.0	< 2.0	< 2.0	< 2.0
acenaphthene	83-32-9	U	396	ug/kg DW	1.7	2.33	2.3172	99.5%	25	23.89	95.6%	44.8	< 1.7	< 1.7	< 1.7	< 1.7
fluorene	86-73-7	U	396	ug/kg DW	1.6	5.02	5.89	117.3%	25	25.63	102.5%	39.1	< 1.6	< 1.6	< 1.6	< 1.6
phenanthrene	85-01-8	U	396	ug/kg DW	3.9	27.54	33.63	122.1%	25	23.16	92.6%	43.4	< 3.9	< 3.9	< 3.9	< 3.9
anthracene	120-12-7	U	396	ug/kg DW	2.4	7.55	7.91	n/a	25	25.93	103.7%	17.9	< 2.4	< 2.4	< 2.4	< 2.4
fluoranthene	206-44-0	U	396	ug/kg DW	2.4	36.78	43.69	118.8%	25	24.94	99.8%	94.2	5.53	< 2.4	< 2.4	< 2.4
pyrene	129-00-0	U	396	ug/kg DW	2.8	41.5	49.39	119.0%	25	24.34	97.4%	98.8	4.04	< 2.8	< 2.8	< 2.8
benzo(a)anthracene	56-55-3	U	396	ug/kg DW	1.6	17.53	19.8	112.9%	25	26.24	105.0%	54.3	< 1.6	< 1.6	< 1.6	< 1.6
chrysene	218-01-9	U	396	ug/kg DW	1.7	N/A	N/A	N/A	25	23.66	94.6%	36.6	< 1.7	< 1.7	< 1.7	< 1.7
benzo(b+j)fluoranthene	205-99-2	U	396	ug/kg DW	1.6	52.02	55.32	106.3%	25	23.53	94.1%	96.5	< 1.6	< 1.6	< 1.6	< 1.6
benzo(k)fluoranthene	207-08-9	U	396	ug/kg DW	2	14.29	15	105.0%	25	23.11	92.4%	28.7	< 2.0	< 2.0	< 2.0	< 2.0
benzo(a)pyrene	50-32-8	U	396	ug/kg DW	0.9	18.58	20.16	108.5%	25	23.8	95.2%	50.0	< 0.9	< 0.9	< 0.9	< 0.9
indeno(1,2,3-c,d)pyrene	193-39-5	U	396	ug/kg DW	2.2	23.18	25.75	111.1%	25	25.7	102.8%	47.3	< 2.2	< 2.2	< 2.2	< 2.2
dibenzo(a,h)anthracene	53-70-3	U	396	ug/kg DW	1.6	N/A	N/A	N/A	25	22.52	90.1%	18.1	< 1.6	< 1.6	< 1.6	< 1.6
benzo(g,h,i)perylene	191-24-2	Ū	396	ug/kg DW	1.4	28.36	31.23	110.1%	25	22.1	88.4%	50.6	< 1.4	< 1.4	< 1.4	< 1.4



Results Summary - Polycyclic Aromatic Hydrocarbons

			Cus	tomer Sam	ole No							BH4 ES19	BH4 ES40	BH5 ES1	BH5 ES12	BH5 ES22
				Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				RPS Sam	nle No							398230	398231	398232	398233	398234
				Sample			SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT		SEDIMENT	SEDIMENT
				Sample Lo			SEDIMENT			OLD ITTER		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Dep								4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				Samplin			IAEA-459		Spik	e on clean se	diment	11/03/2019	11/03/2019	13/03/2019	13/03/2019	13/03/2019
				Samplin	g Time				•							
Determinand	CAS No	Codes	SOP	Units	RL	Assigned	Measured	Recovery %	Assigned	Measured	Recovery %					
						Value	Value	-	Value	Value	•	2.6	2.6	6.40	2.67	2.6
naphthalene	91-20-3	U	396	ug/kg DW	2.6	n/a	n/a	N/A	25	27.67	110.7%	< 2.6	< 2.6	6.48	3.67	< 2.6
acenaphthylene	208-96-8	U	396	ug/kg DW	2	3.06	3.71	121.2%	25	23.21	92.8%	< 2.0	< 2.0	11.0	< 2.0	< 2.0
acenaphthene	83-32-9	U	396	ug/kg DW	1.7	2.33	2.3172	99.5%	25	23.89	95.6%	< 1.7	< 1.7	7.51	< 1.7	< 1.7
fluorene	86-73-7	U	396	ug/kg DW	1.6	5.02	5.89	117.3%	25	25.63	102.5%	< 1.6	< 1.6	17.3	2.04	< 1.6
phenanthrene	85-01-8	U	396	ug/kg DW	3.9	27.54	33.63	122.1%	25	23.16	92.6%	< 3.9	< 3.9	42.4	5.91	< 3.9
anthracene	120-12-7	U	396	ug/kg DW	2.4	7.55	7.91	n/a	25	25.93	103.7%	< 2.4	< 2.4	17.6	< 2.4	< 2.4
fluoranthene	206-44-0	U	396	ug/kg DW	2.4	36.78	43.69	118.8%	25	24.94	99.8%	4.11	< 2.4	81.8	8.21	< 2.4
pyrene	129-00-0	U	396	ug/kg DW	2.8	41.5	49.39	119.0%	25	24.34	97.4%	< 2.8	< 2.8	75.4	10.0	< 2.8
benzo(a)anthracene	56-55-3	U	396	ug/kg DW	1.6	17.53	19.8	112.9%	25	26.24	105.0%	< 1.6	< 1.6	36.9	3.87	< 1.6
chrysene	218-01-9	U	396	ug/kg DW	1.7	N/A	N/A	N/A	25	23.66	94.6%	< 1.7	< 1.7	27.6	2.79	< 1.7
benzo(b+j)fluoranthene	205-99-2	U	396	ug/kg DW	1.6	52.02	55.32	106.3%	25	23.53	94.1%	2.14	< 1.6	50.7	6.06	< 1.6
benzo(k)fluoranthene	207-08-9	U	396	ug/kg DW	2	14.29	15	105.0%	25	23.11	92.4%	< 2.0	< 2.0	17.5	< 2.0	< 2.0
benzo(a)pyrene	50-32-8	U	396	ug/kg DW	0.9	18.58	20.16	108.5%	25	23.8	95.2%	< 0.9	< 0.9	37.9	3.85	< 0.9
indeno(1,2,3-c,d)pyrene	193-39-5	U	396	ug/kg DW	2.2	23.18	25.75	111.1%	25	25.7	102.8%	< 2.2	< 2.2	18.7	2.86	< 2.2
dibenzo(a,h)anthracene	53-70-3	U	396	ug/kg DW	1.6	N/A	N/A	N/A	25	22.52	90.1%	< 1.6	< 1.6	7.67	< 1.6	< 1.6
benzo(g,h,i)perylene	191-24-2	U	396	ug/kg DW	1.4	28.36	31.23	110.1%	25	22.1	88.4%	< 1.4	< 1.4	21.0	3.06	< 1.4



Results Summary - Polycyclic Aromatic Hydrocarbons

			Cus	stomer Sam	ple No							BH6 ES1	BH6 ES5	BH6 ES9	BH7 ES1	BH7 ES14
				Customer Sar	nple ID	Certifi	ied Reference	Material		AQC spike		0.00-0.50m	1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m
				RPS San	nple No							398235	398236	398237	398238	398239
				Sample	е Туре		SEDIMENT	г		SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample L	ocation											i
				Sample Dep	oth (m)							0.00-0.50m	1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m
				Samplir	ng Date		IAEA-459		Spik	e on clean se	diment	16/03/0320	16/03/2019	16/03/2019	07/03/2019	07/03/2019
				Samplin	g Time											
								,							 '	
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %				1 '	i l
naphthalene	91-20-3	11	396	ug/kg DW	2.6	n/a	n/a	N/A	25	27.67	110.7%	8.96	< 2.6	< 2.6	< 2.6	< 2.6
acenaphthylene	208-96-8	II	396	ug/kg DW	2.0	3.06	3.71	121.2%	25	23.21	92.8%	8.35	< 2.0	< 2.0	< 2.0	< 2.0
acenaphthene	83-32-9	II	396	ug/kg DW	17	2.33	2.3172	99.5%	25	23.89	95.6%	11.4	< 1.7	< 1.7	< 1.7	< 1.7
fluorene	86-73-7	II	396	ug/kg DW		5.02	5.89	117.3%	25	25.63	102.5%	15.0	< 1.6	< 1.6	< 1.6	< 1.6
phenanthrene	85-01-8	ii	396	ug/kg DW	3.9	27.54	33.63	122.1%	25	23.16	92.6%	31.5	< 3.9	< 3.9	< 3.9	< 3.9
anthracene	120-12-7	II	396	ug/kg DW	2.4	7.55	7.91	n/a	25	25.93	103.7%	9.58	< 2.4	< 2.4	< 2.4	< 2.4
fluoranthene	206-44-0	Ü	396	ug/kg DW	2.4	36.78	43.69	118.8%	25	24.94	99.8%	54.9	4.44	< 2.4	< 2.4	< 2.4
pyrene	129-00-0	Ü	396	ug/kg DW		41.5	49.39	119.0%	25	24.34	97.4%	54.6	4.64	< 2.8	< 2.8	< 2.8
benzo(a)anthracene	56-55-3	Ü	396	ug/kg DW		17.53	19.8	112.9%	25	26.24	105.0%	30.9	2.14	< 1.6	< 1.6	< 1.6
chrysene	218-01-9	Ü	396	ug/kg DW		N/A	N/A	N/A	25	23.66	94.6%	22.1	< 1.7	< 1.7	< 1.7	< 1.7
benzo(b+j)fluoranthene	205-99-2	Ü	396	ug/kg DW	1.6	52.02	55,32	106.3%	25	23.53	94.1%	48.6	4.24	< 1.6	< 1.6	< 1.6
benzo(k)fluoranthene	207-08-9	Ü	396	ug/kg DW	2	14.29	15	105.0%	25	23.11	92.4%	16.5	< 2.0	< 2.0	< 2.0	< 2.0
benzo(a)pyrene	50-32-8	Ü	396	ug/kg DW	0.9	18.58	20.16	108.5%	25	23.8	95.2%	34.1	2.47	< 0.9	< 0.9	< 0.9
indeno(1,2,3-c,d)pyrene	193-39-5	U	396	ug/kg DW	2.2	23.18	25.75	111.1%	25	25.7	102.8%	20.9	< 2.2	< 2.2	< 2.2	< 2.2
dibenzo(a,h)anthracene	53-70-3	U	396	ug/kg DW	1.6	N/A	N/A	N/A	25	22.52	90.1%	7.00	< 1.6	< 1.6	< 1.6	< 1.6
benzo(g,h,i)perylene	191-24-2	U	396	ug/kg DW	1.4	28.36	31.23	110.1%	25	22.1	88.4%	22.3	< 1.4	< 1.4	< 1.4	< 1.4



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Results Summary - Polycyclic Aromatic Hydrocarbons

customer order no.	70307RD W	,													
			Cus	tomer Sam	ple No							BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
			(Customer San	nnle ID	Certifi	ed Reference	Material		AQC spike		6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
					100							398240	398241	398242	398243
				RPS San				_							
				Sample			SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample L Sample Dep								6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				Samplin			IAEA-459		Snil	e on clean se	diment		05/03/2019		05/03/2019
				Samplin			IAEA-439		Spir	te on clean se	ument	07/03/2013	03/03/2013	03/03/2013	03/03/2013
				Gampiin	9										
B	616 N		600		-	Assigned	Measured	n 0/	Assigned	Measured					
Determinand	CAS No	Codes	SOP	Units	RL	Value	Value	Recovery %	Value	Value	Recovery %				
naphthalene	91-20-3	U	396	ug/kg DW	2.6	n/a	n/a	N/A	25	27.67	110.7%	< 2.6	< 2.6	< 2.6	< 2.6
acenaphthylene	208-96-8	U	396	ug/kg DW	2	3.06	3.71	121.2%	25	23.21	92.8%	< 2.0	< 2.0	< 2.0	< 2.0
acenaphthene	83-32-9	U	396	ug/kg DW		2.33	2.3172	99.5%	25	23.89	95.6%	< 1.7	< 1.7	< 1.7	< 1.7
fluorene	86-73-7	U	396	ug/kg DW	1.6	5.02	5.89	117.3%	25	25.63	102.5%	< 1.6	< 1.6	< 1.6	< 1.6
phenanthrene	85-01-8	U	396	ug/kg DW	3.9	27.54	33.63	122.1%	25	23.16	92.6%	< 3.9	< 3.9	< 3.9	< 3.9
anthracene	120-12-7	U	396	ug/kg DW	2.4	7.55	7.91	n/a	25	25.93	103.7%	< 2.4	< 2.4	< 2.4	< 2.4
fluoranthene	206-44-0	U	396	ug/kg DW	2.4	36.78	43.69	118.8%	25	24.94	99.8%	< 2.4	< 2.4	< 2.4	< 2.4
pyrene	129-00-0	U	396	ug/kg DW	2.8	41.5	49.39	119.0%	25	24.34	97.4%	< 2.8	< 2.8	< 2.8	< 2.8
benzo(a)anthracene	56-55-3	U	396	ug/kg DW	1.6	17.53	19.8	112.9%	25	26.24	105.0%	< 1.6	< 1.6	< 1.6	< 1.6
chrysene	218-01-9	U	396	ug/kg DW	1.7	N/A	N/A	N/A	25	23.66	94.6%	< 1.7	< 1.7	< 1.7	< 1.7
benzo(b+j)fluoranthene	205-99-2	U	396	ug/kg DW	1.6	52.02	55.32	106.3%	25	23.53	94.1%	< 1.6	< 1.6	< 1.6	< 1.6
benzo(k)fluoranthene	207-08-9	U	396	ug/kg DW	2	14.29	15	105.0%	25	23.11	92.4%	< 2.0	< 2.0	< 2.0	< 2.0
benzo(a)pyrene	50-32-8	U	396	ug/kg DW	0.9	18.58	20.16	108.5%	25	23.8	95.2%	< 0.9	< 0.9	< 0.9	< 0.9
indeno(1,2,3-c,d)pyrene	193-39-5	U	396	ug/kg DW	2.2	23.18	25.75	111.1%	25	25.7	102.8%	< 2.2	< 2.2	< 2.2	< 2.2
dibenzo(a,h)anthracene	53-70-3	U	396	ug/kg DW	1.6	N/A	N/A	N/A	25	22.52	90.1%	< 1.6	< 1.6	< 1.6	< 1.6
benzo(g,h,i)perylene	191-24-2	U	396	ug/kg DW	1.4	28.36	31.23	110.1%	25	22.1	88.4%	< 1.4	< 1.4	< 1.4	< 1.4



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Results Summary - Polychlorinated Biphenyls

Report No.: 19-81762 Customer Reference: G191005U Customer Order

Customer Order No:	78367KB-W	/AL													
			Cu	stomer Sam	ple No							BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1
				Customer Sar	nple ID	Certifi	ed Reference	Material		AQC spike		0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m
				RPS San	nple No							398220	398221	398222	398223
				Sampl	е Туре		SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample L	ocation										
				Sample De	pth (m)							0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m
				Samplir	ng Date		CRM BCR-53	6	Spik	e on clean se	liment	04/03/2019	04/03/2019	04/03/2019	02/03/2019
				Samplin	ng Time										
					_	Assissed	Managed	1	Assistant	Managed	ı				
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %				
PCB congener 28	7012-37-5	U	396	ug/kg DW	0.1	44	42.68	97.0%	2.5	2.15	86.0%	< 0.1	< 0.1	< 0.1	< 0.1
PCB congener 52	35693-99-3	U	396	ug/kg DW	0.2	38	41.52	109.3%	2.5	2.18	87.2%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 101	37680-73-2	U	396	ug/kg DW	0.2	44	51.19	116.3%	2.5	2.25	90.0%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 118	31508-00-6	U	396	ug/kg DW	0.2	27.5	31.36	114.0%	2.5	2.57	102.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 138	35065-28-2	U	396	ug/kg DW	0.2	44.2	53.13	120.2%	2.5	2.62	104.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 153	35065-27-1	U	396	ug/kg DW	0.2	50	59.39	118.8%	2.5	2.59	103.6%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 180	35065-29-3	U	396	ug/kg DW	0.2	22.4	26.23	117.1%	2.5	2.6	104.0%	< 0.2	< 0.2	< 0.2	< 0.2



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Results Summary - Polychlorinated Biphenyls

 Report No.:
 19-81762

 Customer Reference:
 G191005U

 Customer Order No:
 78367KB-WAL

No:	78367KB-W	AL													
			Cu	stomer Sam	ple No							BH2 ES5	BH2 ES11	BH3 ES1	BH3 ES25
				Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m
				RPS Sam	ple No							398224	398225	398226	398227
				Sample	Туре		SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample L	ocation										
				Sample Dep	oth (m)							1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m
				Samplin	g Date		CRM BCR-53	66	Spik	e on clean sec	liment	02/03/2019	02/03/2019	08/03/2019	08/03/2019
				Samplin	g Time										
				1		Assissed	Managed	1	Assissad	Management	T				
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %				
	7012-37-5	U	396	ug/kg DW	0.1	44	42.68	97.0%	2.5	2.15	86.0%	< 0.1	< 0.1	< 0.1	< 0.1
	35693-99-3	U	396	ug/kg DW	0.2	38	41.52	109.3%	2.5	2.18	87.2%	< 0.2	< 0.2	< 0.2	< 0.2
	37680-73-2	U	396	ug/kg DW	0.2	44	51.19	116.3%	2.5	2.25	90.0%	< 0.2	< 0.2	< 0.2	< 0.2
	31508-00-6	U	396	ug/kg DW	0.2	27.5	31.36	114.0%	2.5	2.57	102.8%	< 0.2	< 0.2	< 0.2	< 0.2
	35065-28-2	U	396	ug/kg DW	0.2	44.2	53.13	120.2%	2.5	2.62	104.8%	< 0.2	0.9	< 0.2	< 0.2
	35065-27-1	U	396	ug/kg DW	0.2	50	59.39	118.8%	2.5	2.59	103.6%	< 0.2	0.7	< 0.2	< 0.2
	35065-29-3	U	396	ug/kg DW	0.2	22.4	26.23	117.1%	2.5	2.6	104.0%	< 0.2	< 0.2	< 0.2	< 0.2



Results Summary - Polychlorinated Biphenyls

Customer Order No:	78367KB-W	'AL													
			Cu	stomer Sam	ple No							BH3 ES45	BH4 ES1	BH4 ES19	BH4 ES40
				Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		10.50-11.00m	0.00-0.50m	4.50-5.00m	9.50-10.0m
				RPS Sam	nple No							398228	398229	398230	398231
				Sample	е Туре		SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample L	ocation										
				Sample Dep	oth (m)							10.5-11.0m	0.00-0.50m	4.50-5.00m	9.50-10.0m
				Samplin	ng Date		CRM BCR-53	86	Spik	ce on clean sec	diment	08/03/2019	11/03/2019	11/03/2019	11/03/2019
				Samplin	g Time										
Determinand	CAS No	Codes	SOP	Units	RL	Assigned	Measured	Recovery %	Assigned	Measured	Recovery %				
	7012-37-5	II	396	ug/kg DW		Value 44	Value 42.68	97.0%	Value 2.5	Value 2.15	86.0%	< 0.1	< 0.1	< 0.1	< 0.1
PCB congener 28 PCB congener 52	35693-99-3	U	396	ug/kg DW	0.1	38	41.52	109.3%	2.5	2.13	87.2%	< 0.1	< 0.1	< 0.1	< 0.1
PCB congener 101	37680-73-2	Ü	396	ug/kg DW	0.2	44	51.19	116.3%	2.5	2.25	90.0%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 118	31508-00-6	U	396	ug/kg DW	0.2	27.5	31.36	114.0%	2.5	2.57	102.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 138	35065-28-2	U	396	ug/kg DW	0.2	44.2	53.13	120.2%	2.5	2.62	104.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 153	35065-27-1	Ū	396	ug/kg DW	0.2	50	59.39	118.8%	2.5	2.59	103.6%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 180	35065-29-3	Ū	396	ug/kg DW	0.2	22.4	26.23	117.1%	2.5	2.6	104.0%	< 0.2	< 0.2	< 0.2	< 0.2



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Results Summary - Polychlorinated Biphenyls

No:	78367KB-W	AL													
			Cu	stomer Sam	ple No							BH5 ES1	BH5 ES12	BH5 ES22	BH6 ES1
				Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m
				RPS Sam	nple No							398232	398233	398234	398235
				Sample	е Туре		SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample L	ocation										
				Sample Dep	oth (m)							0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m
				Samplin	ng Date		CRM BCR-53	86	Spik	e on clean se	diment	13/03/2019	13/03/2019	13/03/2019	16/03/0320
				Samplin	g Time										
			1	ı											
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %				
	7012-37-5	U	396	ug/kg DW	0.1	44	42.68	97.0%	2.5	2.15	86.0%	< 0.1	< 0.1	< 0.1	< 0.1
	35693-99-3	U	396	ug/kg DW	0.2	38	41.52	109.3%	2.5	2.18	87.2%	< 0.2	< 0.2	< 0.2	< 0.2
	37680-73-2	U	396	ug/kg DW	0.2	44	51.19	116.3%	2.5	2.25	90.0%	< 0.2	< 0.2	< 0.2	< 0.2
	31508-00-6	U	396	ug/kg DW	0.2	27.5	31.36	114.0%	2.5	2.57	102.8%	< 0.2	< 0.2	< 0.2	< 0.2
	35065-28-2	U	396	ug/kg DW	0.2	44.2	53.13	120.2%	2.5	2.62	104.8%	< 0.2	< 0.2	< 0.2	< 0.2
	35065-27-1	U	396	ug/kg DW	0.2	50	59.39	118.8%	2.5	2.59	103.6%	< 0.2	< 0.2	< 0.2	0.9
	35065-29-3	U	396	ug/kg DW	0.2	22.4	26.23	117.1%	2.5	2.6	104.0%	< 0.2	< 0.2	< 0.2	< 0.2



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Results Summary - Polychlorinated Biphenyls

 Report No.:
 19-81762

 Customer Reference:
 G191005U

 Customer Order No:
 78367KB-WAL

No:	78367KB-W	AL													
			Cu	stomer Sam	ole No							BH6 ES5	BH6 ES9	BH7 ES1	BH7 ES14
				Customer San	nple ID	Certific	ed Reference	Material		AQC spike		1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m
				RPS Sam	ple No							398236	398237	398238	398239
				Sample	Туре		SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Lo	ocation										
				Sample Dep	th (m)							1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m
				Samplin	g Date		CRM BCR-53	6	Spik	e on clean sec	liment	16/03/2019	16/03/2019	07/03/2019	07/03/2019
				Samplin	g Time										
	Sample Sample Lo Sample Dept Sampling Sampling														
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %				
	7012-37-5	U	396	ug/kg DW	0.1	44	42.68	97.0%	2.5	2.15	86.0%	< 0.1	< 0.1	< 0.1	< 0.1
	35693-99-3	U	396	ug/kg DW	0.2	38	41.52	109.3%	2.5	2.18	87.2%	< 0.2	< 0.2	< 0.2	< 0.2
	37680-73-2	U	396	ug/kg DW	0.2	44	51.19	116.3%	2.5	2.25	90.0%	< 0.2	< 0.2	< 0.2	< 0.2
	31508-00-6	Ü	396	ug/kg DW	0.2	27.5	31.36	114.0%	2.5	2.57	102.8%	< 0.2	< 0.2	< 0.2	< 0.2
	35065-28-2	U	396	ug/kg DW	0.2	44.2	53.13	120.2%	2.5	2.62	104.8%	< 0.2	< 0.2	< 0.2	< 0.2
·	35065-27-1	U	396	ug/kg DW	0.2	50	59.39	118.8%	2.5	2.59	103.6%	< 0.2	< 0.2	< 0.2	< 0.2
·	35065-29-3	U	396	ug/kg DW	0.2	22.4	26.23	117.1%	2.5	2.6	104.0%	< 0.2	< 0.2	< 0.2	< 0.2



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Results Summary - Polychlorinated Biphenyls

 Report No.:
 19-81762

 Customer Reference:
 G191005U

 Customer Order No:
 78367KB-WAL

No:	78367KB-W	AL													
			Cu	stomer Sam	ple No							BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
				Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				RPS Sam	nple No							398240	398241	398242	398243
				Sample	е Туре		SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample L	ocation										
				Sample Dep	oth (m)							6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				Samplin	ng Date		CRM BCR-53	6	Spik	e on clean sec	diment	07/03/2019	05/03/2019	05/03/2019	05/03/2019
				Samplin	g Time										
		1	1	1		A!	Management	1	Accional		1				
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %				
	7012-37-5	U	396	ug/kg DW	0.1	44	42.68	97.0%	2.5	2.15	86.0%	< 0.1	< 0.1	< 0.1	< 0.1
	35693-99-3	U	396	ug/kg DW	0.2	38	41.52	109.3%	2.5	2.18	87.2%	< 0.2	< 0.2	< 0.2	< 0.2
	37680-73-2	U	396	ug/kg DW	0.2	44	51.19	116.3%	2.5	2.25	90.0%	< 0.2	< 0.2	< 0.2	< 0.2
	31508-00-6	U	396	ug/kg DW	0.2	27.5	31.36	114.0%	2.5	2.57	102.8%	< 0.2	< 0.2	< 0.2	< 0.2
	35065-28-2	U	396	ug/kg DW	0.2	44.2	53.13	120.2%	2.5	2.62	104.8%	< 0.2	< 0.2	< 0.2	< 0.2
	35065-27-1	U	396	ug/kg DW	0.2	50	59.39	118.8%	2.5	2.59	103.6%	< 0.2	< 0.2	< 0.2	< 0.2
	35065-29-3	U	396	ug/kg DW	0.2	22.4	26.23	117.1%	2.5	2.6	104.0%	< 0.2	< 0.2	< 0.2	< 0.2



Results Summary PSA Results

			Customer S	Sample No	BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11	BH3 ES1	BH3 ES25	BH3 ES45
			Customer	Sample ID	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.50-11.00m
			RPS	Sample No	398220	398221	398222	398223	398224	398225	398226	398227	398228
					SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				ole Location									
			Sample	Depth (m)	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.5-11.0m
			Sar	npling Date	04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019	08/03/2019	08/03/2019	08/03/2019
			San	npling Time									
Determinand	CAS No	Codes	SOP	Units									
					Unimodal,	Trimodal,	Unimodal,	Unimodal,	Unimodal,	Polymodal,	Unimodal,		Unimodal,
					Moderately	Very Poorly	Moderately	Moderately	Very Poorly	Very Poorly	Moderately	Unimodal,	Moderately
sample type		S	In-house		Well Sorted	Sorted	Well Sorted	Sorted	Sorted	Sorted	Well Sorted	Poorly Sorted	Sorted
									Slightly				
					Slightly		Slightly		Gravelly		Slightly	Slightly	
textural group (GRADISTAT)		S	In-house		Gravelly Sand	Gravelly Sand	Gravelly Sand	Sand	Muddy Sand	Sandy Mud	Gravelly Sand	Gravelly Sand	Gravelly Sand
									Slightly Very				
					Slightly Very	Very Coarse	J ,	Moderately	Fine Gravelly	Very Fine	Slightly Very		Very Fine
					Fine Gravelly	Gravelly	Gravelly	Sorted	Coarse Silty	Sandy Very		Fine Gravelly	Gravelly
sediment name		S	In-house				Medium Sand						Medium Sand
arithmetic mean (method of moments)		S	In-house	um	389	6700	399	355	308	103	421	409	694
arithmetic sorting (method of moments)		S	In-house	um	194	12900	390	156	226	158	848	262	1100
arithmetic skewness (method of moments)		S	In-house	um	5.33	1.76	9.89	0.502	1.56	2.11	13.5	2.85	5.23
arithmetic kurtosis (method of moments)		S	In-house	um	69.0	4.39	130	5.31	25.2	6.70	204	30.5	33.7
geometic mean (method of moments)		S	In-house	um	336	763	320	290	147	31.0	304	243	420
geometic sorting (method of moments)		S	In-house	um	2.01	8.44	2.21	2.41	5.69	5.87	2.32	5.23	3.27
geometic skewness (method of moments)		S	In-house	um	-5.57	0.309	-4.40	-4.19	-1.53	-0.500	-3.50	-2.79	-3.24
geometic kurtosis (method of moments)		S	In-house	um	52.2	3.90	39.8	26.9	4.67	3.28	32.0	10.5	22.2
logarithmic mean (method of moments)	ļ	S	In-house	phi	1.57	0.390	1.65	1.79	2.76	5.01	1.72	2.04	1.25
logarithmic sorting (method of moments)		S	In-house	phi	1.01	3.08	1.14	1.27	2.51	2.55	1.21	2.39	1.71
logarithmic skewness (method of moments)	ļ	S	In-house	phi	5.57	-0.309	4.40	4.19	1.53	0.500	3.50	2.79	3.24
logarithmic kurtosis (method of moments)	1	S	In-house	phi	52.2	3.90	39.8	26.9	4.67	3.28	32.0	10.5	22.2
mean (Folk and Ward method - um)	1	S	In-house	um	357	1240	338	326	150	34.0	320	358	443
sorting (Folk and Ward method - um)	1	S	In-house	um	1.47	8.08	1.61	1.66	4.84	6.01	1.61	2.97	1.86
skewness (Folk and Ward method - um)	1	S	In-house	um	-0.072	0.621	-0.161	-0.222	-0.720	-0.055 1.06	-0.097	-0.541	0.029
kurtosis (Folk and Ward method - um)		S	In-house	um	0.984	2.09	1.05	1.40	0.945	1.06	1.03	3.07	2.30



Results Summary PSA Results

			Customer S	Sample No	BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11	BH3 ES1	BH3 ES25	BH3 ES45
			Customer	Sample ID	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.50-11.00m
			RPS	Sample No	398220	398221	398222	398223	398224	398225	398226	398227	398228
					SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				ole Location									
					0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.5-11.0m
				npling Date npling Time	04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019	08/03/2019	08/03/2019	08/03/2019
			Sall	ilpling Time									
Determinand	CAS No	Codes	SOP	Units									
mean (Folk and Ward method - phi)		S	In-house	phi	1.49	-0.315	1.57	1.62	2.74	4.88	1.65	1.48	1.17
sorting (Folk and Ward method - phi)		S	In-house	phi	0.555	3.01	0.684	0.730	2.28	2.59	0.682	1.57	0.892
skewness (Folk and Ward method - phi)		S	In-house	phi	0.072	-0.621	0.161	0.222	0.720	0.055	0.097	0.541	-0.029
kurtosis (Folk and Ward method - phi)		S	In-house	phi	0.984	2.09	1.05	1.40	0.945	1.06	1.03	3.07	2.30
and the state of the second se		-	To be seen		Madiana Canal	Very Coarse	Madiana Canal	Madion Card	F: C d	Very Coarse	Madiana Canal	M - 4: C 4	Madiana Canal
mean description (Folk and Ward method)		S	In-house		Medium Sand Moderately	Sand	Medium Sand Moderately		Fine Sand	Silt Very Poorly	Medium Sand Moderately	Medium Sand	Medium Sand Moderately
sorting description (Folk and Ward method)		S	In-house		Well Sorted	Very Poorly Sorted	Well Sorted	Moderately Sorted	Very Poorly Sorted	Sorted	/	Poorly Sorted	
sorting description (Fork and Ward Metriod)		3	III-IIOuse		Well Softed	Very Coarse	Well Softed	Sorted	Very Fine	Sorteu	Well Softed	Very Fine	Sorteu
skewness description (Folk and Ward method)		S	In-house		Symmetrical	Skewed	Fine Skewed	Fine Skewed	Skewed	Symmetrical	Symmetrical	Skewed	Symmetrical
Skewness description (Folk and Ward Method)			III IIOGSC		Symmetrical	very	Title Skewed	Title Sitewed	Skewed	Symmetrical	Symmetrical	Extremely	very
kurtosis description (Folk and Ward method)		S	In-house		Mesokurtic	Leptokurtic	Mesokurtic	Leptokurtic	Mesokurtic	Mesokurtic	Mesokurtic	Leptokurtic	Leptokurtic
MODE 1 - um		S	In-house	um	428	428	428	428	428	38.1	428	428	428
MODE 2 - um		S	In-house	um		38300				428			
MODE 3 - um		S	In-house	um		13600				9.43			
MODE 1 - phi		S	In-house	phi	1.25	1.25	1.25	1.25	1.25	4.74	1.25	1.25	1.25
MODE 2 - phi		S	In-house	phi		-5.24				1.25			
MODE 3 - phi		S	In-house	phi		-3.74				6.75			
D10 - um		S	In-house	um	208	178	184	186	8.6	3.2	181	83.8	235
D50 - um		S	In-house	um	364	400	352	336	323	35.0	327	400	451
D90 - um		S	In-house	um	591	32600	601	562	584	370	582	653	762
(D90/D10) - um		S	In-house	um	2.84	183	3.27	3.03	67.5	117	3.22	7.80	3.25
(D90 - D10) - um		S	In-house	um	383	32400	417	376	575	367	401	569	528
(D75/D25) - um		S	In-house	um	1.70	3.26	1.86	1.77	9.11	9.27	1.90	2.03	1.63



Results Summary PSA Results

			Customer S	Sample No	BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11	BH3 ES1	BH3 ES25	BH3 ES45
			Customer	Sample ID	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.50-11.00m
			RPS	Sample No	398220	398221	398222	398223	398224	398225	398226	398227	398228
				mple Type	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				ole Location									
				Depth (m)		6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.5-11.0m
				npling Date	04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019	08/03/2019	08/03/2019	08/03/2019
			San	npling Time									
	01011												
Determinand (P.75 P.25)	CAS No	Codes	SOP	Units	100	F70	215	102	402	04.0	211	267	227
(D75 - D25) - um		S	In-house In-house	um phi	192 0.759	579 -5.03	215 0.735	193 0.833	403 0.777	84.8 1.43	211 0.781	0.614	0.391
D10 - phi D50 - phi		S	In-house	phi	1.46	1.32	1.51	1.57	1.63	4.84	1.61	1.32	1.15
D90 - phi		S		phi	2.27	2.49	2.44	2.43	6.85	8.31	2.47	3.58	2.09
(D90/D10) - phi		S	In-house In-house	phi	2.27	-0.495	3.33	2.43	8.82	5.80	3.16	5.82	5.34
(D90 - D10) - phi		S	In-house	phi	1.51	7.52	1.71	1.60	6.08	6.87	1.69	2.96	1.70
(D75/D25) - phi		S	In-house	phi	1.70	7.58	1.81	1.70	3.79	1.95	1.80	2.10	1.92
(D75 - D25) - phi		S	In-house	phi	0.769	1.70	0.896	0.821	3.19	3.21	0.927	1.02	0.702
% gravel		S	In-house	%	0.21	23.7	0.77	0.00	0.05	0.00	1.05	0.22	5.13
% sand		S	In-house	%	97.9	71.7	97.1	95.3	73.6	32.4	96.2	89.9	92.0
% mud		Š	In-house	%	1.86	4.61	2.18	4.69	26.4	67.6	2.78	9.88	2.85
% very coarse gravel (>32<64mm or <-5>-6phi)		S	In-house	%	0.00	10.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% coarse gravel (>16<32mm or <-4>-5phi)		S	In-house	%	0.00	6.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% medium gravel (>8<16mm or <-3>-4phi)		S	In-house	%	0.00	4.91	0.00	0.00	0.00	0.00	0.34	0.00	0.46
% fine gravel (>4<8mm or <-2>-3phi)		S	In-house	%	0.00	1.24	0.41	0.00	0.01	0.00	0.25	0.02	2.15
% very fine gravel (>2<4mm or <-1>-2phi)		S	In-house	%	0.21	0.98	0.36	0.00	0.05	0.00	0.46	0.20	2.53
% very coarse sand (>1<2mm or <0>-1phi)		S	In-house	%	0.40	0.83	0.43	0.09	0.10	0.00	0.28	1.89	3.26
% coarse sand (>0.5<1mm or <1>0phi)		S	In-house	%	16.9	12.0	17.2	14.3	16.7	4.25	14.5	26.4	29.6
% medium sand (>0.25<0.5mm or <2>1phi)		S	In-house	%	64.9	40.0	56.5	61.2	46.8	10.1	55.5	48.1	51.3
% fine sand (>0.125<0.25mm or <3>2phi)		S	In-house	%	15.4	17.6	21.3	19.1	9.34	6.65	24.5	12.4	6.23
% very fine sand (>0.0625<0.125mm or <4>3phi)		S	In-house	%	0.25	1.30	1.61	0.64	0.68	11.5	1.44	1.18	1.64
% very coarse silt (>0.03125<0.0625mm or <5>4phi		S	In-house	%	0.51	1.40	0.88	1.42	5.78	21.2	1.02	0.40	0.09
% coarse silt (>0.015625<0.03125mm or <6>5phi)		S	In-house	%	0.44	0.91	0.36	1.20	6.92	16.5	0.57	0.28	0.17
% medium silt (>0.007813<0.015625mm or <7>6phi)		S	In-house	%	0.15	0.45	0.10	0.53	4.41	8.57	0.20	1.87	0.46
% fine silt (>0.003906<0.007813mm or <8>7phi)		S	In-house	%	0.15	0.47	0.12	0.57	4.41	9.05	0.22	2.10	0.39
% very fine silt (>0.001953<0.003906mm or <9>8phi		S	In-house	%	0.15	0.44	0.14	0.40	2.54	6.15	0.20	1.58	0.39
% clay (<0.001953mm or >9phi)		S	In-house	%	0.45	0.94	0.57	0.58	2.33	6.05	0.56	3.65	1.34



Results Summary PSA Results

		(Customer S	ample No	BH4 ES1	BH4 ES19	BH4 ES40	BH5 ES1	BH5 ES12	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9
			Customer	Sample ID	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
			RPS	Sample No	398229	398230	398231	398232	398233	398234	398235	398236	398237
			Sar	nple Type	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				le Location									
			Sample	Depth (m)	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
			San	npling Date	11/03/2019	11/03/2019	11/03/2019	13/03/2019	13/03/2019	13/03/2019	16/03/0320	16/03/2019	16/03/2019
			San	pling Time									
Determinand	CAS No	Codes	SOP	Units									
						Bimodal,	Trimodal,	Polymodal,		Bimodal,	Polymodal,		Trimodal,
					Trimodal,	Very Poorly	Very Poorly	Very Poorly	Unimodal,	Very Poorly	Very Poorly	Unimodal,	Very Poorly
sample type		S	In-house		Poorly Sorted	Sorted	Sorted	Sorted	Poorly Sorted	Sorted	Sorted	Poorly Sorted	Sorted
									Slightly			Slightly	
									Gravelly			Gravelly	
textural group (GRADISTAT)		S	In-house		Gravelly Sand	Sandy Gravel	Gravel	Muddy Sand		Sandy Gravel	Muddy Sand	Muddy Sand	Muddy Sand
									Slightly			Slightly Very	
						Sandy Very		Very Coarse	Medium		Very Coarse	Fine Gravelly	Very Coarse
					Fine Gravelly	Coarse	Very Coarse	Silty Very		Sandy Coarse		Coarse Silty	Silty Fine
sediment name		S	In-house		Medium Sand	Gravel	Gravel	Fine Sand	Coarse Silty	Gravel	Sand	Medium Sand	Sand
arithmetic mean (method of moments)		S	In-house	um	2370	15600	24000	165	445	15200	117	274	173
arithmetic sorting (method of moments)		S	In-house	um	4420	16200	20300	200	983	12500	124	172	177
arithmetic skewness (method of moments)		S	In-house	um	2.61	0.343	0.396	1.49	8.61	0.417	1.88	2.45	1.19
arithmetic kurtosis (method of moments)		S	In-house	um	9.25	1.39	1.65	4.19	79.3	2.01	8.01	33.9	3.91
geometic mean (method of moments)		S	In-house	um	713	3240	8540	62.2	231	6180	51.1	194	71.6
geometic sorting (method of moments)		S	In-house	um	4.26	9.76	11.3	5.47	4.05	6.59	5.22	3.12	5.41
geometic skewness (method of moments)		S	In-house	um	0.339	-0.235	-2.36	-0.870	-2.10	-1.34	-1.17	-2.84	-1.03
geometic kurtosis (method of moments)		S	In-house	um	5.43	1.75	9.04	3.92	9.28	4.68	4.27	13.7	3.95
logarithmic mean (method of moments)		S	In-house	phi	0.488	-1.70	-3.10	4.01	2.11	-2.63	4.29	2.37	3.80
logarithmic sorting (method of moments)		S	In-house	phi	2.09	3.29	3.50	2.45	2.02	2.72	2.38	1.64	2.44
logarithmic skewness (method of moments)		S	In-house	phi	-0.339	0.235	2.36	0.870	2.10	1.34	1.17	2.84	1.03
logarithmic kurtosis (method of moments)		S	In-house	phi	5.43	1.75	9.04	3.92	9.28	4.68	4.27	13.7	3.95
mean (Folk and Ward method - um)	•	S	In-house	um	804	4810	12600	71.8	300	5570	54.8	236	82.5
sorting (Folk and Ward method - um)		S	In-house	um	3.95	7.50	8.30	5.39	2.62	6.16	4.73	2.26	4.86
skewness (Folk and Ward method - um)		S	In-house	um	0.627	-0.494	-0.582	-0.143	-0.468	-0.603	-0.394	-0.267	-0.345
kurtosis (Folk and Ward method - um)		S	In-house	um	1.01	0.489	1.58	1.04	2.39	0.866	1.01	1.94	0.928



Results Summary PSA Results

			Customer S	ample No	BH4 ES1	BH4 ES19	BH4 ES40	BH5 ES1	BH5 ES12	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9
			Customer	Sample ID	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
			RPS	Sample No	398229	398230	398231	398232	398233	398234	398235	398236	398237
					SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				le Location									
				Depth (m)		4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
				npling Date		11/03/2019	11/03/2019	13/03/2019	13/03/2019	13/03/2019	16/03/0320	16/03/2019	16/03/2019
			Sdil	npling Time									
Determinand	CAS No	Codes	SOP	Units									
mean (Folk and Ward method - phi)		S	In-house	phi	0.315	-2.27	-3.65	3.80	1.74	-2.48	4.19	2.08	3.60
sorting (Folk and Ward method - phi)		S	In-house	phi	1.98	2.91	3.05	2.43	1.39	2.62	2.24	1.18	2.28
skewness (Folk and Ward method - phi)		S	In-house	phi	-0.627	0.494	0.582	0.143	0.468	0.603	0.394	0.267	0.345
kurtosis (Folk and Ward method - phi)		S	In-house	phi	1.01	0.489	1.58	1.04	2.39	0.866	1.01	1.94	0.928
		_					Medium	Very Fine			Very Coarse		Very Fine
mean description (Folk and Ward method)		S	In-house		Coarse Sand	Fine Gravel	Gravel		Medium Sand		Silt	Fine Sand	Sand
						Very Poorly	Very Poorly	Very Poorly		Very Poorly	Very Poorly		Very Poorly
sorting description (Folk and Ward method)		S	In-house		Poorly Sorted	Sorted	Sorted	Sorted	Poorly Sorted	Sorted	Sorted	Poorly Sorted	Sorted
decomposed description (Fellowed Mondowath ad)		_	To become		Very Coarse	Very Fine	Very Fine	Eine Channel	Very Fine	Very Fine	Very Fine	Fire Charmed	Very Fine
skewness description (Folk and Ward method)		S	In-house		Skewed	Skewed very	Skewed	Fine Skewed	Skewed	Skewed	Skewed	Fine Skewed very	Skewed
kurtosis description (Folk and Ward method)		S	In-house		Mesokurtic	Platykurtic	Leptokurtic	Mesokurtic	Leptokurtic	Platykurtic	Mesokurtic	Leptokurtic	Mesokurtic
MODE 1 - um		S	In-house	um	428	38300	54000	108	428	27000	215	215	215
MODE 2 - um		S	In-house	um	6800	428	27000	605		428	108		38.1
MODE 3 - um		S	In-house	um	19200		9600	38.1			38.1		9.43
MODE 1 - phi		S	In-house	phi	1.25	-5.24	-5.74	3.24	1.25	-4.73	2.24	2.24	2.24
MODE 2 - phi		S	In-house	phi	-2.74	1.25	-4.73	0.747		1.25	3.24		4.74
MODE 3 - phi		S	In-house	phi	-4.24		-3.24	4.74			4.74		6.75
D10 - um		S	In-house	um	218	250	573	6.1	32.3	329	4.7	60.1	6.6
D50 - um		S	In-house	um	430	10700	19700	77.3	333	13300	80.2	243	113
D90 - um		S	In-house	um	7840	39000	55000	515	600	33100	255	489	433
(D90/D10) - um		S	In-house	um	36.0	156	96.1	84.5	18.6	101	54.0	8.15	65.3
(D90 - D10) - um		S	In-house	um	7620	38800	54400	509	568	32800	250	429	427
(D75/D25) - um		S	In-house	um	5.57	87.8	9.34	8.30	2.12	11.3	7.81	2.05	9.84



Results Summary PSA Results

					_								
			Customer S	Sample No	BH4 ES1	BH4 ES19	BH4 ES40	BH5 ES1	BH5 ES12	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9
			Customer	Sample ID	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
			RPS	Sample No	398229	398230	398231	398232	398233	398234	398235	398236	398237
					SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	SEDIMENT	
			Samp	ole Location									
			Sample	Depth (m)	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
					11/03/2019	11/03/2019	11/03/2019	13/03/2019	13/03/2019	13/03/2019	16/03/0320	16/03/2019	16/03/2019
			Sar	npling Time									
Determinand	CAS No	Codes	SOP	Units									
(D75 - D25) - um	CAS III	S	In-house	um	1350	31200	39700	183	241	22400	156	180	237
D10 - phi		S	In-house	phi	-2.97	-5.29	-5.78	0.958	0.736	-5.05	1.97	1.03	1.21
D50 - phi		S	In-house	phi	1.22	-3.42	-4.30	3.69	1.59	-3.73	3.64	2.04	3.15
D90 - phi		S	In-house	phi	2.20	2.00	0.805	7.36	4.95	1.60	7.73	4.06	7.24
(D90/D10) - phi		S	In-house	phi	-0.740	-0.379	-0.139	7.68	6.73	-0.317	3.92	3.94	6.00
(D90 - D10) - phi		S	In-house	phi	5.17	7.29	6.59	6.40	4.22	6.65	5.76	3.03	6.03
(D75/D25) - phi		S	In-house	phi	-2.45	-0.297	0.411	2.35	1.96	0.243	2.20	1.69	2.71
(D75 - D25) - phi		S	In-house	phi	2.48	6.46	3.22	3.05	1.08	3.50	2.97	1.04	3.30
% gravel		S	In-house	%	23.8	52.1	84.0	0.00	1.38	75.3	0.00	0.03	0.00
% sand		S	In-house	%	75.0	47.1	10.6	54.6	85.8	23.2	54.8	89.9	57.3
% mud		S	In-house	%	1.12	0.88	5.47	45.4	12.8	1.47	45.2	10.1	42.7
% very coarse gravel (>32<64mm or <-5>-6phi)		S	In-house	%	0.00	24.0	31.9	0.00	0.00	11.1	0.00	0.00	0.00
% coarse gravel (>16<32mm or <-4>-5phi)		S	In-house	%	3.78	21.7	23.6	0.00	0.00	32.1	0.00	0.00	0.00
% medium gravel (>8<16mm or <-3>-4phi)		S	In-house	%	5.97	5.15	11.2	0.00	1.03	21.6	0.00	0.00	0.00
% fine gravel (>4<8mm or <-2>-3phi)		S	In-house	%	8.16	0.57	10.6	0.00	0.13	7.35	0.00	0.00	0.00
% very fine gravel (>2<4mm or <-1>-2phi)		S	In-house	%	5.94	0.62	6.59	0.00	0.22	3.12	0.00	0.03	0.00
% very coarse sand (>1<2mm or <0>-1phi)		S	In-house	%	3.44	0.49	3.40	0.00	0.21	1.74	0.00	0.05	0.00
% coarse sand (>0.5<1mm or <1>0phi) % medium sand (>0.25<0.5mm or <2>1phi)		S	In-house In-house	% %	12.2 45.9	7.64 29.8	4.05 3.11	10.8 9.98	16.2 51.3	4.65 12.5	1.90 8.44	8.97 38.6	6.26 20.5
% medium sand (>0.25<0.5mm or <2>1pm) % fine sand (>0.125<0.25mm or <3>2phi)		S	In-house In-house	%	13.3	8.95	0.00	15.9	17.0	4.08	26.4	37.1	20.5
% fine sand (>0.125<0.25mm or <3>2pm) % very fine sand (>0.0625<0.125mm or <4>3phi)		S	In-house In-house	%	0.27	0.21	0.00	18.0	1.10	0.22	18.1	5.21	8.88
					0.27	0.21	0.00			0.22	14.4		
% very coarse silt (>0.03125<0.0625mm or <5>4phi % coarse silt (>0.015625<0.03125mm or <6>5phi)		S	In-house In-house	%	0.34	0.28	0.00	16.0 11.4	2.96 3.24	0.31	14.4	2.94 2.95	14.6 11.5
% coarse siit (>0.015625<0.03125fffff or <6>5pfff) % medium silt (>0.007813<0.015625mm or <7>6phi)		S	In-house In-house	%	0.23	0.19	0.09	5.80	1.88	0.31	5.60	1.09	5.35
% fine silt (>0.007813<0.015025film of <7>6pfil) % fine silt (>0.003906<0.007813mm or <8>7phi)		S	In-house In-house	%	0.07	0.07	1.22	5.80	2.04	0.24	5.00	1.09	4.94
% line slit (>0.003906<0.007813mm or <8>7pm) % very fine silt (>0.001953<0.003906mm or <9>8phi		S	In-house In-house	%	0.08	0.07	0.99	3.20	1.31	0.22	4.00	0.83	3.06
% very line slit (>0.001953<0.003906film of <9>8pfil % clay (<0.001953mm or >9phi)		S	In-house	%	0.08	0.07	2.20	3.39	1.31	0.15	4.00	1.11	3.06
70 clay (~0.00133311111 01 >3ptil)		3	In-House	70	0.32	0.21	2.20	2.28	1.30	0.25	CP.P	1.11	3.23



Results Summary PSA Results

Report No.:19-81762Customer Reference:G191005UCustomer Order No:78367KB-WAL

				p.c	2117 202	2117 2021	2117 2027	2110 202	2110 2022	2110 2022
			Customer	Sample ID	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
			RPS	Sample No	398238	398239	398240	398241	398242	398243
					SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				ole Location						
					0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
			San	npling Date	07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
			San	npling Time						
Determinand	CAS No	Codes	SOP	Units						
						Trimodal,		Bimodal,	Unimodal,	
					Unimodal,	Very Poorly	Unimodal,	Very Poorly	Moderately	Unimodal,
sample type		S	In-house		Poorly Sorted	Sorted	Poorly Sorted	Sorted	Well Sorted	Poorly Sorted
					Slightly		GU 1.1		,	
		_			Gravelly		Slightly			
textural group (GRADISTAT)		S	In-house		Muddy Sand	Muddy Sand	Gravelly Sand	Gravelly Sand	Sand	Sand
					Slightly Fine			_		
					Gravelly Very	Very Coarse	Slightly Very	Coarse	Moderately	
					Coarse Silty	Silty Fine	Fine Gravelly	Gravelly		Poorly Sorted
sediment name		S	In-house		Medium Sand	Sand		Medium Sand		
arithmetic mean (method of moments)		S	In-house	um	305	170	441	5480	331	284
arithmetic sorting (method of moments)		S	In-house	um	349	167	544	9840	134	161
arithmetic skewness (method of moments)		S	In-house	um	10.9	1.24	5.51	1.56	0.724	0.597
arithmetic kurtosis (method of moments)		S	In-house	um	165	4.28	41.6	3.61	4.33	3.55
geometic mean (method of moments)		S	In-house	um	199	76.8	294	850	287	206
geometic sorting (method of moments)		S	In-house	um	3.39	5.05	2.91	6.51	2.04	3.01
geometic skewness (method of moments)		S	In-house	um	-2.58	-1.20	-2.67	0.692	-5.56	-3.06
geometic kurtosis (method of moments)		S	In-house	um	12.0	4.52	16.6	3.58	49.2	15.7
logarithmic mean (method of moments)		S	In-house	phi	2.33	3.70	1.77	0.235	1.80	2.28
logarithmic sorting (method of moments)		S	In-house	phi	1.76	2.34	1.54	2.70	1.03	1.59
logarithmic skewness (method of moments)		S	In-house	phi	2.58	1.20	2.67	-0.692	5.56	3.06
logarithmic kurtosis (method of moments)		S	In-house	phi	12.0	4.52	16.6	3.58	49.2	15.7
mean (Folk and Ward method - um)		S	In-house	um	246	88.4	325	1260	306	247
sorting (Folk and Ward method - um)		S	In-house	um	2.39	4.44	2.02	6.43	1.50	2.17
skewness (Folk and Ward method - um)		S	In-house	um	-0.340	-0.378	-0.200	0.739	-0.012	-0.309
kurtosis (Folk and Ward method - um)		S	In-house	um	2.03	0.989	1.98	1.87	1.04	1.84

Customer Sample No BH7 ES1 BH7 ES14 BH7 ES27

BH8 ES1 BH8 ES11 BH8 ES21



Results Summary PSA Results

		(Customer S	Sample No	BH7 ES1	BH7 ES14	BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
			Customer	Sample ID	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
			RPS	Sample No	398238	398239	398240	398241	398242	398243
					SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				ole Location					_	
				Depth (m)		3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
					07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
				npling Time		, , , , , , , , , , , , , , , , , , , ,	7.57		,,	,
Determinand	CAS No	Codes	SOP	Units						
mean (Folk and Ward method - phi)		S	In-house	phi	2.02	3.50	1.62	-0.337	1.71	2.02
sorting (Folk and Ward method - phi)		S	In-house	phi	1.26	2.15	1.02	2.68	0.588	1.12
skewness (Folk and Ward method - phi)		S	In-house	phi	0.340	0.378	0.200	-0.739	0.012	0.309
kurtosis (Folk and Ward method - phi)		S	In-house	phi	2.03	0.989	1.98	1.87	1.04	1.84
						Very Fine		Very Coarse		
mean description (Folk and Ward method)		S	In-house		Fine Sand	Sand	Medium Sand	Sand	Medium Sand	Fine Sand
						Very Poorly		Very Poorly	Moderately	
sorting description (Folk and Ward method)		S	In-house		Poorly Sorted	Sorted	Poorly Sorted	Sorted	Well Sorted	Poorly Sorted
					Very Fine	Very Fine		Very Coarse		Very Fine
skewness description (Folk and Ward method)		S	In-house		Skewed	Skewed	Fine Skewed	Skewed	Symmetrical	Skewed
					very		very	very		very
kurtosis description (Folk and Ward method)		S	In-house		Leptokurtic	Mesokurtic	Leptokurtic	Leptokurtic	Mesokurtic	Leptokurtic
MODE 1 - um		S	In-house	um	303	215	303	303	303	303
MODE 2 - um		S	In-house	um		38.1		27000		
MODE 3 - um		S	In-house	um		9.43				
MODE 1 - phi		S	In-house	phi	1.75	2.24	1.75	1.75	1.75	1.75
MODE 2 - phi		S	In-house	phi		4.74		-4.73		
MODE 3 - phi		S	In-house	phi		6.75				
D10 - um		S	In-house	um	45.1	7.7	166	212	188	64.6
D50 - um		S	In-house	um	262	122	331	400	306	262
D90 - um		S	In-house	um	504	406	622	25200	495	491
(D90/D10) - um		S	In-house	um	11.2	53.0	3.75	118	2.63	7.59
(D90 - D10) - um		S	In-house	um	459	398	456	24900	307	426
(D75/D25) - um		S	In-house	um	2.10	7.96	1.89	3.01	1.72	2.01



Results Summary PSA Results

			Customer S	ample No	BH7 ES1	BH7 ES14	BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
			Customer	Sample ID	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
			RPS	Sample No	398238	398239	398240	398241	398242	398243
					SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				le Location	JEDINENT.	OLDI: ILIVI	OLDZITILIKI	OLD II ILIVI	OLDINILINI	OLD II ILIVI
					0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
					07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
				pling Time	, , , , , , , , , , , , , , , , , , , ,	, , , , , , , , , , , , , , , , , , , ,	, , , , , , , , , , , , , , , , , , , ,			
Determinand	CAS No	Codes	SOP	Units						
(D75 - D25) - um		S	In-house	um	199	219	214	567	169	185
D10 - phi		S	In-house	phi	0.990	1.30	0.685	-4.65	1.02	1.03
D50 - phi		S	In-house	phi	1.93	3.04	1.60	1.32	1.71	1.94
D90 - phi		S	In-house	phi	4.47	7.03	2.59	2.24	2.41	3.95
(D90/D10) - phi		S	In-house	phi	4.52	5.41	3.78	-0.480	2.38	3.85
(D90 - D10) - phi		S	In-house	phi	3.48	5.73	1.91	6.89	1.40	2.92
(D75/D25) - phi		S	In-house	phi	1.77	2.50	1.81	7.75	1.60	1.70
(D75 - D25) - phi		S	In-house	phi	1.07	2.99	0.921	1.59	0.784	1.00
% gravel		S	In-house	%	0.47	0.00	2.66	24.1	0.00	0.00
% sand		S	In-house	%	88.4	61.8	91.3	74.5	97.7	90.1
% mud		S	In-house	%	11.1	38.2	6.06	1.45	2.26	9.86
% very coarse gravel (>32<64mm or <-5>-6phi)		S	In-house	%	0.00	0.00	0.00	0.00	0.00	0.00
% coarse gravel (>16<32mm or <-4>-5phi)		S	In-house	%	0.00	0.00	0.00	18.0	0.00	0.00
% medium gravel (>8<16mm or <-3>-4phi)		S	In-house	%	0.00	0.00	0.00	3.83	0.00	0.00
% fine gravel (>4<8mm or <-2>-3phi)		S	In-house	%	0.32	0.00	0.48	1.53	0.00	0.00
% very fine gravel (>2<4mm or <-1>-2phi)		S	In-house	%	0.15	0.00	2.18	0.71	0.00	0.00
% very coarse sand (>1<2mm or <0>-1phi)		S	In-house	%	0.06	0.00	2.12	0.65	0.00	0.00
% coarse sand (>0.5<1mm or <1>0phi)		S	In-house	%	9.65	5.19	12.4	9.74	9.23	8.98
% medium sand (>0.25<0.5mm or <2>1phi)		S	In-house	%	43.0	19.8	55.7	49.3	61.5	44.4
% fine sand (>0.125<0.25mm or <3>2phi)		S	In-house	%	31.2	24.4	20.1	14.5	26.5	31.9
% very fine sand (>0.0625<0.125mm or <4>3phi)		S	In-house	%	4.43	12.4	1.02	0.25	0.52	4.88
% very coarse silt (>0.03125<0.0625mm or <5>4phi		S	In-house	%	3.09	13.3	1.93	0.38	0.69	4.00
% coarse silt (>0.015625<0.03125mm or <6>5phi)		S	In-house	%	3.03	10.1	1.43	0.35	0.50	2.54
% medium silt (>0.007813<0.015625mm or <7>6phi)		S	In-house	%	1.43	4.63	0.68	0.12	0.18	0.74
% fine silt (>0.003906<0.007813mm or <8>7phi)		S	In-house	%	1.39	4.47	0.74	0.13	0.20	0.79
% very fine silt (>0.001953<0.003906mm or <9>8phi		S	In-house	%	0.92	2.71	0.52	0.13	0.18	0.67
% clay (<0.001953mm or >9phi)		S	In-house	%	1.25	2.95	0.75	0.35	0.51	1.13



Results Summary PSA Size Class & Statistics

					Т		ı	1			ı			1		1	
	Custo	omer Sam	ple No	BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11	BH3 ES1	BH3 ES25	BH3 ES45	BH4 ES1	BH4 ES19	BH4 ES40	BH5 ES1	BH5 ES12
	Cus	stomer Sai	mple ID	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.50-11.00m	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m
		RPS Sar	nple No	398220	398221	398222	398223	398224	398225	398226	398227	398228	398229	398230	398231	398232	398233
				SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
		Sample L	ocation														
	9	Sample De	pth (m)	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.5-11.0m	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m
		Samplii	ng Date	04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019	08/03/2019	08/03/2019	08/03/2019	11/03/2019	11/03/2019	11/03/2019	13/03/2019	13/03/2019
		Samplir	ng Time														
Sediment	mm	phi φ	Units														
Very coarse gravel	>32<64	<-5>-6		0.00	10.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	31.90	0.00	0.00
Coarse gravel	>16<32	<-4>-5	%	0.00	6.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.78	21.70	23.60	0.00	0.00
Medium gravel	>8<16	<-3>-4	%	0.00	4.91	0.00	0.00	0.00	0.00	0.34	0.00	0.46	5.97	5.15	11.20	0.00	1.03
Fine gravel	>4<8	<-2>-3	%	0.00	1.24	0.41	0.00	0.01	0.00	0.25	0.02	2.15	8.16	0.57	10.60	0.00	0.13
Very fine gravel	>2<4	<-1>-2	%	0.21	0.98	0.36	0.00	0.05	0.00	0.46	0.20	2.53	5.94	0.62	6.59	0.00	0.22
Very coarse sand	>1<2	<0>-1	%	0.40	0.83	0.43	0.09	0.10	0.00	0.28	1.89	3.26	3.44	0.49	3.40	0.00	0.21
Coarse sand	>0.5<1	<1>0	%	16.90	12.00	17.20	14.30	16.70	4.25	14.50	26.40	29.60	12.20	7.64	4.05	10.80	16.20
Medium sand	>0.25<0.5	<2>1	%	64.90	40.00	56.50	61.20	46.80	10.10	55.50	48.10	51.30	45.90	29.80	3.11	9.98	51.30
Fine sand	>0.125<0.25	<3>2	%	15.40	17.60	21.30	19.10	9.34	6.65	24.50	12.40	6.23	13.30	8.95	0.00	15.90	17.00
Very fine sand	>0.0625<0.125	<4>3	%	0.25	1.30	1.61	0.64	0.68	11.50	1.44	1.18	1.64	0.27	0.21	0.00	18.00	1.10
Very coarse silt	>0.03125<0.0625	<5>4	%	0.51	1.40	0.88	1.42	5.78	21.20	1.02	0.40	0.09	0.34	0.28	0.00	16.00	2.96
Coarse silt	>0.015625<0.03125	<6>5	%	0.44	0.91	0.36	1.20	6.92	16.50	0.57	0.28	0.17	0.23	0.19	0.09	11.40	3.24
Medium silt	>0.007813<0.015625	<7>6	%	0.15	0.45	0.10	0.53	4.41	8.57	0.20	1.87	0.46	0.07	0.07	0.97	5.80	1.88
Fine silt	>0.003906<0.007813	<8>7	%	0.15	0.47	0.12	0.57	4.41	9.05	0.22	2.10	0.39	0.08	0.07	1.22	5.56	2.04
Very fine silt	>0.001953<0.003906	<9>8	%	0.15	0.44	0.14	0.40	2.54	6.15	0.20	1.58	0.39	0.08	0.07	0.99	3.20	1.31
Clay	<0.001953	>9	%	0.45	0.94	0.57	0.58	2.33	6.05	0.56	3.65	1.34	0.32	0.21	2.20	3.39	1.36
Statistics*	Mean (phi)			1.49	-0.315	1.57	1.62	2.74	4.88	1.65	1.48	1.17	0.315	-2.27	-3.65	3.80	1.74
	Sorting			0.555	3.01	0.684	0.730	2.28	2.59	0.682	1.57	0.892	1.98	2.91	3.05	2.43	1.39
	Skewness			0.072	-0.621	0.161	0.222	0.720	0.055	0.097	0.541	-0.029	-0.627	0.494	0.582	0.143	0.468
	Kurtosis			0.984	2.09	1.05	1.40	0.945	1.06	1.03	3.07	2.30	1.01	0.489	1.58	1.04	2.39
	% Silt/Clay		%	1.85	4.61	2.17	4.70	26.39	67.52	2.77	9.88	2.84	1.12	0.89	5.47	45.35	12.79
	Textural Group*	**		Slightly Gravelly Sand	Gravelly Sand	Slightly Gravelly Sand	Sand	Gravelly Mudo	Sandy Mud	htly Gravelly S	htly Gravelly S	Gravelly Sand	Gravelly Sand	Sandy Gravel	Gravel	Muddy Sand	Gravelly Mudo

^{*} Folk & Ward

^{**} GRADISTAT classification system (Blott, S. J. & Pye, K., 2001)



Results Summary PSA Size Class & Statistics

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	Custo	mer Sam	ple No	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9	BH7 ES1	BH7 ES14	BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
	Cus	tomer Sar	mple ID	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
		RPS Sar	nple No	398234	398235	398236	398237	398238	398239	398240	398241	398242	398243
		Sampl	е Туре	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
		Sample L	ocation.										
	S	ample De	pth (m)	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
		Samplii	ng Date	13/03/2019	16/03/0320	16/03/2019	16/03/2019	07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
		Samplir	ng Time										
Sediment	mm	phi ø	Units										
Very coarse gravel	>32<64	<-5>-6	%	11.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coarse gravel	>16<32	<-4>-5	%	32.10	0.00	0.00	0.00	0.00	0.00	0.00	18.00	0.00	0.00
Medium gravel	>8<16	<-3>-4	%	21.60	0.00	0.00	0.00	0.00	0.00	0.00	3.83	0.00	0.00
Fine gravel	>4<8	<-2>-3	%	7.35	0.00	0.00	0.00	0.32	0.00	0.48	1.53	0.00	0.00
Very fine gravel	>2<4	<-1>-2	%	3.12	0.00	0.03	0.00	0.15	0.00	2.18	0.71	0.00	0.00
Very coarse sand	>1<2	<0>-1	%	1.74	0.00	0.05	0.00	0.06	0.00	2.12	0.65	0.00	0.00
Coarse sand	>0.5<1	<1>0	%	4.65	1.90	8.97	6.26	9.65	5.19	12.40	9.74	9.23	8.98
Medium sand	>0.25<0.5	<2>1	%	12.50	8.44	38.60	20.50	43.00	19.80	55.70	49.30	61.50	44.40
Fine sand	>0.125<0.25	<3>2	%	4.08	26.40	37.10	21.70	31.20	24.40	20.10	14.50	26.50	31.90
Very fine sand	>0.0625<0.125	<4>3	%	0.22	18.10	5.21	8.88	4.43	12.40	1.02	0.25	0.52	4.88
Very coarse silt	>0.03125<0.0625	<5>4	%	0.31	14.40	2.94	14.60	3.09	13.30	1.93	0.38	0.69	4.00
Coarse silt	>0.015625<0.03125	<6>5	%	0.31	10.80	2.95	11.50	3.03	10.10	1.43	0.35	0.50	2.54
Medium silt	>0.007813<0.015625	<7>6	%	0.24	5.60	1.09	5.35	1.43	4.63	0.68	0.12	0.18	0.74
Fine silt	>0.003906<0.007813	<8>7	%	0.22	5.92	1.20	4.94	1.39	4.47	0.74	0.13	0.20	0.79
Very fine silt	>0.001953<0.003906	<9>8	%	0.15	4.00	0.83	3.06	0.92	2.71	0.52	0.13	0.18	0.67
Clay	< 0.001953	>9	%	0.25	4.45	1.11	3.23	1.25	2.95	0.75	0.35	0.51	1.13
Statistics*	Mean (phi)			-2.48	4.19	2.08	3.60	2.02	3.50	1.62	-0.337	1.71	2.02
Statistics	Sorting			2.62	2.24	1.18	2.28	1.26	2.15	1.02	2.68	0.588	1.12
	Skewness			0.603	0.394	0.267	0,345	0.340	0.378	0.200	-0.739	0.012	0.309
	Kurtosis			0.866	1.01	1.94	0.928	2.03	0.989	1.98	1.87	1.04	1.84
	% Silt/Clay		%	1.48	45.17	10.12	42.68	11.11	38.16	6.05	1.46	2.26	9.87
	70 Sing Siay								22.20	2.00	23.10		2.37
	Textural Group*	k		Sandy Gravel	Muddy Sand	Gravelly Mudo	Muddy Sand	Gravelly Mudo	Muddy Sand	htly Gravelly S	Gravelly Sand	Sand	Sand

^{*} Folk & Ward

^{**} GRADISTAT classification system (Blott, S. J. & Pye, K., 2001)



Results Summary PSA Wentworth Scale

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Customer Samp	le No	BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11	BH3 ES1	BH3 ES25	BH3 ES45	BH4 ES1	BH4 ES19	BH4 ES40	BH5 ES1
Customer Sam	ple ID	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.50-11.00m	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m
RPS Sam	ple No	398220	398221	398222	398223	398224	398225	398226	398227	398228	398229	398230	398231	398232
Sample	Type	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Lo														
		0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.5-11.0m	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m
		04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019	08/03/2019	08/03/2019	08/03/2019	11/03/2019	11/03/2019	11/03/2019	13/03/2019
Sampling	J Time													
Parameter	Units													
Pebble	%	0.00	22.76	0.41	0.00	0.01	0.00	0.59	0.02	2.61	17.91	51.42	77.30	0.00
Granule	%	0.21	0.98	0.36	0.00	0.05	0.00	0.46	0.20	2.53	5.94	0.62	6.59	0.00
Very coarse sand	%	0.40	0.83	0.43	0.09	0.10	0.00	0.28	1.89	3.26	3.44	0.49	3.40	0.00
Coarse sand	%	16.90	12.00	17.20	14.30	16.70	4.25	14.50	26.40	29.60	12.20	7.64	4.05	10.80
Medium sand	%	64.90	40.00	56.50	61.20	46.80	10.10	55.50	48.10	51.30	45.90	29.80	3.11	9.98
Fine sand	%	15.40	17.60	21.30	19.10	9.34	6.65	24.50	12.40	6.23	13.30	8.95	0.00	15.90
Very fine sand	%	0.25	1.30	1.61	0.64	0.68	11.50	1.44	1.18	1.64	0.27	0.21	0.00	18.00
Silt Clay	%	1.85	4.61	2.17	4.70	26.39	67.52	2.77	9.88	2.84	1.12	0.89	5.47	45.35
Total	%	99.9	100.1	100.0	100.0	100.1	100.0	100.0	100.1	100.0	100.1	100.0	99.9	100.0



Results Summary PSA Wentworth Scale

						1	1				1	
	Customer Sample No	BH5 ES12	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9	BH7 ES1	BH7 ES14	BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
	Customer Sample ID	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
	RPS Sample No	398233	398234	398235	398236	398237	398238	398239	398240	398241	398242	398243
	Sample Type	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
	Sample Location											
	Sample Depth (m)	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
	Sampling Date	13/03/2019	13/03/2019	16/03/0320	16/03/2019	16/03/2019	07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
	Sampling Time											
Parameter	Units											
Pebble	%	1.16	72.15	0.00	0.00	0.00	0.32	0.00	0.48	23.36	0.00	0.00
Granule	%	0.22	3.12	0.00	0.03	0.00	0.15	0.00	2.18	0.71	0.00	0.00
Very coarse sand	%	0.21	1.74	0.00	0.05	0.00	0.06	0.00	2.12	0.65	0.00	0.00
Coarse sand	%	16.20	4.65	1.90	8.97	6.26	9.65	5.19	12.40	9.74	9.23	8.98
Medium sand	%	51.30	12.50	8.44	38.60	20.50	43.00	19.80	55.70	49.30	61.50	44.40
Fine sand	%	17.00	4.08	26.40	37.10	21.70	31.20	24.40	20.10	14.50	26.50	31.90
Very fine sand	%	1.10	0.22	18.10	5.21	8.88	4.43	12.40	1.02	0.25	0.52	4.88
Silt Clay	%	12.79	1.48	45.17	10.12	42.68	11.11	38.16	6.05	1.46	2.26	9.87
Total	%	100.0	99.9	100.0	100.1	100.0	99.9	100.0	100.1	100.0	100.0	100.0



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Report No.: 19-81762 Customer Reference: G191005U Customer Order No: 78367KB-WAL

Comments

RPS Sample Number	Customer Number	Sample Comments
398220	BH1 ES1	Visual Inspection: Colour: Light brown Texture: Sandy Odour: Sea Biota: none Anthropogenic Inputs: none
398221	BH1 ES25	Visual Inspection: Colour: Light brown Texture: Sandy Odour: none Biota: none Anthropogenic Inputs: none
398222	BH1 E51	Visual Inspection: Colour: Light brown Texture: Sandy Odour: Sea Biota: Rocks Anthropogenic Inputs: none
398223	BH2 ES1	Visual Inspection: Colour: Dark brown/black Texture: Sandy Odour: Sea Biota: none Anthropogenic Inputs: none
398224	BH2 ES5	Visual Inspection: Colour: Black Texture: Sandy Odour: none Biota: none Anthropogenic Inputs: none
398225	BH2 ES11	Visual Inspection: Colour: Black Texture: Clay Odour: Sulphur Biota: none Anthropogenic Inputs: none
398226	BH3 ES1	Visual Inspection: Colour: Grey Texture: Sand Odour: Sea Sweet Biota: none Anthropogenic Inputs: none
398227	BH3 ES25	Visual Inspection: Colour: Brown Texture: Sand Odour: none Biota: none Anthropogenic Inputs: none
398228	BH3 ES45	Visual Inspection: Colour: Light brown Texture: Sand Odour: Sweet Biota: none Anthropogenic Inputs: none
398229	BH4 ES1	Visual Inspection: Colour: Brown Texture: Sandy/Rocky Odour: Sea Biota: Rocks Anthropogenic Inputs: none



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Report No.: 19-81762 Customer Reference: G191005U Customer Order No: 78367KB-WAL

Comments

RPS Sample Number	Customer Number	Sample Comments
398230	BH4 ES19	Visual Inspection: Colour: Brown Texture: Clay/Rocky Odour: none Biota: Rocks Anthropogenic Inputs: none
398231	BH4 ES40	Visual Inspection: Colour: Black Texture: Sandy/Rocky Odour: none Biota: Rocks Anthropogenic Inputs: none
398232	BH5 ES1	Visual Inspection: Colour: Black Texture: Sludge Odour: Fish Biota: none Anthropogenic Inputs: none
398233	BH5 ES12	Visual Inspection: Colour: Black Texture: Sand Odour: none Biota: none Anthropogenic Inputs: none
398234	BH5 ES22	Visual Inspection: Colour: Brown Texture: Sandy rock Odour: none Biota: Rock Anthropogenic Inputs: none
398235	BH6 ES1	Visual Inspection: Colour: Black Texture: Sludge/Sandy Odour: Light Sulphur Biota: none Anthropogenic Inputs: none
398236	BH6 ES5	Visual Inspection: Colour: Black Texture: Sandy Odour: none Biota: none Anthropogenic Inputs: none
398237	BH6 ES9	Visual Inspection: Colour: Brown/Black Texture: Sludge/Sandy Odour: Sulphur Biota: none Anthropogenic Inputs: none
398238	BH7 ES1	Visual Inspection: Colour: Brown/grey Texture: Sandy Odour: Sweet Biota: none Anthropogenic Inputs: none
398239	BH7 ES14	Visual Inspection: Colour: Brown Texture: Clay/Sandy Odour: Sulphur Biota: none Anthropogenic Inputs: none



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Report No.: 19-81762 Customer Reference: G191005U Customer Order No: 78367KB-WAL

Comments

RPS Sample Number	Customer Number	Sample Comments
398240	BH7 ES27	Visual Inspection: Colour: Brown Texture: Sandy Odour: none Biota: Shell Anthropogenic Inputs: none
398241	BH8 ES1	Visual Inspection: Colour: Brown Texture: Sandy Odour: Sea Biota: Shell/Rock Anthropogenic Inputs: none
398242	BH8 ES11	Visual Inspection: Colour: Brown Texture: Sandy Odour: none Biota: none Anthropogenic Inputs: none
398243	BH8 ES21	Visual Inspection: Colour: Dark brown Texture: Clay/Sandy Odour: Sulphur Biota: none Anthropogenic Inputs: none



398243

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BH8 ES21

Deviating Samples

 Report No.:
 19-81762

 Customer Reference:
 G191005U

 Customer Order No:
 78367KB-WAL

Our policy on Deviating Samples and reference list of Holding Times applied can be supplied on request. These have been implemented in accordance with UKAS Policy on Deviating Samples (TPS63).

RPS is not responsible for the integrity of samples as received, unless RPS personnel performed the sampling, and it is possible that samples submitted may be declared to be deviating.

Where applicable the analysis method remains UKAS accredited, however results reported for a deviating sample may be invalid. The reason for a sample being declared to be deviating is indicated below.

Where no sampling date was supplied, samples have been declared to be deviating. However, if a date of sampling can be supplied, the results may be reissued with the deviating sample status removed. Where the sample container used was unsuitable, the appropriate Holding Time was exceeded, or the sample is flagged as deviating for some other reason, re-sampling/re-submisson may be required.

05/03/2019

RPS No.	Customer No.	Customer ID	Date Sampled	Containers Received	Deviating Sample	Reason for Sample Deviation
398220	BH1 ES1		04/03/2019	plastic & metal containers	No	-
398221	BH1 ES25		04/03/2019	plastic & metal containers	No	
398222	BH1 E51		04/03/2019	plastic & metal containers	No	
398223	BH2 ES1		02/03/2019	plastic & metal containers	No	
398224	BH2 ES5		02/03/2019	plastic & metal containers	No	
398225	BH2 ES11		02/03/2019	plastic & metal containers	No	
398226	BH3 ES1		08/03/2019	plastic & metal containers	No	
398227	BH3 ES25		08/03/2019	plastic & metal containers	No	
398228	BH3 ES45		08/03/2019	plastic & metal containers	No	
398229	BH4 ES1		11/03/2019	plastic & metal containers	No	
398230	BH4 ES19		11/03/2019	plastic & metal containers	No	
398231	BH4 ES40		11/03/2019	plastic & metal containers	No	
398232	BH5 ES1		13/03/2019	plastic & metal containers	No	
398233	BH5 ES12		13/03/2019	plastic & metal containers	No	
398234	BH5 ES22		13/03/2019	plastic & metal containers	No	
398235	BH6 ES1		16/03/320	plastic & metal containers	No	
398236	BH6 ES5		16/03/2019	plastic & metal containers	No	
398237	BH6 ES9		16/03/2019	plastic & metal containers	No	
398238	BH7 ES1		07/03/2019	plastic & metal containers	No	
398239	BH7 ES14		07/03/2019	plastic & metal containers	No	•
398240	BH7 ES27		07/03/2019	plastic & metal containers	No	•
398241	BH8 ES1		05/03/2019	plastic & metal containers	No	
398242	BH8 ES11		05/03/2019	plastic & metal containers	No	
				1 4 4 4 4 4 4		

plastic & metal containers



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Report Information

Key to Report Code			_					_		-		
	PC	١d	\mathbf{C}	rt	n	т	P	R	'n	, t	ev	ĸ

U UKAS Accredited
F UKAS Flexible Scope
M MCERTS Accredited
N Not Accredited

O Marine Management Organisation (MMO) Validated

S Subcontracted to approved laboratory

US Subcontracted to approved laboratory UKAS Accredited for the test

MS Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test

SI Subcontracted to internal RPS Group Laboratory

USI Subcontracted to internal RPS Group Laboratory UKAS Accredited for the test

MSI Subcontracted to internal RPS Group Laboratory MCERTS/UKAS Accredited for the test

I/S (in results)
U/S (in results)
U/S (in results)
S/C (in results)
ND (in results)
Insufficient Sample
Unsuitable Sample
See Comments
Not Detected

DW (in units) Results are expressed on a dry weight basis

Sample Retention and Disposal

Samples will generally* be retained for the following times prior to disposal:

Perishables, e.g. foodstuffs 1 month (if frozen) from the issue date of this report

Waters 2 weeks from the issue date of this report
Other Liquids 1 months from the issue date of this report
Solids (including Soils) 1 months from the issue date of this report

Analytical Methods

PAH's and PCB's GCMS analysis following extraction of the wet sediment with DCM:acetone by ASE 350

extraction. Extract cleaned-up with silica and activated copper.

Metals ICP-MS analysis following microwave assisted digestion in hydrofluoric acid of the dried

(<30°C) and ground sediment.

TOC Combustion and infrared analysis following carbonate removal with hydrochloric acid.

PSA Wet and dry sieving followed by laser diffraction analysis.

Density Determination of density from the dry sediment by gravimetric analysis of a known

volume of sediment.

Dry solids at 105°C A portion of the wet sediment is dried at 105°C to constant weight.

TBT and DBT GCMS analysis following the extraction of the wet sediment and subsequent

derivatisation.

Please note: All testing carried out using the <2mm fraction

Laboratories

RPS Letchworth UKAS Accreditation Laboratory No. 1663 RPS Manchester (Metals only) UKAS Accreditation Laboratory No. 0605

Ocean Ecology PSA only NMBAQC

RPS Letchworth and Manchester Laboratories participate in the QUASIMEME Proficiency Testing Scheme

^{*}Sample retention may be subject to agreement with the customer for particular projects

GLOBAL ENERGY NIGG LIMITED EAST QUAY DEVELOPMENT - MARINE GROUND INVESTIGATION



G. SURVEY

Mean Position Reports

18 Pages

STARFIX

MEAN POSITION REPORT



Project ID	C1982		
Project Name	192186 Nigg East Quay Development		
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 5.50m, DTW = 3.40m Deck Heigh	nt Above CD = 6.3	5m

Session Name: C1982 BH01 Records Used: 294 of 301
Start Time: 04 Mar 2019, 00:03:01+00:00 End Time: 04 Mar 2019, 00:08:02+00:00 Session Length: 00:05:01

	Mean Position for Skate 3A CommonRefere	encePoint
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)
Latitude	57°41'40.35536"N	57°41'39.30291"N
Longitude	004°01'25.47428"W	004°01'30.48544"W
Height	57.109m Ell.	57.109m Ell.
Easting	279,383.704m E(SD: ±0.01m)	
Northing	868,963.576m N(SD: ±0.01m)	
Height	4.295m Ort. (SD: ±0.02m Ort.)	

Sensors	Sensor Averages	SD
Heading	50.00°T 51.71°G	±0.0°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

DTM = 5.50m, DTW = 3.40m Deck Height Above CD = 6.35m

Mean Posit	țion to Waypoint
Waypoint	BH12
Easting	279,384.000m E
Northing	868,964.000m N
Range	0.52m Geodetic
Bearing TO	33.18°True
Bearing FROM	213.18°True

Jimmy Wilson

Party Chief

FGSL (Fugro GeoServices Ltd UK)

Theo Cleave
Party Chief

Fugro Geoservices Ltd



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

	Lab. Ma			24222	•	T			0-4
	Job No			C1982			ssel Skate 3A		Date Saturday 02-Mar-19
То	ANeillings@ar	ch-henderson.	co.uk			Attn.	Andy Neillings	No./email	0141 227 3060
CC	mshuttleworth		rson.co.uk			Attn.	Michael Shuttleworth	No./email	
cc	stuart.innes@g	gegroup.com				Attn.	Stuart Innes	No./email	
cc						Attn.		No./email	
c	m.chappell@fi	ugro.com				Attn.	Mathew Chappell - Nearshore Man	ager No./email	
С	n.armstrong@	fugro.com				Attn.	Nicholas Armstrong - Reporting	Man: No./email	
С	g.crisp@fugro.					Attn.	Glen Crisp - Project Manager	No./email	
0	bserved Weath	_	W	/ind		_			
	Time 00:00		ed Knts	Dir	S	well (Hs)	Sea State	Visibility	Weather Forecast
_	00:00		5	SW		N/A	smooth	good	
_	06:00		10	SW		N/A	smooth	good	See Below
_	12:00		8	S		N/A	smooth	good	
	18:00		20	S		N/A	smooth	good	
	00:00		31	SSW		N/A	smooth	good	
	00.00					19/7	SITIOOTTI	good	
			Leg Pen	etration (m)					Operational Status
	BH no.		1	2	3	4	4		
	BH02	1	3.3	1.9	2.6	1	.3		
	51.102		0.0			+			
							Jacke	ed in Moray Firt	h awaiting tide/weather for towage to Nigg Energy Park
						Summary	of Operations / Borehole Drillin	g - last 24hrs:	
	From	То		Hrs (No.)	Code				Description
	00:00	05:45		5.75	Single Shift St		cked in Moray Firth / Awaiting tow	age to Nigg Ene	gy Park at high water slack.
	05:45	06:30		0.75	Crew Change	/ TBT Da	syshift Trasfer to JUB from Inverne	ess Marina / TBT	on Towing Operations
_	06:30	07:20		0.83	Moving & Jac	cking Ja	ck down and move NE into deepe	r water / Forth C	onstructor arrival on site.
	07:20	08:00		0.67	Moving & Jac	cking BN	// Transfers to Tug with RHIB and	discuss operatio	ns / Tug alongside and towing bridle connected and secured
	08:00	11:35		3.58	Moving & Jac				re drill onboard / Arrival at Nigg Energy Park / Lower legs and disconnect
	11:35	12:10		0.58	Moving & Jac		ove JUB alongside Berth 3 / Preloa		
	12:10	15:40		3.50	Mobilisatio				al drill pipe, IBCs, consumables / General R&M on deck.
	15:40	17:25		1.75	Moving & Jac		ck down and move to BH02 / Prelo		• •
	17:25	19:15		1.83	Cable Percus				8" casing, DML=14.10m / High winds observed, continue to monitor
	19:15	20:00		0.75	Crew Change				Nightshift transfer to JUB / TBT on Rig Abandonment Drill
	20:00	23:30		3.50	Cable Percus		ommence CP drilling from 0.00m to		Nightshift transfer to 30b / 1b1 off trig Abandonment billi
	23:30	00:00		0.50	Moving & Jac		ck up another 1.50m as wind conti		>20kto and awall >1 00m
	23.30	00.00		0.50	Woving & Jak	cking Ja	ck up another 1.50m as wind conti	nues to morease	> Jokus and swell > 1.00m.
						=			
							Washna faransa		
					I Tare		Weather forecast	216	
					Sat 02-	-Mar-2019 09 12	Sun 03-Mar-2		15 1R
				Wind Dim	06 SW	09 12 WSW SE	Sun 03-Mar-2		15 18 SW SSW
				10m Wnd Spd	06 SW 6	09 12 WSW SE 5 4	15 18 21 00 03 SSE SW SSW SSW SSW 8 5 12 17 22 12 7 17 24 31		15 18 1 SW SSW 14 10 20 14
				10m Wnd Spd 10m Gust 50m Wnd Spd	06 SW 6 8	09 12 WSW SE 5 4 7 6 6 5	15 18 21 00 03 SSE SW SSW SSW SSW 8 5 12 17 22 12 7 17 24 31		15 18 / SW SSW 14 10 20 14 19 14
				10m Wnd Spd 10m Gust	06 SW 6 8 8	09 12 WSW SE 5 4 7 6 6 5 9 7 7 5	Sun 03-Mar-2 15		15 18 SW SSW 14 10 19 14 19 14 19 7 20 21 15
				10m Wnd Spd 10m Gust 50m Wnd Spd 50m Gust 100m Wnd Spd 100m Gust	06 SW 6 8 8 11 8	09 12 WSW SE 5 4 7 6 6 5 9 7 7 5	Sun 03-Mar-2 15		15 18 / SW SSW 14 10 20 14 19 14 27 20 21 15 30 0 22
				10m Wnd Spd 10m Gust 50m Wnd Spd 50m Gust 100m Wnd Spd 100m Gust Sig Wav Hgt Max Wav Hot	06 SW 6 8 8 11 8	09 12 WSW SE 5 4 7 6 6 5 9 7 7 5 10 8 -99.0 -99.0	Sun 03-Mar-2 15	06 09 12 SSW SW SV 18 16 16 25 22 23 25 22 23 35 31 32 27 24 25 38 34 34 -99.0 -99.0 -96 -99.0 -99.0 -96	19 14 27 20 21 15 30 22 0 990 990
				10m Wnd Spd 10m Gust 50m Wnd Spd 50m Gust 100m Wnd Spd 100m Gust Sig Wav Hgt Max Wav Hgt Sig Wav Prd	06 SW 6 8 8 11 8 11 -99.0 -99.0	09 12 WSW SE 5 4 7 6 6 5 9 7 7 5 10 8 -99.0 -99.0	Sun 03-Mar-2 15	06 09 12 SSW SW SV 18 16 16 25 22 23 25 22 23 35 31 32 27 24 25 38 34 34 -99.0 -99.0 -96 -99.0 -99.0 -96	19 14 27 27 15 10 22 0.0 99.0 99.0 0.0 99.0 99.0 99 99
				10m Wnd Spd 10m Gust 50m Wnd Spd 50m Gust 100m Wnd Spd 100m Gust Sig Wav Hgt Max Wav Hot	06 SW 6 8 8 11 8 11 -99.0 -99.0	09 12 WSW SE 5 4 7 6 6 5 9 7 7 5 10 8 -99.0 -99.0 -99.0 -99.0 99.0 -99.0	15 18 21 00 03 SSE SW SSW SSW SSW SSW 8 5 12 17 22 12 7 17 24 31 13 9 18 21 28 16 12 25 30 39 14 9 20 23 30 19 13 27 32 42 990	06 09 12 SSW SW SW SW 16 16 16 16 25 22 23 35 31 32 27 24 25 38 34 34 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	19 14 27 20 21 15 30 29 0-99 0-99 0-99 0-99 0-99 0-99 0-99
				10m Wnd Spd 10m Gust 50m Wnd Spd 50m Gust 100m Wnd Spd 100m Gust Sig Wav Hgt Max Wav Hgt Sig Wav Prd Swell Dim	06 SW 6 8 8 11 8 11 -99.0 -99.0 -99.0	09 12 WSW SE 5 4 7 6 6 5 9 7 7 5 10 8 -99.0 -99.0	15 18 21 00 03 SSE SW SSW SSW SSW SSW 8 5 12 17 22 12 7 17 24 31 13 9 18 21 28 16 12 25 30 39 14 9 20 23 30 19 13 27 32 42 990	06 09 12 SSW SW SV 18 16 16 25 22 23 25 22 23 35 31 32 27 24 25 38 34 34 -99.0 -99.0 -96 -99.0 -99.0 -96	19 14 27 27 15 10 12 10 990 490 10 490 490 10 490 990 10 990 990 10 NA NA NA 10 990 990
ealt	th Safety & the	Environment		10m Wnd Spd 10m Gust 50m Wnd Spd 50m Gust 100m Wnd Spd 100m Gust Sig Wav Hgt Max Wav Hgt Sig Wav Prd Swell Dim Swell Dim	06 SW 6 8 8 11 8 11 -99.0 -99.0 -99.0	09 12 WSW SE 5 4 7 6 6 5 9 7 7 5 10 8 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 N/A N/A	Sun 03-Mar-2 15 18 21 00 03 03 05 05 05 05 05	06 09 12 SSW SW SV 18 16 16 25 22 23 25 22 23 35 31 32 27 24 25 28 38 34 34 -99.0 -99.0 -99 -99 -99 99 NVA N/A N/A N/A -99.0 -99.0 -99 -99.0 -99.0 -99 -99.0 -99.0 -99	19 14 27 27 15 10 20 12 20 490 490 490 10 490 590 990 N NA NA NA 0 390 990
ealt	th Safety & the	Environment		10m Wnd Spd 10m Gust 50m Wnd Spd 50m Gust 100m Wnd Spd 100m Gust Sig Wav Hgt Max Wav Hgt Sig Wav Prd Swell Dim Swell Dim	06 SW 6 8 8 11 8 11 -99.0 -99.0 -99.0	09 12 WSW SE 5 4 7 6 6 5 9 7 7 5 10 8 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 N/A N/A	Sun 03-Mar-2 15 18 21 00 03 03 05 05 05 05 05	06 09 12 SSW SW SV 18 16 16 25 22 23 25 22 23 35 31 32 27 24 25 28 38 34 34 -99.0 -99.0 -99 -99 -99 99 NVA N/A N/A N/A -99.0 -99.0 -99 -99.0 -99.0 -99 -99.0 -99.0 -99	19 14 27 27 15 10 20 12 20 490 490 490 10 490 590 990 N NA NA NA 0 390 990
ealt	th Safety & the	Environment		10m Wnd Spd 10m Gust 50m Wnd Spd 50m Gust 100m Wnd Spd 100m Gust Sig Wav Hgt Max Wav Hgt Sig Wav Prd Swell Dim Swell Dim	06 SW 6 8 8 11 8 11 -99.0 -99.0 -99.0	09 12 WSW SE 5 4 7 6 6 5 9 7 7 5 10 8 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 N/A N/A	Sun 03-Mar-2 15 18 21 00 03 03 05 05 05 05 05	06 09 12 SSW SW SV 18 16 16 25 22 23 25 22 23 35 31 32 27 24 25 28 38 34 34 -99.0 -99.0 -99 -99 -99 99 NVA N/A N/A N/A -99.0 -99.0 -99 -99.0 -99.0 -99 -99.0 -99.0 -99	19 14 27 27 15 10 12 10 990 490 10 490 490 10 490 990 10 990 990 10 NA NA NA 10 990 990
ealt	th Safety & the	Environment		10m Wnd Spd 10m Gust 50m Wnd Spd 50m Gust 100m Wnd Spd 100m Gust Sig Wav Hgt Max Wav Hgt Sig Wav Prd Swell Dim Swell Dim	06 SW 6 8 8 11 8 11 -99.0 -99.0 -99.0	09 12 WSW SE 5 4 7 6 6 5 9 7 7 5 10 8 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 N/A N/A	Sun 03-Mar-2 15 18 21 00 03 03 05 05 05 05 05	06 09 12 SSW SW SV 18 16 16 25 22 23 25 22 23 35 31 32 27 24 25 28 38 34 34 -99.0 -99.0 -99 -99 -99 99 NVA N/A N/A N/A -99.0 -99.0 -99 -99.0 -99.0 -99 -99.0 -99.0 -99	19 14 27 27 15 10 20 12 20 490 490 490 10 490 590 990 N NA NA NA 0 390 990
				10m Wnd Spd 10m Gust 50m Wnd Spd 50m Gust 100m Wnd Spd 100m Gust Sig Wav Hgt Max Wav Hgt Sig Wav Prd Swell Dim Swell Dim	06 SW 6 8 8 11 8 11 -99.0 -99.0 -99.0	09 12 WSW SE 5 4 7 6 6 5 9 7 7 5 10 8 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 N/A N/A	Sun 03-Mar-2 15	06 09 12 SSW SW SV 18 16 16 16 16 25 22 23 25 22 23 25 22 23 25 24 25 36 31 32 27 24 25 38 34 42 99.0 99.0 99.0 99.0 99.0 99.0 99.0 99.0	19 14 27 27 15 10 12 10 990 990 990 10 990 990 10 990 990 10 190 990 10 990 990
	th Safety & the			10m Wnd Spd 10m Gust 50m Wnd Spd 50m Gust 100m Wnd Spd 100m Gust Sig Wav Hgt Max Wav Hgt Sig Wav Prd Swell Dim Swell Dim	06 SW 6 8 8 11 8 11 -99.0 -99.0 -99.0	09 12 WSW SE 5 4 7 6 6 5 9 7 7 5 10 8 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 N/A N/A	Sun 03-Mar-2 15 18 21 00 03 03 05 05 05 05 05	06 09 12 SSW SW SV 18 16 16 16 16 25 22 23 25 22 23 25 22 23 25 24 25 36 31 32 27 24 25 38 34 42 99.0 99.0 99.0 99.0 99.0 99.0 99.0 99.0	19 14 27 27 15 10 12 10 990 990 990 10 990 990 10 990 990 10 190 990 10 990 990
GS				10m Wnd Spd 10m Gust 50m Wnd Spd 50m Gust 100m Wnd Spd 100m Gust Sig Wav Hgt Max Wav Hgt Sig Wav Prd Swell Dim Swell Dim	06 SW 6 8 8 11 8 11 -99.0 -99.0 -99.0	09 12 WSW SE 5 4 7 6 6 5 9 7 7 5 10 8 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 N/A N/A	Sun 03-Mar-2 15	06 09 12 SSW SW SV 18 16 16 16 16 25 22 23 25 22 23 25 22 23 25 24 25 36 31 32 27 24 25 38 34 42 99.0 99.0 99.0 99.0 99.0 99.0 99.0 99.0	19 14 27 27 15 10 12 12 10 490 490 490 10 490 590 490 10 490 590 490 10 490 990 490



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

Rotary Drilling (Coring) 0.00 0.00 James Lawson Adam Cook Fugro GeoServices Cable Percussion 0.00 0.00 Callum Allardyce Ashley Lowthian Fugro GeoServices A Standby (Fugro) 0.00 0.00 Stuart Nye Fugro GeoServices A Standby (Other) 0.00 0.00 Stuart Nye Bart Kot Fugro GeoServices A Standby weather 0.00 0.00 Richard Luker Bart Kot Fugro Geot Single Shift Standby 0.00 0.00 Constant	Position Surgemaster Driller Sistant Driller Sistant Driller chnical Engineer Oject Engineer
Moving A. Justing	Driller sistant Driller sistant Driller chnical Engineer
Roday Diffusion	Driller sistant Driller sistant Driller chnical Engineer
Cable Percentation	sistant Driller sistant Driller chnical Engineer
Standby (Other)	sistant Driller chnical Engineer
Standby	chnical Engineer
Standby	
Single Strictley	
Cherr Operations	ject Engineer
Crew Change / TBT	oject Engineer
Committee Comm	
Total 0.00 0.00 0.00	
Total 0.00 0.00 0.00	
Total 0.00 0.00 No. Personnel 10 Total Man Hours 12 No. Personnel 10 No. Personnel 12 No. Personnel 12 No. Personnel 12 No. Personnel 12 No. Personnel 13 No. Personnel 14 No. Personnel 15 No. Personnel 12 No. Personnel 15 No. Personnel 15 No. Personnel 16 No.	
Total 0.00 No. Personnel 10	
Project Program / Progress	
Project Program / Programs	
Project Program / Progress	
Activity	
Canadish all plant, equipment, crew on site	d
Establish all plant, equipment, crew on site	
Standing Time for plant, equipment and crew B11 C19 RIO 0 0 0 0.000 0.000	
Standing Time for plant, equipment and crew B11 C19 R/O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	100.
Parcussion Boring	
Percussion Boring	
Percussion Borling B	
Move boring plant to site of each exploratory hole B1 8.00 1 0.00 0	
Erita over 81 for setting up on a gradient >20%	
Break out surface obstructions where present B3 R/O 3.00 0.0	
Advance BH between groundievel and 10m depth	
As B4 but between 10m and 20m	
As B4 but between 20m and 30m	
As 84 but between 30m and 40m	
Advance BH through hard stratum or obstruction B9 R/O 0 0 0 0 0.00 0.00	
C	
Rotary Drilling	
Rotary Drilling C	
RC drilling between groundlevel and 10m depth	
RC drilling between groundlevel and 10m depth	
As C41 but between 10m and 20m	
As C41 but between 20m and 30m	
Core box to be retained by client	
0 0 0 0.00 0.0	
Sampling, Monitoring during investigation E	
Small Disturbed Sample E1 59.00 0 0.00 0.0	
Bulk Disturbed Sample	
Large Bulk disturbed sample E3 R/O 0 0 0.00 0.0	
1	
Institu Testing	
Standard Penetration Test in Borehole	
Standard Penetration Test in Rotary Drill Hole	
Standard Penetration Test in Rotary Drill Hole	
Company Comp	
Geoenvironmental Laboratory Testing L 0.0 Marine Scotland Sample L2 121 0 0 0.00 0.0 Additional Items 0 0 0.00 0.0 0.0 0.0	
Marine Scotland Sample L2 121 0 0 0.00 0.0 Additional Items U 121 0 0 0.00 0.0 0.0	
Additional Items 0 0 0.000 0.00 0.00 0.00 0.00	
Additional Items 0.0	
0 0 0.00	
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0 0 0.00 0.00	
Health & Safety Summary Today Actual To Date Lost & Damaged	
Hoc Cards 2 5	· <u> </u>
Safety Drills 2 4	
Tool Box Talks 1 3	
HSE Meetings 1 1	
Incidents/Near Miss 0	
Environmental 0	
Hours Worked 120 120 Fugro GeoServices Representative Comments Client Representative Comments	
FGSL Rep: Theo Cleave Client Rep:	
Signed: Signed:	
Tages Control of the	



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

Attn. Stuart Innes No./email cc Attn. No./email cc Math. No./email cc No./email n.armstrong@fugro.com Attn. Nicholas Armstrong - Reporting Manal No./email		Job No			C1982			Vesse	ı	Skate 3A		Date	Sunday 03-Mar-19
See State Annual Annual Month Process ### A	То	ANeillings@ar	rch-hender	rson.co.uk				Attn. A	ndy Neilling	ţs	No./em	ail 0141 227 306	60
ABIL Markey Carpel Registration (A) ABIL Markey Carpel Registrate (A) ABIL	СС	mshuttlewortl	h@arch-he	enderson.co.uk	<u>k</u>			Attn. M	lichael Shut	tleworth	No./em	ail	
Ann. Annex Ann. Annex Ann. Annex Ann. Ann. Annex Ann. Ann	СС	stuart.innes@	gegroup.c	<u>om</u>				Attn. S	tuart Innes	5	No./em	ail	
Ann. Not-color Ann. Not-	СС							Attn.			No./em	ail	•
Description Description	СС	m.chappell@f	ugro.com					Attn. M	athew Cha	ppell - Nearshore Manag	er No./em	ail	
Color Colo	СС	n.armstrong@	fugro.com	<u>1</u>				Attn. N	icholas Ar	mstrong - Reporting M	ana No./em	ail	
The Bod	СС							Attn. G	len Crisp	Project Manager	No./em	ail	
See Below See	Ob		ner				Swe	ell (Hs)		Sea State	Visibility		Weather Forecast
1200 34													
12:00 36					_							_	See Below
1 500 21 SSW NA Smooth good Lag Penetration (m) BH no. 1 2 3 4 Smooth good BH 1 2 3 3 4 Smooth good BH 1 2 3 3 4 Smooth good BH 1 1 1 0 1 1 0 2 2 3 1 Smooth good BH 1 1 0 1 0 2 2 3 1 Smooth good BH 1 1 0 1 0 2 2 3 1 Smooth good good good good good good good goo													000 201011
Summary of Operations Summary of Operations Bit no. 1 2 3 4												_	
Bit no. 1 2 3 4 4													
BHno. 1 1 2 3 4 4 BH02		00.00						W/A		SIIIOUII	good		
BH02 3.3 1.9 2.6 1.3 Summary of Operations / Bornholde Drilling - last 24brs: Summary of Operations / Bornholde Drilling - last 24brs: Summary of Operations / Bornholde Drilling - last 24brs: Description To New York New York Operations / Bornholde Drilling - last 24brs: Description Operations / Bornholde Drilling - last 24brs: Description Operations / Bornholde Drilling - last 24brs: Description Operations / Bornholde Drilling - last 24brs: Description Operations / Bornholde Drilling - last 24brs: Description Operations / Bornholde Drilling - last 24brs: Description Operations / Description Operations / Ope												Operation	onal Status
BH01 1.0 1.0 1.0 2.2 3.1 Summary of Operations / Borchole Drilling - last 24hrs: From To Hrs (No.) Code 0.000 0.2-15 2.25 Cable Percussion 0.300 0.7-5 Other Operations / Borchole Drilling - last 24hrs: 0.300 0.500 0.7-30 2.50 Shandby weather 0.500 0.7-30 2.50 Shandby weather 0.7-30 0.8-30 0.50 0.50 Cew Change / Borchole Drilling - Institute of the same swind speed / 2-358ts 0.000 0.7-30 0.50 0.50 Cew Change / Borchole Drilling - Institute of the same swind speed / 2-358ts 0.000 0.7-30 0.50 0.50 Cew Change / Borchole Drilling - Institute of the same swind speed / 2-358ts 0.000 0.7-30 0.50 0.50 Cew Change / Borchole Drilling - Institute of the same swind speed / 2-358ts 0.000 0.7-30 0.50 0.50 Cew Change / Borchole Drilling - Institute of the same swind speed / 2-358ts 0.000 0.7-30 0.50 0.50 Cew Change / Borchole Drilling - Institute of the same swind speed / 2-358ts 0.000 0.7-30 0.50 0.50 Cew Change / Borchole Drilling - Institute of the same swind speed / 2-358ts 0.000 0.7-30 0.50 0.50 Cew Change / Borchole Drilling - Institute of the same swind speed / 2-358ts 0.000 0.7-30 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.		BH no.		1	2	2	3	4					
Summary of Operations / Boreloise Drilling - last 24/ns: Summary of Operations Boreloise Drilling - last 24/ns:		BH02		3.3	1.	9	2.6	1.3					
Summary of Operations / Borehole Drilling - last 24brs: From To Hrs (No.) 62 15 2.25 Code Control of Code Control of Code Control of Code Code Code Code Code Code Code Code		BH01		1.0	1.	.0	2.2	3.1					
From												Cable percussion	n drilling underway.
From													
00:00 02:15 03:00 0.75 Other Operations of Continue CP from 3.00 to 6.00 BML / Social educk against gale force winds / Continue CP from 3.00 to 6.00 0.75 Other Operations on Synthesis from the Center of Continue CP from 3.00 to 6.00 0.75 Other Operations on Standby weather Continue CP from 3.00 to 6.00 0.50 Crew Change / TBT C 0.5 / Nighthish finandover at accomodation / TBT on Operational immits / Center of Social and CP from 4.00 to 6.00 0.50 Crew Change / TBT C 0.5 / Nighthish finandover at accomodation / TBT on Operational immits of CP from 3.00 to 6.00 0.50 Other Operations Operation of CP from 3.00 to 6.00 0.50 Crew Change / TBT C 0.5 / Nighthish finandover at accomodation / TBT on Operational immits of CP from 4.00 to 6.00 0.50 Crew Change / TBT C 0.5 / Nighthish finandover at accomodation / TBT on Operational immits of CP from 4.00 to 6.00 0.50 Crew Change / TBT C 0.5 / Nighthish finandover at accomodation / TBT on Operational immits of CP from 4.00 to 6.00 0.50 Crew Change / TBT C 0.5 / Nighthish finandover at accomodation / TBT on Operational immits of CP from 4.00 to 6.00 Crew Change / TBT C 0.5 / Nighthish finandover at accomodation / TBT on Operational immits of CP from 4.00 to 6.00 Continue CP drilling operations of CP on 6.00 to 6.00 to 6.00 to 6.00 Crew Change / TBT D continue CP drilling operations of CP of the 6.00 to 6.00 to 6.00 Crew Change / TBT D continue CP drilling operations of CP of the 6.00 to 6.00 Crew Change / TBT D continue CP drilling operations of CP of the 6.00 to 6.00 Crew Change / TBT D continue CP drilling operations of CP of the 6.00 to 6.00 Crew Change / TBT D continue CP drilling operations of CP of the 6.00 to 6.00 Crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D crew Change / TBT D cre								ımmary of C	peration	s / Borehole Drilling -	last 24hrs		
90.15 0.30.0 0.75 0.75 0.75 0.75 0.75 0.75 0.75 0													
O3300 05:00 2.00 Standby weather O5500 07:30 2.50 Standby weather O5500 07:30 08:00 0.50 Crew Change / 18T E. D.S. / Nighthish fandover at accomodation / 18T on Operational limitations and Emergency Drills 08:00 14:00 6.00 Standby weather C5500 08:00 0.50 Crew Change / 18T E. D.S. / Nighthish fandover at accomodation / 18T on Operational limitations and Emergency Drills 08:00 14:00 14:30 0.50 Other Operations 14:30 18:30 4.00 Cabbe Percussion 18:30 19:15 0.75 Other Operations 18:30 19:15 0.75 Other Operations 19:15 20:00 0.0 7.5 Other Operations 19:15 20:00 0.0 0.55 Crew Change / 18T Exploit Intender to July / 18T on Operations 19:15 0.0 0.0 0.0 0.55 Other Operations 20:00 22:00 0.0 0.5 Other Operations 20:00 0.0 0.5 Other Operations 20:00 0.0 0.5 Other Operations 20:00 0.0 0.5 Other Operations 20:00 0.0 0.5 Other Operations 20:00 0.0 0.5 Other Operations 20:00 0.0 0.5 Other Operations 20:00 0.0 0.5 Other Operations 20:00 0.0 0.5 Other Operations 20:00 0.0 0.5 Other Operations 20:00 0.0 0.5 Other Operations 20:00 0.0 0.5 Other Operations 20:00 0.0 0.5 Other Operations 20:00 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0													
Option Option													
OF 7/30 OR 0/0 O. 50 Crew Change / TBT O. 5 / Nightshift handover at accomodation / TBT on Operations and Emergency Drills O. 50 Other Operations Oth													
Standby weather Standby weather Standby weather Standby weather Standby weather Standby weather Standby Standby weather Standby Standby Weather Standby Stan													
14:30 14:30 4.00 Cable Percussion 18:30 4.00 Cable Percussion 18:30 19:15 0.75 Other Operations 18:30 19:15 0.75 Other Operations 19:15 20:00 1.75 Crew Change / TBT 20:00 1.75 Other Operations 20:00 12:00 1.75													
18:30													• •
19:15 20:00 0.75 Crew Change / TBT D support										•			
19:15 20:00 2.20 2.00 Standby (Tide) Waiting on lide to move to BH01 / Prepare JUB for move / Jack down and pull legs 22:00 2.345 1.75 Moving & Jacking Move from BH20 in Prepare JUB for move / Jack down and pull legs 23:45 00:00 0.25 Cable Percussion Run in casing to mudline and prepare deck for CP ope / DTM=5.50m Weather forecast W													
22:00 22:04 1.75 Moving & Jackson Wow from BH02 to BH01 / Prepare JUS for move / Jack down and pull legs 22:05 23:45 1.75 Moving & Jackson Wow from BH02 to BH01 / Prepare JUS for move / Jack down and pull legs 23:45 00:00 0.25 Cable Percussion Run in casing to mudline and prepare deck for CP ops / DTM=5.50m Weather forecast Weather													
22:00 23:45 1.75 Moving & Jacking Move from BH02 to BH01 / Preload and jack up to safe working height 23:45 00:00 0.25 Cable Percussion Run in casing to mudline and prepare deck for CP ops / DTM=5.50m Weather forecast Weather													
Weather forecast Weather forecast Weather forecast Substantial Su													id pull legs
Weather forecast Weather forecast													
Accordance Acc		23.43	00	7.00	0.23	-	able i elcussi	on Runn	i casing ic	muuline and prepare	deck for Cr	ора / БТМ-3.30П	
Accordance Acc													
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### (See 1995)						Local time			0 5:00 5:00	00 200 900 1000 1100 1200			
### A 20 19 20 20 20 20 20 20 20 20 20 20 20 20 20													
## 1							30 2	26 28	27 22	21 25 26 26 26 27	24 24 20	10 16 14 13 13 12	12 14
Count of mark Count of mar													
Procedure (No. 10							47 4	42 6	44 40		-	24 24 24 25 25 25	
Note 180 C C						Precipitation type	0 0		a a		0		
Health Safety & the Environment Winds in excess of operational and emergency limits. Crew continue to monitor weather with anomometer and updated forecasts for safe transfer window. Client Rep: Client Rep:							0.2 8	2 61 61 61	81 81	57 62 62 81 83	81		
Health Safety & the Environment Winds in excess of operational and emergency limits. Crew continue to monitor weather with anomometer and updated forecasts for safe transfer window. Client Rep:						Feels like (°C)	(0)						1 1
Health Safety & the Environment Winds in excess of operational and emergency limits. Crew continue to monitor weather with anomometer and updated forecasts for safe transfer window. FGSL Rep: Theo Cleave Client Rep:													86 87
Health Safety & the Environment Winds in excess of operational and emergency limits. Crew continue to monitor weather with anomometer and updated forecasts for safe transfer window. FGSL Rep: Theo Cleave Client Rep:							-			2 2 2 24 x 31		3 20 8 8 8 2	H 29
Health Safety & the Environment Winds in excess of operational and emergency limits. Crew continue to monitor weather with anomometer and updated forecasts for safe transfer window. FGSL Rep: Theo Cleave Client Rep:								8.3	0	10,00		17:04	22.61
FGSL Rep: Theo Cleave Client Rep:	Health	Safety & the	Environm	ent		rate median (m)	-		100 61			10 10 10 10 10	30.30
FGSL Rep: Theo Cleave Client Rep:					v limits Cros	w continue to	monitor weath	ner with anon	mometer a	nd undated forecasts:	for safe tran	nsfer window	
·	vviilus	11 CVCC22 01 0	perautridi	and emergenc	y minis. Grev	, conditue to	monitor weath	ioi widi aliOf	nometer a	na apuated forecasts	ioi salt liäl	ISICI WIIIGOW.	
Signed: Signed:	FGSL	Rep: Theo	Cleave							Client Rep):		
- Control Cont	Siane	ed:								Signed:			
	. 3												



Daily Report No.

02

Nigg Energy Park - Marine Ground Investigation

Activity Time Sun	mary	Т	oday	To Da	ate	D	ay Shift		Night	Shift		Comp	any	Posi	tion
Mobilisation			0.00	3.50	_					JUB (mobil					
Moving & Jacking			1.75	9.67		,lim	my Wilso	n I	Joshua			o Geo	Services	Barger	master
Rotary Drilling (Coring)			0.00	0.00	_		es Lawso		Adam				Services	Dril	
Cable Percussion			6.50	11.8	3	Callu	ım Allardy	/ce	Ashley L	.owthian	Fugn	o Geo	Services	Assistar	nt Driller
Standby (Fugro)			0.00	0.00		St	tuart Nye				Fugre	o Geo	Services	Assistar	ıt Driller
Standby (Tide)		_	2.00	2.00)										
Standby weather			0.50	10.5	_	Ricl	hard Luke	er .	Bart	Kot		Fugn	n	Geotechnic	al Engineer
Single Shift Standby				5.75		11101	nara Luk	J1	Dant	itot		i ugi		Ocolconnio	ai Engineer
			0.00			_					_	_			
Other Operations			2.00	2.00		The	eo Cleave	е			Fugre	o Geo	Services	Project E	:ngineer
Crew Change / TBT			1.25	2.75	5										
			0.00	0.00)										
			0.00	0.00)										
		_	0.00	0.00	_										
			0.00	0.00											
			0.00	0.00											
			0.00	0.00)										
											Total M				
	Tota	al 2	24.00	24.0	0	No.	Personn	el	1	0	Hours			120	
											Worke	ed			
Project Program / Pro		D-				Tadau			-4l T- D	-4-			۰, ۰		
Project Program / Pro			ogramme			Today			ctual To D		H		% Program	Completed	
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours					
General Items, Provisional Services	Α										0				
Establish all plant, equipment, crew on site	A2		1.0					0	1	0.00					100.0
								0	0	0.00	0.0				
	B4: -:-	l		P/O		—	10.50				0.0				
Standing Time for plant, crew, etc - WEATHER	B11 C19	-		R/O			10.50	0	0	10.50					
Standing Time for plant, crew, etc - TIDE	B11 C19	<u></u>	<u></u>	R/O			2.00	0	0	2.00	0.0				
					I			0	0	0.00	0.0				
Percussion Boring	В										0.0				
		l	0.00		1	4		l					25.0		
Move boring plant to site of each exploratory hole	B1		8.00			1		0	2	0.00			25.0		
Extra over B1 for setting up on a gradient >20%	B2		R/O					0	0	0.00	0.0				
Break out surface obstructions where present	B3			R/O	I			0	0	0.00	0.0				
Advance BH between groundlevel and 10m depth	B4	80.00			6.40			9	0	0.00		11.8			
					0.40		-								
As B4 but between 10m and 20m	B5	36.50						0	0	0.00	0.0				
As B4 but between 20m and 30m	B6	R/O						0	0	0.00	0.0				
As B4 but between 30m and 40m	B7	R/O						0	0	0.00	0.0				
Advance BH through hard stratum or obstruction	B9			R/O				0	0	0.00	0.0				
Advance bit inough hard stratum or obstitution				100											
								0	0	0.00	0.0				
Rotary Drilling	С										0.0				
Move rotary plant to site of each exploratory hole	C15		6.00			1		0	1	0.00		16.	7		
RC drilling between groundlevel and 10m depth	C41	R/O									0.0				
								0	0	0.00					
As C41 but between 10m and 20m	C42	20.50						0	0	0.00	0.0				
As C41 but between 20m and 30m	C43	9.50						0	0	0.00	0.0				
Core box to be retained by client	C49		21.00					0	0	0.00	0.0				
· · · · · · · · · · · · · · · · · · ·											0.0				
	_							0	0	0.00					
Sampling, Monitoring during investigation	E										0.0				
Small Disturbed Sample	E1		59.00			19		0	19	0.00			32.2		
Bulk Disturbed Sample	E2		59.00					0	0	0.00	0.0				
Large Bulk disturbed sample	E3		R/O								0.0				
carge built disturbed sample			100					0	0	0.00					
								0	0	0.00	0.0				
Insitu Testing	н										0.0				
Standard Penetration Test in Borehole	H1		40					0	0	0.00	0.0				
Standard Penetration Test in Rotary Drill Hole	H2		R/O					0	0	0.00	0.0				
Similar rock in rocking brill riole		1	,,,,		1	1	-				H				
				—	—		1	0	0	0.00	0.0				
Geoenvironmental Laboratory Testing	L				Ь					<u> </u>	0.0				
Marine Scotland Sample	L2		121		1	8		0	8	0.00	6.6				
·		İ						0	0	0.00	0.0				
Additional Itams		l		 	1	!	1	· ·		0.00	0.0				
Additional Items				 		 					H .				
					1			0	0	0.00	0.0				
			1		I	1		0	0	0.00	0.0				
								0	0	0.00	0.0				
		l	-		1	1		0	0	0.00	0.0				
		l		-	-		1				H				
								0	0	0.00	0.0				
Health & Safety Sum	nary		Today		Act	tual To I	Date				Los	t & Da	maged		
Hoc Cards			1			6			·				· <u> </u>	·	
Safety Drills			0			4									
Tool Box Talks			1			4									
HSE Meetings			0			1		1							
Incidents/Near Mis		1	0			0		1							
		1	0		 	0		1							
Environmental			120		_			l							
Hours Worked Fugro GeoServices Representative Comm				240		<u> </u>	e Commen								
						CI	ient Re	p:							
FGSL Rep: Theo Cleave							ient Re	p:							



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

	Job No				C1982	•		Ves	sel	Skate 3A			Date	Monday 04-Mar-19
То	ANeillings@ar	rch-henderso	n.co.uk					Attn.	Andy N	Neillings	N	No./email	0141 227 306	
СС	mshuttlewortl			.uk				Attn.	Micha	el Shuttleworth		No./email		
СС	stuart.innes@	gegroup.con	1					Attn.	Stuart	Innes		No./email		
CC								Attn.				No./email		
CC CC	m.chappell@f n.armstrong@							Attn. Attn.		w Chappell - Nearshore Mana las Armstrong - Reporting N		No./email No./email		
cc	g.crisp@fugro							Attn.		Crisp - Project Manager		No./email		
	served Weath				ind		Swe	ell (Hs)		Sea State	Vis	sibility		Weather Forecast
	00:00		Speed Kn 10	ts	Dir SW			V/A		smooth		good		
	06:00		11		W			V/A		smooth	_	good		See Below
	12:00		18		W			N/A	-	smooth	_	good		
	18:00		20		W			N/A		smooth	ç	good		
	00:00		17		SW			N/A		smooth	ç	good		
			Le	g Pen	etration (m)								Operation	onal Status
	BH no.		1		2		3	4					·	
	BH01		1.0	0	1.0		2.2	3.	1					
														up on BH01 nce CP from mudline
												-	,	
							Sı	ımmary o	f Oper	ations / Borehole Drilling	- last	t 24hrs:		
	From	То			Hrs (No.)		Code						Descriptio	n
	00:00	07:1			7.25		e Percussi			e CP drilling from 0.00m to			-	
	07:15 08:00	08:0 17:2			9.33		Change / Tele Percussi			transfer to shore / Handove CP from 10.00m to 17.35m			/ Dayshift transfer	to JUB / TBT on Site Rules
	17:20	18:5			1.50		Drilling (Co			obor to depth / Flush hole	. Divic	-		
	18:50	19:1			0.42		er Operatio			ant / Wash down and clear	deck 1	for E.O.S		
	19:15	20:0			0.75		Change / 1			ansfer to shore / Handover				
	20:00	00:0	0		4.00	Rotary	Drilling (Co	ring) Cor	nmenc	e RC drilling from 17.35m t	to 23.3	35m BML	/ E.O.H at -22.50n	nCD / CD 0.85m below mudline
								_						
								_						
								_						
								_						
								_						
										Weather forecast				
					Local time					00 800 700 800 900 1000 1100				
					Wind directio Wind speed		SW 3			ON NOW NOW NOW W NOW				
							12 ,	11 12	94 3	16 16 13 15 17 18 20	21	21 20 20	20 16 66 17	15 18 15 10
					Wind gusts ((max kts)		8 2		26 26 27 A 31	-31	jin 27 31	29 29 25 27	
					Cloud cover Precipitation	type	0 0	0	0				W.	
					Precipitation Air temperate			41			1000	T	0.1	A. C. C. C. C. C. C. C. C. C. C. C. C. C.
					Feets like (*) Relative hum	0)	1	E T 1	1 (1)	0 0 9 0 T 1 T 83 81 84 83 79 75 76	1 72	2 2 3 80 85 80	1 1 0 0	4 4 4 4 M 87 M 89
					Air pressure		677 9	6 977 976	976 9	176 SY8 S75 S76 S76 S77 S78	979	979 979 30	0 560 581 981 982	982 982 982 983
					Tide type Time		α ,		- 5	th	4	3 3 5	1735	2239
Health	Safety & the	Environmen	ıt		Tide height (35. 2	22 (8	17 1	8 67 22 28 15 18 4	3.7	3.1 2.5 1	1 15 12 12 16	24 31 16 35
FGSI	Rep: Theo	Cleave								Client Re	p:			
٠.														
Sign	ea:									Signed:				
										•				



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

			_										<u> </u>		
Activity Time St	ımmary		Т	oday	To Da	ite	D	ay Shift		Night	Shift	Con	npany	Posi	ition
Mobilisation				0.00	3.50					Onboard .		isation)			
Moving & Jacking				0.00	9.67	7	Jimi	my Wilso	n	Joshua	Sandy	Fugro G	eoServices	Barger	master
Rotary Drilling (Coring)				5.50	5.50)	Jam	es Lawso	on	Adam	Cook	Fugro G	eoServices	Dril	ller
Cable Percussion				6.58	28.4	2	Callu	m Allardy	/ce	Ashley L	owthian	Fugro G	eoServices	Assistar	nt Driller
Standby (Fugro)				0.00	0.00)	St	uart Nye				Fugro G	eoServices	Assistar	nt Driller
Standby (Tide)				0.00	2.00)									
Standby weather				0.00	10.5	0	Rich	nard Luke	er	Bart	Kot	Fu	gro	Geotechnic	al Engineer
Single Shift Standby				0.00	5.75	5									
Other Operations				0.42	2.42	2	The	eo Cleave	9			Fugro G	eoServices	Project E	Engineer
Crew Change / TBT				1.50	4.25										
				0.00	0.00										
				0.00	0.00										
				0.00	0.00)									
				0.00	0.00										
				0.00	0.00										
				0.00	0.00										
												Total Man	1		
		Total	2	24.00	24.0	0	No. I	Personn	el	10	0	Hours		120	
												Worked			
Project Program / P	rogress		Pro	ogrammed			Today		Δ	ctual To Da	ate		% Program	Completed	
Activity		Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	1	,v. iogiaii	_ Dp. 3164	
General Items, Provisional Services		A					. ,			1.0.		0			
				1.0		1					0.00				100.0
Establish all plant, equipment, crew on site	^	N2		1.0				-	0.0	1	0.00	0.0			100.0
					D.10			10 ==	0.0	0	0.00	0.0			
Standing Time for plant, crew, etc - WEATHER	B11	C19			R/O			10.50	0.0	0	10.50	0.0			
Standing Time for plant, crew, etc - TIDE	B11	C19			R/O	L	L	2.00	0.0	0	2.00	0.0			
					L				0.0	0	2.00	0.0			
Percussion Boring		В										0.0			
Move boring plant to site of each exploratory ho	e B	31		8.00					0.0	2	0.00		25.0		
Extra over B1 for setting up on a gradient >20%		32		R/O					0.0	0	0.00	0.0			
Break out surface obstructions where present		33		.,,	R/O							0.0			
· ·			80.00		100	17.35			0.0	0	0.00	5.5	33.4		
Advance BH between groundlevel and 10m dep		34				17.35			26.8	0	0.00		33.4		
As B4 but between 10m and 20m		35	36.50						0.0	0	0.00	0.0			
As B4 but between 20m and 30m		36	R/O						0.0	0	0.00	0.0			
As B4 but between 30m and 40m	Е	37	R/O						0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	n E	39			R/O				0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
Rotary Drilling		С							0.0		0.00	0.0			
Move rotary plant to site of each exploratory hol		15		6.00					0.0	1	0.00		6.7		
RC drilling between groundlevel and 10m depth		41	R/O	0.00					0.0		0.00	0.0			
						0.05			0.0	0	0.00				
As C41 but between 10m and 20m		42	20.50			2.65			2.7	0	0.00	12.			
As C41 but between 20m and 30m		43	9.50			3.35			3.4	0	0.00		35.3		
Core box to be retained by client	С	49		21.00					0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
Sampling, Monitoring during investigation		E										0.0			
Small Disturbed Sample	E	<u>-</u> 1		59.00			35		0.0	54	0.00				91.5
Bulk Disturbed Sample	Е	2		59.00					0.0	0	0.00	0.0			
Large Bulk disturbed sample	F	3		R/O					0.0	0	0.00	0.0			
1	+								0.0	0	0.00	0.0			
Insitu Testing		Н							0.0	U	0.00	0.0			
Standard Penetration Test in Borehole		11		40								0.0			
									0.0	0	0.00				
Standard Penetration Test in Rotary Drill Hole		12		R/O					0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing		L										0.0			
Marine Scotland Sample	L	.2		121			26		0.0	34	0.00		28.1		
									0.0	0	0.00	0.0			
Additional Items												0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
	-					1			0.0	0	0.00	0.0			
					-							0.0			
									0.0	0	0.00				
Hoghh Costs: O	mmanı			Today		A	ual T- f	Date	0.0	U	0.00	0.0	Damaged		
Health & Safety Su	шпагу			Today		Act	ual To [vate				LOST &	Damaged		
Hoc Cards				1			7								
Safety Drills Tool Box Talk	2	-		1			5								
HSE Meeting:		-		0			1								
Incidents/Near M				0			0								
Incidents/Near in Environmenta				0			0								
Hours Worker		1		120			360								
riours Worker				120				ent Rop-	esentativa	Comment	is .				
Fugro GeoServices Representative Com								•							
Fugro GeoServices Representative Com															
Fugro GeoServices Representative Con							Cli	ient Re	p:						
								ient Re	p:						



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

	Job No				C1982			Vessel	Skate 3A			Date	Tuesday 05-Mar-19
То	ANeillings@ar	rch-hender	on.co.uk				Att	n. And	y Neillings		No./email	0141 227 306	60
СС	mshuttlewort						Att		nael Shuttleworth		No./email		
				JO.UK									
cc	stuart.innes@	gegroup.co	<u>1111</u>				Att		art Innes		No./email		
СС							Att				No./email		
СС	m.chappell@f	fugro.com					Att	n. Mat	hew Chappell - Nearshore N	/lanager	No./email		
СС	n.armstrong@	fugro.com					Att	n. Nich	olas Armstrong - Reporti	ng Mana	No./email		
СС	g.crisp@fugro	.com					Att	n. Gler	n Crisp - Project Manager		No./email		
Ol	served Weath	her		W	/ind		0		00				Waster Farmer
	Time 00:00		Speed K	ínts	Dir		Swell (HS)	Sea State	VI	isibility		Weather Forecast
	00:00		6		SSW		N/A		smooth		good		
	06:00		4		SSW		N/A		smooth		good		See Below
	12:00		5		SW		N/A		smooth		good		
	18:00		8		NE		N/A		smooth		good		
	00:00		9		NE		N/A		smooth		good		
			1	Leg Pen	etration (m)							<u> </u>	
	BH no.			1	2	3		4				Operatio	onal Status
			_										
	BH01			1.0	1.0	2.	2	3.1					
	BH08			0.3	0.9	1.		1.3			_		inderway on BH01
			-		0.9	1.0	•	1.3			P	repare to move to	o BH08 at high water
							Sum	mary of Op	erations / Borehole Drill	ling - las	t 24hrs:		
	From	Т	0		Hrs (No.)		Code					Description	n
	00:00	00:		-	0.33		rilling (Corin	a) Commor	nce RC drilling from 17 25	im to 22	35m RMI		nCD / CD 0.85m below mudline
	00:00	00:		+	2.17		Operations		Geobor to deck / Pull all c				
				+									
	02:30	07:			4.50		dby (Tide)		o move JUB until high wa				
<u> </u>	07:00	08:		1	1.00		hange / TBT						to JUB / TBT on Rotary Drilling Operations
	08:00	10:			2.50		dby (Tide)		o move JUB until high wa				
	10:30	11:			1.33		g & Jacking		e move from BH01 to BH				
	11:50	18:			6.92	Cable	Percussion	Run in c	asing to mudline / Comm	ence CP	drilling fron	n 0.00m to 7.00m	BML
	18:45	19:	15		0.50	Other	Operations	Wash ar	nd clear down deck for E.	O.S / Fue	el all plant		
	19:15	20:	00		0.75	Crew C	hange / TBT	Dayshift	transfer to shore / Hando	ver on C	TV Quay /	Nightshift transfer	to JUB / TBT on Rotary Drilling Operations
	20:00	00:	00		4.00	Cable	Percussion	Continue	e CP drilling from 7.00m t	o 13.00n	n BML		
				+				+					
								_					
				+				_					
				-									
									Weather forecast				
					Local tin		200 100	200 100 44	00 5:00 6:00 7:00 8:00 8:00 fc	100 (100 12	00.11.00.14.00	55.00 (6.00 (7.00 (4.00 H	900 2000 2100 2200 2310
					Wind dir	ection	SW 5W	3W 5W 5	N 5W 5W 5W 5W N	E 6 0	NE NE NE	NE ENE ENE NE N	IN THE NAME OF THE PARTY OF THE
					Wind sp								
												11 7 5	
					Wjed ou	its (max kts)	24 24				-		0. 10. 10.
					Cloud or	ver	- 4	* * *			0.0	0000	
					Precipita	tion type tion (mm / h)						03 04 03 03	0.1 0.2
						tion (mm / h) trature (°C)	4.0		1 10 Mars 14 1	100		The second of	NO SEC SEC. IN 18
					Feets Mr		4 4	4 4 4	5 00 00 80 04 01 0 6 00 00 80 07 07 07	2 2	1 1 1	1 1 1 1	1 1 1 1 1
					Relative	humidity (%) ure (hPa)	NO. 105	80 MG M	6 80F 807 807 907 907 9	00 000 to	m 200 000	000 000 001 000 0	90 90 90 90 90 90
					Tide type		9 3	34 37 3	K K K K K 🛂	7 7 7	78 24 34	N N N N N	1 2 2 2 1
					Time Tide hei	44.000			5.27	1.9	132	17.50	
	0.6.4.0				Tide hel	per (stil)	31, 31	26 18 19	E 14 14 18 25 32 3	41 4	- SH 28	x 10 12 11 1	18 27 29 28
Health	Safety & the	Environme	ent										
FGSI	Rep: Theo	Cleave							Client	Rep:			
									1	10.			
Sign	ed:								Signed	1:			
J									J.gilet				



Daily Report No.

04

Nigg Energy Park - Marine Ground Investigation

Mobilisation 0.00 3.50 Onboard JUB (mobilisation) Moving & Jacking 1.33 11.00 Jimmy Wilson Joshua Sandy Fugro GeoServices Bargemaster Rotary Drilling (Coring) 0.33 5.83 James Lawson Adam Cook Fugro GeoServices Driller Cable Percussion 10.92 39.33 Callum Allardyce Ashley Lowthian Fugro GeoServices Assistant Driller Standby (Fugro) 0.00 0.00 Stuart Nye Fugro GeoServices Assistant Driller Standby (Tide) 7.00 9.00 Stuart Nye Fugro GeoServices Assistant Driller	Activity Time Sum	narv	т	oday	To Da	ite	D:	ay Shift		Night	Shift	Comp	oanv	Position
133 100		/					- 0	., 5						i osition
Comment Comm						_	.limr	ny Wileo	n I				Services	Bargemaster
1932 30.30														
												-		
Search First Fir			_							, willoy L		-		
Control Cont						_	50					. 29.0 000		Drillo
Project Programs Project Proje			_			_	Rich	ard Luke	er	Bart	Kot	Fua	го	Geotechnical Engine
Project Program Programs 2.67 0.60 1.76 0.00 0.00 1.76 0.00 0			_					· _ Lunc		Dan		. ug		
1900 1900							The	o Cleave	,			Fugro Geo	Services	Project Engineer
0.00												.5.2 300		,
0.000 0.	<u> </u>													
Total 24.00 0.00 0.00														
				0.00	0.00)								
Project Program Progress														
Project Program Programs														
Project Program / Progress														
Project Program / Programs				4.00					. 1					465
Project Program / Progress		Tota	11 2	4.00	24.0	U	No. I	ersonn	B1	1	U			120
Activity Bool Item No. Issue No.									_			WOINEU		
Activity 800 lbm			Pro						A				% Program	Completed
March Marc						m.	No.	Hours	m.	No.	Hours			
Recording Time for giant, crow, etc. *VEATHER \$11 C19	eneral Items, Provisional Services	Α										0		
Marcing Time for joint, crew, etc YEATHER	stablish all plant, equipment, crew on site	A2		1.0	\Box				0.0	1	0.00			
Leading Time for planet, crow, etc.**TIDE									0.0	0	0.00	0.0		
Section Sect	tanding Time for plant, crew, etc - WEATHER	B11 C19			R/O					0		0.0		
Note Continued					R/O			7.00				0.0		
No.	, ,,											0.0		
Two entropy control solid or face the exploratory note that we control the control of the contro	ercussion Boring	R								1				
Mark ower Pf for setting up on a gradient 20% 82 R/O R/O 0.00 0.0				8.00			1		0.0	2	0.00		37.5	
rease call surface extensions where present 83							•					0.0	00	
Advance Bit New Processing From Annual Color					R/O									
a 84 but between 20m and 30m			80.00		100	10.00						0.0	36.0	
8 84 but between 20m and 40m													_	
## Set Not Detivemen 30m and 40m						3.00						0.0	28.4	
R/O														
Contain Distribute Sample E1			R/O									18		
Color Colo	dvance BH through hard stratum or obstruction	B9			R/O				0.0	0	0.00			
Note totary plant to site of each exploratory hole C15 RIO									0.0	0	0.00			
Coding between groundlevel and 10m depth	Rotary Drilling	С										0.0		
Sc C41 but between 10m and 20m	Nove rotary plant to site of each exploratory hole	C15		6.00					0.0	1	0.00	16	.7	
See C41 but between 20m and 30m	RC drilling between groundlevel and 10m depth	C41	R/O						0.0	0	0.00	0.0		
Scale Letween 20m and 30m	s C41 but between 10m and 20m	C42	20.50						2.7	0	0.00	12.9		
Code box to be retained by client	As C41 but between 20m and 30m	C43	9.50						3.4	0			35.3	
Sampling Monitoring during investigation E	Core box to be retained by client	C49		21.00								0.0		
Compiling Monitoring during investigation E												0.0		
Small Disturbed Sample E1 59.00 0.0 54 0.00	Sampling, Monitoring during investigation	Е										0.0		
Sale Disturbed Sample E2 59.00 0.0				59.00					0.0	54	0.00			
Bulk disturbed sample												0.0		
Name												18		
National Testing H	9											18		
Standard Penetration Test in Borehole	neitu Teeting	ш							0.0	0	0.00			
Standard Penetration Test in Rotary Drill Hole H2 R/O 0.0				40					0.0	_	0.00			
Committee Comm												#		
Company Comp	Autoria reneration rest III Rotary Drill Hole	ΠZ		R/U		-						#		
Marine Scotland Sample	No. of the second secon								0.0	0	0.00			
		_		461		-						0.0	- 00 :	
Midditional Items	Marine Scotland Sample	L2		121		-						0.0	28.1	
									0.0	0	0.00			
0.0 0.00	additional Items													
0.0 0 0.0										_		ш		
0.0 0.00												#		
Health & Safety Summary Today Actual To Date Lost & Damaged														
Health & Safety Summary Today Actual To Date Lost & Damaged														
Hoc Cards									0.0	0	0.00			
Safety Drills 0 4 Tool Box Talks 1 6 HSE Meetings 0 1 Incidents/Near Miss 0 0 Environmental 0 0 Hours Worked 120 480		ary				Act	ual To E	ate				Lost & D	amaged	
Tool Box Talks 1 6 HSE Meetings 0 1 Incidents/Near Miss 0 0 Environmental 0 0 Hours Worked 120 480														
HSE Meetings														
Incidents/Near Miss 0 0 Environmental 0 0 Hours Worked 120 480														
Environmental 0 0 Hours Worked 120 480														
Hours Worked 120 480														
ugis secon note representance comments		nte		120				nt Pope	acantati	Common	te			
	Hours Worked	nts					480	ent Repr	esentative	e Commen	ts			



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

	JOD NO			C1902		Vessel Skale SA Date Wednesday 00-Mai-19										
То	ANeillings@ar	rch-hendersor	n.co.uk			Attn. And	y Neillings	No./email	0141 227 3060							
СС	mshuttlewort						hael Shuttleworth	No./email								
								No./email								
СС	stuart.innes@gegroup.com						art Innes									
СС						Attn.		No./email								
СС	m channell@fugro.com						hew Chappell - Nearshore Mana	ger No./email								
							holas Armstrong - Reporting N									
CC	g.crisp@fugro	.com				Attn. Gle	n Crisp - Project Manager	No./email								
0	bserved Weath	her		Wind												
	Time 00:00		peed Knts	Dir	Sw	ell (Hs)	Sea State	Visibility	Weather Forecast							
		3														
	00:00		7	ENE		N/A	smooth	good								
	06:00		15	ENE		N/A	smooth	good	See Below							
	12:00		27	ENE		N/A	smooth	good								
	18:00		25	ENE		N/A	smooth	good								
	00:00		21	NE		N/A	smooth	good								
			1													
			Leg Pe	enetration (m)					Operational Status							
	BH no.		1	2	3	4			Operational otatas							
				-												
BH08			0.3	0.9	1.4	1.3										
									CP drilling underway on BH08							
					Summary of Operations / Borehole Drilling - last 24hrs:											
					S	tode Description ercussion Continue CP from 13.00m to 15.82m BML / -15mCD ercussion BH08 continued from 15.82 to 19.00m BML / -18.18mCD / Rockhead confirmed										
		-				, 0	g		Book delice.							
	From	То		Hrs (No.)	Code				-							
	00:00	02:45	5	2.75	Cable Percuss	on Continu	e CP from 13.00m to 15.82m	BML / -15mCl)							
	02:45	04:30		1.75	Cable Percuss											
	04:30	07:00 08:00		2.50	Standby (Tide											
L	07:00)	1.00	Crew Change /	ΓBT Nightsh	ift transfer to shore / Handove	on CTV Quay	/ Dayshift transfer to JUB / TBT on							
08:00		10:45	5	2.75	Moving & Jack	ing Pull lea:	and start move to BH07 / Wind speed and swell increasing / Move aborted									
10:45		12:15		1.50	Moving & Jack		30m from BH07 / wind, swell and steep contours preventing move / Preload and jack up to await safe weather window.									
	12:15)	1.75	Standby (weath	ier) JUB jac	JUB jacked up ~30m from BH07 / Client Rep tranfers to JUB after witnessing attempted move from shore.									
	14:00)	5.00	Standby (weath	er) JUB jac	ked up ~30m from BH07 / awa	I up ~30m from BH07 / await weather window to complete move / Client Rep transits to shore after inspection								
	19:00		1	1.00	Crew Change /	TRT Dayshif	Dayshift transfer to shore / Handover on CTV Quay / Nightshift transfer to JUB / TBT on									
		20:00														
	20:00	00:00	J	4.00	Standby (weath	ier) vvina re	orded at 24kt average, swell <1m / Continue to monitor weather and await window to complete move.									
						_										
						_										
1						I										
		1					144 - 41 - 16									
							Weather forecast									
				Local time	0.00 1.00 2.00	3.00 4.00 5.00	8 90 7:00 E.GE 9:00 10:00 TF:00 12:00	12.00 14.00 15.00 16.0	NO 17:00 18:00 18:90 20:00 21:00 23:00							
				Wind direction					NE NE NNE NNE NNE NNE N							
				Wind speed (kts)			22 23 34	26 26 29 24								
1					0 0 10	12 11 12	15 16 19 19 22 22 21	er -: 22 2)	20 20 20 17 18 14 12							
1																
1				Wind gusts (max k	ti) 11 12 S		24 25 75 78 20 20	76 No 29 77	25 24 25 TO VIII TO VIII							
1				Cloud cover	200	D 19 19	0000000		0000000							
1				Precipitation type	(1)			0 0 0 0	1 00 02 03 03 04 03							
1				Precipitation (mm. Air temperature (*)			71 12 11		THE RELEASE DESCRIPTION OF THE PARTY OF THE							
1				Feels like (°C)	0 1 1	4 4 4	8 0 1 0 1 1 1	4 4 4 4	4 4 4 4 1 1							
				Relative humidity (66 93 93	83 83 91 92 84 96 96	90 97 97 97	97 97 96 94 95 96 95							
				Air pressure (hPa)		900 900 900	NEE 507 506 505 564 583 592	GET 500 W/S 975	978 977 977 976 976 976 976							
1				Tide type	JF 4 %	3 3 3	35 7 7 7 7 7 7 7 T		3 34 3 7 7 7 7							
1				Time	0.04		51.50 52.00		68.23							
_					4 38 31	72 16 13	12 15 21 29 36 4 43	41 33 34 18	12 69 1 15 22 49 36							
Healt	h Safety & the	Environment	ı													
1																
1																
FGS	L Rep: Theo	Cleave					Client Rep	n:								
	Litep. Illeo	Cicave					Shelit Kej	••								
l																
Sign	ied:						Signed:									
بَـــــــــــــــــــــــــــــــــــــ																



Daily Report No.

05

Nigg Energy Park - Marine Ground Investigation

Activity Time Summ	anv	Т	oday	To Da	ıto.	n	ay Shift		Nigh	t Shift	Com	nany	Position
Mobilisation Activity Time Summi	ui y		0.00	3.50			uy Olilli			JUB (mobil		pully	1 osition
Moving & Jacking		_	4.25	15.2		Jim	my Wilso	n		Sandy	Fugro Ge	Services	Bargemaster
Rotary Drilling (Coring)			0.00	5.83	3	Jam	es Lawso	on	Adam	Cook	Fugro Ge	oServices	Driller
Cable Percussion			4.50	43.8	3	Callu	m Allardy	yce	Ashley I	Lowthian	Fugro Ge	Services	Assistant Driller
Standby (Fugro)			0.00		0.00		Stuart Nye				Fugro Ge	Services	Assistant Driller
Standby (Tide)			2.50	11.5									
Standby (weather)			10.75	21.2		Richard Luker		er	Bart Kot		Fug	ro	Geotechnical Engineer
Single Shift Standby Other Operations			0.00		5.75 5.08		Theo Cleave				Fuero Coo Condoo		Project Engineer
Crew Change / TBT		_	2.00		8.00		Theo Cleave		-		Fugro GeoServices		Project Engineer
Cicw Change / 121			0.00	0.00									
			0.00	0.00									
			0.00	0.00)								
			0.00	0.00)								
			0.00	0.00									
			0.00	0.00)						Total Man	ı	
	Tota	al 2	24.00	24.0	0	No.	Personn	iel	1	0	Hours		120
											Worked		
Project Program / Progr	ess	Pre	ogramme	d		Today		A	ctual To D	ate		% Program	Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours			•
General Items, Provisional Services	Α										0		
Establish all plant, equipment, crew on site	A2		1.0					0.0	1	0.00			100.0
								0.0	0	0.00	0.0		
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O			10.75	0.0	0	21.25	0.0		
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O			2.50	0.0	0	11.50	0.0		
								0.0	0	0.00	0.0		
Percussion Boring	В										0.0		
Move boring plant to site of each exploratory hole	B1		8.00					0.0	3	0.00	0.0	37.5	
Extra over B1 for setting up on a gradient >20%	B2		R/O					0.0	0	0.00	0.0		
Break out surface obstructions where present	B3	00.00	1	R/O			-	0.0	0	0.00	0.0	20.7	
Advance BH between groundlevel and 10m depth	B4	80.00		-	0.00		-	29.4	0	0.00		36.8	44.0
As B4 but between 10m and 20m	B5	36.50			6.00			16.4	0	0.00	0.0		44.8
As B4 but between 20m and 30m As B4 but between 30m and 40m	B6 B7	R/O						0.0	0	0.00	0.0		
	B7 B9	R/O		R/O				0.0	0	0.00	0.0		
Advance BH through hard stratum or obstruction	БЭ			R/U				0.0	0	0.00	0.0		
Rotary Drilling	С							0.0	0	0.00	0.0		
Move rotary plant to site of each exploratory hole	C15		6.00					0.0	1	0.00	16	5.7	
RC drilling between groundlevel and 10m depth	C41	R/O	0.00					0.0	0	0.00	0.0		
As C41 but between 10m and 20m	C42	20.50						2.7	0	0.00	12.9		
As C41 but between 20m and 30m	C43	9.50						3.4	0	0.00		35.3	
Core box to be retained by client	C49		21.00					0.0	0	0.00	0.0		
·								0.0	0	0.00	0.0		
Sampling, Monitoring during investigation	Е										0.0		
Small Disturbed Sample	E1		59.00			19		0.0	73	0.00			
Bulk Disturbed Sample	E2		59.00			19		0.0	19	0.00		32.2	
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0		
								0.0	0	0.00	0.0		
Insitu Testing	Н										0.0		
Standard Penetration Test in Borehole	H1		40					0.0	0	0.00	0.0		
Standard Penetration Test in Rotary Drill Hole	H2		R/O					0.0	0	0.00	0.0		
				ļ				0.0	0	0.00	0.0		
Geoenvironmental Laboratory Testing	L										0.0		
Marine Scotland Sample	L2		121			11		0.0	45	0.00	0.0	37.2	
Additional Name				-			-	0.0	0	0.00	0.0		
Additional Items			1	-			-		1	0.55	0.0		
	+	-						0.0	0	0.00	0.0		
	+	-						0.0	0	0.00	0.0		
			1					0.0	0	0.00	0.0		
	+		1					0.0	0	0.00	0.0		
Health & Safety Summa	rv		Today		Act	ual To I	Date	0.0	J	0.00		amaged	
Hoc Cards		1 Actua			9					_03t & D	gou		
Safety Drills		0			4		1						
Tool Box Talks		1			7		1						
HSE Meetings		0			1								
Incidents/Near Miss	-	0			0		ł						
Environmental Hours Worked			120			600		1					
	ts		3				ent Repr	resentative	e Commer	its			
Fugro GeoServices Representative Commer				Ч									
BH08 was continued below JUB was waiting o	n tide during this additiona ata down to rockhead av	al drilling tin ailable,	ne.										
BH08 was continued below JUB was waiting o Additional c Alternatively, this period may be	n tide during this additiona ata down to rockhead av	al drilling tin ailable,	ne.			C	ient Pa	n·					
BH08 was continued below JUB was waiting o Additional c	n tide during this additiona ata down to rockhead av	al drilling tin ailable,	ne.			Cli	ient Re	p:					



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

	Job No				C1982			Ves	sel	Skate 3A			Date	Thursday 07-Mar-19
То	ANeillings@ar	rch-henderso	n.co.uk					Attn.	Andy N	leillings	١	No./email	0141 227 306	60
СС	mshuttlewort			.uk				Attn.		el Shuttleworth	١	No./email		
СС	stuart.innes@	gegroup.com	<u>1</u>					Attn.	Stuart	Innes	1	No./email		
СС								Attn.				No./email		
СС	m.chappell@f							Attn.		w Chappell - Nearshore Mana	-	No./email	<u>- </u>	
CC CC	n.armstrong@ g.crisp@fugro							Attn. Attn.		as Armstrong - Reporting N Crisp - Project Manager		No./email No./email		
	served Weath			W	/ind				Gleff					
<u> </u>	Time 00:00		peed Kn		Dir		Swe	ell (Hs)		Sea State	Vis	sibility		Weather Forecast
	00:00		21		NE			V/A		smooth/slight	9	good		
	06:00		24		E			V/A		slight	ç	good		See Below
	12:00		28		NE			N/A		slight	_	good		
	18:00		19		NNW			V/A		smooth		good		
	00:00		16		NW			V/A		smooth	9	good		
			Le	eg Pen	etration (m)								Operation	onal Status
	BH no.		1		2		3	4						
	BH07		3.	2	4.4	4	1.4	3.4	4					
														BH07 after aborted move
												Awaitiii	g suitable weather	r window to complete move.
			1				9,	ımmarı/ o	f Oper	ations / Borehole Drilling	- lact	t 24hre:		
	From	То			Hrs (No.)		Code	I I	. open	and the portion of thining	iust	7111 3.	Descriptio	n
	00:00	07:0	0		7.00	Stand	dby (weath	er) JUF	iacke	d up ~30m from BH07 / aw	ait we	eather wind		
	07:00	08:0			1.00		Change / 1		•					fer to JUB / TBT on Moving & Jacking Ops
	08:00	16:3	0		8.50		dby (weath							nal limits / Dayshift continue to monitor conditions
	16:30	17:3			1.00		dby (weath			settling as winds move fro				
	17:30	19:4			2.25		ng & Jacki							to BH07 / Preload and jack up to safe working height
	19:45 20:15	20:1			0.50 3.75		Change / 1 e Percussi							g / Dayshift transfer to shore / TBT as above BML / Seabed below CD = 4.01m
	20.13	00.0	U		5.75	Cabit	e r ercussi	on ixui	i iii cas	ing to madime / Commence	e Cr (unning noi	11 0.00111 10 0.00111	DML / Seabed below CD = 4.0 IIII
								_						
										Weather forecast				
					Local time Wind direction					00 7:00 0:00 0:00 10:00 11:00 12:00 6 M N N N N N N N				
					Wind speed (id	ts)				s 17 18 28 25 27 28				
							13 14 1		15 1				22 20 18 17 1	17 18 17
					Wind gusts (m Cloud cover	ax kts)	30 37			10 17 18 18 18 18 18 18 18 18 18 18 18 18 18		9 9 V	30 33 10 20	es 28 39
					Precipitation by		6 6	8 8	8 /8			8 8 8	9 2 2 4	* 4 *
					Precipitation (r Air temperature		0.0 0.1 4	2 04 02	0.1 03	2 63 65 65 66 62	0.1		NAME OF TAXABLE PARTY.	w. (1911 to 1
					Feets like (°C) Relative humid		95 80 1	1 1 1	p 0	0 00 07 00 05 00 01	0 :	1 2 3	4 4 4 4 4	4 4
					Air pressure (h		576 675 6	16 1970 979	976 197	7 977 978 979 981 982 984	ees po	NOT 988 990	101 903 904 905 00	967 968
					Tide type Time		9735		181		12:38		1851	
					Tide height (m))	4 41 4	8 28 18	43 1	1 12 17 25 33 38 42	44 3	18 28 19	13 1 68 12 1	9 27 34
Health	Safety & the	Environmen	t											
EC 61	Rep: Theo	Cleave								Client Be	n·			
1.031	- rep. 11160	Cleave								Client Re	μ.			
Sign	ed:									Signed:				



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

Activity Time Si Mobilisation Moving & Jacking Rotary Drilling (Coring) Cable Percussion Standby (Fugro) Standby (Tide) Standby (weather) Single Shift Standby Other Operations Crew Change / TBT			0.00 2.25 0.00 3.75 0.00 0.00 16.50 0.00	3.50 17.5 5.83 47.5 0.00 11.5	0 3 8 0	Jim Jam Callu	mmy Wilsones Lawsoum Allardy	on	Onboard Joshua Adam Ashley L	JUB (mobil Sandy Cook	isation) Fugro (Fugro (GeoServices GeoServices GeoServices	Bargemaster Driller Assistant Driller
Rotary Drilling (Coring) Cable Percussion Standby (Fugro) Standby (Tide) Standby (weather) Single Shift Standby Other Operations			0.00 3.75 0.00 0.00 16.50	5.83 47.5 0.00 11.5	8	Jam Callu	nes Lawso ım Allardy	on	Joshua Adam	Sandy Cook	Fugro (GeoServices	Driller
Cable Percussion Standby (Fugro) Standby (Tide) Standby (Weather) Single Shift Standby Other Operations			3.75 0.00 0.00 16.50	47.5 0.00 11.5	8	Callu	ım Allardy						
Standby (Fugro) Standby (Tide) Standby (weather) Single Shift Standby Other Operations			0.00 0.00 16.50	0.00)			/ce	Ashley L	owthian	Fuaro (SenServices	Assistant Driller
Standby (Tide) Standby (weather) Single Shift Standby Other Operations			0.00 16.50	11.5		S					i ugio (JCOOCI VICCS	
Standby (weather) Single Shift Standby Other Operations			16.50				tuart Nye				Fugro (GeoServices	Assistant Driller
Single Shift Standby Other Operations					0								
Other Operations			0.00	37.7		Ric	hard Luke	er	Bart	Kot	F	ugro	Geotechnical Engineer
				5.75									
Crew Change / TBT			0.00	5.08		Th	eo Cleave	Э			Fugro (GeoServices	Project Engineer
			1.50	9.50									
			0.00	0.00									
			0.00	0.00									
			0.00	0.00									
			0.00	0.00	_								
			0.00	0.00									
			0.00	0.00							Total Mar		
	Т	otal	24.00	24.0	0	No.	Personn	el	1	0	Hours		120
											Worked		
Project Program / P	rogress		Programme	d		Today	,	Δ	ctual To D	ate		% Prograi	n Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours			
General Items, Provisional Services	Α										0		
Establish all plant, equipment, crew on site	A2		1.0					0.0	1	0.00			10
								0.0	0	0.00	0.0		
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O	L_		16.50	0.0	0	37.75	0.0		
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O				0.0	0	11.50	0.0		
								0.0	0	0.00	0.0		
Percussion Boring	В										0.0		
Move boring plant to site of each exploratory ho			8.00			1		0.0	4	0.00			50.0
Extra over B1 for setting up on a gradient >20%			R/O					0.0	0	0.00	0.0		
Break out surface obstructions where present	B3			R/O				0.0	0	0.00	0.0		
Advance BH between groundlevel and 10m dep		80.00			8.00			37.4	0	0.00			46.8
As B4 but between 10m and 20m	B5	36.50						16.4	0	0.00			44.8
As B4 but between 20m and 30m	B6	R/O						0.0	0	0.00	0.0		
As B4 but between 30m and 40m	B7	R/O						0.0	0	0.00	0.0		
Advance BH through hard stratum or obstructio				R/O				0.0	0	0.00	0.0		
5		_		100					0		0.0		
Rotary Drilling	С							0.0	U	0.00	0.0		
Move rotary plant to site of each exploratory hol			6.00			1			2	0.00	0.0	33.3	
RC drilling between groundlevel and 10m depth		R/O	0.00			- '		0.0		0.00	0.0	33.3	
As C41 but between 10m and 20m	C41	20.50						0.0	0	0.00	12		
								2.7	0	0.00	14		
As C41 but between 20m and 30m	C43	9.50						3.4	0	0.00	0.0	35.3	
Core box to be retained by client	C49	_	21.00					0.0	0	0.00	0.0		
	_							0.0	0	0.00	0.0		
Sampling, Monitoring during investigation	E		50.00								0.0		
Small Disturbed Sample	E1		59.00					0.0	73	0.00			
Bulk Disturbed Sample	E2		59.00					0.0	19	0.00		32.2	
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0		
								0.0	0	0.00	0.0		
Insitu Testing	Н										0.0		
Standard Penetration Test in Borehole	H1		40					0.0	0	0.00	0.0		
Standard Penetration Test in Rotary Drill Hole	H2		R/O					0.0	0	0.00	0.0		
								0.0	0	0.00	0.0		
Geoenvironmental Laboratory Testing	L										0.0		
Marine Scotland Sample	L2		121					0.0	45	0.00		37.	2
								0.0	0	0.00	0.0		
Additional Items											0.0		
								0.0	0	0.00	0.0		
								0.0	0	0.00	0.0		
								0.0	0	0.00	0.0		
								0.0	0	0.00	0.0		
								0.0	0	0.00	0.0		
Health & Safety Su	mmary		Today		Act	tual To	Date				Lost 8	Damaged	
Hoc Cards			1			10							
Safety Drills Tool Box Talk	e	_	<u>0</u>			8							
HSE Meeting			0			1							
Incidents/Near M		+	0			0							
Environmenta		1	0			0							
Hours Worke			120			720							
Fugro GeoServices Representative Con	ments					Cli	ient Repr	esentativ	e Commen	ts			
FGSL Rep: Theo Cleave							ient Re	p:					
Signed:						Si	gned:						



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

	Job No			·	C1982		V	essel	Skate 3A		Date Frid	lay 08-Mar-19
То	ANeillings@a	rch-henders	on.co.uk				Attn.	Andy	Neillings	No./email	0141 227 3060	
				ode				_				<u>l</u>
СС	mshuttlewort			<u>uK</u>			Attn.	_	ael Shuttleworth	No./email		<u>l</u>
СС	stuart.innes@	gegroup.com	<u>m</u>				Attn.	Stuar	rt Innes	No./email		
СС	1						Attn.			No./email		
	m channell@	fugro com					Attn.	N. C. C.	ow Channell Nearthern Maria			<u>l</u>
СС	m.chappell@1								ew Chappell - Nearshore Manag		l	
CC	n.armstrong@						Attn.		olas Armstrong - Reporting M			
СС	g.crisp@fugro	o.com					Attn.		Crisp - Project Manager	No./email		
0	bserved Weat			Wi	ind							
Ť			Cnood V.		Dir	_ ;	Swell (Hs)		Sea State	Visibility	Weather Fore	ecast
	Time 00:00		Speed Knts	5						· ·		
	00:00		16		NW	L	N/A	1	smooth	good		
	06:00		8		SW		N/A		smooth	good	See Belov	W
	12:00		21		SSW		N/A	-	smooth	good		
								-				
	18:00		25		SSW		N/A		smooth	good		
	00:00		20		SSW		N/A		smooth	good		
		•	Lac	a Done	etration (m)	-						
			reí	y rene	etration (III)						Operational Status	
	BH no		1		2	3		4			, p	
	BH07		3.2	!	4.4	4.4		3.4				<u>l</u>
	BH03		2.3		0.8	1.9		2.7			Jacked up on BH07	<u>l</u>
	БПОЗ		2.3		0.0	1.5		<u>1</u>			CP underway at approx12.00mCD	<u>l</u>
				Ţ					1			<u>l</u>
			-									
							Summar	of Ope	rations / Borehole Drilling	last 24hrs:		
	From	To		H	Hrs (No.)	Code					Description	
	00:00	07:1			7.25	Cable Percu		`ontinu-	CP drilling from 8.00m to 18.	45m RMI		
	07:15	08:0			0.75	Crew Change					Dayshift transfer to JUB / TBT on Working	
	08:00	09:3	30		1.50	Cable Percu	ussion	Continue	CP drilling from 18.45m to 1	9.50 BML / E.	D.H confirmed by client at -23.51mCD / SPT	tested to -23.62mCD
	09:30	10:1			0.67	Other Opera			sing / Wash down and clear			
	10:10	12:4			2.58						Preload and jack up to safe working height	
<u> </u>						Moving & Ja						
	12:45	19:0			6.25	Cable Percu					m 0.00m to 8.00m BML / Seabed = -0.75m0	CD
	19:00	19:3	30		0.50	Other Opera	ations V	Vash do	wn and clear deck for E.O.S	Fuel all plant	nad RHIB	
	19:30	20:0	00		0.50	Crew Change	e / TBT	avshift t	ransfer to shore / Handover	on CTV Quay	Nightshift transfer to JUB / TBT on Working	at Height
	20:00	00:0			4.00	Cable Percu					Taginorial daniele to Coby TbT on Working	at Holgh
	20.00	00.0	,,,		4.00	Cable Felci	ussion	onunue	CP drilling from 8.00m to 13	.00 BIVIL		
		1										
_		-										
		1										
							T					
		1					t					
		 										
		1										
									Weather forecast			
					Local time	0 00	1.00 2.00	00 4.00		12:00 13:00 14:00 1	00 1600 17:00 18:00 10:00 20:00 21:00 22:00 23:00	
					Wind direct						SW SSW SW SW WSW WSW WSW WSW WSW	<u>l</u>
					Wind speed	1 (kts)					The second secon	<u>l</u>
						. 2	(F F)	7 8	8 8 9 10 10 11 13	10 15 18	6 47 16 47 17 20 16 15 14	
									H U H = 17 - 11	_		<u>l</u>
					Wind gusts					20 27	29 71 32 31 27 27 29	
					Cloud cove Precipitatio	n hone	4 4	1	4 4 0 0 0 0 0	0 0 0	* * * * * * * * * * * * * * * * * * * *	<u>l</u>
					Precipitatio Precipitatio				01	0 0 0	5 12 03 11 11	<u>l</u>
					Air tempera							<u>l</u>
					Feels like	°C) -1	13 0	0 -1	1 2 2 1 6 6 6	0 1 1	0 dr 0 1 h -1 -1 -1 -2 15 85 88 80 85 85 82 79 78	
					Relative hu		77 76	75 78	78 89 81 80 77 76 83	90 84 87	15 85 88 90 85 85 82 79 76	<u>l</u>
					Air pressur		1800 1000 1	1000 1	000 1000 1001 100 100 100 101	996 995 893	92 200 986 987 868 868 988 990 89G	<u>l</u>
					Tide type	25	105	2 2	14 28 28 28 28 28 28 28 28 28 28 28 28 28	77 74 %	E 1 E E & E E E E E E	<u>l</u>
					Time Tide height	(m) 3.9	42 10	1 22	15 12 1 13 7 29 14	41 44 42	4 23 15 11 08 09 15 24 31	
Healt	n Safety & the	Environmen	nt		- non story in							
neait	alety & the	- LIIVII ONIMEI										
												<u>l</u>
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FGS	L Rep: Theo	Cleave							Client Rep):		<u>l</u>
									I			
Sign	ed:								Signed:			<u>l</u>
Jugii	ou.								oigileu.			<u>l</u>
_												



Daily Report No.

07

Nigg Energy Park - Marine Ground Investigation

2.75																
100 2.50 2	Activity Time S	ımmary		Т	oday	To Da	te	0	Day Shift		Night	Shift	Com	oany	Posi	tion
100 2.50 2	Mobilisation				-	3.50)									
See Programm				_				lim	my Wileo					Sanicas	Barger	naeter
1900 1900				_			_									
	Rotary Drilling (Coring)						_						-			
antity (15th) 1001 1975 Prichard Lubr 1001 1	Cable Percussion			1	9.00	66.58	8	Callu	um Allardy	rce	Ashley Lo	owthian	Fugro Geo	Services	Assistar	t Driller
antity (15th) 1001 1975 Prichard Lubr 1001 1	Standby (Fugro)				0.00	0.00		S	tuart Nye			-	Fugro Geo	Services	Assistar	t Driller
100 3775 Ribbert Learn Bert feet Figure Goodeniness Expriser Figure Goodeniness Expriser Figure Figu	Standby (Tide)				0.00	11.50	0									
Project Engineer Project Eng								Ric	hard Luke	er	Rart	Kot	Fire	ro	Gentechnic	al Engineer
1.17 6.25								1410	mara Lane	,	Barr		, ug		000000111110	ar Eriginoor
1.25				_			_	т,	00 CI				Eu C	Consinc -	D1	nainee-
0.00							_	ın	ieo Cleave	9			Fugro Geo	Services	Project E	ngineer
0.00 0.00	Crew Change / TBT															
Project Program Projects Project Proje					0.00	0.00)									
Project Program Projects Project Proje					0.00	0.00)									
Code Code				_			_									
Total 24.00 26.00 No. Personnel Project Program Progress Active Broke Total 24.00 26.00 No. Personnel Project Program Progress Active Broke Total 24.00 10.00 No. Personnel Active Broke Total 25.00 No. No. No. No. Personnel Active Broke Total 26.00 No. Personnel Active Broke Total 26.00 No. Personnel Active Broke Total 26.00 No. No. No. No. No. No. No. No. No. No.				_			_									
Total 24 030 24 030 12 050 12 0				_			_									
Project Program / Programs Program Progr																
Project Program / Programs Pr					0.00	0.00)									
Project Program / Program									_							
Project Program Program Program Program No.			Total	2	24.00	24.0	0	No.	Personn	el	10)			120	
Activity BoD Both													Worked			
Activity BoD Both	Desired Description (D			-				Toda			otual T- D	to.		0/ D	0	
Section Company Comp) Itom				-						H	% Program	Completed	
March Section Sectio				m.	NO.	Hours	m.	No.	Hours	m.	No.	nours				
Maintain planet, concert asks	General Items, Provisional Services		Α										0			
March Marc	stablish all plant, equipment, crew on site	Δ	A2		1.0					0.0	1	0.00				100.0
anderly These for search comes dec. YMEATER 611.11 1 1 1 1 1 1 1 1	an plant, equipment, elew on site								1				0.0			
Note Part Control Part Control Part Control Part Control Part Control Part Control Part Control Part Control Part Control Part Control Part Control Part Part Control Part					-	D.'0			+-							
Section Section Sectio	Standing Time for plant, crew, etc - WEATHER	B11	C19							0.0	0	37.75				
Section Bording	Standing Time for plant, crew, etc - TIDE	B11	C19		1	R/O				0.0	0	11.50	0.0			
New Control Section													0.0			
The bording parts valle of each explosionary role in the case B1 training on a graduate 20%. 83 RIO	Danis Barina		В						+	5.0	-	5.00				
Its cover B1 for welling up on a gradient 25% 80 80 10 120 10 10 10 10 10	· ·												0.0			
Set of the first extend colorations where present State	love boring plant to site of each exploratory ho	le B	31					1		0.0	5	0.00			62.5	
Section of the content of the cont	xtra over B1 for setting up on a gradient >20%	В	32		R/O					0.0	0	0.00	0.0			
Name Bit Netween groundered and 10m depth B4 B8.00						R/O										
Bit but between 10th and 20th 65 86.50 12.50				00.00		.00	10.00		+						04.0	
18-bit bit bit bears 18-bit bit bit 18-bit bit bit 18-bit bit bit 18-bit bit bit 18-bit bit bit 18-bit bit bit 18-bit bit bit 18-bit bit bit 18-bit bit bit 18-bit bit bit 18-bit bit bit 18-bit bit bit 18-bit bit bit 18-bit bit 18-bit bit bit 18-bit bit bit 18-bit bit bit bit bit 18-bit bit bit bit bit bit bit bit bit bit										49.4		0.00			61.8	
18 bit Delivered 20 may of 30 may 18 may 1	s B4 but between 10m and 20m	В	35	36.50			12.50			28.9	0	0.00				79.0
Bit but between 30m and 40m	s B4 but between 20m and 30m	В	36	R/O									0.0			
Name Principal Part distaltum or obstinction Principal Part distal																
Color Colo				R/U									48			
Committee Comm	dvance BH through hard stratum or obstruction	n B	39			R/O			3.00	0.0	0	3.00	0.0			
Composition Composition										0.0	0	0.00	0.0			
Second color Seco	Rotary Drilling		C								-	0.00	0.0			
Cell by between groundwest and 10m depth					0.00			4							E0.0	
Cold File Methoren 10m and 20m					6.00			1		0.0	3	0.00			50.0	
Cest but between 20m and 30m	RC drilling between groundlevel and 10m depth	C-	41	R/O						0.0	0	0.00	0.0			
Cest but between 20m and 30m	As C41 but between 10m and 20m	C-	:42	20.50							0		12.9			
Verbot to be retained by client	As C41 but between 20m and 30m	C	43	0.50										35.3		
				9.50										33.3		
Indicated Sample	Jore box to be retained by client	C.	49		21.00					0.0	0	0.00	0.0			
Note Section										0.0	0	0.00	0.0			
Second Control Seco	Sampling, Monitoring during investigation		E										0.0			
A continue E2 Section Sectio					50.00			21			0.4	0.00				
Signature E3																
Name								19		0.0	38	0.00			64.4	
Situ Testing	arge Bulk disturbed sample	E	≣3		R/O					0.0	0	0.00	0.0			
Situ Testing										0.0	0	0.00	0.0			
andard Penetration Test in Bonehole H1	nsitu Testina		н		 					0.0		3.50	#			
Actual To Destriction Test in Rotary Drill Hole					40				-		-	0.00	0.0	27.5		
								11						27.5		
Companies Comp	Standard Penetration Test in Rotary Drill Hole	Н	12		R/O					0.0	0	0.00	0.0			
Companies Comp										0.0	0	0.00	0.0			
121	Secenvironmental Laboratory Testing												#			
			_		104			40				0.00	5.5		50.4	
Iditional Items	varine ocotiano sample				127			16							50.4	
Health & Safety Summary Today Actual To Date Health & Safety Summary Today Actual To Date Lost & Damaged Hoc Cards 1 11 Safety Drills 0 0 4 Tool Box Talks 1 9 HSE Meetings 0 11 Incidents/Near Miss 0 0 0 Environmental 0 0 0 Environmental 0 0 0 Hours Worked 120 840 Client Representative Comments Client Representative Comments Client Representative Comments Client Representative Comments "As per our discussion, please continue the BH to a level of -24mCD. This should allow you to complete and move before 10AM." GSL Rep: Theo Cleave Client Rep:										0.0	0	0.00				
Health & Safety Summary Today Actual To Date Health & Safety Summary Today Health & Safety Summary Today Actual To Date Hoc Cards 1 111 Safety Drills 0 4 Tool Box Talks 1 9 HSE Meetings 0 4 Hours Worked 120 Beroir GeoServices Representative Comments Client rep contacted at shift change to update on forecasted high winds and current stage of BH07. Agreement to continue BH07 to -24mCD and then pull casing to allow a move before conditions deteriorate. Client Rep: Client Rep: Client Rep: Client Rep: Client Rep:	dditional Items												0.0			
Health & Safety Summary Today Actual To Date Health & Safety Summary Today Health & Safety Summary Today Actual To Date Hoc Cards 1 111 Safety Drills 0 4 Tool Box Talks 1 9 HSE Meetings 0 4 Hours Worked 120 Beroir GeoServices Representative Comments Client rep contacted at shift change to update on forecasted high winds and current stage of BH07. Agreement to continue BH07 to -24mCD and then pull casing to allow a move before conditions deteriorate. Client Rep: Client Rep: Client Rep: Client Rep: Client Rep:										0.0	n	0.00				
Health & Safety Summary Today Actual To Date Hoc Cards Hoc Cards 1 11 Safety Drills O		- 			1				+ -							
Health & Safety Summary Today Actual To Date Hoc Cards 1 111 Safety Drills 0 4 Tool Box Talks 1 9 HSE Meetings Incidents/Near Miss 0 0 1 Environmental 0 0 0 Environmental 0 0 0 Hours Worked 120 840 Client rep contacted at shift change to update on forecasted high winds and current stage of BH07. Agreement to continue BH07 to -24mCD and then pull casing to allow a move before conditions deteriorate. Client Rep: Client Rep: Client Rep: Client Rep:									1							
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Health & Safety Summary Hoc Cards 1 11 Safety Drills 0 4 Tool Box Talks 1 9 HSE Meetings 0 0 1 Incidents/Near Miss 0 0 Environmental 0 Hours Worked 120 840 Client rep contacted at shift change to update on forecasted high winds and current stage of BH07. Agreement to continue BH07 to -24mCD and then pull casing to allow a move before conditions deteriorate. Client Rep: Client Rep: Client Rep: Client Rep: Client Rep: Client Rep:													0.0			
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Safety Drills Tool Box Talks 1 9 HSE Meetings 0 1 Incidents/Near Miss 0 0 0 Environmental 0 Hours Worked 120 840 GSL Rep: Theo Cleave Client Rep: Client Rep: Client Rep: Client Rep: Client Rep: Client Rep:	•						- 701						_03t & D	uguu		
Tool Box Talks HSE Meetings 0 1 Incidents/Near Miss 0 Environmental 0 Hours Worked 120 Bato GeoServices Representative Comments Client rep contacted at shift change to update on forecasted high winds and current stage of BH07. Agreement to continue BH07 to -24mCD and then pull casing to allow a move before conditions deteriorate. Client Representative Comments "As per our discussion, please continue the BH to a level of -24mCD. This should allow you to complete and move before 10AM." Client Rep: Client Rep:																
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Hours Worked 120 840 Igro GeoServices Representative Comments Client Representative Comments Client Representative Comments "As per our discussion, please continue the BH to a level of -24mCD. This should allow you to complete and move before 10AM." GSL Rep: Theo Cleave Client Representative Comments "As per our discussion, please continue the BH to a level of -24mCD. This should allow you to complete and move before 10AM." Client Representative Comments "As per our discussion, please continue the BH to a level of -24mCD. This should allow you to complete and move before 10AM."																
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Client rep contacted at shift change to update on forecasted high winds and current stage of BH07. Agreement to continue BH07 to -24mCD and then pull casing to allow a move before conditions deteriorate. "As per our discussion, please continue the BH to a level of -24mCD. This should allow you to complete and move before 10AM." Client Rep: Client Rep:	mours worke				120				iont Dev	000nt-ti	Com	•				
Agreement to continue BH07 to -24mCD and then pull casing to allow a move before conditions deteriorate. Client Rep:		ments						Cli	ient Repr	esentative	Comment	S				
Agreement to continue BH07 to -24mCD and then pull casing to allow a move before conditions deteriorate. Client Rep:	ugro GeoServices Representative Con															
deteriorate. GSL Rep: Theo Cleave Client Rep:			ecasted high						"As per c	our discus					D. This should	allow you to
deteriorate. GSL Rep: Theo Cleave Client Rep:	Client rep contacted at shift change				move bef	ore cond	ditions									•
GSL Rep: Theo Cleave Client Rep:	Client rep contacted at shift change			o allow a												
	Client rep contacted at shift change	4mCD and then i	pull casing to	o allow a												
	Client rep contacted at shift change	4mCD and then i	pull casing to	o allow a												
	Client rep contacted at shift change	4mCD and then i	pull casing to	o allow a												
igned: Signed:	Client rep contacted at shift change Agreement to continue BH07 to -2	4mCD and then i	pull casing to	o allow a												
igned: Signed:	Client rep contacted at shift change	4mCD and then i	pull casing to	o allow a				CI	lient Re _l	p:						
ground Jorgina L	Client rep contacted at shift change Agreement to continue BH07 to -2	4mCD and then i	pull casing to	o allow a						p:						



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

erestating 100	10013												
Job No				C1982		Ves	sel	Skate 3A		Date	Saturday 09-Mar-19		
ANeillings	s@arch-hend	derson.c	o.uk			Attn.	Andy Neil	lings	No./email	0141 227 3060			
mshuttlev	worth@arch-	-henders	on.co.uk			Attn.	Michael S	huttleworth	No./email				
stuart.inn	es@gegroup	p.com				Attn.	Stuart In	nes	No./email				
						Attn.	1		No./email				
m.channe	ell@fugro.cor	m				Attn.	Mathew (Chappell - Nearshore Mana					
	ong@fugro.co					Attn.	1	Armstrong - Reporting M	-				
	ugro.com	OIII				Attn.		p - Project Manager	No./email	 			
Observed W				Vind		Attii.	Gleff Cris	sp - Froject Manager	No./email				
					Sw	rell (Hs)		Sea State	Visibility	V	Veather Forecast		
Time 00			ed Knts	Dir									
00:00			20	SSW		N/A		smooth/slight	good		Can Palour		
06:00			31	SSW		N/A		slight	good		See Below		
12:00			28	WSW		N/A		slight	good		Weather Forecast See Below al Status s underway on BH03 Ing further I continue BH from 17.00m JUB / TBT I topul / Carew onboard monitoring conditions JUB / TBT ach / Wait for suitable weather window to move		
18:00			26	W		N/A		slight	good				
00:00)		19	WSW		N/A		smooth/slight	good				
			Leg Per	netration (m)									
RH	l no.		1	2	3	4				Operational Status			
	H03	-	•	1		•					ing further d continue BH from 17.00m JUB / TBT to pull casing to deck move / Crew onboard monitoring conditions		
ы	HUS		2.3	0.8	1.9	2.	1				Weather Forecast See Below al Status s underway on BH03 Ing further I continue BH from 17.00m JUB / TBT to pull casing to deck nove / Crew onboard monitoring conditions JUB / TBT ach / Walt for suitable weather window to move		
						1			CI	P drilling operations underwa			
				1	1								
						Summary o	of Operation	ons / Borehole Drilling	- last 24hrs:				
From		То		Hrs (No.)	Code					Description			
00:00		06:30		6.50	Cable Percuss					able to advance casing further			
06:30		07:00		0.50	Rotary Drilling (C					Run in Geobor S and continue	3H from 17.00m		
07:00		08:00		1.00	Crew Change /					Dayshift transfer to JUB / TBT			
08:00		09:00		1.00	Rotary Drilling (C					-23.25mCD / begin to pull cas			
09:00		19:00		10.00	Standby (weat	her) Ver	y high win	ds in excess of 40kts / V	Vait for suitable	weather window to move / Crev	v onboard monitoring conditions		
19:00	2	20:00		1.00	Crew Change /	TBT Day	yshift trans	fer to shore / Handover	on CTV Quay /	Nightshift transfer to JUB / TBT			
20:00	(00:00		4.00	Standby (weat	her) Wir	nds margir	nal with gusts in excecss	of limits / Swell	>1m on shelving beach / Wait	for suitable weather window to move		
	_												
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			_		1								
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			_		 								
					<u> </u>								
								leather forecast					
					Local time Wind direction				0.00 11:00 12:00 13:00 W W W W	14.00 15:00 16:00 17:00 18:00 19:00 20:00 21 W W W W W WSW SW SW M	00 32:00 23:00.		
					Wind speed (kts)						H Hall		
						12 18	14 15.	st 72 22 21 21 26	26 21 27 29	28 25 23 16 14 13 12 1	0 12		
					Wind gusts (max kts) Cloud cover	25' 10	P 20	2 2 2 2 4 4			and the second s		
					Precipitation type	4	-				-		
					Precipitation (mm / h)	0.2					01		
					Air temperature (°C) Feets like (°C)					4 4 4 1 4 2 2	d let tel		
					Relative humidity (%)	01 73				59 65 61 65 79 80 63 6	1 01 61		
					Air pressure (hPa)	991 891	995 991 6	of 601 801 901 692 803 1	993 995 986 'yeë	997 907 948 995 196 999 995 96	g 997 997		
					Tide type	2. 4	7 7	5 3 7 3 3 3	7 6 3 8	27 3 2 X Y Y 24 24 2	3 3		
					Time Tide height (m)	37 4	136 41 16 1	721 10 10 13 1 11 10	25 35 30 42	1140 1952 43 38 20 10 13 1 00 1	2 10 20		
Ith Safety &	the Environ	nment											
-			and for-	ed of year lear-	material								
steep seab	ed gradient ir	in this are		ed of very loose	material.								
y steep seab res require m	ed gradient ir ore time to a	in this are	s to the cha	inging contours.	material. el need to be consi	dered wher	n judging v	weather windows.					
y steep seab ves require m s additional ti	ed gradient ir lore time to a me and the ri	in this are adjust leg risk of me	s to the cha	inging contours.		dered wher	n judging v						
ves require m	ed gradient ir lore time to a me and the ri	in this are adjust leg risk of me	s to the cha	inging contours.		dered wher	n judging v	weather windows.	o:				
y steep seab ves require m s additional ti	ed gradient ir lore time to a me and the ri	in this are adjust leg risk of me	s to the cha	inging contours.		dered wher	n judging v		o:				



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

Activity Time St	ımmary		1	Гoday	To Da	ate	D	ay Shift		Night	Shift	Comp	oany	Position	
Mobilisation				0.00	3.50	_					JUB (mobil				
Moving & Jacking				0.00	20.0		.lim	my Wilso	n	Joshua		Fugro Geo	Services	Bargemaste	er
Rotary Drilling (Coring)						_		_				_		Driller	٠.
				1.50	7.33			nes Lawso		Adam		Fugro Geo			
Cable Percussion				6.50	73.0	_		ım Allardy		Ashley L	owthian	Fugro Geo		Assistant Dri	
Standby (Fugro)				0.00	0.00	_	St	tuart Nye				Fugro Geo	Services	Assistant Dri	ıııer
Standby (Tide)				0.00	11.5	0									
Standby (weather)				14.00	51.7		Ric	hard Luke	er	Bart	Kot	Fugi	ro	Geotechnical En	ngineer
Single Shift Standby				0.00	5.75	5									
Other Operations				0.00	6.25	5	The	eo Cleave	е			Fugro Geo	Services	Project Engin	neer
Crew Change / TBT				2.00	12.7										
g-,				0.00	0.00										
				0.00	0.00										
			_			_									
				0.00	0.00										
				0.00	0.00										
				0.00	0.00										
				0.00	0.00)									
		Tota		04.00	24.0	0	N-	D			•	Total Man Hours		120	
		1018	11 4	24.00	24.0	0	NO.	Personn	eı	1	U	Worked		120	
					•										
Project Program / P	rogress			ogrammed			Today			Actual To Da		4	% Progran	n Completed	
Activity		BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours				
General Items, Provisional Services		Α										0			
Establish all plant, equipment, crew on site		A2		1.0					0.0	1	0.00				100.0
, , , , , , , , , , , , , , , , , , , ,									0.0	0	0.00	0.0			
Observation Throughout the Committee of		D44 610		 	R/O		!	14.00				0.0			
Standing Time for plant, crew, etc - WEATHER		B11 C19		1		-		14.00	0.0	0	51.75				
Standing Time for plant, crew, etc - TIDE		B11 C19		1	R/O				0.0	0	11.50	0.0			
									0.0	0	0.00	0.0			
Percussion Boring		В										0.0			
Move boring plant to site of each exploratory ho	le	B1		8.00					0.0	5	0.00			62.5	
Extra over B1 for setting up on a gradient >20%		B2		R/O	 	 	 	+				0.0			
				NO					0.0	0	0.00				
Break out surface obstructions where present		B3			R/O		_		0.0	0	0.00	0.0			
Advance BH between groundlevel and 10m dep	th	B4	80.00						49.4	0	0.00			61.8	
As B4 but between 10m and 20m		B5	36.50			4.00			32.9	0	0.00				90.0
As B4 but between 20m and 30m		B6	R/O						0.0	0	0.00	0.0			
As B4 but between 30m and 40m		B7	R/O									0.0			
			NO		B/0				0.0	0	0.00	41			
Advance BH through hard stratum or obstruction	n	B9			R/O				0.0	0	3.00	0.0			
									0.0	0	0.00	0.0			
Rotary Drilling		С										0.0			
Move rotary plant to site of each exploratory hol	ρ.	C15		6.00					0.0	3	0.00			50.0	
RC drilling between groundlevel and 10m depth		C41	R/O	0.00								0.0			
									0.0	0	0.00	0.0			
As C41 but between 10m and 20m		C42	20.50			3.00			5.7	0	0.00		27.6		
As C41 but between 20m and 30m		C43	9.50			2.50			5.9	0	0.00			61.6	
Core box to be retained by client		C49		21.00					0.0	0	0.00	0.0			
•									0.0	0	0.00	0.0			
Once the Manthada desired to the Manthada		_							0.0	- "	0.00	0.0			
Sampling, Monitoring during investigation		Е										0.0			
Small Disturbed Sample		E1		59.00			22		0.0	116	0.00				
Bulk Disturbed Sample		E2		59.00			16		0.0	54	0.00				91.5
Large Bulk disturbed sample		E3		R/O					0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
Insitu Testing		Н							0.0		0.00	0.0			
		H1		40			40			0.4	0.00	0.0		52.5	
Standard Penetration Test in Borehole				40			10		0.0	21	0.00			52.5	
Standard Penetration Test in Rotary Drill Hole		H2		R/O					0.0	0	0.00	0.0			
				1		I			0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing		L	-									0.0			
Marine Scotland Sample		L2		121			22		0.0	83	0.00			68.6	
						1			0.0	0	0.00	0.0		55,5	
Additional liams				1	-	 	-	1	0.0	U	0.00	#			
Additional Items				-			1					0.0			
									0.0	0	0.00	0.0			
						L	L]	0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
				1	 	!	!		0.0	0	0.00	0.0			
Health & Safety Su	mmary			Today		Λ-4	tual To	Date	5.0		0.00	Lost & D	amanod		
	iiiiai y					ACI		Date				LUSI & D	umayeu		
Hoc Cards				1			12		l						
Safety Drills				0			4								
Tool Box Talk				1			10		l						
HSE Meeting				0			1								
Incidents/Near N	liss			0			0								
Environmenta				0			0]							
Hours Worke				120			960		<u> </u>						
Fugro GeoServices Representative Com				ice, WindF	inder e	tc.) and		ent Kepr	esentativ	e Commen	is				
Wind speed recorded and monitore anonome		dheld and station n													
anonome		dheld and station r					CI	ient Po	n·						
		dheld and station r					CI	ient Re	p:						
anonome		dheid and station r						ient Re	p:						



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

	Job No			C1982			Vessel	Skate 3A			Date	Sunday 10-Mar-19
То	ANeillings@ar	rh-hondorson				Attn.		Neillings	-	No./email	0141 227 3060	-
CC	mshuttleworth					Attn.		ael Shuttleworth		No./email	0141 227 0000	•
	stuart.innes@		I SOII.CO.UK			Attn.		rt Innes		No./email	l 	
cc cc	Stuart.IIIIes@	gegroup.com				Attn.	Stua	it illiles		No./email		
CC	m channell@f	uaro com				Attn.	Made	Channell Nassehara				
	m.chappell@f					Attn.		iew Chappell - Nearshore olas Armstrong - Repoi				
cc cc	n.armstrong@ g.crisp@fugro					Attn.		Crisp - Project Manag		No./email		
	bserved Weath	_	V	Vind								
	Time 00:00		eed Knts	Dir		Swell (Hs)	Sea State		Visibility		Weather Forecast
	00:00		19	WSW		N/A		smooth		good		
	06:00		20	W		N/A		smooth/slight		good		See Below
	12:00		25	W		N/A		slight		poor		
	18:00		39	W		N/A		slight		poor		
	00:00		28	W		N/A		smooth/slight		poor		
			Leg Per	netration (m)							Operation	and Status
	BH no.		1	2	3		4				Operation	iai Status
	BH03		2.3	0.8	1.9		2.7					
								_			ВН03 со	mpleted.
	BH04		2.4	0.7	1.6		2.9			Awaitin		window for move to BH04.
						Summa	ry of Ope	erations / Borehole Dr	rilling - la	ast 24hrs:		
	From	To		Hrs (No.)	Cod	de					Description	
	00:00	03:00		3.00	Standby (weather)	Winds ma	arginal with gusts in ex	cecss of	limits / Swell	~1m on shelving be	each / Wait for suitable weather window to move
	03:00	03:30		0.50	Standby (conditions / General R&M
	03:30	06:00		2.50	Moving &							Preload and jack to sage working height
	06:00	07:30		1.50	Cable Pe			asing to depth / Comme				
	07:30 08:00	08:00 11:00		0.50 3.00	Crew Char Cable Pe			transfer to JUB / Handor CP drilling from 1.00m			ng continuation / IB	T with all crew - Crew Transfers
	11:00	11:45		0.75	Other Op			deck for forecast storm			east Umay and see	ure all dack items
	11:45	12:00		0.25	Crew Char							k operations and evacuation limits.
	12:00	19:00		7.00	Standby (-		to monitor storm from				
	19:00	19:45		0.75	Crew Char			r with nightshift at acco		_		
	19:45	00:00		4.25	Standby (weather)	Continue	to monitor storm from	shore / A	Avg. 25-30kt	winds, gusting >30kt	s
-												
<u> </u>												
—												
								Weather forecast				
				Local time		100 200 300 ISW WSW SSW		500 700 8.00 900 10:00 SSW SW SSE SSE SSE			16.00 17.00 18.00 19.00 21	
				Wind direction Wind speed (kts)							34 37 36 35	
									15 22	27		21 21 22
				Wind gusts (max kt				1 2 2 7		#1 47 46		
				Cloud cover	-0.0	M 0 1	0 0	00000		1 47 46 • C C		0 0 0 0
				Precipitation type Precipitation (mm /	*			o o	4. 4		0 4 4 5	
				Air temperature (°C		E 01-01			3.6 :0.5	0.2	58 05 03 NA 6	17 02
				Feels like (°C)				W # 0 0 A				4 0 0 0
				Relative humidity (1 Air pressure (hPa)			900 905	79 -90 79 75 90 985 994 994 982 582		70 75 80 688 688 687		nn - G2 F7 FF noi bear nies nies
				Tide type	26			107 K 16 K		3 24 9	9 9 9 9	24 S S S S
				Time Tide height (m)	341		23 23	18 12 11 13 2	20 36			
Healt	h Safety & the	Environment										
									complex	ity in movem	ent and developmen	nt of the synoptic pattern."
				er the next few								
FGS	L Rep: Theo	Cleave						Clien	nt Rep:			
									-			
Sign	ed:							Sign	ed:			



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

			_												
Activity Time St	mmary		Т	oday	To Da	te	D	ay Shift		Night	Shift	Comp	oany	Po	osition
Mobilisation				0.00	3.50					Onboard .					
Moving & Jacking				2.50	22.58			my Wilso		Joshua		Fugro Geo			gemaster
Rotary Drilling (Coring)	<u> </u>		_	0.00	7.33			es Lawso		Adam		Fugro Geo			Driller
Cable Percussion			_	4.50	77.58			ım Allardy		Ashley L	owthian	Fugro Geo			tant Driller
Standby (Fugro)			(0.00	0.00		St	tuart Nye				Fugro Geo	Services	Assis	tant Driller
Standby (Tide)			_	0.00	11.50	_									
Standby (weather)			_	4.75	66.50		Ric	hard Luke	er	Bart	Kot	Fugi	ro	Geotechr	nical Engineer
Single Shift Standby				0.00	5.75										
Other Operations				0.75	7.00		The	eo Cleave	е			Fugro Geo	Services	Projec	t Engineer
Crew Change / TBT				1.50	14.2										
				0.00	0.00										
			_	0.00	0.00	_									
				0.00	0.00										
				0.00	0.00										
				0.00	0.00										
			+ '	J.00	0.00	_						Total Man			
		Total	2	4.00	24.0	0	No.	Personn	el	1	0	Hours		120	
												Worked			
Project Program / P	rograss		Dre	grammed			Today	,		Actual To Da	ato		0/ Drogram	n Completed	
	boring plant to site of each exploratory hole B1 over B1 for setting up on a gradient >20% B2 out surface obstructions where present B3 ce BH between groundlevel and 10m depth B4 but between 10m and 20m B5							Hours	m.	No.	Hours	1	/6 Flogran	Completed	
_			m.	No.	Hours	m.	No.	1		1		0			
				1.0					0.0	1	0.00				100.0
Compiler an plant, equipment, trew on site	MZ			,					0.0	0	0.00	0.0			
Chanding Time for plant	D44 01	_			R/O			14.75				0.0			
					R/O			5	0.0	0	66.50	0.0			
oranium I ime for plant, crew, etc - TIDE	B11 C1	9			100				0.0	0	11.50	0.0			
D							-		0.0	0	0.00	0.0			
Percussion Boring												0.0			75.0
• • • • • • • • • • • • • • • • • • • •				8.00			1		0.0	6	0.00	0.0			75.0
				R/O					0.0	0	0.00	0.0			
Break out surface obstructions where present					R/O				0.0	0	0.00	0.0			
Advance BH between groundlevel and 10m dep			80.00			4.00			53.4	0	0.00			6	66.8
As B4 but between 10m and 20m			36.50						32.9	0	0.00				90.0
As B4 but between 20m and 30m	B6		R/O						0.0	0	0.00	0.0			
As B4 but between 30m and 40m	B7		R/O						0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	B9				R/O				0.0	0	3.00	0.0			
									0.0	0	0.00	0.0			
Rotary Drilling	С											0.0			
Move rotary plant to site of each exploratory hol	C15			6.00			1		0.0	4	0.00			6	66.7
RC drilling between groundlevel and 10m depth	C41		R/O						0.0	0	0.00	0.0			
As C41 but between 10m and 20m	C42		20.50						5.7	0	0.00		27.6		
As C41 but between 20m and 30m	C43		9.50						5.7	0	0.00			61.6	3
Core box to be retained by client	C49		3.50	21.00						0		0.0		010	
Solo Box to be rotalined by dilott	0.0			21.00					0.0	0	0.00	0.0			
Complies Manitories during investigation	Е								0.0	U	0.00	0.0			
Sampling, Monitoring during investigation				50.00								0.0			
Small Disturbed Sample	E1			59.00					0.0	116	0.00				04.5
Bulk Disturbed Sample	E2			59.00					0.0	54	0.00				91.5
Large Bulk disturbed sample	E3			R/O					0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
Insitu Testing	Н											0.0			
Standard Penetration Test in Borehole	H1			40					0.0	21	0.00			52.5	
Standard Penetration Test in Rotary Drill Hole	H2			R/O					0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing	L											0.0			
Marine Scotland Sample	L2			121					0.0	83	0.00				68.6
				<u> </u>			_		0.0	0	0.00	0.0			
Additional Items						L	L					0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
Health & Safety Su	nmary			Today		Act	tual To	Date				Lost & D	amaged		
Hoc Cards				1			13								
Safety Drills				0			4]						
Tool Box Talk				1			11		l						
HSE Meeting				0			1								
Incidents/Near N				0			0								
Environmenta				0			0								
Hours Worker				120			1080		<u> </u>						
Fugro GeoServices Representative Com	lex low passes over			rive on sit	e in 48h	rs.	CII	епт керг	esentativ	e Commen	ıs				
First comp Second low currently tracking l															
							CI	ient Re	p:						
Second low currently tracking l								ient Re	p:						



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

	Job No			C1982		Vesse	I Skat	te 3A		Date	Monday 11-Mar-19				
То	ANeillings@are	-h-handarson					ndy Neillings		No./email						
cc	mshuttleworth						ichael Shuttleworth		No./email						
cc	stuart.innes@g		13011.CO.UK				tuart Innes		No./email						
CC	Stuart.iiiies@j	gegroup.com				Attn.	tuart irires		No./email						
cc	m shannall@fu	uaro com					athau Channall Naan								
	m.chappell@fu n.armstrong@						athew Chappell - Nears icholas Armstrong - F								
CC CC	g.crisp@fugro.						len Crisp - Project Ma		No./email						
	bserved Weath		V	/ind				Ť							
	Time 00:00		eed Knts	Dir	Sw	ell (Hs)	Sea State	е	Visibility		Weather Forecast				
	00:00		28	W		N/A	smooth/slig	ght	good						
	06:00		19	SW		N/A	smooth		good		See Below				
	12:00		20	WSW		N/A	smooth		good						
	18:00		8	SW		N/A	smooth		good						
	00:00		29	SSW		N/A	slight		good						
			Leg Pen	etration (m)											
	BH no.		1	2	3	4				Operation	nal Status				
	BH04		2.4	0.7	1.6	2.9									
	DI 104		2.4	0.7	1.0	2.5				CP drilling und	erway on BH04				
					s	ummary of C	perations / Boreho	le Drilling -	- last 24hrs:						
	From	То		Hrs (No.)	Code					Description					
	00:00	02:15		2.25	Standby (weath	er) Winds	marginal with gusts	in excecss	of limits / Swel						
	02:15	02:45		0.50	Crew Change /		hift transfer to JUB fr								
	02:45	07:00		4.25	Cable Percuss					scraps etc. / Contin	ue CP from 4.00m to 7.50m BML				
	07:00	07:15		0.25	Other Operation	ns Fuel a	Il plant / Wash down	and clear d	leck for E.O.S						
	07:15	08:00		0.75	Crew Change /	TBT Nights	hift transfer to shore	/ Handover	at CTV Quay	/ Dayshift transfer to	JUB / TBT & Fire Drill				
	08:00	15:40		7.67	Cable Percuss	ion Contir	ue CP drilling from 7	.50m to 12	.50m BML / C	hiselling through very	y course gravels				
	15:40	19:20		3.67	Cable Percuss	ion Run in	7" casing and contir	nue CP drill	ing from 12.50	m to 18m BML					
	19:20	20:00		0.67	Crew Change /										
	20:00	22:35		2.58	Cable Percuss										
	22:35	00:00		1.42	Other Operation	ns Pull al	I casing to deck / Wa	ish down ar	nd clear deck f	or E.O.H / Fuel all pla	ant / General R&M				
-															
						-									
						_									
					<u> </u>		Weather forec	aat							
				Local time	0.00	00 200 300			1 1100 1200 120	1 14.00 15.00 16.00 17.00	18.00 19.00 20.00 21.00 22.00 23.00				
				Wind direction	WWW. 'v										
				Wind speed	(kts)	20 19 18	10 17 10 15 1	14 15 15	16 18 15		17 16 28 17 17				
								14 15 13		14 15 15 12	12 77 10 17 34				
				Wind gusts (00 01 70		2 2	10 D 20	DATE OF THE REAL PROPERTY.	70 11 04 29 00				
				Cloud cover Precipitation		0 0 0				0 0 0 0					
				Precipitation			01 01				01 02 04 08 18				
				Air temperati			0 0 0 0	0 4 5	2 2 3	0 0 0 0					
				Feets like (*) Relative hum											
1				Air pressure											
1				Tide type	.29		3 3 3 3		7 7 1		× × × × × ×				
I				Time Tide height	(m) 3.9	236 in 39 4	35. 26 18 13 1		24 32 37						
Healt	h Safety & the E	Environment													
								t ridge build	s over UK and	drifts into the centra	I and southern North Sea."				
					days, forecasts u										
FGS	L Rep: Theo	Cleave					Ic	lient Rep):						
1								•		/ Dayshift transfer to JUB / TBT & Fire Drill hisselling through very course gravels m to 18m BML Nightshift transfer to JUB / TBT & Fire Drill E.O.H @ -24.10mCD / Seabed below Chart Datum = 2.00m or E.O.H / Fuel all plant / General R&M 1					
Sign	ed:						s	igned:							
ـــــــــــــــــــــــــــــــــــــــ															



Daily Report No.

10

Nigg Energy Park - Marine Ground Investigation

Activity Time Summ Mobilisation Moving & Jacking Rotary Drilling (Coring) Cable Percussion Standby (Fugro) Standby (Tide) Standby (Weather) Stingle Shift Standby Other Operations Crew Change / TBT		1	0.00 0.00 0.00 0.00 8.17 0.00 0.00 0.00 2.25 0.00	3.50 22.5 7.33 95.7 0.00 11.5 68.7 5.75	8 55 00 55 66	Jam Callu St	my Wilso es Lawso m Allardy uart Nye	on yce	Joshua Adam Ashley L	Cook	Fugro Geo Fugro Geo Fugro Geo Fugro Geo	Services Services	Dr Assista	master iller nt Driller nt Driller
Rotary Drilling (Coring) Cable Percussion Standby (Fugro) Standby (Tide) Standby (weather) Single Shift Standby Other Operations		1	0.00 8.17 0.00 0.00 0.00 2.25 0.00	7.33 95.7 0.00 11.5 68.7 5.75	55 00 00 55 66	Jam Callu St	es Lawso m Allardy uart Nye	on yce	Joshua Adam Ashley L	Sandy Cook	Fugro Geo Fugro Geo Fugro Geo	Services Services	Dr Assista	iller nt Driller
Cable Percussion Standby (Fugro) Standby (Tide) Standby (weather) Single Shift Standby Other Operations		1	8.17 0.00 0.00 0.00 2.25 0.00	95.7 0.00 11.5 68.7 5.75	5 0 5 5 5 6	Callu St	m Allardy uart Nye	yce	Ashley L		Fugro Geo	Services	Assista	nt Driller
Standby (Fugro) Standby (Tide) Standby (weather) Single Shift Standby Other Operations		(0.00 0.00 2.25 0.00 1.67	0.00 11.5 68.7 5.75	0 5 6	St	uart Nye			owthian				
Standby (Tide) Standby (weather) Single Shift Standby Other Operations		(0.00 2.25 0.00 1.67	11.5 68.7 5.75	5						Fugro Geo	Services	Assista	nt Driller
Standby (weather) Single Shift Standby Other Operations			2.25 0.00 1.67	68.75 5.75	5	Rich	nard Luke	or						
Single Shift Standby Other Operations			0.00 1.67	5.75	5	11101	iaia Lak			Kot	Fug	ro	Geotechnic	al Engineer
Other Operations			1.67		_			CI	Duit	TOU	i ug	10	Geoleciiii	ai Engineer
Crew Change / TBT			1.00			The	eo Cleave	е			Fugro Geo	Services	Project	Engineer
			1.92	16.1	7									
			0.00	0.00										
			0.00	0.00	_									
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
											Total Man		I	
	Tota	al 2	4.00	24.0	0	No.	Personn	iel	10	0	Hours Worked		120	
					H						Worked			
Project Program / Program			ogrammed			Today			ctual To Da		H	% Progran	n Completed	
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	0			
General Items, Provisional Services	A		1.0					0.0		0.00	U			100.0
Establish all plant, equipment, crew on site	A2		1.0					0.0	1	0.00	0.0			100.0
Standing Time for plant are the MEATUES	P11 C10			R/O				0.0	0	0.00	0.0			
Standing Time for plant, crew, etc - WEATHER Standing Time for plant, crew, etc - TIDE	B11 C19 B11 C19	-		R/O	1			0.0	0	66.50 11.50	0.0			
orang time for plant, crew, etc - TIDE	011 019			.00				0.0	0	0.00	0.0			
Percussion Boring	В	l			1			5.0		5.00	0.0			
Move boring plant to site of each exploratory hole	B1		8.00					0.0	6	0.00				75.0
Extra over B1 for setting up on a gradient >20%	B2		R/O					0.0	0	0.00	0.0			
Break out surface obstructions where present	B3			R/O				0.0	0	0.00	0.0			
Advance BH between groundlevel and 10m depth	B4	80.00			6.00			59.4	0	0.00				74.3
As B4 but between 10m and 20m	B5	36.50			10.00			42.9	0	0.00				
As B4 but between 20m and 30m	B6	R/O			2.10			2.1	0	0.00	0.0			
As B4 but between 30m and 40m	B7	R/O						0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	B9			R/O			6.08	0.0	0	9.08	0.0			
								0.0	0	0.00	0.0			
Rotary Drilling	С										0.0			
Move rotary plant to site of each exploratory hole	C15		6.00					0.0	4	0.00			66	.7
RC drilling between groundlevel and 10m depth	C41	R/O						0.0	0	0.00	0.0			
As C41 but between 10m and 20m	C42	20.50						5.7	0	0.00		27.6		
As C41 but between 20m and 30m	C43	9.50						5.9	0	0.00			61.6	
Core box to be retained by client	C49		21.00					0.0	0	0.00	0.0			
Occupitant Manifestory during to continue to	-							0.0	0	0.00	0.0			
Sampling, Monitoring during investigation Small Disturbed Sample	E E1		59.00			25					0.0			
Bulk Disturbed Sample	E2		59.00			21		0.0	141	0.00			_	
Large Bulk disturbed sample	E3		R/O			21		0.0	75 0	0.00	0.0			
zargo zant alotarzoa campio	20		100					0.0	0	0.00	0.0			
Insitu Testing	Н							0.0	0	0.00	0.0			
Standard Penetration Test in Borehole	H1		40			12		0.0	33	0.00				82.5
Standard Penetration Test in Rotary Drill Hole	H2		R/O					0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing	L										0.0			
Marine Scotland Sample	L2		121			21		0.0	104	0.00				86.0
								0.0	0	0.00	0.0			
Additional Items											0.0			
								0.0	0	0.00	0.0			
	ļ							0.0	0	0.00	0.0			
	ļ							0.0	0	0.00	0.0			
	1							0.0	0	0.00	0.0			
Haalth 9 Cafaty Comme			Today		A ==	tual To I	Dato	0.0	0	0.00	0.0 Lost & D	amanod		
Health & Safety Summa Hoc Cards	У		Today 1		ACI	14	Jale				LOST & D	amayea		
Safety Drills			1			5		1						
Tool Box Talks			1			12		1						
11000111			0			1								
HSE Meetings			0			0		1						
Incidents/Near Miss			0		i	0		1						
			120			1200								



Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No.

11

	rating 100 Years										
	Job No			C1982		Ve	ssel	Skate 3A		Date Tuesday 12-Mar-1	19
	ANeillings@ard mshuttleworth stuart.innes@g	@arch-he	nderson.co.u	ı <u>k</u>		Attn. Attn. Attn.	Andy Ne Michael Stuart I	Shuttleworth	No./email No./email No./email	0141 227 3060	
	m.chappell@fu	fugro.com				Attn. Attn. Attn.	Nichola	Chappell - Nearshore Ma s Armstrong - Reporting	g Mana No./email	_	
)h	g.crisp@fugro. oserved Weath			Wind		Attn.	Glen C	risp - Project Manager	No./email		
,,,	Time 00:00	ei .	Speed Knts		Sv	vell (Hs)		Sea State	Visibility	Weather Forecast	
	00:00		28	W		N/A		slight	good	See Below	
_	06:00 12:00		20 31	SW		N/A N/A		smooth/slight slight	good good	See Below	
	18:00		36	SSV		N/A		slight	good		
_	00:00		23	W		N/A		slight	good		
	BH no.			Penetration (m)	3	1	4			Operational Status	
	ВН 110.		2.4	0.7	1.6	+	.9				
	Brios		2.4	0.7	1.0		.5		Mon	Pulling casing on BH04 Complete to -24.10mCD itor weather for suitable window to move.	
				•		Summary	of Opera	tions / Borehole Drillin	ng - last 24hrs:		
	From	T		Hrs (No.)	Code					Description	
	00:00 00:45	00: 07:		0.75 6.25	Other Operat Standby (wea			ng to deck / Wash down ner system moving over		or E.O.H / Fuel all plant / General R&M ~25kts	
	07:00	08:	:00	1.00	Crew Change	TBT Ha	ndover w	ith dayshift / TBT with a	all crew / Dayshift	transfer to quayside to monitor weather	
	08:00 19:00	19: 20:		11.00 1.00	Standby (wea			ner system moving over		~30kts, gusts >50kts / Crew not onboard through v.high w	vinds
	20:00	00:		4.00	Standby (wea			ner system moving over		~22kts, gusts >30kts /	
						-					
						t					
					Local time	0.00 1.00		Weather forecast	00 10:00 11:00 12:00 1	130 1400 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00	
					Wind direction			SW SW SW SW S	W SW SW SW	SW SW SSW SW SW WSW SW WSW W W	
					Wind speed (kts)	23 25	20 16	16 15 16 17 20 1	7 29 26 28	22 34 34 35 29 21 23 23 20 20 18	
					Wind gusts (max kts)						
					Cloud cover Precipitation type	0 0	0 0	a a a a a a	S 11 8 40	85 88 89 89 82 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
					Precipitation (mm / h)		0 0		0 2 0.1	0 0 0 0 0 0 0 0 0 01 10 04 13 08 04 05 18	
					Air temperature (°C) Feets like (°C)		1 1			1 2 2 3 3 1 1 6 1 1 6	
					Relative humidity (%) Air pressure (hPa)	76 B3.	86 (0)	87 86 86 85 81 8 865 885 864 984 863 96		09 71 76 81 SZ 86 89 85 86 81 84	
					Tide type Time		77 JA			7 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	
-10"	0-1-1-0-1				Tide height (m)	27 33			3 15 2 26	52 37 4 39 34 26 (8 14 13 14 17	
aith	Safety & the E	environme	ent								
t Of	ffice - "Large a	nd deep A	tlantic low to	the NW of Scotlan	d moves ESE acros	s the far n	orth of Sc	otland through Tuesday	and into souther	n Scandinavia on Wednesday."	
					w days, forecasts					· · · · · · · · · · · · · · · · · · ·	
SI	Rep: Theo	Cleave						Client R	Rep:		

Signed:



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

					_									
Activity Time Su	mmary		Today	To Da	te	D	ay Shift		Night	Shift	Comp	oany	Pos	sition
Mobilisation			0.00	3.50					Onboard .					
Moving & Jacking			0.00	22.58			my Wilso		Joshua		Fugro Geo		_	emaster
Rotary Drilling (Coring)			0.00	7.33			es Lawso		Adam		Fugro Geo			riller
Cable Percussion			0.00	95.75			m Allardy		Ashley L	owthian.	Fugro Geo			nt Driller
Standby (Fugro)			0.00	0.00	_	St	tuart Nye				Fugro Geo	Services	Assista	int Driller
Standby (Tide)			0.00	11.50	_						_			
Standby (weather)			21.25	90.00		Rich	hard Luke	er	Bart	Kot	Fugi	ro	Geotechni	cal Engineer
Single Shift Standby			0.00	5.75		Th	01				F C	Ci	Desir et	Fi
Other Operations			0.75	9.42		ine	eo Cleave	е			Fugro Geo	Services	Project	Engineer
Crew Change / TBT		-	0.00	18.17										
		+	0.00	0.00										
		-+	0.00	0.00	_									
		-+	0.00	0.00										
			0.00	0.00										
			0.00	0.00										
											Total Man			
		Total	24.00	24.00	0	No.	Personn	el	1	0	Hours Worked		120	
											Worked			
Project Program / P			Programmed			Today		Α	ctual To D		1	% Progran	n Completed	
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours				1
General Items, Provisional Services	Α										0			
Establish all plant, equipment, crew on site	A2		1.0					0.0	1	0.00				100.0
								0.0	0	0.00	0.0			
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O			21.25	0.0	0	87.75	0.0			
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O				0.0	0	11.50	0.0			
								0.0	0	0.00	0.0			
Percussion Boring	В										0.0			
Move boring plant to site of each exploratory ho	e B1		8.00					0.0	6	0.00				75.0
Extra over B1 for setting up on a gradient >20%	B2		R/O					0.0	0	0.00	0.0			
Break out surface obstructions where present	B3			R/O				0.0	0	0.00	0.0			
Advance BH between groundlevel and 10m dep	th B4	80.00	0					59.4	0	0.00				74.3
As B4 but between 10m and 20m	B5	36.50	0					42.9	0	0.00				
As B4 but between 20m and 30m	B6	R/O						2.1	0	0.00	0.0			
As B4 but between 30m and 40m	B7	R/O						0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	в В9			R/O				0.0	0	9.08	0.0			
								0.0	0	0.00	0.0			
Rotary Drilling	С							0.0		0.00	0.0			
Move rotary plant to site of each exploratory hole			6.00					0.0	4	0.00			66	5.7
RC drilling between groundlevel and 10m depth	C41	R/O						0.0	0	0.00	0.0			
As C41 but between 10m and 20m	C42	20.50						5.7	0	0.00	5.0	27.6		
As C41 but between 20m and 30m	C43	9.50						5.7	0	0.00			61.6	
Core box to be retained by client	C49	3.50	21.00					0.0	0	0.00	0.0		01.0	
core box to be retained by enem	0.0	_	21.00					0.0	0	0.00	0.0			
Sampling, Monitoring during investigation	Е		_					0.0	0	0.00	0.0			
Small Disturbed Sample	E1		59.00					0.0	444	0.00	0.0			
Bulk Disturbed Sample	E2	_	59.00					0.0	141 75	0.00				
Large Bulk disturbed sample	E3	_	R/O					0.0		0.00	0.0			
Large Bulk distarbed sample			100					0.0	0	0.00	0.0			
Insitu Testing	Н							0.0	0	0.00	0.0			
Standard Penetration Test in Borehole	H1	_	40					0.0	33	0.00	0.0			82.5
Standard Penetration Test in Boteriole Standard Penetration Test in Rotary Drill Hole	H2	_	R/O					0.0	0	0.00	0.0			02.5
Standard Penetration Test III Notary Drill Flore	112	_	- NO					0.0			H			
Goognaironmental Laboratory Tastin		_		1			1	0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing	L		121			-			10.	0.00	0.0			86.0
Marine Scotland Sample	L2	+	121				1	0.0	104	0.00	0.0			80.0
Additional Items		_		1			1	0.0	0	0.00	0.0			
nuuruolidi iteliis		4-		1			1	0.0	-	0.00	0.0			
		+-		1			1	0.0	0	0.00	0.0			
		+-						0.0	0	0.00	-11			
		+-						0.0	0	0.00	0.0			
		+-						0.0	0	0.00	0.0			
Health & Safety Su	mmary		Today	1	Act	tual To I	Date	0.0	U	0.00	0.0 Lost & D	honeme		
Health & Sarety Su Hoc Cards	aı y	_			Act		Daile				LUST & D	umayeu		
Hoc Cards Safety Drills		+	0			15 5		ł						
Tool Box Talk	3		1			13		1						
HSE Meetings			0			1		1						
Incidents/Near N	liss		0			0		1						
Environmenta			0			0								
Hours Worked			120			1320		<u> </u>						
Fugro GeoServices Representative Com	ments ther systems developing velopment for possible					Cli	ent Repr	esentativ	e Commen	ts				
Monitor de						CI	ient Re	p:						
							ient Re	p:						



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

	Job No			C1982		Vesse	l Sk	ate 3A		Date	Wednesday 13-Mar-19	
То	ANeillings@ai	rch-henderson	.co.uk			Attn. A	ndy Neillings		No./emai	0141 227 306	0	
СС		h@arch-hende	erson.co.uk				ichael Shuttleworth		No./emai			
СС	stuart.innes@	gegroup.com					tuart Innes		No./emai			
cc						Attn. M	-thChII No.		No./emai ger No./emai			
cc cc	m.chappell@t n.armstrong@						athew Chappell - Nei icholas Armstrong -				1	
CC	g.crisp@fugro						len Crisp - Project I		No./emai			
0	bserved Weatl			Vind	Swe	ell (Hs)	Sea Sta	ate	Visibility		Weather Forecast	
	00:00	Sp	eed Knts	Dir W		N/A	slight		good			
	06:00		28 37	WNW		N/A	smoot		good good		See Below	
	12:00		21	W		N/A	smoot		good			
	18:00		34	WSW		N/A	slight	İ	good			
	00:00		23	SSW		N/A	smooth/s	light	good			
			Leg Pen	netration (m)						Operatio	onal Status	
	BH no.		1	2	3	4				·		
	BH04		2.4	0.7	1.6	2.9						
									Δ		complete ndow to move to BH05	
										goaco		
					Si	ummary of C	perations / Boreh	ole Drilling -	last 24hrs:			
	From	То		Hrs (No.)	Code					Description	1	
	00:00	00:45		0.75	Standby (weath					continue to monitor		
<u> </u>	00:45 07:00	07:00 08:00		6.25 1.00	Standby (weath Crew Change / *		weather window for				o JUB / TBT & Abandonment Drill	
	08:00	13:00		5.00	Standby (weath						tional limits / Monitor closely	
	13:00	15:15		2.25	Moving & Jacki						I JUB West against wind / Abort move	
	15:15	16:45		1.50	Standby (weath						nmence drilling 17m from BH05	
	16:45				Cable Percussi				ū	from 0.00m to 2.00i	m BML	
19:00 19:20 0.33 Other Operations Fuel all plant and RHIB / Wash down for E.O.S 19:20 20:00 0.67 Crew Change / TBT Dayshift transfer to shore / Handover on CTV Quay / Nightshift transfer to JUB / TBT & Abandonment Drill												
	19:20	20:00	to JUB / TBT & Abandonment Drill									
	20:00	00:00		4.00	Cable Percussi	ion Contir	ue CP drilling from	2.00m to 7.0	JUM BML			
							Weather fore	cast				
				L.	ocal time	EDS 100 250			10 00 11 00 12 00 1	13:00 14:00 15:00 16:00 17:00	18.00 19.00 20.00 21.00 22.00 23.00	
					Wind direction	VINT VINT VIN	NA THE REAL PROPERTY.	NOW NOW YOU	MIN NO WHEN Y	MW W W WSW	SW SW SW SW SW SSW	
					Nind speed (kts)	26 28 30	x2 x2 35 x2	31 31 27	26 26 21	16 14 20 17 18	12 16 12	
					Most muster (many letter)						17 16 17 15 12 12	
					Nind gusts (max kts) Cloud cover	F = 40	44 43 50 45				000000	
					recipitation type	0 0	0 0 0 0			0 0	0 0 0	
					Precipitation (mm / h) Air temperature (*C)	01 01	01 03 03 02			0.1 0.2	24 24 21	
					eels like (°C)		4 4 4 4	1 9 9	1 1 2	2 2 1 Y 0	0 0 0 0 0 0	
I					Relative humidity (%) Air pressure (hPa)					73 Bt 82 B4 B6 993 994 995 995 996	12 83 86 88 89 90 198 186 184 1862 1861 1865	
I					lide type	2 2 2			2 2 2			
I					ime Tide height (m)	22 28 33			15 10 22		3.1 24 18 16 16 17	
Healtl	n Safety & the	Environment										
					orthern Denmark	by this eveni	ng then to Sweden	by Thur. Ano	ther low move	es from near Iceland	on a similar track on Thur with ridge briefly moving east	
Conti	entral and sout	thern North Se r anditions of	a overnight int	to Fri." sts up to and exc	ceeding 40kte							
			Josiy, iorecas	up to anu ext	Journa Hunto.			Oliant D				
FGS	L Rep: Theo	cieave						Client Rep	J.			
Sign	ed:							Signed:				
Ľ								-				



Daily Report No.

12

Nigg Energy Park - Marine Ground Investigation

Activity Time Su	Т	Today To Date			D	ay Shift		Night	Shift	Com	pany	Posi	tion		
Mobilisation				0.00	3.50)				Onboard .	JUB (mobil	isation)			
Moving & Jacking			:	2.25	24.8	3		my Wilso		Mark		Fugro Geo		Barger	
Rotary Drilling (Coring)				0.00	7.33			m Allardy		Adam		Fugro Geo		Dril	
Cable Percussion				6.25	102.0		St	uart Nye		Ashley L	owthian	Fugro Geo		Assistar	
Standby (Fugro)				0.00	0.00							Fugro Geo	oservices	Assistar	II DIIIIEI
Standby (Tide) Standby (weather)				0.00	11.5		Dick	nard Luke	or.	Bart	Kot	Fug	ro	Geotechnic	al Engineer
Single Shift Standby				0.00	5.75		IXICI	Iaiu Luke	J1	Dait	Rot	i ug	10	Geolecinic	ai Liigiileei
Other Operations				0.33	9.75		The	eo Cleave	е			Fugro Geo	Services	Project E	ngineer
Crew Change / TBT				1.67	19.8							J -			<u> </u>
				0.00	0.00										
			_	0.00	0.00)									
			_	0.00	0.00)									
			_	0.00	0.00	_									
				0.00	0.00										
				0.00	0.00	_						Total Man			
		Tota	1 2	24.00	24.0	0	No. I	Personn	el	9)	Hours Worked		108	
Project Program / Pr	rogress		Pro	ogrammed	1		Today		A	ctual To Da	ate		% Program	Completed	
Activity	_ J. J.J.	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours]	,, Jyruin	_p u	
General Items, Provisional Services		Α										0			
Establish all plant, equipment, crew on site		A2		1.0					0.0	1	0.00				100.0
									0.0	0	0.00	0.0			
Standing Time for plant, crew, etc - WEATHER		B11 C19			R/O				0.0	0	87.75	0.0			
Standing Time for plant, crew, etc - TIDE		B11 C19			R/O				0.0	0	11.50	0.0			
									0.0	0	0.00	0.0			
Percussion Boring		В							.			0.0			
Move boring plant to site of each exploratory hol		B1		8.00			1		0.0	7	0.00	0.0			87.5
Extra over B1 for setting up on a gradient >20%		B2		R/O	D.'0				0.0	0	0.00	0.0			
Break out surface obstructions where present	41.	B3	00.00		R/O	7.00			0.0	0	0.00	0.0			92.0
Advance BH between groundlevel and 10m dep	itn	B4	80.00			7.00			66.4	0	0.00				83.0
As B4 but between 10m and 20m		B5 B6	36.50						42.9	0	0.00	0.0			
As B4 but between 20m and 30m		B6 B7	R/O R/O						2.1	0	0.00	0.0			
As B4 but between 30m and 40m Advance BH through hard stratum or obstruction		B7 B9	RIU		R/O	-			0.0	0	0.00	0.0			
Auvance on illough hard stratum or obstruction	-	Ba			K/U				0.0	0	9.08	0.0			
Rotary Drilling		С							0.0	0	0.00	0.0			
Move rotary plant to site of each exploratory hole	e	C15		6.00			1		0.0	-	0.00	0.0			83.3
RC drilling between groundlevel and 10m depth		C15	R/O	3.00					0.0	5 0	0.00	0.0			55.5
As C41 but between 10m and 20m		C42	20.50									0.0	27.6		
As C41 but between 10m and 20m As C41 but between 20m and 30m		C42	9.50						5.7 5.9	0	0.00		27.0	61.6	
Core box to be retained by client	-+	C49	3.30	21.00					0.0	0	0.00	0.0		01.0	
		0.0		21.00					0.0	0	0.00	0.0			
Sampling, Monitoring during investigation		Е							0.0	0	0.00	0.0			
Small Disturbed Sample		E1		59.00					0.0	142	0.00				
Bulk Disturbed Sample		E2		59.00					0.0	75	0.00				
Large Bulk disturbed sample		E3		R/O					0.0	0	0.00	0.0			
		*							0.0	0	0.00	0.0			
Insitu Testing		Н							3.0	Ť	2.00	0.0			
Standard Penetration Test in Borehole		H1		40					0.0	33	0.00				82.5
Standard Penetration Test in Rotary Drill Hole		H2		R/O					0.0	0	0.00	0.0			
·									0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing		L										0.0			
Marine Scotland Sample		L2		121					0.0	104	0.00				86.0
									0.0	0	0.00	0.0			
Additional Items												0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
Health & Safety Su	mmary			Today		Ac	tual To [Date				Lost & D	amaged		
Hoc Cards			11			16		l							
Safety Drills Tool Box Talk:				1			6 14		ł						
HSE Meetings				0			1		İ						
Incidents/Near M				0			0		1						
Environmenta				0			0		1						
Hours Worked				108			1428								
Fugro GeoServices Representative Com	ments						Cile	ent Kepr	esentátive	e Commen					
FGSL Rep: Theo Cleave							Client Rep:								
Signed:								gned:	-						
							`'\	, . u.							



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

	Job No			C1982		Vessel	Sk	ate 3A		Date	Thursday 14-Mar-19						
То	ANeillings@a						idy Neillings		No./email		60						
СС			nderson.co.uk				ichael Shuttleworth		No./email								
cc	stuart.innes@	gegroup.co	<u>om</u>				uart Innes		No./email No./email								
cc cc	m.chappell@t	fugro com				Attn. M	athew Chappell - Ne	archoro Manac									
CC	n.armstrong@						cholas Armstrong -		-		1						
CC	g.crisp@fugro						en Crisp - Project I		No./email								
0	served Weat			Wind	Sw	ell (Hs)	Sea St	ato	Visibility		Weather Forecast						
	Time 00:00		Speed Knts	Dir					-		Treatier Forecast						
	00:00		23	SSW		N/A	smool		good		See Below						
	06:00 12:00		25 22	WSW		N/A N/A	smoo		good good		OCC BOION						
	18:00		22	SW		N/A	smoo		good								
	00:00		22	WSW		N/A	_	smooth good									
			Leg P	enetration (m)				-									
	BH no		1	2	3	4				Operation	onal Status						
	BH05		1.8	1.7	2.5	2.6											
	51100		1.0		2.0	2.0				CD deillie e	demonstrate PUOF						
										CP arilling un	derway on BH05						
						ummary of O	perations / Boreh	ole Drilling -	- last 24hrs:								
	From	To		Hrs (No.)	Code					Descriptio							
	00:00	07:		7.00	Cable Percuss					reak down and swa	ap over bailer						
\vdash	07:00 07:15	07: 08:		0.25 0.75	Other Operation		down clear down for			/ Dayshift transfer	to JUB / TBT & Man Overboard Drill						
\vdash	08:00	12:		4.25	Cable Percuss						20 - 12.50m, large gravels						
	12:15	16:		3.75	Rotary Drilling (C						24.25mCD / Pull all casing to deck						
	16:00	19:	30	3.50	Standby (weath	ner) Await	weather window for	move to BH	05 / Wind over	r operational limits f	for moving & jacking						
											to JUB / TBT & Man Overboard Drill						
	20:15	00:	00	3.75	Standby (weath	ner) Await	weather window for	move to BH	05 / Nightshift	continue to monitor	r						
						_											
					l.		Weather fore	cast									
				Local time	0.00 100 2:00	300 400 50	0 8:00 7:00 8:00 0)	0 10 00 11 00 1	12:00 13:00 14:00	15:00 16:00 17:00 18:00	10.00 20.00 21.00 22.00 23.00						
				Wind direction Wind speed (kts)	aw aw w	M MaM Ma	w waw w w y	w w	M MRM MRM	wsw wsw sw	SW SW WSW WSW						
					54 31 34	34 33 34	\$5 17 \$5 ft	18 17	17 17 15	16 16 15 14	16. 17 18 18 13						
I				Wind gusts (max kts)	00 000	E 36	25 25 2	2 30 20	21 21 21	20 20 21 71	GEV 67 24 67 68						
				Cloud cover	2 2 1	11 11 2											
				Precipitation type		0.3	82 B		0.1 0.1		01 02 1 04						
I				Precipitation (mm / h) Air temperature (*C)	100	100 100	10.00	F 7	0 0	THE PARTY OF	THE RESIDENCE OF THE						
				Feels like (°C)	1 2 2 88 80 80		0 0 0 85 84 83 8		2 2 2 75 81 81	2 3 2 1	t 0 0 0 t						
I				Relative humidity (%) Air pressure (hPa)	DES DES DE4	994 994 983					903 903 903 903 902						
I				Tide type	3 3 3	3 3 7			2 2 2	7 7 7 Y	N N N N 78						
I				Time Tide height (m)	19 23 28	32 35 35		9.56 7 1.6 1.7.	19 22 28	17.03 3.1 3.4 3.6 3.5	2246 3 25 2 18 18						
Healt	Safety & the	Environme	ent														
Met C	ffice: "A low m	noves east r	near Shetland o	n Friday morning to a early on Sunday	hen fills near Norw	ay on Saturd	ay morning. Anoth	er low is expe	ected over Irela	and deepening as it	pushes northeast through the UK. This low continues to						
	Rep: Theo						Client Rep	D :									
Sign	ed:							Signed:									



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

Activity Time S	<u> </u>	Today	To Da	ıto.	D	ay Shift		Night	Shift	Com	pany	Posit	ion	
Mobilisation Activity Time St	Activity Time Summary obilisation					J.	ay Oilli			JUB (mobil		pany	Fosit	
Moving & Jacking			0.00	3.50 24.8		Jimi	my Wilso		Mark	_	Fugro Ge	oServices	Bargem	aster
Rotary Drilling (Coring)			3.75	11.0	_		m Allardy		Adam		Fugro Ge		Drille	
Cable Percussion			11.25	113.2			stin Smith		Ashley L		-	oServices	Assistant	
Standby (Fugro)			0.00	0.00								oServices	Assistant	
Standby (Tide)			0.00	11.5										
Standby (weather)			7.25	110.7		Rich	nard Luke	er	Bart	Kot	Fug	ıro	Geotechnica	l Engineer
Single Shift Standby			0.00	5.75							-			
Other Operations			0.25	10.0	0	The	eo Cleave	е			Fugro Ge	oServices	Project Er	ngineer
Crew Change / TBT			1.50	21.3	3									
			0.00	0.00)									
			0.00	0.00)									
			0.00	0.00)									
			0.00	0.00)									
			0.00	0.00										
			0.00	0.00)									
	т	otal	24.00	24.0	0	No. I	Personn	ol.	g		Total Man Hours		108	
	•	Jiai	24.00	24.0	0	140.1	reisoiiii	CI .	٠	'	Worked		100	
				•								•		
Project Program / P			rogramme			Today			ctual To D			% Prograi	m Completed	
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	0			
General Items, Provisional Services	Α		4.0					l		_	0			400.0
Establish all plant, equipment, crew on site	A2		1.0				l	0.0	1	0.00	0.0			100.0
								0.0	0	0.00	0.0			
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O				0.0	0	87.75	0.0			
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O				0.0	0	11.50	0.0			
								0.0	0	0.00	0.0			
Percussion Boring	В										0.0			
Move boring plant to site of each exploratory ho	e B1		8.00			L		0.0	7	0.00				87.5
Extra over B1 for setting up on a gradient >20%	B2		R/O		Ĺ	L		0.0	0	0.00	0.0			
Break out surface obstructions where present	B3			R/O				0.0	0	0.00	0.0			
Advance BH between groundlevel and 10m dep		80.00			3.00			69.4	0	0.00				86.8
As B4 but between 10m and 20m	B5	36.50			4.50			47.4	0	0.00				
As B4 but between 20m and 30m	B6	R/O						2.1	0	0.00	0.0			
As B4 but between 30m and 40m	B7	R/O						0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction				R/O				0.0	0	9.08	0.0			
	-			100							0.0			
Rotary Drilling	С							0.0	0	0.00	0.0			
			6.00								0.0			83.3
Move rotary plant to site of each exploratory hol		R/O	0.00					0.0	5	0.00	0.0			00.0
RC drilling between groundlevel and 10m depth	C41				0.00			0.0	0	0.00	0.0			
As C41 but between 10m and 20m	C42	20.50			3.00			8.7	0	0.00			42.2	
As C41 but between 20m and 30m	C43	9.50						5.9	0	0.00			61.6	
Core box to be retained by client	C49		21.00					0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
Sampling, Monitoring during investigation	E										0.0			
Small Disturbed Sample	E1		59.00			16		0.0	158	0.00				
Bulk Disturbed Sample	E2		59.00			14		0.0	89	0.00				
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
Insitu Testing	Н										0.0			
Standard Penetration Test in Borehole	H1		40			8		0.0	41	0.00				
Standard Penetration Test in Rotary Drill Hole	H2		R/O					0.0	0	0.00	0.0			
•								0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing	L		1					3.0	Ť	2.00	0.0			
Marine Scotland Sample	L2		121			10		0.0	114	0.00				94.2
	-	1	<u> </u>					0.0	0	0.00	0.0			U T.Z
Additional Items			1					0.0	U	0.00	0.0			
- Maria Italia			1	-			1	0.0	0	0.00	0.0			
		+	+	-		-	 	0.0		0.00	0.0			
		+	1				l	0.0	0	0.00	#			
		-	1	-			-	0.0	0	0.00	0.0			
		_					ļ	0.0	0	0.00	0.0			
			.		_			0.0	0	0.00	0.0			
Health & Safety Su	mmary		Today		Act	tual To [Date				Lost & D	Damaged		
Hoc Cards			1			17		l						
Safety Drills Tool Box Talk			1			7 15		l						
HSE Meeting:			0			1		l						
Incidents/Near N		+	0			0		l						
Environmenta		+	0			0		l						
Hours Worker			108			1536		1						
Fugro GeoServices Representative Com							ent Repr	esentative	Commen	s				
FGSL Rep: Theo Cleave						Cli	ient Re	p:						
FGSL Rep: Theo Cleave Signed:							ient Re	p:						



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

	Job No			C1982		Vessel Skate 3A Date				Friday 15-Mar-19			
То	ANeillings@ar	ch-henderson.	.co.uk			Attn.	Andy Ne	eillings	No./ema	ail 0141 227	3060		
cc		n@arch-hende				Attn.		Shuttleworth	No./ema	l l			
СС	stuart.innes@					Attn.	Stuart Ir	nnes	No./ema				
СС						Attn.			No./ema	ail			
СС	m.chappell@f	ugro.com				Attn.	Mathew	Chappell - Nearshore Mana	ger No./ema	ail			
СС	n.armstrong@	fugro.com				Attn.	Nicholas	s Armstrong - Reporting Man	agei No./ema	ail			
СС	g.crisp@fugro					Attn.	Glen Cri	sp - Project Manager	No./ema	ail			
C	bserved Weath	ner	V	Vind	Qu/	ell (Hs)		Sea State	Visibility			Weather Forecast	
	Time 00:00	Sp	eed Knts	Dir	O.	CII (113)		oca otate	Visibility			Weather Forecast	
	00:00		22	WSW		N/A		smooth	good				
	06:00		25	W		N/A		smooth/slight	good			See Below	
	12:00		38	W		N/A		slight	good				
	18:00		29	W		N/A		slight	good				
	00:00		23	SW		N/A		smooth	good				
			Leg Per	netration (m)						Onor	ational Statu	•	
	BH no.		1	2	3	4				Oper	ational Status	s	
	BH05		1.8	1.7	2.5	2.	6						
	Brios		1.0	1.7	2.5	۷.							
]	,	Awaiting weather	window to m	nove to BH06	
				•	9	ummarv d	f Opera	tions / Borehole Drilling	- last 24hrs				
	From	То		Hrs (No.)	Code	1	,,			Descrip	tion		
	00:00	07:00		7.00	Standby (weath	ner) Aw	ait weath	ner window for move to BH	05 / Nightshi				
	07:00	08:00		1.00	Crew Change /							continue to monitor weather	
_	08:00	11:00		3.00	Standby (weath			board to monitor weather a					
_	11:00	14:00		3.00	Standby (weath			nsfer to shore ahead of fo				red for demobilisation	
	14:00	19:00		5.00	Standby (weath			ntinue to monitor weather					
	19:00	20:00		1.00	Crew Change /							to continue monitoring conditions	
	20:00	00:00		4.00	Standby (weath	ner) Nig	htshift co	ontinue to monitor weather	for opportur	nity to move to BH0	06		
					1			Weather forecast					
				Local time	0.00	2 20F 100		800 700 800 900 10.00 11.00	12.66 12.65 12.0	0 15.00 15.00 17.00 14.00	1900 3200 3100	3765 3166	
				Local time Wind direction		V SW SW			W W W	W W W W	W W W	WEI WEIN	
				Wind speed ((Ats)			24 27 27 30 30	37 SR 33	34 52 10 29	26. 26		
I					12 10	14 15	15 16	20 24 27 27 30 30			et 21	17 14	
I				Wind gusts ()				2 8 8 6 6	6 N H	ST 50 43 4f	Charles and the		
				Cloud cover	10.00	- CT - CR	D D				J J 2	2 1	
I				Precipitation : Precipitation									
I				Precipitation Air temperatu		11 5	5 5	62 63 84 64 62	9 8 8	A LINE	B B B		
I				Feets like (*C	9	1 0	1 2	1 4 4 2 2 2				3 3	
I				Relative hum Air pressure	rang (10)	16 86 7 986 985		63 60 78 75 74 74 584 584 585 586 586 586		71 71 73 75 75 989 990 990 991		294 294	
				Tide type		* *		24 2 2 2 2 2d	7 7 7	A A A A	* 3 3	3 3	
I				Time Tide height ()	18 2	23 27	31 34	11.21		24 28 37 35		25 2	
Hac!	controlled held												
neall	Ith Safety & the Environment												
l	Office: "A low moves east near Shetland on Friday morning then fills near Norway on Saturday morning. Another low is expected over Ireland deepening as it pushes northeast through the UK. This low continues to												
				Friday morning to early on Sunday		ay on Sat	uraay mo	orning. Another low is exp	ectea over Ire	eiana aeepening a	s it pushes no	ortrieast through the UK. This low continues to	
				y on canday	•			lau					
FGS	L Rep: Theo	Cleave						Client Re):				
ei	ad.							Cian - 4.					
Sigr	ieu:							Signed:					



Daily Report No.

14

Nigg Energy Park - Marine Ground Investigation

Activity Time Sum	nary	Т	oday	To Date		Da	ay Shift		Night	Shift	Com	pany	Posi	tion
Mobilisation		_	0.00	3.50						JUB (mobi				
loving & Jacking			0.00	24.83			ny Wilso		Mark		Fugro Ge		Barger	
otary Drilling (Coring)			0.00	11.08			m Allardy		Adam		Fugro Ge		Dril	
able Percussion			0.00	113.25		Jus	tin Smith	1	Ashley L	owthian	Fugro Ge		Assistar	
tandby (Fugro)			0.00	0.00							Fugro Ge	oServices	Assistar	t Driller
tandby (Tide)			0.00	11.50										
tandby (weather)			22.00	132.75		Rich	ard Luke	er	Bart	Kot	Fug	ro	Geotechnic	al Engineer
ingle Shift Standby			0.00	5.75										
ther Operations			0.00	10.00		The	o Cleave	9			Fugro Ge	oServices	Project E	ngineer
rew Change / TBT			2.00	23.33										
			0.00	0.00										
			0.00	0.00	_									
			0.00	0.00	_									
			0.00	0.00	_									
			0.00	0.00	-									
			0.00	0.00							Total Man	ı		
	Tota	al 2	24.00	24.00		No. I	Personn	el	9)	Hours		108	
											Worked			
Project Program / Prog	ress	Pre	ogrammed	1		Today		Δ.	Actual To D	ate		% Program	n Completed	
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	1	/01 logial	ii Compicica	
eneral Items, Provisional Services	Α										0			
stablish all plant, equipment, crew on site	A2		1.0					0.0	1	0.00				100
an plain, equipment, frew on aire	- FIL							0.0	0	0.00	0.0			
anding Time for plant, crew, etc - WEATHER	B11 C19			R/O			22.00	0.0	0	132.75	0.0			
tanding Time for plant, crew, etc - WEATHER tanding Time for plant, crew, etc - TIDE	B11 C19			R/O	-+		50	0.0	0	11.50	0.0			
arrowing rime for plant, crew, etc - TIDE	011 019							0.0	0	0.00	0.0			
ercussion Boring	В			+	-+			0.0	U	0.00	0.0			
ercussion Boring ove boring plant to site of each exploratory hole	B B1		8.00		-+					0.00	0.0			87
	B1 B2		8.00 R/O				-	0.0	7	0.00	0.0			0/
eak out surface obstructions where present			K/U	R/O				0.0	0	0.00	0.0			
	B3	00.00		R/O				0.0	0	0.00	0.0			00
dvance BH between groundlevel and 10m depth	B4	80.00		\vdash				69.4	0	0.00				86.
s B4 but between 10m and 20m	B5	36.50		\vdash				47.4	0	0.00				
s B4 but between 20m and 30m	B6	R/O						2.1	0	0.00	0.0			
s B4 but between 30m and 40m	B7	R/O						0.0	0	0.00	0.0			
dvance BH through hard stratum or obstruction	B9			R/O				0.0	0	9.08	0.0			
								0.0	0	0.00	0.0			
otary Drilling	С										0.0			
love rotary plant to site of each exploratory hole	C15		6.00					0.0	5	0.00				83.3
C drilling between groundlevel and 10m depth	C41	R/O						0.0	0	0.00	0.0			
s C41 but between 10m and 20m	C42	20.50						8.7	0	0.00		4	12.2	
s C41 but between 20m and 30m	C43	9.50						5.9	0	0.00			61.6	
ore box to be retained by client	C49		21.00					0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
ampling, Monitoring during investigation	Е										0.0			
imall Disturbed Sample	E1		59.00					0.0	158	0.00				
ulk Disturbed Sample	E2		59.00					0.0	89	0.00				
arge Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
situ Testing	Н										0.0			
tandard Penetration Test in Borehole	H1		40					0.0	41	0.00				
tandard Penetration Test in Rotary Drill Hole	H2		R/O		-+			0.0	0	0.00	0.0			
, <u>-</u>	1							0.0	0	0.00	0.0			
ecenvironmental Laboratory Testing	L							5.0		5.00	0.0			
larine Scotland Sample	L2		121		-+			0.0	114	0.00				9
			.21	 	-+						0.0			
dditional Items				\vdash				0.0	0	0.00	0.0			
				\vdash				0.0	0	0.00	0.0			
	+			+	-+			0.0	0	0.00	0.0			
	+			\vdash	-+			0.0	0	0.00	0.0			
	+			\vdash	-+						0.0			
	+			1	-+			0.0	0	0.00	0.0			
Health & Safety Sumn	iary		Today	+	Actu	ıal To E	ate	0.0	U	0.00	Lost & D	amaged		
Hoc Cards	,		10uay		ACIU	18	-410				LUSI & L	unugeu		
Safety Drills			0			7								
Tool Box Talks			1			16								
HSE Meetings			0			1								
Incidents/Near Miss			0			0								
Environmental			0			0								
Hours Worked			108			1644								
	nts		100				ent Repr	esentativ	e Commen	ts				
Eugro GeoServices Representative Comme														
Fugro GeoServices Representative Commo							ent Re	p:						



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

	Job No			C1982		Vessel	Skate 3A	A		Date	Saturday 16-Mar-19	
То	ANeillings@a	rch-henderso	n.co.uk			Attn. Ar	dy Neillings	N	No./email	0141 227 306	0	
СС	mshuttleworl	th@arch-henc	lerson.co.uk				chael Shuttleworth	N	No./email		1	
СС	stuart.innes@	gegroup.com	L			Attn. Sto	uart Innes	N	No./email			
СС						Attn.		N	No./email			
СС	m.chappell@	fugro.com				Attn. M	athew Chappell - Nearshore	e Manager N	No./email			
СС	n.armstrong@	@fugro.com				Attn. Ni	cholas Armstrong - Reporti	ing Managei N	No./email			
СС	g.crisp@fugro					Attn. Gl	en Crisp - Project Manager	N	No./email			
0	bserved Weat			/ind	Sw	ell (Hs)	Sea State	Vis	sibility		Weather Forecast	
	Time 00:00	S	peed Knts	Dir								
	00:00		23	SW		N/A	smooth		good		See Below	
	06:00		11	SW		N/A	smooth		good		OCC BOIOW	
	12:00 18:00		8	NE NNW		N/A N/A	smooth		good			
-	00:00		22	NW		N/A	smooth smooth		good			
	00.00					10/1	Sillouti	<u> </u>	jood			
			1	etration (m)						Operatio	nal Status	
	BH no		1	2	3	4						
	BH05	j	1.8	1.7	2.5	2.6						
	BH06	;	3.2	5.2	3.4	2.9			Aw	aiting weather wir	ndow to move to BH06	
									0.41			
	_					ummary of C	perations / Borehole D	rilling - last	24nrs:			
	From	To		Hrs (No.)	Code Standby (weeth	or) Aliebi	hift continue to'	unatha-f	nnort := "	Description	1	
<u> </u>	00:00 04:20	04:3		4.50 2.08	Standby (weath Moving & Jack		hift continue to monitor w				/ Preload and jack up to safe working height	
\vdash	06:25			0.83	Other Operation		e drill deck for operation					
	07:15	07:15 0.83 07:45 0.50			Crew Change /						o JUB / TBT on CP Operations	
	07:45	18:45 11.00			Cable Percuss		casing to -9.60mCD/ Co				•	
	18:45	19:1		0.50	Other Operation		and wash down deck for					
	19:15	20:0	0	0.75	Crew Change /	TBT Daysh	ift transfer to shore / Han	ndover on CT	TV Quay /	Nightshift transfer t	to JUB / TBT on CP Operations	
	20:00 00:00 4.00 Cable Percussion Continue CP drilling from 10.50m to 15.00m BML / E.O.H @ -24.6mCD											
-						_						
						_						
-												
				ш			Weather forecast					
				Local time	0.00 1.00 2.00	300 400 500	600 700 800 900 1000	11.00 12.00 13.0	08 14:00 15:	00 16:00 17:00 18:00 19:	00 2000 21:00 22:00 23:00	
				Wind direction	WSW WSW WSW							
				Wind speed (kts)	13 14 13	11 10 10	9 9 7 5 1				10 11 14 15	
1										8 7 9		
				Wind gusts (max kts)	0.00	0 0 0					- 1 0 5 0	
				Cloud cover Precipitation type	50. 50. 50	Sec. 35. 50	0 0 0 0		3 0 0	4 4 3		
				Precipitation (mm / h)			01 03 04 03	0.2 0.1		93 16 9	4 0.3	
				Air temperature (°C) Feets like (°C)	1 1 1	0 0 0	0 -1 0 0 1	3 4 2	2 2 2	2 1 1 2	-1 -1 -1 -1	
				Relative humidity (%)	82 82 84	54 80 52	86 91 93 95 94	92 88 85	5 82 75	74 80 92 8	8 87 82 79 78	
1				Air pressure (hPa)		100 900 501	991 990 990 989 988	988 987 998				
				Tide type Time	0.52	4 3 4	25 27 N N N	3 3 3	14.01		1941	
<u> </u>				Tide height (m)	19 18 19	21 25 3	3.3 3.4 3.3 2.9 2.5	21 18 17	7 1.6 1.7	21 26 32 3		
Healt	h Safety & the	Environmen	t									
			ves NE across I	reland the centra	I UK and into the	North Sea too	lay and then into souther	rn Scandinav	via on Sun	day. A ridge of high	h pressure then topples across the UK and surrounding	
	s from the wes											
FGS	L Rep: Theo	o Cleave					Clier	nt Rep:				
e;	od.						G!	ad.				
Sign	ea:						Sign	iea:				



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

Activity Time Su	_	To	oday	To Da	to		ay Shift		Night	Shift	Com	nany	Position		
	obilisation							ay Sillit			JUB (mobil		parry	Fosition	
Moving & Jacking				.00	3.50 26.7		.lim	my Wilso		Mark		Fugro Ge	oServices	Bargemast	er
Rotary Drilling (Coring)				.00	11.0	_		ım Allardy		Adam		Fugro Ge		Driller	
Cable Percussion				5.00	128.2			stin Smith		Ashley L		Fugro Ge		Assistant Dri	iller
Standby (Fugro)				.00	0.00			our ornic		7101110 / 2	owenan	Fugro Ge		Assistant Dri	
Standby (Tide)				.00	11.5										
Standby (weather)				.50	137.2		Rich	hard Luke	er	Bart	Kot	Fug	iro	Geotechnical Er	naineer
Single Shift Standby				.00	5.75								,		
Other Operations				.33	11.3		The	eo Cleave	9			Fugro Ge	oServices	Project Engir	neer
Crew Change / TBT				.25	24.5							-		, ,	
-				.00	0.00										
			0.	.00	0.00)									
			0.	.00	0.00)									
			0.	.00	0.00)									
			0.	.00	0.00)									
			0.	.00	0.00)									
												Total Man			
		Total	24	4.00	24.0	0	No.	Personn	el	9)	Hours Worked		108	
		_	_		_	_						Worked	_		
Project Program / P			Prog	grammed	t		Today	,	Α	ctual To D			% Program	m Completed	
Activity	BoQ Item		m.	No.	Hours	m.	No.	Hours	m.	No.	Hours				
General Items, Provisional Services	Α											0			
Establish all plant, equipment, crew on site	A2			1.0					0.0	1	0.00				100.0
									0.0	0	0.00	0.0			
Standing Time for plant, crew, etc - WEATHER	B11 C19				R/O	L	L	4.50	0.0	0	137.25	0.0			
Standing Time for plant, crew, etc - TIDE	B11 C19				R/O				0.0	0	11.50	0.0			
									0.0	0	0.00	0.0			
Percussion Boring	В											0.0			
Move boring plant to site of each exploratory ho		_		8.00			1		0.0	8	0.00				100.0
Extra over B1 for setting up on a gradient >20%		\dashv		R/O					0.0	0	0.00	0.0			
Break out surface obstructions where present	B3	-			R/O				0.0	0	0.00	0.0			
		Q.	0.00		100	10.00						0.0			99.3
Advance BH between groundlevel and 10m dep As B4 but between 10m and 20m	tn 84		6.50			5.00			79.4	0	0.00				99.0
						5.00			52.4	0	0.00	0.0			
As B4 but between 20m and 30m	B6		R/O						2.1	0	0.00	0.0			
As B4 but between 30m and 40m	B7		R/O						0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	n B9				R/O			1.50	0.0	0	10.58	0.0			
									0.0	0	0.00	0.0			
Rotary Drilling	С											0.0			
Move rotary plant to site of each exploratory hol-	e C15			6.00			1		0.0	6	0.00				100.0
RC drilling between groundlevel and 10m depth	C41	F	R/O						0.0	0	0.00	0.0			
As C41 but between 10m and 20m	C42	20	0.50						8.7	0	0.00			42.2	
As C41 but between 20m and 30m	C43	9	9.50						5.9	0	0.00			61.6	
Core box to be retained by client	C49			21.00					0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
Sampling, Monitoring during investigation	Е											0.0			
Small Disturbed Sample	E1	_		59.00			15		0.0	173	0.00				
Bulk Disturbed Sample	E2	_		59.00			15		0.0	104	0.00				
Large Bulk disturbed sample	E3	_		R/O					0.0	0	0.00	0.0			
Eargo Bank diotarbod campio									0.0	0	0.00	0.0			
Insitu Testing	н								0.0	U	0.00	0.0			
Standard Penetration Test in Borehole	H1			40			8		0.0	49	0.00	0.0			
Standard Penetration Test in Boteriole Standard Penetration Test in Rotary Drill Hole	H2	-		R/O			0					0.0			
Standard Penetration Test III Notary Drill Hole	112			NO					0.0	0	0.00	#			
Commissionmental transfer T									0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing	L			407			_					0.0			
Marine Scotland Sample	L2			121		!	5		0.0	119	0.00	0.0			98.3
									0.0	0	0.00	0.0			
Additional Items												0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
Health & Safety Su	nmary			Today		Act	tual To I	Date				Lost & D	Damaged		
Hoc Cards				1			19								
Safety Drills	_			0			7								
Tool Box Talk				1			17								
HSE Meetings				0			1								
Incidents/Near N				0			0								
Environmenta				0			0								
Hours Worker Fugro GeoServices Representative Com				108			1752			Commen					
	no decontracts representative comments														
FGSL Rep: Theo Cleave							CI	ient Re	p:						
								ient Re	p:						



Nigg Energy Park - Marine Ground Investigation

Daily Report No.

	Job No				C1982		Vess	el	Skate 3A		Date	Sunday 17-Mar-19				
То	ANeillings@ar	rch-hend	erson.co.u	ık			Attn.	Andy Ne	Andy Neillings No./email 0141 227 3060							
СС	mshuttlewort						Attn.		Shuttleworth	No./ema						
СС	stuart.innes@							Stuart I		No./ema						
CC	scaar cirries@	ъсві Оир.					Attn.	otudit II		No./ema						
		_														
cc	m.chappell@f		_						Chappell - Nearshore Mana							
CC	n.armstrong@	fugro.co	<u>m</u>				Attn.	Nichola	s Armstrong - Reporting N	lana No./ema	ail					
СС	g.crisp@fugro	.com					Attn.	Glen Cr	isp - Project Manager	No./ema	ail					
	bserved Weath	her		٧	Vind					•						
	Time 00:00		Speed		Dir	Sw	ell (Hs)		Sea State	Visibility		Weather Forecast				
							NI/A	-								
	00:00		25		NW		N/A	_	smooth	good		See Below				
	06:00		21		NW		N/A		smooth	good		See Below				
	12:00		26	3	NNW		N/A		smooth/slight	good						
	18:00		27	7	NW		N/A		smooth/slight	good						
	00:00		16		WSW		N/A		smooth	good						
										3						
				Leg Per	netration (m)						Operation	onal Status				
	BH no.			1	2	3	4				Орстан	onai otatas				
			_													
	BH06			3.2	5.2	3.4	2.9									
												and pulling casing.				
			_						l	Awaiti	ing weather window	v to move to park up location				
							ummary of	Onoro	tions / Borehole Drilling	last 24hra						
							uniniary Of	Spera	rous a porenois prining	- iast 241115:						
	From		То		Hrs (No.)	Code					Descriptio					
	00:00	0	3:00		3.00	Other Operation	ns Pull	all casir	ng to deck / Break casing o	down onto sti	illages / Clear down a	and fuel all plant				
	03:00	0	7:30		4.50	Standby (weath	ner) Awa	it weath	er window for move to par	k up location	n / Nightshift continue	to monitor				
	07:30		8:00		0.50	Crew Change /			ansfer to shore / Handove							
\vdash	08:00		9:00	_	11.00	Standby (weath			er window for move to par							
<u> </u>	19:00		9:30	_	0.50	Crew Change /					., Jayanin continue t	to monitor				
├				_		,	,		nsfer to shore for end of sh		/ Nichardin C :					
	19:30	0	0:00		4.50	Single Shift Star	ndby No f	Nightshi	ft as crew prepares for der	nobilisation /	/ Nightshift resting to	change shift pattern				
							_									
\vdash		1		-			-+									
_																
								,	Weather forecast							
				Local tim					00 9:00 10:00 11:00 12:00 13:00							
				Wind dire		W W W	IN MAN MA	NW NN	W NNW NNW N NNW NNW	NNW NNW NN	W NW NW NW NW	NW NW WSW				
				Wind spe	eed (kts)	20 22 22 1	-13		7 15 16 20 19 19	21 22 21	80 er 80 er					
					16		10 14	13 1	15 16 20 19 19		19 17 30 17	15 10 7				
				Wind	ists (max kts) 27	2 2 2	29	1 2	4 27 24 30 32	20 70 70	2 2 2 2					
				Cloud co							9 28 20 27 76					
					ation type		0		0 0 0	-13 27 15						
					ation (mm/h) 9.2		0.1		2 01 01 02							
				Air tempe	erature (°C)		1 1		1 4 4 1 4 4	0.00	1 1 1 1 1 1 1	DE LOS DESCRIPTIONS DE LA CONTRACTOR DE				
				Feels Mo		2 2 2 3		06		0 0 0		-3 -1 0				
					humidity (%) 82							78. 79 77				
				Air press Tide type			-		7 980 901 993 996 996	998 1000 100	01 1002 1004 1005 1006	1907 1008 1009				
				Tide type Time	3	A N 74	4 4	4 3			R R R R.	27 3 N				
				Tide heig	ght (m)	242	24 24	24 3	24 6 35 32 27 21 17	15 22	1 18 25 12 12	2108				
Hea!	h Safety & the	Environ	mont		121	- W - W - C	44 .44	J-0 3	e e e e e	Gr. 10 14	10 40 32 35					
riedit	ii Jaiety & the	Liviioni	ment													
	ghtshift as cre															
					ow move to coir	ncide with benine	forecast o	n Mond	lay.							
rus	L Rep: Theo	Cleave	9						Client Rep):						
									1							
Sign	ed:								Signed:							



Daily Report No.

16

Nigg Energy Park - Marine Ground Investigation

					_									
Activity Time Su	mmary		Today	To Dat		Da	ay Shift		Night		Com	pany	Posit	ion
Mobilisation			0.00	3.50	_					JUB (mobil			-	
Moving & Jacking			0.00	26.75			my Wilso		Mark		Fugro Ge		Bargen	
Rotary Drilling (Coring)			0.00	11.08			m Allardy		Adam		Fugro Ge		Drill	
Cable Percussion			0.00	128.2	_	Jus	stin Smith	1	Ashley L	owthian.	Fugro Ge		Assistant	
Standby (Fugro)			0.00	0.00							Fugro Ge	oServices	Assistant	Driller
Standby (Tide)		_	0.00	11.50										
Standby (weather)			15.50	152.75		Rich	nard Luke	er	Bart	Kot	Fug	ro	Geotechnica	l Engineer
Single Shift Standby			4.50	10.25										
Other Operations			3.00	14.33		The	eo Cleave	9			Fugro Ge	oServices	Project E	ngineer
Crew Change / TBT			1.00	25.58	1									
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
	_										Total Man			
	To	tal	24.00	24.00)	No. F	Personn	el	9)	Hours		108	
				L .							Worked	ļ		
Project Program / Pr	ogress	Pr	ogramme	t		Today		Δ	ctual To D	ate		% Program	n Completed	
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours				
General Items, Provisional Services	A										0			
Establish all plant, equipment, crew on site	A2	1	1.0					0.0	1	0.00				100
Localism an praint, equipment, crew on site	MZ MZ	1		1					0		0.0			
	p	1	1	R/O			15.50	0.0		0.00	0.0			
Standing Time for plant, crew, etc - WEATHER	B11 C19	1	1				15.50	0.0	0	152.75	11			
Standing Time for plant, crew, etc - TIDE	B11 C19	1		R/0				0.0	0	11.50	0.0			
								0.0	0	0.00	0.0			
Percussion Boring	В									<u> </u>	0.0			
Move boring plant to site of each exploratory hol	e B1	<u> </u>	8.00				oxdot	0.0	8	0.00				100
Extra over B1 for setting up on a gradient >20%	B2		R/O					0.0	0	0.00	0.0			
Break out surface obstructions where present	B3	1		R/O				0.0	0	0.00	0.0			
Advance BH between groundlevel and 10m dept		80.00						79.4	0	0.00				99.
As B4 but between 10m and 20m	B5	36.50		1		1			0					50
As B4 but between 10m and 20m As B4 but between 20m and 30m	B6	R/O		1		1		52.4		0.00	0.0			
				⊢ I		1		2.1	0	0.00	4			
As B4 but between 30m and 40m	B7	R/O						0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	B9	1		R/O				0.0	0	10.58	0.0			
]						0.0	0	0.00	0.0			
Rotary Drilling	С			<u> </u>]				0.0			
Move rotary plant to site of each exploratory hole	C15	1	6.00					0.0	6	0.00				100.
RC drilling between groundlevel and 10m depth	C41	R/O						0.0	0	0.00	0.0			
As C41 but between 10m and 20m	C42	20.50				1		8.7	0	0.00		4	12.2	
As C41 but between 10m and 20m As C41 but between 20m and 30m	C42	9.50		 									61.6	
	C43	9.50	24.00	1		1		5.9	0	0.00	0.0		01.0	
Core box to be retained by client	C49	1	21.00					0.0	0	0.00				
		1				-		0.0	0	0.00	0.0			
Sampling, Monitoring during investigation	E										0.0			
Small Disturbed Sample	E1	1	59.00					0.0	173	0.00				
Bulk Disturbed Sample	E2	<u> </u>	59.00					0.0	104	0.00				
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0			
		_						0.0	0	0.00	0.0			
Insitu Testing	Н										0.0			
Standard Penetration Test in Borehole	H1	1	40					0.0	49	0.00				
Standard Penetration Test in Rotary Drill Hole	H2	1	R/O					0.0	0	0.00	0.0			
,		1		1		1		0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing		1	<u> </u>	 		1		0.0		0.00	0.0			
	L2	1	121						440	0.00	0.0			98
Marine Scotland Sample	L2	+	121			-		0.0	119	0.00	0.0			98.
A delite and the second		1		1		-		0.0	0	0.00	0.0			
Additional Items				 							0.0			
		1	1					0.0	0	0.00	0.0			
		1						0.0	0	0.00	0.0			
				╚			$oxedsymbol{oxedsymbol{oxed}}$	0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
		1						0.0	0	0.00	0.0			
Health & Safety Sur	nmary		Today		Ac	tual To E	Date				Lost & D	amaged		
Hoc Cards			1			20								
Safety Drills		1	0			7								
Tool Box Talks	;		1			18								
HSE Meetings			0			1								
Incidents/Near M		1	0			0								
Environmenta		1	0			0								
Hours Worked		1	108			1860								
Fugro GeoServices Representative Com		•					ent Repr	esentativ	e Commen	ts				
FGSL Rep: Theo Cleave						Cli	ent Re	p:						
FGSL Rep: Theo Cleave							ent Rep	p:						

MEAN POSITION REPORT



Geodetic Parameters

Name - OSCR 4025 / British National Crid (OSCR LIV Chr02 NT)										
Name : OSGB 1936 / British National Grid [C	•									
EPSG Code	EPSG::27700									
Local Geodetic Datum Parameters										
Datum	OSGB 1936	EPSG::6277								
Ellipsoid	Airy 1830									
Semi major axis a = 6,377,563.396 m										
Inverse flattening 1/f = 299.3249646										
Datum Transformation Parameters from ETRS89 to OSGB 1936										
OSGB 1936 to ETRS89 (1)										
Latitude and longitude difference file	OSTN02_NTv2.gsb									
Local Projection Parameters										
Map Projection	Transverse Mercator									
Grid System	British National Grid	EPSG::19916								
Latitude Origin	49°00'00.000"N									
Central Meridian	002°00'00.000"W									
Scale Factor on Central Meridian	0.999601272									
False Easting	400,000 m									
False Northing	-100,000 m									

MEAN POSITION REPORT



Project ID	C1982										
Project Name 192186 Nigg East Quay Development											
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg								
Client	Fugro Geoservices Ltd	Vessel	Skate 3A								
Comment											

Session Name: 20190303-160430 Records Used: 301 of 301
Start Time: 03 Mar 2019, 16:05:44+00:00 End Time: 03 Mar 2019, 16:10:45+00:00 Session Length: 00:05:01

Mean Position for Skate 3A CommonReferencePoint			
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)	
Latitude	57°41'39.38423"N	57°41'38.33184"N	
Longitude	004°01'27.88485"W	004°01'32.89565"W	
Height	56.111m Ell.	56.111m Ell.	
Easting	279,342.906m E(SD: ±0.01m)		
Northing	868,934.747m N(SD: ±0.02m)		
Height	3.295m Ort. (SD: ±0.03m Ort.)		

Sensors	Sensor Averages	SD
Heading	5.61°T 7.32°G	±0.1°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Position to Waypoint			
Waypoint BH2			
Easting 279,344.000m E			
Northing 868,935.000m N			
Range 1.12m Geodetic			
Bearing TO	75.28°True		
Bearing FROM	255.28°True		

Jimmy Wilson Barge/Rig Superintendent FGSL (Fugro GeoServices Ltd UK) Theo Cleave Site Manager/Supervisor Fugro Geoservices Ltd

MEAN POSITION REPORT



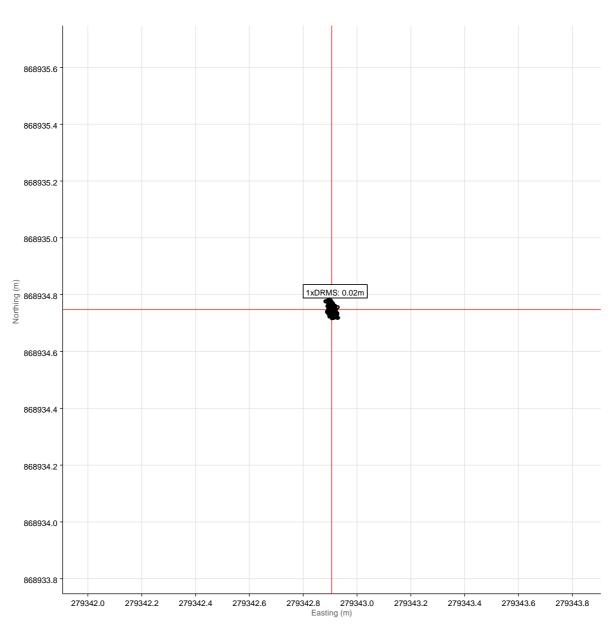
Geodetic Parameters

Name : OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]				
EPSG Code	EPSG::27700	-		
Local Geodetic Datum Parameters				
Datum	OSGB 1936	EPSG::6277		
Ellipsoid	Airy 1830			
Semi major axis	a = 6,377,563.396 m			
Inverse flattening	1/f = 299.3249646			
Datum Transformation Parameters from	Datum Transformation Parameters from ETRS89 to OSGB 1936			
OSGB 1936 to ETRS89 (1)	NTv2	EPSG::5338		
Latitude and longitude difference file	OSTN02_NTv2.gsb	OSTN02_NTv2.gsb		
Local Projection Parameters				
Map Projection	Transverse Mercator			
Grid System	British National Grid	EPSG::19916		
Latitude Origin	49°00'00.000"N			
Central Meridian	002°00'00.000"W	002°00'00.000"W		
Scale Factor on Central Meridian	0.999601272			
False Easting	400,000 m			
False Northing	-100,000 m			

MEAN POSITION REPORT



Scatter Plot



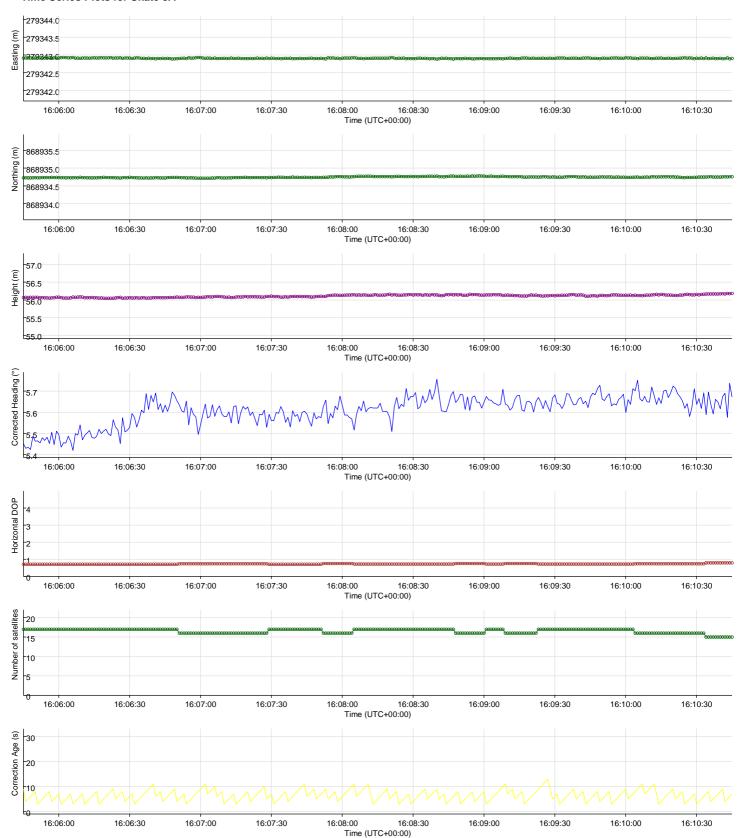
Mean Position

	Easting	Northing
Skate 3A	279,342.906m E	868.934.747m N

MEAN POSITION REPORT



Time Series Plots for Skate 3A



MEAN POSITION REPORT



Project ID	C1982		
Project Name	192186 Nigg East Quay Development	,	
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 6.90m, DTW = 2.40m Deck Height Above CD = 6.15m		

Session Name: MorganMap 20190308-131604 Records Used: 291 of 301
Start Time: 08 Mar 2019, 13:16:04+00:00 End Time: 08 Mar 2019, 13:21:05+00:00 Session Length: 00:05:01

Mean Position for Skate 3A CommonReferencePoint			
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)	
Latitude	57°41'38.95397"N	57°41'37.90167"N	
Longitude	004°01'25.58768"W	004°01'30.59877"W	
Height	56.815m Ell.	56.815m Ell.	
Easting	279,380.533m E(SD: ±0.01m)		
Northing	868,920.311m N(SD: ±0.02m)		
Height	4.001m Ort. (SD: ±0.02m Ort.)		

Sensors	Sensor Averages	SD
Heading	44.11°T 45.83°G	±0.0°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Position to Waypoint			
Waypoint BH3			
Easting 279,382.000m E			
Northing 868,920.000m N			
Range 1.50m Geodetic			
Bearing TO	100.25°True		
Bearing FROM	280.25°True		

Jimmy Wilson

Party Chief

FGSL (Fugro GeoServices Ltd UK)

Theo Cleave
Party Chief

Fugro Geoservices Ltd

MEAN POSITION REPORT



Geodetic Parameters

Name : OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]				
EPSG Code	EPSG::27700			
Local Geodetic Datum Parameters				
Datum	OSGB 1936	OSGB 1936 EPSG::6277		
Ellipsoid	Airy 1830			
Semi major axis	a = 6,377,563.396 m			
Inverse flattening	1/f = 299.3249646			
Datum Transformation Parameters from	ETRS89 to OSGB 1936			
OSGB 1936 to ETRS89 (1)	NTv2	NTv2 EPSG::5338		
Latitude and longitude difference file	OSTN02_NTv2.gsb	OSTN02_NTv2.gsb		
Local Projection Parameters				
Map Projection	Transverse Mercator			
Grid System	British National Grid	EPSG::19916		
Latitude Origin	49°00'00.000"N	49°00'00.000"N		
Central Meridian	002°00'00.000"W	002°00'00.000"W		
Scale Factor on Central Meridian	0.999601272	0.999601272		
False Easting	400,000 m			
False Northing	-100,000 m			

MEAN POSITION REPORT



Project ID	C1982		
Project Name	192186 Nigg East Quay Development		
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 10.00m, DTW = 4.60m Deck Height Above CD = 7.98m		

Session Name: MorganMap 20190311-023904 Records Used: 301 of 301
Start Time: 11 Mar 2019, 02:39:04+00:00 End Time: 11 Mar 2019, 02:44:05+00:00 Session Length: 00:05:01

Mean Position for Skate 3A CommonReferencePoint			
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)	
Latitude	57°41'37.36438"N	57°41'36.31226"N	
Longitude	004°01'25.48464"W	004°01'30.49567"W	
Height	58.729m Ell.	58.729m Ell.	
Easting	279,380.771m E(SD: ±0.01m)		
Northing	868,871.120m N(SD: ±0.02m)		
Height	5.915m Ort. (SD: ±0.02m Ort.)		

Sensors	Sensor Averages	SD
Heading	27.61°T 29.32°G	±0.1°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Position to Waypoint		
Waypoint	BH4	
Easting	279,382.000m E	
Northing	868,872.000m N	
Range	1.51m Geodetic	
Bearing TO	52.68°True	
Bearing FROM	232.68°True	

Jimmy Wilson

Party Chief

FGSL (Fugro GeoServices Ltd UK)

Theo Cleave
Party Chief
Fugro Geoservices Ltd

MEAN POSITION REPORT



Geodetic Parameters

Name : OSGB 1936 / British National Gri	d [OSGB-UK Gbr02 NT]		
EPSG Code	EPSG::27700	EPSG::27700	
Local Geodetic Datum Parameters			
Datum	OSGB 1936	EPSG::6277	
Ellipsoid	Airy 1830		
Semi major axis	a = 6,377,563.396 m		
Inverse flattening	1/f = 299.3249646		
Datum Transformation Parameters from	ETR\$89 to OSGB 1936		
OSGB 1936 to ETRS89 (1)	NTv2	EPSG::5338	
Latitude and longitude difference file	OSTN02_NTv2.gsb	OSTN02_NTv2.gsb	
Local Projection Parameters			
Map Projection	Transverse Mercator		
Grid System	British National Grid	British National Grid EPSG::19916	
Latitude Origin	49°00'00.000"N	49°00'00.000"N	
Central Meridian	002°00'00.000"W	002°00'00.000"W	
Scale Factor on Central Meridian	0.999601272	0.999601272	
False Easting	400,000 m		
False Northing	-100,000 m	-100,000 m	

MEAN POSITION REPORT



Project ID	C1982		
Project Name	192186 Nigg East Quay Development		
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 12.50m, DTW = 3.20m Deck Height Above CD = 5.75m		

Session Name: MorganMap 20190313-174839 Records Used: 296 of 301 Start Time: 13 Mar 2019, 17:48:39+00:00 End Time: 13 Mar 2019, 17:53:39+00:00 Session Length: 00:05:00

Mean Position for Skate 3A CommonReferencePoint		
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)
Latitude	57°41'35.68569"N	57°41'34.63376"N
Longitude	004°01'25.45040"W	004°01'30.46137"W
Height	56.419m Ell.	56.419m Ell.
Easting	279,379.788m E(SD: ±0.01m)	
Northing	868,819.209m N(SD: ±0.02m)	
Height	3.605m Ort. (SD: ±0.04m Ort.)	

Sensors	Sensor Averages	SD
Heading	55.42°T 57.13°G	±0.0°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Position to Waypoint		
Waypoint	BH5	
Easting	279,367.000m E	
Northing	868,808.000m N	
Range	17.01m Geodetic	
Bearing TO	227.05°True	
Bearing FROM	47.05°True	

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Theo Cleave
Party Chief

Fugro Geoservices Ltd

MEAN POSITION REPORT



Geodetic Parameters

Name : OSGB 1936 / British National Gri	d [OSGB-UK Gbr02 NT]		
EPSG Code	EPSG::27700	EPSG::27700	
Local Geodetic Datum Parameters			
Datum	OSGB 1936	EPSG::6277	
Ellipsoid	Airy 1830		
Semi major axis	a = 6,377,563.396 m		
Inverse flattening	1/f = 299.3249646		
Datum Transformation Parameters from	ETR\$89 to OSGB 1936		
OSGB 1936 to ETRS89 (1)	NTv2	EPSG::5338	
Latitude and longitude difference file	OSTN02_NTv2.gsb	OSTN02_NTv2.gsb	
Local Projection Parameters			
Map Projection	Transverse Mercator		
Grid System	British National Grid	British National Grid EPSG::19916	
Latitude Origin	49°00'00.000"N	49°00'00.000"N	
Central Meridian	002°00'00.000"W	002°00'00.000"W	
Scale Factor on Central Meridian	0.999601272	0.999601272	
False Easting	400,000 m		
False Northing	-100,000 m	-100,000 m	

MEAN POSITION REPORT



Project ID	C1982		
Project Name	192186 Nigg East Quay Development		
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 13.80m, DTW = 2.30m Deck Height Above CD = 4.20m		

Session Name: MorganMap 20190316-100855 Records Used: 301 of 301 Start Time: 16 Mar 2019, 10:08:56+00:00 End Time: 16 Mar 2019, 10:13:56+00:00 Session Length: 00:05:00

Mean Position for Skate 3A CommonReferencePoint		
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)
Latitude	57°41'33.34574"N	57°41'32.29407"N
Longitude	004°01'25.20824"W	004°01'30.21914"W
Height	54.946m Ell.	54.946m Ell.
Easting	279,381.637m E(SD: ±0.01m)	
Northing	868,746.754m N(SD: ±0.01m)	
Height	2.133m Ort. (SD: ±0.03m Ort.)	

Sensors	Sensor Averages	SD
Heading	88.51°T 90.22°G	±0.0°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Position to Waypoint		
Waypoint	BH6	
Easting	279,382.000m E	
Northing	868,746.000m N	
Range	0.84m Geodetic	
Bearing TO	152.56°True	
Bearing FROM	332.56°True	

Jimmy Wilson

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Theo Cleave
Party Chief

Fugro Geoservices Ltd

MEAN POSITION REPORT



Geodetic Parameters

Name : OSGB 1936 / British National Gri	d [OSGB-UK Gbr02 NT]			
EPSG Code	EPSG::27700	EPSG::27700		
Local Geodetic Datum Parameters				
Datum	OSGB 1936	EPSG::6277		
Ellipsoid	Airy 1830			
Semi major axis	a = 6,377,563.396 m			
Inverse flattening	1/f = 299.3249646			
Datum Transformation Parameters from	ETR\$89 to OSGB 1936			
OSGB 1936 to ETRS89 (1)	NTv2	EPSG::5338		
Latitude and longitude difference file	OSTN02_NTv2.gsb	OSTN02_NTv2.gsb		
Local Projection Parameters				
Map Projection	Transverse Mercator			
Grid System	British National Grid	EPSG::19916		
Latitude Origin	49°00'00.000"N	49°00'00.000"N		
Central Meridian	002°00'00.000"W	002°00′00.000"W		
Scale Factor on Central Meridian	0.999601272	0.999601272		
False Easting	400,000 m	400,000 m		
False Northing	-100,000 m	-100,000 m		

MEAN POSITION REPORT



Project ID	C1982		
Project Name	192186 Nigg East Quay Development		
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 11.20m, DTW = 6.40m Deck Height Above CD = 7.19m		

Session Name: MorganMap 20190307-201214 Records Used: 299 of 301 Start Time: 07 Mar 2019, 20:12:14+00:00 End Time: 07 Mar 2019, 20:17:14+00:00 Session Length: 00:05:00

Mean Position for Skate 3A CommonReferencePoint		
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)
Latitude	57°41'33.41635"N	57°41'32.36476"N
Longitude	004°01′21.01763″W	004°01'26.02909"W
Height	57.844m Ell.	57.844m Ell.
Easting	279,451.072m E(SD: ±0.01m)	
Northing	868,746.866m N(SD: ±0.01m)	
Height	5.035m Ort. (SD: ±0.02m Ort.)	

Sensors	Sensor Averages	SD
Heading	83.63°T 85.34°G	±0.0°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Position to Waypoint		
Waypoint	BH7	
Easting	279,450.000m E	
Northing	868,746.000m N	
Range	1.38m Geodetic	
Bearing TO	229.36°True	
Bearing FROM	49.36°True	

Jimmy Wilson Party Chief

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Theo Cleave
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Fugro Geoservices Ltd

MEAN POSITION REPORT



Geodetic Parameters

Name : OSGB 1936 / British National Gri	d [OSGB-UK Gbr02 NT]			
EPSG Code	EPSG::27700	EPSG::27700		
Local Geodetic Datum Parameters				
Datum	OSGB 1936	EPSG::6277		
Ellipsoid	Airy 1830			
Semi major axis	a = 6,377,563.396 m			
Inverse flattening	1/f = 299.3249646			
Datum Transformation Parameters from	ETR\$89 to OSGB 1936			
OSGB 1936 to ETRS89 (1)	NTv2	EPSG::5338		
Latitude and longitude difference file	OSTN02_NTv2.gsb	OSTN02_NTv2.gsb		
Local Projection Parameters				
Map Projection	Transverse Mercator			
Grid System	British National Grid	EPSG::19916		
Latitude Origin	49°00'00.000"N	49°00'00.000"N		
Central Meridian	002°00'00.000"W	002°00′00.000"W		
Scale Factor on Central Meridian	0.999601272	0.999601272		
False Easting	400,000 m	400,000 m		
False Northing	-100,000 m	-100,000 m		

MEAN POSITION REPORT



Project ID	C1982		
Project Name	192186 Nigg East Quay Development		
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 6.00m, DTW = 1.60m Dech Height Above CD = 5.18m		

Session Name: MorganMap 20190305-114536 Records Used: 300 of 301 Start Time: 05 Mar 2019, 11:45:36+00:00 End Time: 05 Mar 2019, 11:50:36+00:00 Session Length: 00:05:00

Mean Position for Skate 3A CommonReferencePoint		
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)
Latitude	57°41'35.22782"N	57°41'34.17603"N
Longitude	004°01'21.30072"W	004°01'26.31222"W
Height	55.914m Ell.	55.914m Ell.
Easting	279,448.057m E(SD: ±0.01m)	
Northing	868,803.004m N(SD: ±0.01m)	
Height	3.104m Ort. (SD: ±0.02m Ort.)	

Sensors	Sensor Averages	SD
Heading	46.50°T 48.21°G	±0.0°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Posițion to Waypoint		
Waypoint	BH8	
Easting	279,448.000m E	
Northing	868,803.000m N	
Range	0.06m Geodetic	
Bearing TO	264.09°True	
Bearing FROM	84.09°True	

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MEAN POSITION REPORT



Geodetic Parameters

Name : OSGB 1936 / British National Gr	id [OSGB-UK Gbr02 NT]			
EPSG Code	EPSG::27700	-		
Local Geodetic Datum Parameters				
Datum	OSGB 1936	EPSG::6277		
Ellipsoid	Airy 1830			
Semi major axis	a = 6,377,563.396 m			
Inverse flattening	1/f = 299.3249646			
Datum Transformation Parameters from	ETRS89 to OSGB 1936			
OSGB 1936 to ETRS89 (1)	NTv2	EPSG::5338		
Latitude and longitude difference file	OSTN02_NTv2.gsb			
Local Projection Parameters				
Map Projection	Transverse Mercator			
Grid System	British National Grid	EPSG::19916		
Latitude Origin	49°00'00.000"N			
Central Meridian	002°00'00.000"W			
Scale Factor on Central Meridian	0.999601272			
False Easting	400,000 m			
False Northing	-100,000 m			

GLOBAL ENERGY NIGG LIMITED EAST QUAY DEVELOPMENT - MARINE GROUND INVESTIGATION



H. MARINE ACTIVITIES

Daily Progress Reports

32 Pages

GLOBAL ENERGY NIGG LIMITED EAST QUAY DEVELOPMENT - MARINE GROUND INVESTIGATION

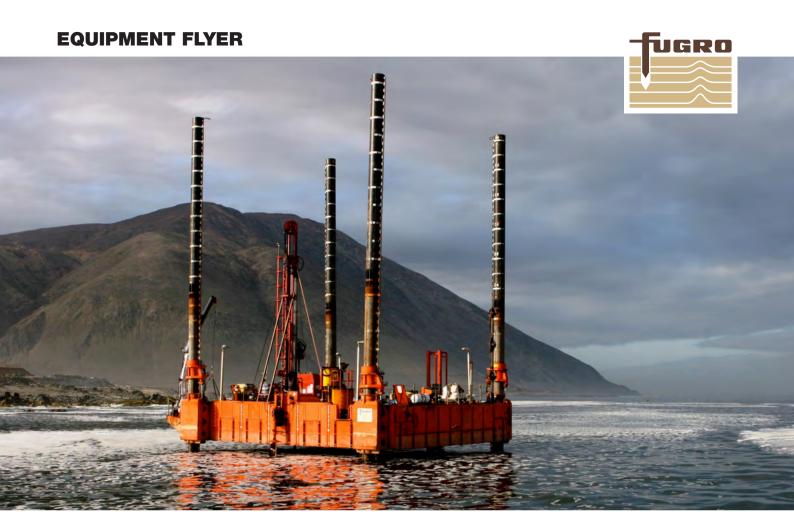


I. VESSEL AND PLANT DATA SHEETS

Skate 3A

Comacchio MC1200

Terracore S-Geobor



FUGRO SKATE 3

The Skate 3 range consists of medium sized, high payload, container transportable jack-up platforms. These platforms have low international transport cost coupled with high performance capabilities.

Skate 3's modular design means that jack-ups can be provided in a variety of sizes, with deck areas ranging from 178 m² to 238.1 m² and the capability of operating in water depths between 1-30 m. Each craft in the Skate range has a rapid deck elevating system and is equipped with four legs mounted externally to provide maximum stability.

All pontoon components and equipment are designed around the container freight concept. In transit, the pontoons double as containers in which the jack-up legs, power units and all other ancillary equipment are housed. This allows cost-effective international transportation by road, rail or container ship. Assembly and

commissioning of the jack-up is achieved in under two shifts.

The jack-ups can be fitted with one of the range of Fugro hydraulic thrusters to provide self-propulsion. In compact configurations, these fast elevating, self propelled jack-up craft are ideal for confined intertidal areas, where swift, accurate moving and positioning is required. In their larger configuration, Skate 3 jack-ups are capable of working safely in exposed open seas.

For maximum safety, they are equipped with rigid steel bulwarks and 110 V fluorescent lights providing full inboard and outboard illumination for 24 hour working.

All Fugro jack-ups are equipped with VHF radios, life saving and first aid equipment, and high speed outboard driven personnel launches.

Operated and maintained exclusively by Fugro's trained and experienced marine engineers, the Skate 3 jack-up is a versatile, stable, self-elevating platform for overwater work.



Skate 3 on site in Uruguay.

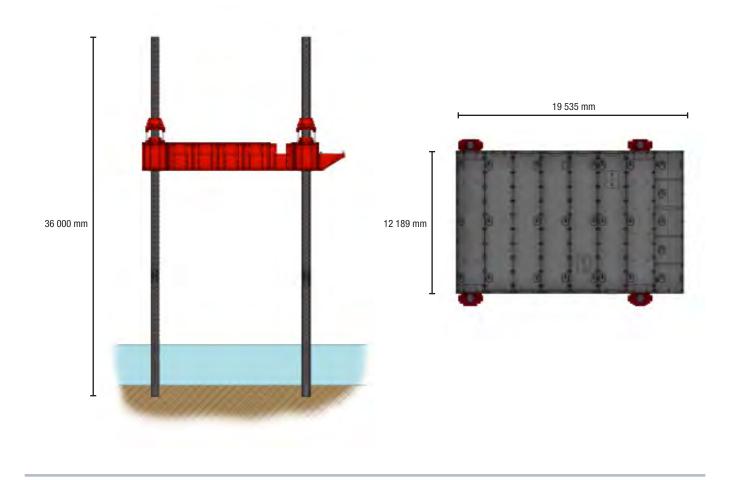
EQUIPMENT FLYER



SPECIFICATIONS

Skate 3 Jack-up Barge

Max. separation:	32 m
Working draft:	0.985 m
No. of containers:	7
Deck area:	238.1 m ²
Leg size:	762 mm diameter
Elevating system:	Hydraulic ram & duo pin rack
Accommodation:	Workshop/canteen container





FUGRO COMACCHIO MC1200

The MC1200 is a hydraulic skid mounted drilling rig capable of operating all rotary and/or rotary percussive drilling systems.

During the design stage, Fugro worked closely with Comacchio to ensure the development of a fully integrated drilling unit capable of withstanding both the complex and rigorous nature of marine works. For example, the MC1200 has a unique triple holding clamp and breakout arrangement for handling the various casings required. These are complimented by a set of hydraulically adjusted drill string centralisers.

The main mast is equipped with a crane boom and a drill string manipulator arm that enables drill rods and casings to be manoeuvred to and from the working deck with minimal manual intervention.

The main power supply is fully silenced and the hydraulics operate a closed system with biodegradable oil.

The control console is deployed on a multipositional arm, providing the driller with an uninterrupted view of all drilling activities. All rotating parts are guarded within a fully interlocked cage.

The MC1200 is suitable for all aspects of rotary soil investigations, core drilling as well as specialised civil engineering works such as micropiles, anchors and ground consolidation works.



MC1200 deck layout on Excalibur jack-up.

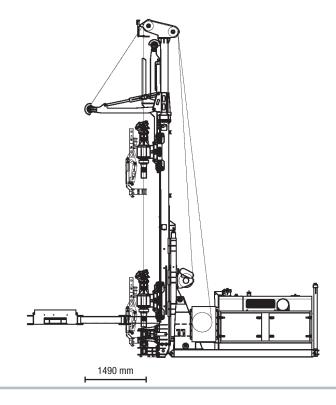


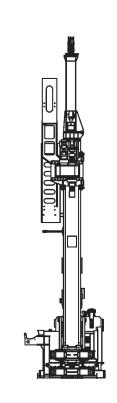
SPECIFICATIONS

MC1200 Marine Drill

Power Pack	
Diesel engine:	New generation 132 kW DEUTZ diesel engine series 2012
Engine power:	132 kW (180 HP)/2300 rpm
Main pump:	2 x 190 lt/min./2 x 50, 2 gal/min.
Oil tank:	400 lt / 105.6 gal
Fuel tank:	350 lt / 92.5 gal
Mast	
Feed stroke:	4750/7200/10 200 mm
Total length:	7100/9550/12 550 mm/ 23,3/31,3/41,2 ft
Feed force:	7000 daN/ 15 736 lbs
Retract force:	7000 daN/ 15 736 lbs
Clamps	
	45 (40)
	•
	000 111117 1 1 1 1
Clamping force:	280 kN / 62 946 lbs
Breaking torque:	3500 daNm / 25 814 lb ft

Rotary Head	
Gears:	6
Max torque:	1230 daNm/ 9072 lb ft
Max speed:	340 (550) rpm
Head passage:	93 mm/3,6"
Swivel passage:	2"
Winch	
Max line pull:	2000 daN/4496 lbs
Drum capacity:	50 mt/164 ft
Rope speed:	30 mt/min./98 ft/min
Rope diameter:	10 mm/0.39"





9076 mm

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FUGROGEOBOR-S

With 40 years of drilling experience, Fugro has examined and tested many methods of coring - aiming to minimise core disturbance and maximise core recovery and quality.

GEOBOR-S SYSTEM

Our experience leads us to recommend the use of Geobor-S triple tube wireline drilling system, which has been specially developed for core drilling and undisturbed sampling in a wide variety of soil and rock formations. The Geobor-S is a triple tube core barrel which cuts an "S" size core sample. It has a plastic core liner, which is seated within the inner barrel assembly, considerably reducing friction between the core and the inner tube and enhancing core recovery.

SAMPLE RECOVERY

A nominal 102 mm diameter core sample is recovered from this system, generally in 1.5 m lengths.

The relatively large diameter enhances drilling performance whilst obtaining high-quality core samples, for soil and rock testing.

We provide a wide range of coring bits including but not limited to:

- annular and face discharge,
- surface set and impregnated diamond,
- tungsten carbide saw tooth,
- PCD (polycrystalline diamond).

The core barrel itself is designed for flushing with water, mud or air, and can easily be adapted for most soil and rock conditions by the use of an appropriate core bit or non-coring device.





EQUIPMENT FLYER

CORE LINER

The core liner is a rigid, transparent PVC tube with a wall thickness of approximately 1 mm that fits snugly inside the Geobor-S core barrel inner tube, trimmed to 1.5 m lengths. This is provided for all coring works.

The core samples are recovered within the core liner tube and removed from the inner barrel between each consecutive run. The sample can be retained within the core liner tube sealed at both ends and placed into the core box. This minimises handling induced core disturbance, both on the drill deck and during subsequent transport of the core sample to the onshore core store and testing laboratories.

From our experience, the combination of the Geobor-S system used with core liners:

- reduces coring and transport induced disturbance,
- maintains sample quality,
- significantly enhances recovery especially in mixed formations.

Furthermore, we monitor the effectiveness of the various bit types throughout drilling, selecting bits appropriate to varying ground conditions as each borehole progresses. This allows us to maximise core quality and recovery in an appropriate and cost effective manner.

Four methods can be used to suit varying ground conditions:

- In medium to hard formations, many types of core bits can be used depending on the formation.
- For coring in soft soil formations, TC-set bits are used and the bit consists of two parts (pilot and reamer).



Geobor-S Core Liner.

Technical Specifications	Metric	Imperial
Hole diameter, method 1 & 4:	146.0 mm	5.75 in
Hole diameter, method 2 & 3:	150.0 mm	5.90 in
Drill bit outer diameter:	145.6 / 149.6 mm	5.73 / 5.90 in
Drill rod outer diameter:	139.7 mm	5.58 in
Bit kerf, method 1:	21.8 mm	0.86 in
Bit kerf, method 2 & 3:	23.8 mm	0.94 in
Core diameter:	102.0 mm	4.05 in
Hole area (od 146/150):	167.3 / 176.7 cm ²	26.0 / 27.4 in ²
Core area:	81.7 cm ²	12.7 in ²
Cutting area in % of hole area:	51.7 %	51.7 %

- For coring in very soft or loose formations, TC-set bits are used. The bit is in two parts as in method two but one core lifter is extended to run 25 mm in front of the bit.
- 4. For coring in very soft, loose formations with varying layers. The spring-loaded inner tube assembly is extended to run in front of the bit, but is retractable for optimised adaptation to the consistency and density of the ground.

OTHER ADVANTAGES

The advantages of wireline coring over conventional coring (using drill rods and core barrels) include:

- Separate temporary lining casing for borehole stabilisation may not be required.
- The drill string is more rigid.
- The core barrel may be recovered without removing the outer drill rod, thus reducing disturbance to the borehole wall.
- The small annulus between the drill pipe and borehole wall requires significantly lower volumes of flush fluid compared to conventional drilling to achieve adequate uphole velocity for removal of cuttings from the hole. As a consequence, erosion of the formation (particulary at the bit face) is reduced.

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