

Peterhead Smith Quay Extension: Ground Investigation Works

Proposed method statement

Peterhead Port Authority

Date: 12 August 2024

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1 Introduction

This method statement outlines the methodology for the proposed Ground Investigation (GI). The objectives of the investigation include the following:

- undertake overwater boreholes, overwater vibrocores and overwater hydraulic grab samplers;
- undertake seabed profiling;
- retrieve soil samples and rock cores; and
- take samples of the surface marine sediments for soil classification and contamination testing to assess suitability for dredging and disposal or reuse of the sediment.

A borehole location plan indicating the location of the boreholes is provided in Appendix A.

The table below summarises the exploratory holes proposed for these ground investigations.

Table 1.1 List of Exploratory holes

Hole number	Type	Scheduled level : m CD	National Grid Reference		WGS84 Reference		Requirements / Remarks
			Easting: m	Northing: m	Latitude: deg.min.	Longitude: deg.min.	
BH101	Overwater BH	-27.5 (approx. 1m superficial deposits, 20.5m rock)	413197.048	845760.773	57°30.111'N	001°46.886'W	<ul style="list-style-type: none"> • Soils boring and rotary coring for retrieval of representative, high-quality, soil samples (disturbed and undisturbed) and rock cores. • Most appropriate plant and equipment (i.e. boring and drilling methodologies) for achieving the technical requirements of the works will be determined after taking cognisance of the existing site conditions and environment. • The nominal core diameter shall be 102mm (4 inch) to recover undisturbed core samples in compliance with EC7. Coring to scheduled depth to prove the minimum length of competent rock specified (i.e. 95% core recovery of medium strength or better), or otherwise advised by Investigation Supervisor on site based on site observations. • In-situ testing to include SPTs at regular intervals with depth. • Geotechnical sampling for geotechnical laboratory testing of soils and rock. • Geo-environmental sampling for chemical and geo-environmental laboratory testing. • Accurate geological logging of soil samples and rock cores.
BH102	Overwater BH	-27.5 (approx. 1m superficial deposits, 22.5m rock)	413154.018	845763.369	57°30.113'N	001°46.929'W	
BH103	Overwater BH	-15.0 (approx. 1m superficial deposits, 10m rock)	413120.320	845742.841	57°30.102'N	001°46.963'W	
BH104	Overwater BH	-12.0 (approx. 0.5m superficial deposits, 7.5m rock)	413174.709	845731.172	57°30.095'N	001°46.909'W	
BH105	Overwater BH	-12.0 (approx. 1m superficial deposits, 7m rock)	413183.890	845778.117	57°30.121'N	001°46.899'W	
BH106	Overwater BH	-12.0 (approx. 0.5m superficial deposits, 6.5m rock)	413230.277	845775.677	57°30.119'N	001°46.853'W	



Hole number	Type	Scheduled level : m CD	National Grid Reference		WGS84 Reference		Requirements / Remarks
			Easting: m	Northing: m	Latitude: deg.min.	Longitude: deg.min.	
VB101	Overwater VB	To rockhead (expected to be <2m superficial deposits)	413120.320	845742.841	57°30.102'N	001°46.963'W	<ul style="list-style-type: none"> • Vibro-core sampling for retrieval of continuous cores of undisturbed superficial deposits for geo-environmental testing • Most appropriate plant and equipment (i.e. overwater plant and methodologies) for achieving the technical requirements of the works will be determined after taking cognisance of the existing site conditions and environment. • Geo-environmental sampling for chemical and geo-environmental laboratory testing. • Accurate geological logging of soil samples
VB102	Overwater VB	To rockhead (expected to be <2m superficial deposits)	413154.018	845763.369	57°30.113'N	001°46.929'W	
VB103	Overwater VB	To rockhead (expected to be <2m superficial deposits)	413183.890	845778.117	57°30.121'N	001°46.899'W	
GS101	Overwater GS	To rockhead (expected to be <0.5m superficial deposits)	413197.048	845760.773	57°30.111'N	001°46.886'W	<ul style="list-style-type: none"> • Geo-environmental sampling for chemical and geo-environmental laboratory testing.
GS102	Overwater GS	To rockhead (expected to be <0.5m superficial deposits)	413174.709	845731.172	57°30.095'N	001°46.909'W	<ul style="list-style-type: none"> • Geo-environmental sampling for chemical and geo-environmental laboratory testing.

Notes: BH = Superficial deposits and Rock Borehole

VB = Superficial deposits Vibro-core sample

GS = Superficial deposits Grab sample

SPT= Standard Penetration Tests

The bathymetry at and immediately surrounding Smith Quay is predominantly dredged seabed. At the berth, there is a dredged pocket approximately 219m long (east to west) and 30m wide. The dredged pocket has a design dredged level of -10mCD. To the south and west of the dredged pocket, the seabed is dredged to -9mCD, tying into the natural seabed level in the nearby basin. To the west of the dredged area, side slopes transition to the natural seabed, which varies in level between approximately -4.5mCD to the north and -9mCD to the south.

The latest bathymetric survey drawing 81400408-23 is provided in Appendix B.

2 Boreholes

The Contractor may use a combined soil boring (or continuous sampling/coring) and rock coring system to achieve the technical requirements of the GI whilst minimising plant set-ups on over-water platform. All boreholes shall commence with casing diameters appropriate to obtain the exploratory hole depths required. The method of advancement and the minimum diameter of boreholes will be such to allow continuation by double barrel rotary cored drillholes to obtain a minimum core diameter of 102 mm, with subsequent requirements for in situ testing, sampling and installations.

The first sample shall be taken at 0.5 m below the seabed level, the next at 1.0 m deeper, thereafter at 1.0 m depth intervals to 5 m depth below ground level then at 1.5 m depth intervals. Where strata changes occur below 5 m depth, the interval between samples shall be reduced back to 1.0 m until 5 m penetration into that stratum has been achieved.



Figure 2-1 Jack-up barge

Overwater boreholes shall be backfilled with cement/bentonite grout to rockhead level, unless otherwise directed by the Investigation Supervisor. The grout shall be introduced at the bottom of the hole by means of a tremie pipe, the end of which shall be kept a short distance below the upper surface of the

grout in the borehole at all times as the filling proceeds. The holes shall be filled from the base up to within 1m of rockhead level. The borehole casing shall be withdrawn concurrent with the introduction of the grout into the borehole in such a manner as to ensure that the base of the casing is below the upper surface of the grout in the borehole at all times. Above rockhead, the sediments shall be allowed to self-collapse and backfill the remaining borehole.

3 Vibrocore

The typical vibrocorer consists of a tall steel frame and tripod support. Within the frame is a standard 102 mm steel coring barrel in which is inserted a 90 mm PVC liner to contain the sample. A spring steel corecatcher is fitted to the cutting shoe.

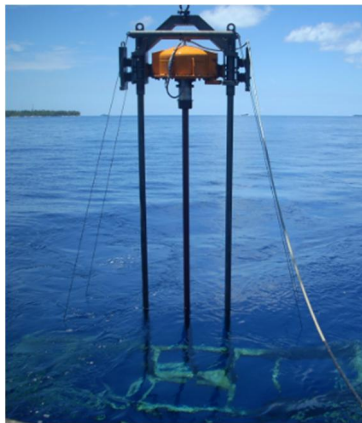


Figure 3-1 Vibrocorer

Two linear electric motors enclosed in a pressure housing provide the vibratory motion; the core barrel is attached directly to the motor housing. Power (415 VDC) is fed to the motors via an electrical control line from the surface support vessel. Once in motion, the heavy motor housing provides the mass to drive the core barrel into the seabed. A typical 6 m vibrocorer will weigh nearly two tonnes and requires a crane for deployment and recovery. Power is normally provided from a separate generator installed on deck.

Core samples of seabed sediments, using vibrocores will be taken at 3 No. locations (coinciding with marine plant set-up positions for boreholes). Sediment samples shall be undertaken in accordance with Marine Scotland Pre-dredging guidance (Pre- disposal Sampling Guidance Version 2 – November 2017) i.e. sub-sample the surface layer (0-15cm)

then every 50cm thereafter. Core samples shall extend from bed level to rockhead, total depth of which is not expected to be more than 3m.

4 Grab sampler

The grab sampler comprises two steel clamshells acting on a single or double pivot. The shells are brought together either by a powerful spring (Shipek type) or powered hydraulic rams operated from the support vessel.

In operation, the grab is lowered to the seabed and activated either automatically or by remote control. The shells swivel together in a cutting action and remove a section of seabed. The sample is then recovered to the surface for examination. The two samples will be taken of the surface layer (0-50cm).

All machinery will be supported by a suitable jack-up barge.

There will be no permanent structures, all site investigation will be facilitated by temporary works. The moving marine plant will remain on-site for the duration of the Works.

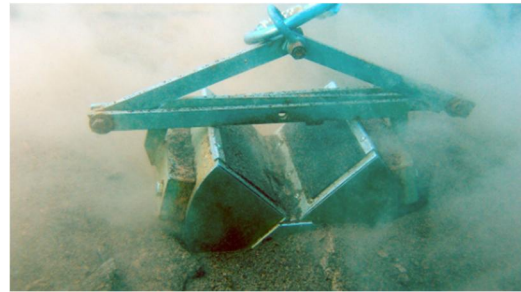


Figure 4-1 Grab sampler

5 Marine Sub-Bottom Profiling

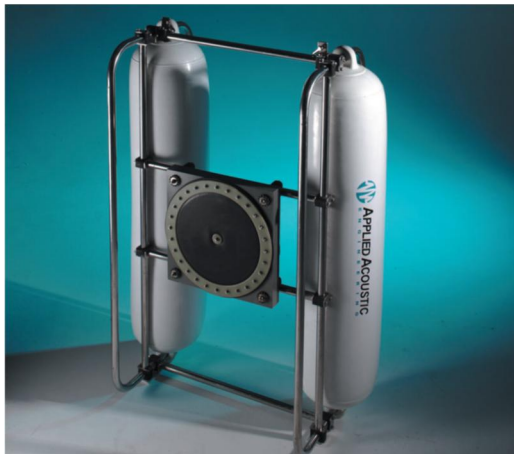
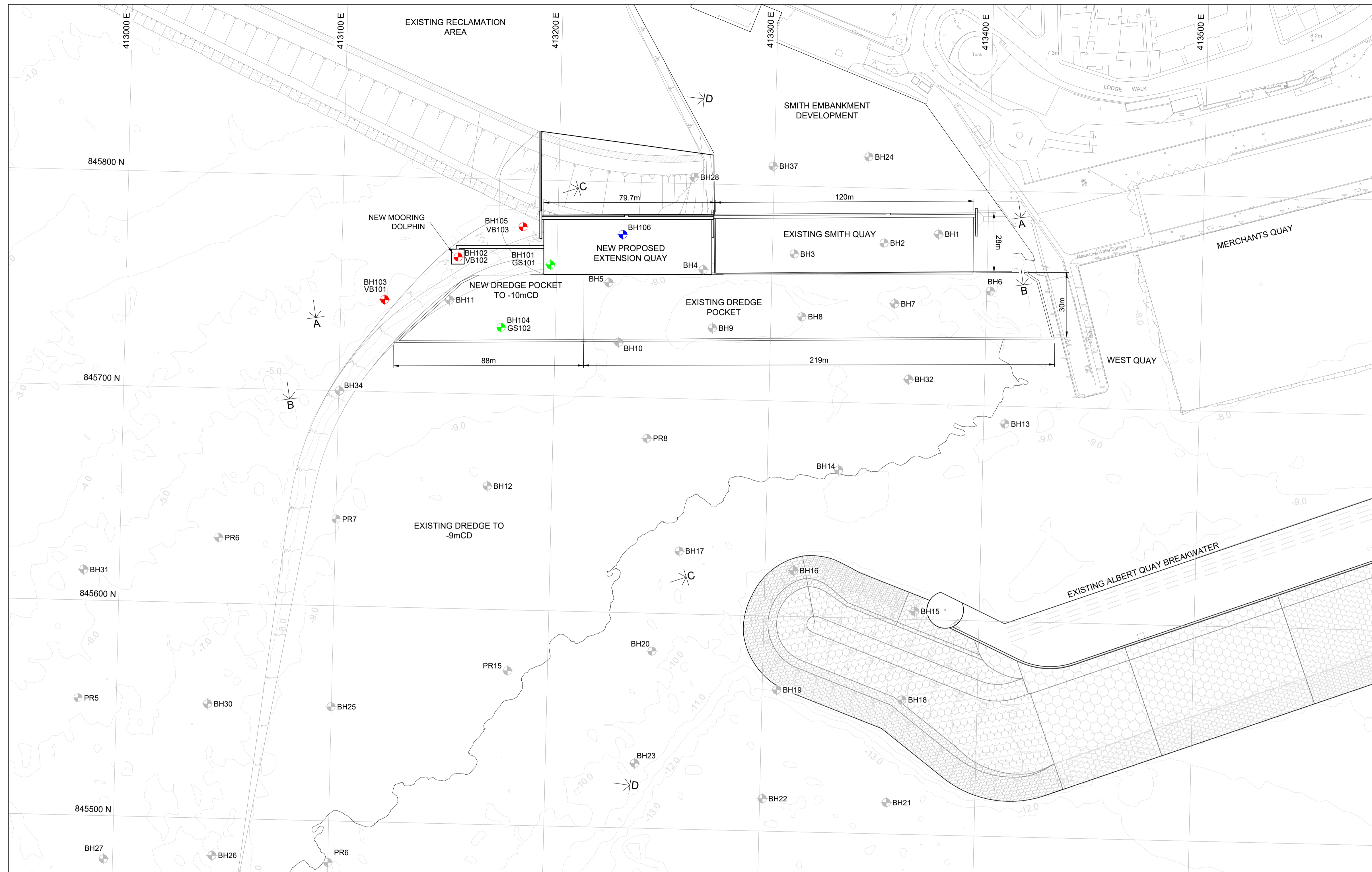


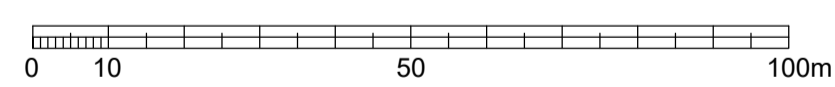
Figure 5-1 Seismic Sound Source, Boomer Plates

A sub-bottom profiler system (SBP) will be installed and towed behind the survey vessel. The SBP will emit low-frequency sound pulses vertically towards the seabed using a transducer. The pulses will penetrate the seabed layers and be reflected back by different sediment types.

By calculating the time taken for the sound pulses to return to the ship, the sediment composition, thickness, and other characteristics will be determined. Data will be collected on shipboard computers, which will generate cross-sections depicting sediments below the seabed.



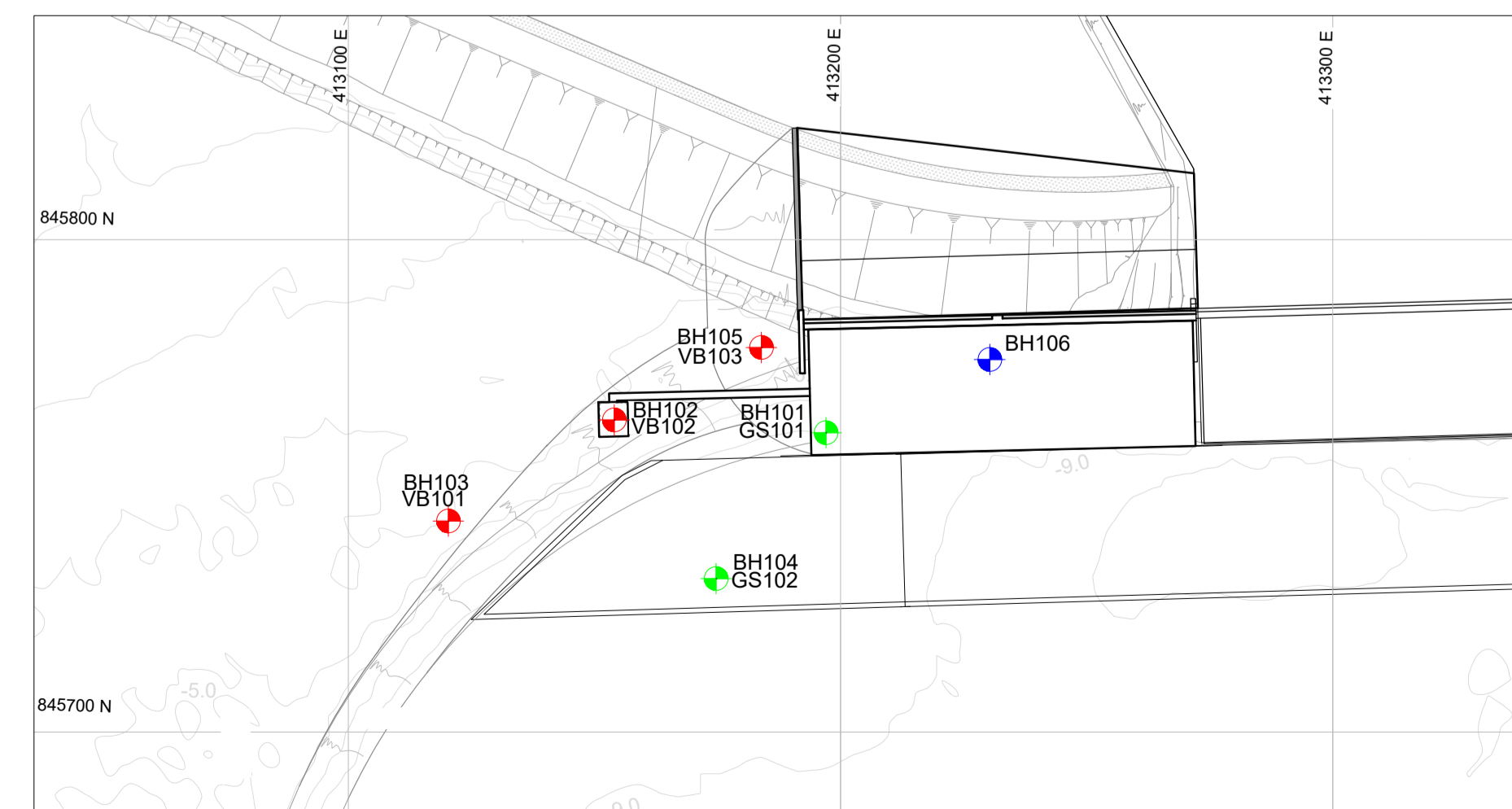
GENERAL ARRANGEMENT, 1:1000



NEW BOREHOLES POSITIONS			
Borehole No.	Easting	Northing	Target Termination Level (m CD)
BH101	413197.048	845760.773	-27.5
BH102	413154.018	845763.369	-27.5
BH103	413120.320	845742.841	-15
BH104	413174.709	845731.172	-12
BH105	413183.890	845778.117	-12
BH106	413230.277	845775.677	-27.5

GRAB SAMPLERS POSITIONS		
Grab Sampler No.	Easting	Northing
GS101	413197.048	845760.773
GS102	413174.709	845731.172

VIBROCORERS POSITIONS		
Vibrocorer No.	Easting	Northing
VB101	413120.320	845742.841
VB102	413154.018	845763.369
VB103	413183.890	845778.117



NEW BOREHOLES ONLY, 1:1250

NOTES

- ALL LEVELS TO CHART DATUM.
- ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
- SMITH QUAY EXTENSION IS INDICATIVE.
- EXISTING BOREHOLES AND PROBE POINTS TAKEN FROM FUGRO GROUND INVESTIGATION (AUG 2007)

LEGEND

- EXISTING BOREHOLES & PROBE
- NEW BOREHOLES
- BOREHOLES + VIBROCORES
- BOREHOLES + GRAB SAMPLES

Rev.	Date	Description	App'd
0	12-07-24	FOR INFORMATION	ACW

Client :



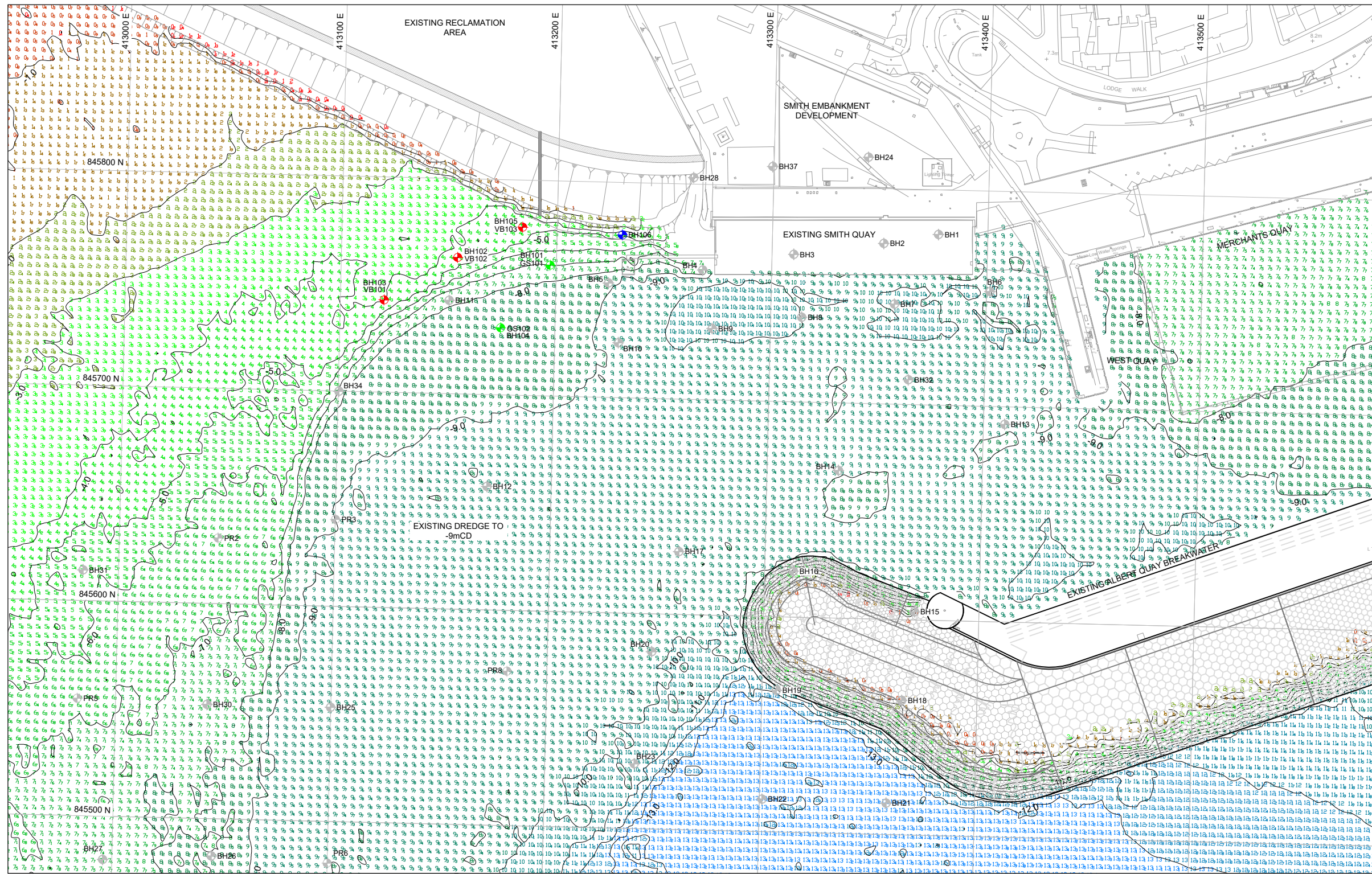
Title :
**SMITH QUAY EXTENSION
 DEVELOPMENT
 SITE INVESTIGATION
 CONCEPT 1 - NEW BOREHOLES**



Project No: 81400408

Drawn	Checked	Approved	Scale (at A1): As Shown
MAAO	KLO	ACW	Date: Jul 2024

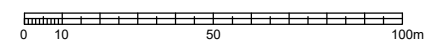
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81400408-24 New Boreholes GA	0



NOTES

1. ALL LEVELS TO CHART DATUM.
2. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
3. BATHYMETRIC LEVELS TAKEN FROM CLYDESIDES BATHYMETRY SURVEY APRIL 2023.

GENERAL ARRANGEMENT, 1:1000



Rev.	Date	Description	App'd
0	05-07-24	FOR INFORMATION	ACW

Client :

Title :
**SMITH QUAY EXTENSION
 DEVELOPMENT
 BATHYMETRIC SURVEY DATA**

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Drawn	Checked	Approved	Scale (at A1): 1:1000
MAAO	KLO	ACW	Date: Jul 2024
Drg No: 81400408-23 Bathymetric Survey			Rev: 0