CONTRACT NO. GE/2021/03

TASK ORDER NO. GE/2021/03.23

AGREEMENT NO. CE 26/2022 (EP)

DEVELOPMENT OF INTEGRATED WASTE MANAGEMENT FACILITIES PHASE 2 – INVESTIGATION, DESIGN AND CONSTRUCTION (SA1)

MARINE GEOPHYSICAL SURVEY (GS)

FINAL REPORT

HK268623

SEPTEMBER 2023

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Contract Data Summary						
Project Name & No. GE/2021/03.23			Site Name		Date: 23-Jun-2023 to	8-Nov-2023
Marine Geophysical Survey		Agreement No. CE 26/2022 (EP) Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1)		Official only		
G.I. Contractor	Fugro Ge EGS (Asi	eotechnical Services Ltd./ ia) Limited	Employer CEDD		G.E.O. Data Bank No.	- I
Contract No	. GE/2021	/03	Task Order No. GE/2021	1/03.23	File Ref.	
			Field Wor	k Summary		
Drillholes To	otal No. N/A		Method: N/A		Date: 26-Jun-2023 to	6-Jul-2023
Pits / Trench	nes / Caissons : 1	No. N/A	•			
Probes : No.	N/A					
Piezometers	: No. N/A					
Insitu Tests	: No. N/A		Types			
Geophysics	: Mari	ine	Type SBES/ MBES/ SS	SS/ SBP/ MAG/ SBP+MAG		
			Laboratory Te	esting Summary		
Total No. of	Tests :			Date	to	
	Physical Prop	erties	LL	PL	PSD	MC
			SG	γm/γd		
	Strength Tests	S	CU	CD	UU	Shear box
Soil	Compaction &	& CBR Tests	Standard	Modified		CBR
	Oedometer & Perm. Tests		Cv	k		
	Others					
Rock	γ		Pt load	UC	Shear Box	US Vel.
Location Plan SCALE 1 :		SCALE 1 :	20 000	Derived from :	20 000 Sheet	<u> </u>
SCALE 1 :		5 000		5 000 Sheet		
N Survey Area New Territories Lantau Island Hong Kong Island Ninepins Group						
G.S. Laboratory GEOTECHNICAL ENGINEERING OFFICE					GINEERING OFFICE	
Сог	ntractor	Fugro Geotechnical Services Ltd./ EGS (Asia) Limited		-		IL ENGINEERING AND VELOPMENT
Works Order No. GE/2021/03.23			-	HO AD	NG KONG SPECIAL MINISTRATIVE REGION	

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DIGITAL DATA DVD

Digital Copy of Survey Report

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DEVELOPMENT OF INTEGRATED WASTE MANAGEMENT FACILITIES PHASE 2 – INVESTIGATION, DESIGN AND CONSTRUCTION (SA1)

MARINE GEOPHYSICAL SURVEY (GS)

FINAL REPORT

JOB NUMBER HK268623

September 2023 (HK268623/Report/Final HW)

1 INTRODUCTION

1.1 INSTRUCTIONS AND OBJECTIVES

Under the Task Order No. GE/2021/03.23 issued by the Civil Engineering and Development Department (CEDD) on 15th June 2023, geophysical surveys were commissioned to study the seabed features and the shallow geology covering the designated survey area SA1 at Tsang Tsui and its surrounding area, west of New Territories, to facilitate the investigation, design and construction for development of integrated waste management facilities.

According to the survey scope, the study area SA1 was further divided into two areas: Area N1 and N2 (Figure 1 and Figure 2). As shown in Table 1 below, a list of geophysical survey methods was utilised to achieve specified survey objectives:

AREA	SURVEY TYPE	OBJECTIVE
	Single beam echo sounding (SBES)	To spontaneously measure seabed levels on site and to authenticate the multi-beam sounding system
N1 and N2	Multibeam echo sounding (MBES)	To provide seabed levels in detail
	Side scan sonar (SSS)	To locate anomalous features and map sediment types on the seabed
	Sub-bottom profiling (SBP)	To provide levels and thicknesses of geological interfaces, if identified
N1	Marine magnetometer (MAG)	To identify metallic objects and any archaeological remains on, or just beneath the seabed
	Subsea utility survey (SBP+MAG)	To locate the existing subsea utilities

Table 1: Geophysical survey methods used in the project

1.2 SURVEY PERIOD AND LOCATION OF THE SURVEY AREA

From 26th June to 29th June 2023, an EGS survey vessel *M.V. Wing Hung (WH2)* was utilised to conduct the MAG survey in Area N1, including the subsea utility survey for the existing power



cable and pipelines. From 3rd July to 6th July 2023, another shallow draft vessel M.V. GEO1 (GEO1) was mobilised to perform the MBES and SSS survey in both Area N1 and N2 as well as the SBP survey in Area N1. The outstanding SBP and MAG survey in Area N2 will be conducted in the next phase. Overview images of the survey site are shown in Figure 1 and Figure 2 below. Appendix A of this report provides the Daily Site Records for reference.



Figure 1: Satellite image of the survey area (Courtesy of Google Earth 2023)





2 SITE DESCRIPTION

The survey site is located to the north of Black Point Power Station (Figure 1 and Figure 2). The eastern portion of the site is bounded by a rubble mound seawall on the south and extensive oyster farms on the north (Figure 1, Figure 3 and Figure 4). Area N2 covers the narrow navigation channel marked by a series of navigation beacons (Figure 5).

During the survey period, various types of vessels were observed passing-by or anchoring in the survey area, including ferries, cargos, speed boats and small fishing boats, etc. (Figure 6). Fishing buoys were occasionally encountered (Figure 7). Survey operations were impacted and infill lines were run to avoid data gaps. Survey coverage was restricted in the proximity of the oyster farms.

The weather was mostly sunny during the survey period with scattered showers and generally calm sea states. Heavy rain and rough sea were encountered in the afternoon of 4th July 2023, and the survey was consequently aborted (Figure 8). Strong current was experienced during the survey, especially in the west of Area N1.



Figure 3: The coast of Area N2



Figure 4: Oyster farms to the northeast of the site







Figure 6: Vessels in transit or at anchor in the vicinity of the survey area



Figure 7: Fishing buoy and boat sighted in the survey area

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Figure 8: Rough sea and heavy rain encountered on 4th July 2023



3 GEOLOGICAL BACKGROUND OF SURVEY AREA

According to the Geological Map of Hong Kong (Figure 9), the solid geology around the survey site is dominated by mid-Jurassic granite while the coastal area at Tsang Tsui is reclaimed with fill materials. A subcropping area is marginally present in the south-western corner of the survey site. A northeast/southwest striking fault is charted intercepting the eastern Area N1.





4 EQUIPMENT LIST

The survey vessel *GEO1* was utilised to conduct the main surveys (MBES, SSS and SBP). The MAG and subsea utility surveys were performed by the vessel *WH2*. The following equipment was mobilised on board the vessels (Table 2 and Table 3).

Туре	Equipment	
Survey Vessel	M.V. GEO1	
Horizontal positioning	NovAtel PwrPak7 GNSS system	
Motion and Heading	Teledyne TSS Saturn 10	
MBES&SSS	EdgeTech 6205s combined bathymetry and side scan sonar system	
SVP	Valeport miniSVP	
SBES	Odom Echotrac MK III single beam echo sounding system	
SBP	C-Boom low voltage boomer (LVB) system	
Survey Software	QPS QINSy survey and office modules C-View Nav computerised navigation suite C-View Acquisition EdgeTech Discover	
Table 2: The equipment mobilised on the survey vessel M.V. GEO1 (GEO1)		

Туре	Equipment	
Survey Vessel	M.V. Wing Hung 2	
Positioning	C-Nav 3050 GNSS system	
SBES	Kongsberg EA440 single beam echo sounder system	
MAG	Geometrics G882 Caesium Vaper magnetometer	
SBP	Innomar SES-2000 medium-100 parametric sub-bottom profiler EdgeTech 3400-OTS sub-bottom profiler	
Survey Software	C-View Nav computerised navigation suite EdgeTech Discover Geometrics MagLog SESWIN Innomar data acquisition software ISE Innomar post processing software	
Table 3: The equipment mobilised on the survey vessel M.V. Wing Hung 2 (WH2)		



5 LOCATION CONTROL

5.1 HORIZONTAL

5.1.1 POSITIONING AND NAVIGATION

The survey vessels were located by NovAtel PwrPak7 (on *GEO1*) and C-Nav 3050 (on *WH2*) GNSS systems. Both systems have positioning technique using a proprietary Precise Point Positioning message broadcasting from their processing centres which provides decimetre positioning to terrestrial users. The system consists the following:

- A geodetic-quality dual frequency GNSS receiver which tracks and locks onto the L1 (C/A code and phase) and L2 (Y-code and phase) signals from GPS and GLONASS satellites.
- An integrated INMARSAT L-Band decoder to receive the TerraStar corrections (NovAtel system) and RTG Gipsy corrections (C-Nav 3050 system) from geostationary INMARSAT communications satellites.

5.1.2 COMPUTERISED NAVIGATION

The computerised navigation system was added to the positioning system to control the steering of the boat along the traverses specified, and to log all horizontal and vertical control data. This system provides the user with a dynamic screen display on which the following are continuously updated:

Skewed grid set parallel to the desired survey line direction The water depth Date and Time DGNSS diagnostics enabling quality control

Other information displayed for the assistance of the hydrographic surveyor includes, course, speed, fixing status, coordinates on the Hong Kong Metric Grid, as well as a number of other user-defined options including a graphical 'left and right' offset indicator and a numerical display of water depth along the survey line. The system includes a multiple instrument fixing unit and records the single beam echo sounding data during the survey.

5.1.3 CALIBRATION, ACCURACY AND QUALITY ASSURANCE

The positioning systems used on the two vessels were checked at a control point located at Yau Ma Tei Typhoon Shelter for positioning accuracy. For *GEO1*, the calibration results revealed a horizontal offset of 0.468 m in Easting and -0.317 m in Northing, corresponding to a bias of 0.566 m. The Distance Root Mean Squared (DRMS) was 0.049 m. For *WH2*, the bias was 0.666 m with a DRMS of 0.070 m. Such small offsets and DRMS confirmed that the system achieved a high positioning accuracy. Please refer to **Appendix B** for the GPS check plots.



5.2 VERTICAL

5.2.1 DATUM

The datum in use or implied in Hong Kong are as follows in Figure 10:



5.2.2 UTILIZATION OF TIDAL MEASUREMENTS

Tide records from the Chek Lap Kok (West) tide gauge managed by the Airport Authority were used to reduce the soundings to the Hong Kong Principal Datum (PD) in this survey.

A full set of sounding data was acquired between 3rd and 6th July 2023. The tide data for the same period is presented in **Appendix C** for reference.

FIELD PROCEDURES 6

SURVEY VESSEL 6.1

Two survey vessels, GEO1 and WH2, were utilised for this survey (Figure 11 and Figure 12). The daily site records are enclosed in Appendix A.



Figure 11: Survey vessel GEO1





Figure 12: Survey vessel WH2

6.2 COVERAGE

The following survey traverse intervals (Table 4) were agreed with the client prior to the fieldwork. Due to the presence of oyster farms, the survey coverage was restricted in the northeast of Area N1.

AREA	SURVEY TYPE	SURVEY SPACING
N1 and N2	MBES	20 m plus infill lines
NI anu NZ	SSS	40 m plus coast-lines
	SBP	40 m x 100 m
N1	MAG	10 m
NI	Utility survey	100 m perpendicular to the pipeline alignments
	(SBP+MAG)	25 m perpendicular to the power cable alignment

Table 4: Survey types and intervals

6.3 MULTI-BEAM ECHO SOUNDING BATHYMETRY

Seabed level observations were made with a multi-beam echo sounder (EdgeTech 6205s) on *GEO1*.

To achieve high position accuracy, the MBES system requires careful calibrations. A potential significant source of error relates to the speed of sound in water. The system requires the speed of sound to be measured through the water column, and for these data to be entered into a file which is accessed by the acquisition and processing software. In addition, due to the fact that the speed of sound can vary significantly near the sea surface, a sound velocity probe was installed at the MBES transducer so that measurements were recorded at all times during the survey and the corresponding corrections can be made within the system in real time.

A patch test was required to calibrate system components as listed in the following Table 5.



Test	Description
Roll Offset	A survey line was set over an area with a flat and featureless seabed. The line was run in opposite direction at the same speed.
Pitch Offset	A survey line was set exactly over a well-defined feature. The line was run in opposite directions at the same speed.
Yaw (Heading) Offset	Two parallel lines were set to either side of a well-defined feature with the feature positioned in the middle of the two lines. The off- track distance between the feature and the lines were selected according to water depth and the fan width of the MBES system, so that the features were detected at the outer part of sounding 'fan'. The lines were run in the same direction at the same speed, once passing the feature to Port and once to Starboard.
Navigation Delay	A survey line was set exactly over a well-defined feature, such as a rock outcrop, a significant slope or a man-made structure. The line was run twice in the same direction at different speeds of 3 knots and 6 knots.

By applying appropriate algorithms to match the apparent differences in the positions of the selected feature and the seabed topography measured in the individual calibration line, these calibration factors were determined and then entered into the acquisition system to correct the sounding measurements in real time.

Velocity profiles collected during the MBES survey are presented in **Appendix D1**. Daily MBES patch test report for the survey is given in **Appendix E**.



Figure 13: EdgeTech 6205s MBES transducer (left) and illustration of bathymetry swath (right)

In the case of the Edgetech 6205s combined bathymetry and side scan sonar system on board *GEO1* used in this survey (Figure 13), the interferometric sonar measures the sum of all returns on both port and starboard sides combining both Beamforming and Phase Differencing techniques to determine each sounding along the seafloor. The seabed level data is obtained over a seafloor coverage centred on the vessel track depending on the range



settings of the sonar, which controls the seafloor coverage with suitable selection to different water depths. The system produces up to 800 soundings in each resulting ping. Considering the resolution of the side scan imagery, the range was set to 50 m with a sounding bin size of 0.3 m in this survey.

A single beam echo sounder was also installed as a QC tool for the bathymetry survey. The SBES transducer produced pulses of acoustic waves at set intervals and recorded two-way travel time for the primary seabed reflection signal. This time was correlated to seabed depth by sinking a metal plate at known depths below the transducer, and recording travel times for the different depths. This process, known as a "bar check", was carried out before and after the survey operations. The procedure is important to correct the sound velocities in water.

Please refer to **Appendix D2** for an example of the bar check record.

6.4 SIDE SCAN SONAR SURVEY

A schematic diagram (towed mode) of side scan sonar survey is presented in Figure 14. Sidescan uses a sonar device that emits a fan-shaped pulse down toward the seafloor across a wide angle perpendicular to the path of the sensor through the water to map the features on seabed. Before survey commencement, the side scan sonar system was wet tested to ensure that the system is in good working condition.

For this survey the EdgeTech 6205s was pole-mounted on the *GEO1*. The SSS wet test was performed by running a test line with the same settings for the coming survey. Parameters like gain, slant ranges, equipment connections, etc. were all tested and the results were checked and approved by the on-site geoscientist before proceeding to the survey work.

The recording parameters for the side scan survey were as follows:

Vessel speed:	generally 1.5 - 2.0 m/sec
Fix interval:	10 seconds
Source frequency:	230 kHz and 550 kHz
Slant range:	50 m

Four channels (low and high frequency; port and starboard) were simultaneously recorded with navigation information and the high resolution 550 kHz data were used in the data processing.





6.5 SEISMIC REFLECTION SURVEY

A schematic diagram of seismic reflection survey is presented in Figure 15. In short, the seismic energy generated by a boomer is transmitted downwards through water column. The signals are then reflected by the seabed and underlying geological interfaces, on both sides of which the acoustic impedances are different. The return signals are recorded by a hydrophone after the two-way travel time. By using appropriate velocities in different mediums, the seismic reflectors (horizons) are constructed.

The boomer was towed behind the survey vessel at a distance of 20 m from the stern to minimise noises from the vessel (Figure 16). Before the commencement of the survey, the C-Boom low voltage boomer was wet-tested. Further test on SBP system was conducted by running a test line with settings adjusted for the best data quality. System parameters like source frequency, power, equipment connections, etc. were all tested, adjusted and the results were checked and approved by the on-site geoscientist before proceeding to the survey work.

The recording parameters for the seismic reflection survey were as follows:

1.2 - 2.2 m/sec
10 seconds
~1.0 kHz dominant
200 ms
0 ms
20,000 Hz









6.6 **MAGNETIC SURVEY**

A marine magnetic survey was conducted for the identification of any ferrous objects on the seabed or buried within sediments at shallow depths (Figure 17). Before the start of the survey, the magnetometer (Geometrics G-882) was wet-tested to ensure that the system is in good working condition.

The magnetometer was towed astern the survey vessel. Cable out and vessel speeds were adjusted during the survey to keep the magnetometer around 3-4 m above seabed.

The recording parameters for the magnetometer survey were as follows:

Vessel speed:	1.5 - 2.5 m/sec
Fix interval:	10 seconds
Magnetic sensor sample rate:	10 Hz



Figure 17: The Geometrics G-882 marine magnetometer

6.7 SUBSEA UTILITY SURVEY

The above marine magnetometer was used for the subsea utility survey, with lower fish altitudes (1-2 m). Additionally, two high frequency sub-bottom profiling systems (Innomar SES-2000 medium-100 and EdgeTech 3400-OTS as a supplement, shown in Figure 18) were also utilised to detect the subsea utilities within the survey area.

The Innomar system provides a wide range of high frequencies (4-15 kHz) of acoustic signals. Operating frequency of 8 kHz was selected to ensure both high data resolution and good seismic penetration throughout the survey.

The EdgeTech 3400-OTS transmits wide band Frequency Modulated (FM) pulses utilising EdgeTech's proprietary Full Spectrum CHIRP technology. The system uses flat multi-channel hydrophone array to generate high resolution images of the sub-bottom stratigraphy provides excellent penetration in various bottom types. The 3400-OTS receiver array is segmented for



standard sub-bottom profiling operations or "pipeline" mode for optimal location and imaging of buried pipelines or cables.

Alternately, the Innomar and EdgeTech 3400-OTS transducers were rigidly mounted over-theside of the survey vessel and located underneath the GPS antenna (Figure 19), to attain a high positioning accuracy of the seismic data. Furthermore, a motion sensor was secured just next to the transducer pole, which allowed a smooth profiling image to be recorded from the seismic traces, particularly under marginal weather condition.



Figure 18: Innomar (left) and EdgeTech 3400-OTS (right) transducers





6.8 SITE SAFETY

An internal safety system was implemented in accordance with the EGS Safety Manual that was based on industry requirements as set out in the 'Marine Geophysical Operations Safety Manual' (International Association of Geophysical Contractors, Eighth Edition, 1996) and local requirements.

6.9 QUALITY ASSURANCE

Quality is assured by adopting the measures set out in the EGS ISO9001 Quality Handbook.



7 REDUCTION OF OBSERVATIONS AND INTERPRETATION

7.1 SOUNDING DATA

For MBES data reduction, data coverage and density were checked. Soundings were cleaned for outliers or artefacts by using various data filters and surface cleaning algorithms before they are validated.

All instrument offsets derived from patch test results, sound velocity correction, draft and attitude data correction were applied in the processing environment. All bathymetric data were corrected for speed of sound based on the SVP measurements. The smoothed sounding data were reduced to levels below HKPD using the measured tide levels.

After all corrections applied, "BASE Surfaces" (Bathymetry with Associated Statistical Error) were generated for a correlated check on the data quality. Any irregularity or artefact in the data identified would trigger further processing for the tidal and sound velocity corrections. Then the Digital Terrain Model as "BASE Surfaces" was calculated and exported. All BASE Surfaces were finally processed into grids. Localised gradients on features of smaller lateral extent may not be resolved.

Gridded sounding selection was used for this survey, as is widely used for engineering purposes. The selection procedures for this project are as follows:

- The processed data were gridded on to 1 m spacing dataset, during which median sounding values were used.
- The gridded data were then plotted at a spacing of 6 mm at the charting scale, to provide a sounding plan for the whole area surveyed.

This gridded plot was then contoured and coloured using 'C-View Bathy' processing and charting software, to provide the sounding plans.

Contours with 1 m intervals were derived based on the final bathymetry grid and presented along with spot depth values in Chart 6 series of this report. The digital MBES results are also provided in ASCII .XYZ files.

7.2 SIDE SCAN SONAR DATA

Processing and interpretation of side scan sonar data were carried out using the C-View interpretation software. Relevant geometries were applied to the C-View system and features were individually marked or grouped into regions. The subsequently generated interpretation files were then imported to the AutoCAD environment on a line-by-line basis where a detailed check was performed and the interpretations reconciled.

The SSS data interpretation is presented in Chart 7 series of this report.



7.3 SEISMIC DATA

7.3.1 GENERAL

The quality of the seismic records is generally good for the interpretation of the sub-bottom geology. However, some specific strata are barely discernible, as constrained by the following conditions:

- 1. Along the 2 existing pipelines, the surficial armour rock layer largely blocked the acoustic penetration where the seismic interpretation was extended as much as possible and interpolation was made wherever unmapped. Moreover, gas masking was present in places in the west of the survey area and restricted the recognition of the deeper geological interfaces. Another masking area from dumped materials was present in the coastal area.
- 2. In the northeast of Area N1, a depression of ROCK head level was mapped near the charted fault on the geological map, where the signal return was generally weak. The interpreted ROCK head in this area is of low confidence and the result is presented in dashed lines on the charts.

7.3.2 INTERPRETATION OF THE GEOLOGICAL SUCCESSION

In general, the seismic records acquired in Hong Kong can quantify the following four elements of marine geological succession (Table 6):

GEOLOGICAL UNIT	AGE
Marine Deposits	
(Hang Hau Formation, mainly mud with beach	Holocene (after the last glacial period)
deposit or debris flow deposit in coastal area)	
Alluvium	
(Chek Lap Kok Formation; mainly coarse	Pleistocene
sediments with gravels)	
Highly to Completely Decomposed Rock	Various
Fresh to Moderately Decomposed Rock	Various

Table 6: Marine geological units commonly applied in HK

Marine Deposits, the most recent upper layers are generally soft or very soft clay or silt and are readily identifiable on seismic records as clear conformable horizontal layers, sometimes with unconformities represented by displaced reflections which could be results of local reworking of deposits underwater currents. Coarse-grained sediments such as sand, gravel, cobbles and boulders could be present near shore, which would produce wavy and discontinuous reflections in the seismic profile.

Alluvium is generally comprised of sand and gravel which produced wavier, semi-horizontal reflectors in the seismic records. Reflectors of alluvial deposits could be graded, inclined and cross-bedded, and sometimes traces of old river channels could be seen.

Highly to Completely Decomposed Rocks are more heterogenic than superficial deposits and therefore produced more chaotic, non-linear reflections in the seismic records.



Fresh to Moderately Decomposed Rocks produced very strong reflection when first encountered, and reflection diminishes very quickly within the rock.

7.3.3 DATA PROCESSING AND INTERPRETATION

Seismic data processing was conducted in C-View Processing and subsequent interpretation was carried out in 3D environment. Related procedures are summarised as follows:

- 1. Seismic records were band-pass filtered and the water column noise was suppressed.
- All traces were corrected for positions and seabed levels by using C-View Processing. Data files were then exported to the 3D seismic interpretation environment for horizon picking.
- 3. Seismic horizons/geological interfaces were picked in the two-way-travel time domain in accordance with the geological sequences listed above. Inline-crossline correlation was conducted for the horizons in the 3D interpretation environment.
- 4. For time-to-depth conversion, the speed of sound was estimated as 1600 m/s in *Marine Deposits*, 1800 m/s in *Alluvium*, and 2000 m/s in *Highly to Completely Decomposed Rocks*.
- 5. Available borehole data was imported into the 3D interpretation environment and displayed as borehole stick for correlation with the nearby seismic records.
- 6. Finally, the correlated horizons were exported in digital ASCII format. Calculations were done for horizon levels with reference to the vertical datum and isopachs of each sediment/soil unit.
- 7. Horizon levels and isopachs were then gridded for contouring and charting.

The results of the SBP data interpretation are presented in Chart 8 to 13 series of this report.

A screenshot of the 3D interpretation environment is presented in Figure 20:





7.4 MAGNETIC DATA

A 10 m line interval magnetic survey was designed to detect the existence of any utilities or ferromagnetic objects on the seafloor or shallowly buried over the survey area.

The Geometrics G-882 Marine Magnetometer recorded the total magnetic field which was the sum of several magnetic fields: Earth's internal field (IGRF), lithospheric anomalies associated with sediments, solid geology and tectonic activities, physical interferences from outer space and anomalies associated with man-made objects.

IGRF and external interferences are time-dependent within this small survey area, whilst magnetic anomalies related to man-made objects and solid geology were generally independent of time since they contain remnant magnetization acquired in their formation and induced magnetization associated with the material's susceptibility.

In data space, these magnetic anomalies have wavelengths relatively shorter than timedependent anomalies. In addition, their wavelengths vary with the depth of their corresponding source, by which anomalies related to very shallow objects can be differentiated from the background field. Various data processing procedures were conducted to isolate such signals from the background geology and interferences.

The data processing in this project is summarised below:

1. Median Filtering

Marine magnetic data were processed through median filters in the space domain to remove long-wave components or background field generated by deep causative sources, magnetic anomalies associated with regional geology and Earth's internal magnetic field. Highfrequency noises, such as spikes, were also removed.



2. Transform to Quasi-Analytical Signal

The result of background filtering would be a residual magnetic field dominated by a series of dipole anomalies, associated with shallow causative sources such as ferromagnetic man-made objects and volcanic rock outcrop. However, these localised anomalies would vary dramatically in amplitudes, directions and wavelengths and anomaly peaks or troughs would not necessarily locate exactly above source positions, due to different source burial depths and different remnant magnetizations.

To remove such dipolar effect and present source positions more accurately, the anomalies underwent a quasi-analytical signal transformation, which involved a calculation for field gradients in all three dimensions and their quadratic means. The peak of the analytical signal represented a local gradient maximum, and more importantly, would coincide with horizontal positions of the causative sources in general, regardless of their magnetization directions.

The resultant map of the quasi-analytical signal is presented in Chart 14 series of this report.

7.5 SUBSEA UTILITY SURVEY DATA

Survey lines perpendicular to the database alignments of existing subsea utilities were run utilising the magnetometer and seismic profiling systems, for utility detection.

The subsea utility is generally made of ferromagnetic substances which can produce a magnetic field, and the electric current of the cathodic protection or power transmission along the seabed utilities can also produce an additional magnetic field at the same time. Such generated magnetic fields would induce a magnetic anomaly in the total magnetic field measured. The location and amplitude of the anomalies were recorded and measured on each survey line to delineate the subsea utilities.

Reflected seismic signals recorded by the Innomar or EdgeTech 3400-OTS SBP system were used to identify the subsea utility. Ideally, as the vessel moved along a survey traverse, continuous pings formed a section image showing the near seabed geological changes and the buried pipeline position as a characteristic 'diffraction hyperbola'. However, it should be noted that the seismic profiling data can be used to confirm sections of subsea utility covered by rock armour or natural backfill of coarse sediments, but the burial depth along these sections is unlikely to be determined due to the signal masking.

The subsea utility survey result is described together with Seabed Feature Result in Section 8.4 and presented with the SSS data interpretation in Chart 7 series of this report.



8 RESULTS

8.1 PRESENTATION

The results have been presented as follows:

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APPENDICES

Appendix A	Daily Site Records
Appendix B	GPS Check Records
Appendix C	Tide Data
Appendix D	Velocity Profiles
Appendix E	MBES Calibrations
Appendix F	Contacts (sonar contacts, seismic contacts and magnetic contacts)
Appendix G	Positions of High Magnetic Gradients
Appendix H	Borehole Records

DIGITAL DATA DVD

Digital Copy of Survey Report

DRAWINGS

Chart 1 series	Swath Track Plot
Chart 2 series	Hydrophone Track Plot
Chart 3 series	Side Scan Sonar Track Plot
Chart 4 series	Magnetometer Track Plot
Chart 5 series	Subsea Utility Survey Track Plot
Chart 6 series	Contoured Swath Bathymetry Plan
Chart 7 series	Seabed Features
Chart 8 series	Contoured Levels at the Base of Marine Deposits
Chart 9 series	Contoured Levels at the Top of ROCK in Any State of Decomposition
Chart 10 series	Contoured Levels at the Top of Presumed Moderately Decomposed ROCK
Chart 11 series	Contoured Isopachs of Marine Deposits
Chart 12 series	Contoured Isopachs of Alluvium
Chart 13 series	Contoured Isopachs of Highly to Completely Decomposed ROCK
Chart 14 series	Magnetic Analytic Signal Plan

8.2 SURVEY TRACK PLOTS (CHART 1 TO 5 SERIES)

The survey tracks were plotted to show the data coverage of the bathymetry echo sounding, seismic reflection, side-scan sonar, magnetic and subsea utility surveys.

The survey lines were slightly deviated in places to avoid buoys, vessels and navigation beacons within the survey area. Infill lines were run to achieve full data coverage. The northeast of the survey area was blocked by the extensive oyster farms.



8.3 SWATH BATHYMETRY PLAN (CHART 6 SERIES)

Tide-reduced, datum corrected and 1 m-gridded seabed levels in the survey area were plotted with colour codes and spot values (positive downwards) in 6 mm spacing at the chart scale. Level contours are presented in 1 m interval.

To the east of the Urmston Road Fairway, the seabed ascends quickly from around -11 mPD at the western limit of Area N1 to -7 mPD, and then maintains generally -5 mPD to -7 mPD across the rest of Area N1. Rugged terrain along the backfilled trench of Second West East Gas Pipeline (WEPII) is apparent (Figure 21). Shallow patches of armour rock are present along Yacheng Pipeline in the west of Area N1.

Eastwards, the central Area N2 was dredged for the navigation purpose with levels of -5 mPD to -6.7 mPD. The seabed shoals southwards towards the rubble mound seawall and up to -2 mPD along the northern survey limit (Figure 22).







8.4 SEABED FEATURES (CHART 7 SERIES)

The seabed predominantly comprises CLAY/SILT throughout Area N1 and N2, with some SAND content in places giving rise to the increase of the sonar reflectivity. Patches of dumped materials were locally observed. Scattered debris/tyres/boulders were commonly found. Scattered depressions were observed in the western Area N1 and fields of scattered to numerous pockmarks were mapped in places. Seabed scars are scattered and intensify eastwards, mainly caused by vessel anchoring and likely seabed dredging in the vicinity of the navigation channel across Area N2. Typical data examples are present in Figure 23 to Figure 26 below.

Backfilled trench of WEPII Pipeline was evidently observed, with scattered to numerous armour rock (Figure 26). Patches of rock dump were intermittently found along Yacheng Pipeline in the central Area N1.

Throughout Area N1 and N2, totally 17 sonar contacts were picked, including 15 debris and 2 unknown objects of larger dimensions. A data example can be found in Figure 25. A summary table and specific screen captures of the sonar contacts are provided in **Appendix F**.







Figure 24: Side scan sonar data capture showing dumped materials and scars





Figure 25: Side scan sonar data capture showing debris/boulders, scars and a sonar contact



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The subsea utility survey results are also presented in Chart 7 series of this report. Both pipelines were positively located by the magnetometer (Figure 27). The WEPII Pipeline was found to generally match well with its database position, while the as-found Yacheng Pipeline lies about 10-25 m north of its database alignment. Due to heaving signal masking from the rock armour, the pipelines could not be revealed from the seismic profiling data (Figure 28).

Over the Shekou power cable, hyperbolic reflections were recorded from the seismic data, the top of which ranges from 0.9 m to 1.5 m below the ambient seabed (Figure 29). Considering a general cable burial depth of 5 m as per EGS's as-laid record, those diffraction hyperbolae were interpreted as top of backfill or protection layer of the cable. The as-found alignment agrees well with the as-laid record and the subtle cable trench as exhibited by the MBES data.

In total 47 magnetic contacts and 8 seismic contacts were recorded from the utility survey. The summary tables can also be found in **Appendix F**.











8.5 MARINE DEPOSITS (CHART 8 AND CHART 11 SERIES)

Chart 8 series illustrates the general regime of the base levels of the Marine Deposits and Chart 11 series presents the thickness of the interpreted Marine Deposits.

Across the surveyed Area N1 from the west to the east, the base of the Marine Deposits gradually ascends from nearly -19 mPD to about -10 mPD. Signal masking was locally observed at both ends of the survey area due to gas and/or dumped materials.

The thickness of the interpreted Marine Deposits generally ranges between 7 m and 11 m, decreasing to around 4 m towards the eastern end of Area N1.

8.6 ALLUVIUM (CHART 9 AND CHART 12 SERIES)

Chart 9 series illustrates the top levels of ROCK in any state of decomposition which serves as the bottom of Alluvium deposits (if present), and Chart 12 series demonstrates the thickness of the interpreted Alluvium.

The base of Alluvium rises irregularly from -40 mPD to -28 mPD eastwards in Area N1, and shoals quickly up to around -14 mPD towards the coast. The unit of Alluvium deposits maintains mainly 16 m to 25 m thick and thins up to about 3 m in the coastal area. Acoustic masking due to gas and dumped materials are present in places.

8.7 HIGHLY TO COMPLETELY DECOMPOSED ROCK (CHART 10 AND CHART 13 SERIES)

Presented in Chart 10 series are the top levels of presumed moderately decomposed ROCK (ROCK head). The thickness of the highly to completely decomposed ROCK is presented in Chart 13 series.

The ROCK head varies between -30 mPD and -44 mPD in the majority of Area N1, and shoals locally up to around -18 mPD in the eastern portion. A depression of ROCK head was mapped in the northeast of Area N1 near the charted fault on the geological map, where the ROCK head level descends to slightly over -50 mPD. Due to generally weak signal return, the interpreted results are of low confidence and shown in dashed lines on the charts. Other than that, no clear indication about the fault could be revealed from the SBP data acquired during this survey.

The thickness of the highly to completely decomposed ROCK is predominantly less than 8 m across Area N1, and increases locally to around 20 m towards the low confidence area of interpreted ROCK head and the coastal area in the south-eastern corner.

Some examples of the SBP data with interpreted units are given below.
















8.8 CORRELATION WITH BOREHOLE RECORDS

Existing borehole (BH) records were provided by Client for the SBP data correlation. The borehole records are included in **Appendix H** of this report and the locations are shown on the survey charts.

Three boreholes are located within the seismic survey area and were taken into account during data interpretation. Table 7 below compares the levels of the major geological interfaces from seismic interpretation with those logged in the boreholes. The boreholes generally match with the SBP data, while the differences are mainly from the offsets to the SBP survey lines where the "Survey" results were estimated from interpolation.

BH No	Seabe (m bel	d Level low PD)	Base Level of MD (m below PD)		Base Level of AL (m below PD)		Top Level of Grade III Rock (m below PD)		BH Termination
bir ito.	вн	Survey	вн	Survey	вн	Survey	вн	Survey	Level (m below PD)
19102_ODB/3	5.93	6.4	17.93	17.0	-	39.0	-	41.5	41.43
16442_90830/1D	5.50	5.7	9.50	10.2	16.30	15.5	19.59	19.0	25.00
5718_C2	5.04	5.6	10.14	10.2	25.04	25.3	-	31.0	29.54

Table 7: Comparison of major horizons observed on seismic data and in borehole logs

Note: MD = Marine Deposits; AL = Alluvium



8.9 MAGNETIC ANALYTIC SIGNAL PLAN (CHART 14 SERIES)

A plan of the quasi-analytic signal derived from the processed magnetic data is presented in Chart 14 series and extracted here in Figure 35. The quasi-analytical signal represents the gradient "amplitude" of the magnetic total field which indicates how fast the magnetic field changes and normally peaks over locations of ferrous objects or other causative sources.

Apart from the intense magnetic variations along WEPII Pipeline and Yacheng Pipeline, the surveyed Area N1 is characterised by scattered low to high magnetic peaks which largely concentrate in the eastern portion of the survey area. Totally 68 magnetic anomalies of >10 nT/m were marked, including two from the navigation beacons and one likely related to the power cable. Several of the anomalies correlate well with the sonar contacts identified as debris/ unknown objects, notably the two (SA1-MC055 and MC066) near the eastern survey limit. The remaining ones are of unknown origin.

Due to the widespread oyster farms, the MAG data coverage was limited in the northeast of Area N1.

The positions of high magnetic gradients are presented in Chart 14 series and enclosed as **Appendix H** of the report.







9 ACCURACY

9.1 ACCURACY OF SEABED LEVELS

The overall accuracy of an echo sounding survey could have been affected by numerous factors listed below, and the quality assurance procedures were sought to eliminate some of the potential errors (those marked with an asterisk (*)):

- * Incorrect benchmark level
- * Settlement of benchmark between successive surveys
- * Uncertainties in setting up the tide gauge Reading off errors of the tide gauge data Surveyor bias in seabed interpretation Incorrect removal of the effects of waves The (inevitable) assumption that there is no water surface gradient between the tide gauge and the survey boat from time to time Variations in the salinity of the seawater across the survey period, affecting the speed of sound in water
- * Minor uncertainties in bar checks
- * Uncertainty in horizontal control The beamwidth of the transducer Variations in boat 'balance'
- * Manufacturer's stated echo sounder accuracy

In this survey, the sounding data collected by MBES have been cross-checked within the overlapping areas. Generally, the accuracy of seabed levels is better than 0.2 m.

9.2 PRESENTATION OF DATA IN CONTOURED FORM

Presentation of data in contoured form implied knowledge of the level between survey lines, for which traverse separation and topographic relief determined the extent to which such interpolation is justified. Where a smaller traverse separation and smoother topography would result in a smaller interpolation error, large separation and rough topography would increase the error beyond that of the estimations presented below.

9.3 ESTIMATES OF ACCURACY

The following estimates of accuracy would be appropriate in this project, which are of high accuracy for the surveying equipment deployed:

Horizontal position of soundings	±1m
Seabed level	± 0.2 m
Horizontal position of seabed features and boundaries	± 2 m
Base level of marine deposits	±1m
Base level of Colluvium/Alluvium	± 1-2 m
Top level of Presumed Moderately Decomposed Rock	± 3-5 m



10 CONCLUSIONS

The survey was carried out to locate the subsea utilities, measure the seabed levels and reveal the nature of materials of seabed and underneath. All surveys were conducted in a safe manner.

In Area N1, the seabed maintains generally between -5 mPD and -7 mPD with apparent undulations along the two existing pipelines, and descends quickly up to about -11 mPD towards the Urmston Road Fairway. Across Area N2, the seabed is generally shallower than -5 mPD and deepens into the narrow navigation channel up to -6.7 mPD.

The seabed predominantly comprises CLAY/SILT throughout Area N1 and N2, with scattered depressions, pockmarks fields and patches of dumped materials. Seabed scars, mainly related to anchoring and dredging activities, are scattered and intensive in the east of Area N1. Backfilled trench of WEPII Pipeline is evident with scattered to numerous armour rock. Patches of rock dump were intermittently found along Yacheng Pipeline. Totally 17 sonar contacts were marked, including two unknown objects of relatively prominent dimensions.

Geological units of marine deposits, Alluvium and decomposed ROCK/bedrock were mapped wherever possible. A depression of ROCK head was observed in the northeast of Area N1, within which the interpreted level of the ROCK head should be used with caution due to acoustic penetration limit of the SBP data. No clear topographic or subsurface indication of the fault as shown on the geological map could be found from the survey datasets.

Other than the strong magnetic variations related to the two pipelines, totally 68 anomalies of high magnetic gradients were picked. Some of them were found to be associated with the sonar contacts.

The alignments of the subsea utilities within the survey area were determined. However, no burial information could be obtained due to the signal masking from the backfill materials and/or protection layer (i.e. armour rock).

Howard Wang Senior Geoscientist EGS (Asia) Limited Date: 12 September 2023 Certified Complete By:

Mr. WONG Sai Cheong, George Main Contractor's Representative

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APPENDICES

APPENDIX A

Daily Site Records

	GEOPHYSICA	L SURVEY - DAI	LY SITE RECORD	
CEDD CONTRA	CT NO. : GE/2021/0	03		
PROJECT TITLE :	Task Order No. GE/ Agreement No. CE 2 Facilities Phase 2 - Geophysical Surve	2021/03.23 26/2022 (EP) Developn Investigation, Design v (GS)	nent of Integrated Waste Mana (SA1) -	/anagement Marine
Works Order no. :	GE/2021/03.23	Locati	on : Nim Wan	
Contractor :	EGS (Asia) Ltd	Survey	Type : Geophysical S	Survey
AA PERSONNE	L ON SITE			
Site In-charge :	1002	Contact No. : 613	Ct 0436 Vehicle / Vess	sel: NPH2
Number of	Geophysicist	Surveyor 1	Engineer	Technician 2
Site Staff	Client Rep. Z	GEO Rep.	Others	
BB MAJOR EQ	UIPMENT			
Item	GPS	SBES	MBES	
Model Number	GIPS 133			
Item	Side Scan	Marine Seismic	Marine Magnetic	
Model Number		EdgeTech3 40	0 G882	
CC SUITABILIT	Y OF WORK	Innomar		
Weather	Fine	Sunny	Suitable for work	YES / NO
Site Clearance	OC	Good	Suitable for work	YES / NO
Noise Monitoring	316	Good	Suitable for work	YES / NO
DD ACTIVITY S			DATE: 2	6/06/2023
On Site Time	Activity	· · · · · · · · · · · · · · · · · · ·	Comment	
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10:00	Sant	WH Br util	144	
13:00	Longoh	und gr)	
12'00	Enli	lin Amil		
(7.0	Cria	or any		
EE PRODUCTIO	ON SUMMARY			
Survey Item	Estimated no.	of dayworks	% Completed	
SBOT MAG	7	•	10%	
			l	
	2			
FF PROGRAMI	ME FOR NEXT DAY	Y	DATE : 2	-16/2023
Proposed On Site T	ime Activity		Vehicle / Vessel	No. of Staff
0830	mp	tG	WH2	5
		2		
Site In-charge	Leo >	Contact No.	61510436	
GG INSPECTED) BY			
Title	Name	Signat	ure "	
Binnipe	Citing to	AN YUZAL	dis	
PINNUS	uniu ll	AN MEN		

	GEOPHYSICAL	SURVEY	- DAILY	SITE RECORD	
CEDD CONTRAC	T NO. : GE/2021/0 Task Order No. GE/2 Agreement No. CE 2 Facilities Phase 2 - In Geophysical Survey	3 021/03.23 6/2022 (EP) D nvestigation, (GS)	evelopment Design and	of Integrated Waste M Construction (SA1) - M	anagement <i>I</i> larine
Works Order no. :	GE/2021/03.23		Location	: Nim Wan	
Contractor :	EGS (Asia) Ltd		Survey Typ	e : Geophysical S	urvey
AA PERSONNE	L ON SITE				
Site In-charge :	Leo 2	Contact No	.:	Vehicle / Vess	el: WH2
Number of	Geophysicist	Surveyor	2	Engineer	Technician (
Site Staff	Client Rep.	GEO Rep.	¢ "{	Others	
BB MAJOR EQU	JIPMENT				
Item	GPS	SBES		MBES	
Model Number	6195133				
Item	Side Scan	Marine Seis	mic	Marine Magnetic	
Model Number		Educie	ch 3 400	6882	
CC SUITABILITY	OF WORK	1			
Weather	Sunna			Suitable for work	YES / NO
Site Clearance	Quoter form in	side survey	alla	Suitable for work	YES / NO
Noise Monitoring	Good	in a social	0.00	Suitable for work	YES/NO
DD ACTIVITY SI	JMMARY		an weath	DATE: 27	-06-2023
On Site Time	Activity			Comment	
0830	Meet a	Jo Then 1	Tur		
0945	start to	work			
1300	Having Lo	unch			
1330	start to) Survey			
1830	End o	F day			
EE PRODUCTIC	N SUMMARY	1			
Survey Item	Estimated no. o	of dayworks		% Completed	
SBp+ Mag	7			25%	_
. ,					
FF PROGRAMM	IE FOR NEXT DAY			DATE : 21	-06-2023
Proposed On Site Ti	me Activity			Vehicle / Vescel	No of Staff
083-	Mar			WH 7_	5
					,
Site In-charge U	Al Pai Min	Cont	act No. 6	1910436	
GG INSPECTED	ВҮ	0			
Title	Name		Signature		

	GEOPHYSICA	L SURVEY	- DAILY	SITE RECORD	
CEDD CONTRA	CT NO. : GE/2021 Task Order No. GE Agreement No. CE Facilities Phase 2	/03 E/2021/03.23 E 26/2022 (EP) D - Investigation,	evelopment Design and	of Integrated Waste I Construction (SA1) -	Vanagement Marine
	Geophysical Surve	ev (GS)			
Works Order no. :	GE/2021/03.23		Location	: Nim Wan	
Contractor :	EGS (Asia) Ltd		Survey Ty	pe : Geophysical	Survey
AA PERSONNE					
Site In-charge :	Leol	Contact No	.: 61510	436 Vehicle / Ves	sel: W172
Number of Site Staff	Geophysicist	Surveyor	2	Engineer	Technician
BB MAJOR EQ	UIPMENT			Outers	
ltem	GPS	SBES		MBES	
Model Number	6145133				
ltem	Side Scan	Marino Sois	mic	Marino Magnotic	
Model Number	Side Scan	Edgelech	3400	6 88 2	
CC SUITABILIT	Y OF WORK				
Weather	Sunny			Suitable for work	YES NO
Site Clearance	Oyster form	inside sur	ley area	Suitable for work	YES NO
Noise Monitoring	6000]	Suitable for work	YES NO
DD ACTIVITY S	UMMARY			DATE : 2	8-06-2023
On Site Time	Activity			Comment	
0830	Then M	un check	Sately.	Comment	8
1015	tede	Start	Surren		
1300	Luch) 001 -	in the		
1330	start	to Su	ney		
1830	Tind 0	1 days	0		
EE PRODUCTIO	ON SUMMARY	ung			
Survey Item	Estimated no	o. of dayworks		% Completed	
Mag	1			65%	
tend of					
×					
FF PROGRAM	ME FOR NEXT DA	Α Υ		DATE : 2	3-06-2023
Proposed On Site T	ime Activity			Vehicle / Vessel	No. of Staff
0830	Ma	y		WH2	5
Site In-charge	Al Pai Mi	ng Cont	act No.	61510436	1
GG INSPECTED	BY	0	111		
Title	Name		Signature		

	GEOPHYSICAL	SURVEY	- DAILY	SITE RECOR	D	
CEDD CONTRA	CT NO. : GE/2021/0 Task Order No. GE/2 Agreement No. CE 2 Facilities Phase 2 - Geophysical Survey)3 2021/03.23 26/2022 (EP) D Investigation, 7 (GS)	evelopment Design and	of Integrated Wast Construction (SA1	e Management) - Marine	
Works Order no. :	GE/2021/03.23	21/03.23 Location			W.	
Contractor :	EGS (Asia) Ltd		Survey Ty	pe : Geophysic	al Survey	
AA PERSONNE	EL ON SITE					
Site In-charge :	Leoz	Contact No	61510	436 Vehicle / V	essel: WHL	
Number of	Geophysicist	Surveyor	2	Engineer (Technician	
Site Staff	Client Rep.	GEO Rep.		Others		
BB MAJOR EQ	UIPMENT					
Item	GPS	SBES		MBES		
Model Number	GP5133					
Item	Side Scan	Marine Seis	smic	Marine Magnetic		
Model Number				4882		
CC SUITABILIT	Y OF WORK					
Weather	Sunna			Suitable for work	YESINO	
Site Clearance	aister farm	inside su	wey area	Suitable for work	YES/NO	
Noise Monitoring	Good	11 7.00	10-00	Suitable for work	YES / NO	
DD ACTIVITY S	UMMARY				29-06-2023	
On Site Time 0830 0945 1300 1330 1830	Activity Meet to to site Lunch 5tart t End of 2	Then start o Survey Day	Mun Survey W	Comment		
EE PRODUCTIO	ON SUMMARY	/				
Survey Item	Estimated no.	of dayworks		% Completed		
Mag	. 4			100%		
MBES/SSS	3			0 %		
FF PROGRAMI	ME FOR NEXT DAY	1		DATE :	2F	
Proposed On Site T	Time Activity			Vehicle / Vessel	No. of Staff	
Site In-charge	Leo 2	Cont	act No.	61510436		
GG INSPECTED						
Title	Name		Signature			

	GEOPHYSICA	L SURVEY	- DAILY	SITE RECORD	
CEDD CONTRAC	T NO. : GE/2021/ Task Order No. GE/ Agreement No. CE Facilities Phase 2 - Geophysical Surve	03 /2021/03.23 26/2022 (EP) De Investigation, D v (GS)	velopment)esign and	of Integrated Waste Man Construction (SA1) - Mar	agement rine
Works Order no. :	GE/2021/03.23		Location	: Nim Wan	
Contractor :	EGS (Asia) Ltd		Survey Ty	pe: Geophysical Sur	vey
AA PERSONNEI	ON SITE				
Site In-charge :	ung Trz kie	Contact No.	9754	9901 Vehicle / Vessel	6201
Number of	Geophysicist 🗡 🕻	Surveyor	13	Engineer 📈 🔪	Technician
Site Staff	Client Rep.	GEO Rep.		Others	
BB MAJOR EQU	IPMENT				
Item	GPS	SBES		MBES	
Model Number	NovAtel	Odom M.	KI	Edge Tech 62055	
ltem	Side Scan	Marine Seisn	nic	Marine Magnetic	
Model Number	EdgeTech 6205	is LVB			
CC SUITABILITY	OF WORK				
Weather	Rainy & cloudy			Suitable for work	YES/NO
Site Clearance	Oyster farm	r inside sur	my are	Suitable for work	YES / NO
Noise Monitoring	N/A			Suitable for work	YES / NO
DD ACTIVITY SL	JMMARY			DATE : 03-0	7-2023
On Site Time	Activity			Comment	
08:30 ~09:5	o Survey cr	rew onboa	erd		
09:50 ~ 11:0	no MBES Ca	libration			
11:00 - 16:1	10 Start to	Surry			
16:10 ~ 16:	30 Endofsu	my, back to YUT			41
16:20 ~ 18:	20 End of	l day			
EE PRODUCTIO	N SUMMARY	,			
Survey Item	Estimated no.	. of dayworks		% Completed	
Geophysical Su	ineg 4 day.			30 %.	
	5				
FF PROGRAMN	IE FOR NEXT DA	Y		DATE : 04-	07-2023
Proposed On Site Ti	me Activity			Vehicle / Vessel	No. of Staff
08:30.	Continue	the Geoph	rsical	6001	5
	Sung	t			
	5				
Site In-charge		Conta	ct No. 9	7549901	
GG INSPECTED	ВҮ				
Title	Name		Signature		

	GEO	PHYSICAL	SURVEY	- DAILY	SITE RECORD	
CEDD CONTRAC	T NC Task Agre Facil	0. : GE/2021/03 Order No. GE/20 ement No. CE 26 lities Phase 2 - In	21/03.23 /2022 (EP) De vestigation, I	evelopment Design and	of Integrated Waste Mar Construction (SA1) - Ma	nagement rine
Works Order po	Geor	physical Survey (GS)	Location	Nim Mon	
Works Order no. :	GE/2	.021/03.23		Location	: Nim Wan	
	EGS			Survey Typ	e : Geophysical Su	rvey
AA PERSONNEL		511E		07511	88.1	1701
Site In-charge : 20	ung	152 KQ	Contact No.	: 9/34	Vehicle / Vessel	Geol
Number of Site Staff	Geop	physicist 🖌 🔪	Surveyor	x 3	Engineer 🔀	Technician
	Clien	t Rep.	GEO Rep.		Others	
BB MAJOR EQU	IPMI	ENT			T	
Item	GPS		SBES		MBES	
Model Number	No	VAte 1	Odom M	IK TY	EdgeTech 62055	
Item	Side	Scan	Marine Seis	mic	Marine Magnetic	
Model Number	Edg	etech 62055	LVB			
CC SUITABILITY	OF	WORK				
Weather	Ro	ring & clon	dy		Suitable for work	YES NO
Site Clearance	Oys	ter Farm insi	de surry	aver	Suitable for work	YESNO
Noise Monitoring		NA	0		Suitable for work	YES / NO
DD ACTIVITY SL	JMM	ARY			DATE : 04-0	07-2023
On Site Time		Activity			Comment	
08:30 ~ 09:1	4	Surry Cores	Surry Crew or board.			
09:15 ~ 09=0	to	Deploy LVB	LVB, bor check, SVP			
09:40 ~ 14=1	70	Stare to surver				
14:00 ~ 15:0		is beatly or struck by days store			2 6 2 2	
$1100 \sim 180$	00	MBBs cal, and of day			Vive	
EE PRODUCTIO	N CI			g		
EE PRODUCTIO	NOC					
Survey Item		Estimated no. of	f dayworks		% Completed	
Geophysial Su	ny	4 days			60 %.	
FF PROGRAMM	IE FO	DR NEXT DAY			DATE : 05-	07-2023
Proposed On Site Tir	me	Activity		1	Vehicle / Vessel	No. of Staff
08:30		Tuen Mu	n Pier.			
Site In-charge	N	Ju Lung	Conta	act No.	73647464	1
GG INSPECTED	BY					
Title		Name		Signature		
1				L		

	GEOPHYSICAL SURVEY - DAILY SITE RECORD						
CEDD CONTRAC	T NO. : GE/2021/0	3					
Task Order No. GE/2021/03.23 Agreement No. CE 26/2022 (EP) Development of PROJECT TITLE : Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1) - Marine Geophysical Survey (GS)							
Works Order no. :	GE/2021/03.23		Location	: Nim Wan			
Contractor :	EGS (Asia) Ltd		Survey Type	e: Geophysical S	urvey		
AA PERSONNEL	ON SITE						
Site In-charge : S	in fu Lunda	Contact No.	93647	the Vehicle / Vess	el: GEO 1		
Number of Site Staff	Geophysicist 1	Surveyor	3	Engineer \	Technician		
	Client Rep.	GEO Rep.		Others			
BB MAJOR EQU		1		T			
Item	GPS	SBES		MBES			
Model Number	NovAtel	Odom MK III		EdgeTech 6205S			
Item	Side Scan	Marine Seis	mic	Marine Magnetic			
Model Number	EdgeTech 6205S	LVB System		/			
CC SUITABILITY	OF WORK						
Weather	Heavy rain i	in afterna	on	Suitable for work	ES/NO		
Site Clearance	Oyster form ins	side survey	area	Suitable for work	ES NO		
Noise Monitoring	, ,	,		Suitable for work	YES / No		
DD ACTIVITY SU	JMMARY			DATE : 5	17/2023		
On Site Time	Dn Site Time Activity			Comment			
0830 -0910	meet at To	1, transit	to site				
0910 - 144	5 Deploy equip	nent, Barc	hock, svi	, start survey			
1445 - 1545	5 Weather	standby	creavy 1	Rain)			
1545-1630	MB Cal,	Barched	-, SVP				
1630 - 180	to Transit b	sade to Y	MT, Ee	D.			
EE PRODUCTIO	N SUMMARY						
Survey Item	Estimated no.	of dayworks		% Completed			
Geophysical		1			8.%		
FF PROGRAMM	E FOR NEXT DAY	,		DATE : 💪	17/2023		
Proposed On Site Tir	me Activity			Vehicle / Vessel	No. of Staff		
08:30	Tuen W	lun Die	-	GEOI	3		
Site In-charge Str u Lung Contact No. 93647464							
GG INSPECTED BY							
GG INSPECTED	BY						
GG INSPECTED	BY Name		Signature				

	GEOPHYSICA	L SURVEY	- DAIL	Y SITE RECORD			
CEDD CONTRAC	T NO. : GE/2021	/03					
Task Order No. GE/2021/03.23 Agreement No. CE 26/2022 (EP) Development of PROJECT TITLE : Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1) - Marine Geophysical Survey (GS)							
Works Order no. :	GE/2021/03.23	_	Location	: Nim Wan			
Contractor :	EGS (Asia) Ltd		Survey T	ype : Geophysical S	Survey		
AA PERSONNEI	L ON SITE						
Site In-charge :S	in fu Lunde	Contact No	9364	7464 Vehicle / Vess	el: GEO 1		
Number of Site Staff	Geophysicist	Surveyor	3	Engineer	Technician		
BB MAJOR FOL		IGEO Rep.		Others			
Item	GPS	SBES		MBES			
Model Number	NovAtel	Odom MK II	1	EdgeTech 6205S			
Itom	Sido Scan	Marina Sais	mio	Marina Magnetia			
Model Number	Side Scall	Marine Sets	SIIIC	Marine Magnetic			
Weather	Sum			Suitable for work	(FR) NO		
Site Clearance	Justor form in	side survey	area	Suitable for work	VES NO		
Noise Monitoring	093001 1000 11	Chile Station	UTCH	Suitable for work	VES / NO		
On Site Time	Activity			Commont	17/2013		
0830 - 0900	Most at	TM , to	t for	t to site			
0900 - 0945	Declary F	1 × 10	Bur C	o stree			
6945 - 114	O Cartingo	Capital -	Barch	de CUD			
1140 - 100	Transf	back t	- YM	T			
14000 1400	Demob	equiduo	+ I	DD			
	N SUMMARY	Colores -		<u> </u>			
Survey Item	Estimated no	of dayworks		% Completed			
Graduit	Listimated no						
Seepingsie							
FF PROGRAMM	E FOR NEXT DA	Y	Maria	DATE: 7	7 2023		
Proposed On Site Ti	me Activity			Vehicle / Vessel	No. of Staff		
	No fis	eldwork	_				
Site In-charge		Cont	act No.				
GG INSPECTED	ВҮ						
Title	Name		Signature	3			
	_		1				

APPENDIX B

GPS Check Records





APPENDIX C

Tide Data



Legend :

Tide Curve



HK268623



Legend :

Tide Curve



HK268623

APPENDIX D

Velocity Profiles

APPENDIX D1

Sound Velocity Profile (Refer to DVD)

APPENDIX D2

Example of Bar Check Records





APPENDIX E

MBES Calibrations



Task Order No. GE/2021/03.23 - Agreement No. CE 26/2022 (EP) Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1) Marine Geophysical Survey (GS)

EdgeTech 6205s Combined Bathymetry and Side Scan Sonar Calibration Report

The Patch Test for EdgeTech 6205s combined bathymetry and side scan sonar was carried out on 03^{rd} July 2023 and the result was illustrated below.

1) Roll Calibration – Port Head





2) Roll Calibration – Starboard Head

The line is set over a flat seabed terrain; running in opposite directions at the same speed Speed: 5.5 knots Water Depth: 8.5 m Line Separation: 50.0 m





3) Pitch Calibration – Port Head



Water Depth: 7.6 – 9.6 m Speed: 5.5 knots



Line Separation: 30.0 m



4) Pitch Calibration – Starboard Head



Water Depth: 7.6 – 9.7 m Speed: 5.5 knots



Line Separation: 30.0 m



5) Yaw Calibration – Port Head



Water Depth: 7.6 – 9.8m Speed: 5.5 knots

Line Separation: 10.0 m





6) Yaw Calibration – Starboard Head



Water Depth: 7.6 – 9.6 m Speed: 5.5 knots

Line Separation: 10.0 m





7) Latency (Navigation Delay) Calibration



Water Depth: 8.0 – 10.0 m

Speed: 3.0 knots / 5.5knots



Summary of MBES Calibration Results

The MBES calibration results are presented as follows:

Pc	ort	Starboard		
Roll:	0.58°	Roll:	1.24°	
Pitch:	0.55°	Pitch:	0.25°	
Yaw:	-1.65°	Yaw:	-0.80°	
Navigation Delay (Latency):		Negligible (be	cause of 1pps)	

Table 1: Summary of EdgeTech 6205s combined bathymetry and side scan sonar calibration parameters



Task Order No. GE/2021/03.23 - Agreement No. CE 26/2022 (EP) Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1) Marine Geophysical Survey (GS)

EdgeTech 6205s Combined Bathymetry and Side Scan Sonar Calibration Report

The Patch Test for EdgeTech 6205s combined bathymetry and side scan sonar was carried out on 04th July 2023 and the result was illustrated below.

1) Roll Calibration – Port Head




2) Roll Calibration – Starboard Head

The line is set over a flat seabed terrain; running in opposite directions at the same speed

Water Depth: 23.0 m Speed: 5.5 knots

Line Separation: 50.0 m





3) Pitch Calibration – Port Head



Water Depth: 12.5 – 23.0 m Speed: 5.5 knots

Line Separation: 30.0 m





4) Pitch Calibration – Starboard Head



Water Depth: 12.5 – 23.0 m Speed: 5.5 knots

Line Separation: 30.0 m





5) Yaw Calibration – Port Head



Water Depth: 12.5 – 23.0 m Speed: 5.5 knots

Line Separation: 10.0 m





6) Yaw Calibration – Starboard Head



Water Depth: 12.5 – 23.0 m Speed: 5.5 knots

Line Separation: 10.0 m





7) Latency (Navigation Delay) Calibration



Water Depth: 12.5 – 23.0 m Speed: 3.0 knots / 5.5 knots



Summary of MBES Calibration Results

The MBES calibration results are presented as follows:

Po	ort	Starboard		
Roll:	3.00°	Roll:	3.58°	
Pitch:	-1.12°	Pitch:	-1.18°	
Yaw:	-0.77°	Yaw:	2.30°	
Navigation Delay (Latency):		Negligible (be	cause of 1pps)	

Table 1: Summary of EdgeTech 6205s combined bathymetry and side scan sonar calibration parameters



Task Order No. GE/2021/03.23 - Agreement No. CE 26/2022 (EP) Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1) Marine Geophysical Survey (GS)

EdgeTech 6205s Combined Bathymetry and Side Scan Sonar Calibration Report

The Patch Test for EdgeTech 6205s combined bathymetry and side scan sonar was carried out on 05th July 2023 and the result was illustrated below.

1) Roll Calibration – Port Head



Water Depth: 12.5 m Speed: 5.5 knots

Line Separation: 50.0 m





2) Roll Calibration – Starboard Head

The line is set over a flat seabed terrain; running in opposite directions at the same speed

Water Depth: 12.0 m Speed: 5.5 knots

Line Separation: 50.0 m





3) Pitch Calibration – Port Head



Water Depth: 12.5 – 23.0 m Speed: 5.5 knots

Line Separation: 30.0 m





4) Pitch Calibration – Starboard Head



Water Depth: 12.5 – 23.0 m Speed: 5.5 knots

Line Separation: 30.0 m





5) Yaw Calibration – Port Head



Water Depth: 12.5 – 23.0 m Speed: 5.5 knots

Line Separation: 10.0 m





6) Yaw Calibration – Starboard Head



Water Depth: 12.5 – 23.0 m Speed: 5.5 knots

Line Separation: 10.0 m





7) Latency (Navigation Delay) Calibration



Water Depth: 12.5 – 23.0 m Speed: 3.0 knots / 5.5knots



Summary of MBES Calibration Results

The MBES calibration results are presented as follows:

Port		Starboard	
Roll:	3.78°	Roll:	2.66°
Pitch:	-1.94°	Pitch:	1.78°
Yaw:	1.28°	Yaw:	2.80°
Navigation Delay (Latency):		Negligible (be	cause of 1pps)

Table 1: Summary of EdgeTech 6205s combined bathymetry and side scan sonar calibration parameters



Task Order No. GE/2021/03.23 - Agreement No. CE 26/2022 (EP) Development of Integrated Waste Management Facilities Phase 2 - Investigation, Design and Construction (SA1) Marine Geophysical Survey (GS)

EdgeTech 6205s Combined Bathymetry and Side Scan Sonar Calibration Report

The Patch Test for EdgeTech 6205s combined bathymetry and side scan sonar was carried out on 06th July 2023 and the result was illustrated below.

1) Roll Calibration – Port Head





2) Roll Calibration – Starboard Head

The line is set over a flat seabed terrain; running in opposite directions at the same speed

Water Depth: 8.0 m Speed: 5.5 knots

Line Separation: 50.0 m





3) Pitch Calibration – Port Head



Water Depth: 7.4 – 9.4 m Speed: 5.5 knots



Line Separation: 30.0 m



4) Pitch Calibration – Starboard Head



Water Depth: 7.2 – 9.4 m Speed: 5.5 knots

Line Separation: 30.0 m





5) Yaw Calibration – Port Head



Water Depth: 7.8 – 9.4m Speed: 5.5 knots

Line Separation: 10.0 m





6) Yaw Calibration – Starboard Head



Water Depth: 7.6 – 9.4 m Speed: 5.5 knots

Line Separation: 10.0 m





7) Latency (Navigation Delay) Calibration



Water Depth: 8.0 – 10.0 m Speed: 3

Speed: 3.0 knots / 5.5knots



Summary of MBES Calibration Results

The MBES calibration results are presented as follows:

Pc	ort	Starboard		
Roll:	3.39°	Roll:	3.35°	
Pitch:	-3.47°	Pitch:	0.23°	
Yaw:	0.31°	Yaw:	-0.25°	
Navigation Delay (Latency):		Negligible (be	cause of 1pps)	

Table 1: Summary of EdgeTech 6205s combined bathymetry and side scan sonar calibration parameters

APPENDIX F

Contacts (sonar contacts, seismic contacts and magnetic contacts)



Contact	Chart	Latitude	Easting	Water	Dimensions	Description
number	number	Longitude	Northing	depth (m)	(m)	Description
SA1 SC001	71	22° 25.512' N	840228.6E	0.0	220 820 4	Debrie
SA1-SC001	7.1	113° 53.477' E	831643.1N	9.0	2x0.6x0.4	Debris
\$41 \$6002	71	22° 25.428' N	840226.9E	0 5	11.0.4	Dobris
3A1-3C002	7.1	113° 53.524' E	831408.1N	8.5	1X1X0.4	DEDLIS
\$41 \$6002	71	22° 25.539' N	840189.0E	70	1 2 1 2 0 2	Dobris
3A1-3C003	7.1	113° 53.569' E	831394.2N	7.0	1.5X1X0.5	DEDLIS
SA1-SC004	71	22° 25.589' N	840269.7E	5.0	3 220 620 5	Debris
3A1-3C004	7.1	113° 53.842' E	831177.5N	5.5	5.2X0.0X0.5	DEDLIS
\$41-\$005	71	22° 25.616' N	840240.0E	57	320 520 4	Debris
3A1-3C003	7.1	113° 53.853' E	831137.1N	5.7	3.0.3.0.4	Debris
\$41-\$006	71	22° 25.594' N	840263.6E	61	1 5v1 2v0 3	Debris
371-30000	7.1	113° 53.861' E	831124.5N	0.1	1.5/1.2/0.5	Debris
SA1-SC007	71	22° 25.530' N	840176.8E	5 9	1 5v1 2v<0 3	Debris
JA1-30007	7.1	113° 54.024' E	831083.0N	5.5	1.5/1.2/(0.5	Debris
SA1-SC008	71	22° 25.578' N	840183.2E	5 9	2 5v1v0 3	Debris
371-30000	7.1	113° 54.059' E	830860.8N	5.5	2.37170.3	DCBIIS
SA1-SC009	7 2	22° 25.461' N	840177.1E	5.5	1.8x1x0.6	Debris
3A1-3C003	1.2	113° 54.487' E	830845.9N			
SA1-SC010	7.2	22° 25.362' N	840136.7E	5 1	4x1 5x0 3	Dehris
341 30010	7.2	113° 54.764' E	830834.1N	5.1	471.570.5	DEDLIS
SA1-SC011	72	22° 25.334' N	840207.1E	55	5x1x1	Unknown obiect
541 50011	7.2	113° 54.788' E	830823.2N	5.5	5,1,1	onknown object
SA1-SC012	7.2	22° 25.285' N	840175.7E	5.6	9x<0 5x0 5	Unknown object
341 30012	7.2	113° 54.811' E	830616.4N	5.0	57 (0.570.5	onknown object
SA1-SC013	7273	22° 25.326' N	840181.3E	6.4	3x2x0.8	Dehris
341 30013	7.2, 7.3	113° 54.883' E	830614.9N	0.4	57270.0	DEDLIS
SA1-SC014	73	22° 25.345' N	840146.7E	6.6	2x0 5x0 4	Dehris
5/11 50014	7.5	113° 54.943' E	830330.1N	0.0	2.0.3.0.4	Debris
SA1-SC015	73	22° 25.390' N	840426.4E	57	1 2x0 5x0 3	Dehris
	7.5	113° 55.037' E	829963.8N	5.7	, 1.2.0.3.0.3	Debris
SA1-SC016	73	22° 25.404' N	840410.2E	6.1 2x1x0.5	2x1x0 5	Dehris
0.11 00010	,	113° 55.157' E	829957.0N		2/1/0.5	.5 Debris
SA1-SC017	73	22° 25.444' N	840434.2E	55	2x1.2x0.5	Debris
SA1-SCU17	7.5	113° 55.258' E	829903.8N	J.J		

Summary of Sonar Contacts







































Contact number	Chart number	Latitude Longitude	Easting Northing	Water depth (m)	Burial depth (m below seabed)	Description
	7.2	22° 25.251' N	809106.6E	G	1 0	Top of backfill/
SAT-SEIUUT	1.2	113° 54.783' E	831301.9N	0	1.5	protection layer
	7.2	22° 25.263' N	809104.5E	ГО	1 0	Top of backfill/
SAT-SEIUUZ	1.2	113° 54.782' E	831323.3N	5.9	1.5	protection layer
	7.2	22° 25.284' N	809107.7E	ГО	0.9	Top of backfill/
SAT-SEI003	1.2	113° 54.784' E	831362.9N	5.8		protection layer
644.651004	7.2	22° 25.300' N	809106.2E	6	1.5	Top of backfill/
SA1-SE1004	1.2	113° 54.783' E	831392.1N			protection layer
	7.2	22° 25.331' N	809107.8E	5.9	1.4	Top of backfill/
SAT-SEIUUS	1.2	113° 54.784' E	831449.3N			protection layer
	7.2	22° 25.331' N	809106.9E	C	1.3	Top of backfill/
SAT-SEIUUD	1.2	113° 54.783' E	831450.5N	O		protection layer
	7.2	22° 25.344' N	809108.3E	гр	0.9	Top of backfill/
SAT-SEI007	1.2	113° 54.784' E	831473.6N	5.2		protection layer
	7.2	22° 25.367' N	809109.2E	5.1	0.9	Top of backfill/
SAT-SEI008	1.2	113° 54.785' E	831515.4N			protection layer

Summary of Seismic Contacts



Summary of Magnetic Contacts

Contact	Chart	Latitude	Easting	Water depth	Anomaly	Description				
number	number	Longitude	Northing	(m)	(nT)	Description				
SA1-M001	7 1	22° 25.397' N	806869.8E	10.2	2261	WEPII				
3A1-101001	7.1	113° 53.480' E	831576.2N	10.2	2201	Pipeline				
SA1-M002	7 1	22° 25.348' N	806902.1E	10	101	Yacheng				
3A1-101002	7.1	113° 53.498' E	831485.2N	10	101	Pipeline				
SA1-M003	7 1	22° 25.414' N	806967.6E	85	3111	WEPII				
SALINIOUS	7.1	113° 53.537' E	831606.4N	0.5	5111	Pipeline				
SA1-M004	7 1	22° 25.413' N	806970.9E	85	570	WEPII				
5A1-101004	7.1	113° 53.538' E	831605.2N	0.5	570	Pipeline				
SA1-M005	7 1	22° 25.365' N	806998.9E	83	81	Yacheng				
3/11 11/003	,	113° 53.555' E	831517.1N	0.5	01	Pipeline				
SA1-M006	7 1	22° 25.430' N	807062.4E	6.9	273	WEPII				
3/11 11000	,	113° 53.592' E	831635.6N	0.5	275	Pipeline				
SA1-M007	7 1	22° 25.379' N	807089.9E	7.6	184	Yacheng				
5/11 11007	,	113° 53.608' E	831541.8N	7.0	104	Pipeline				
SA1-M008	7 1	22° 25.380' N	807092.5E	74	46	Yacheng				
5/11 11000	,	113° 53.609' E	831543.8N	7	-10	Pipeline				
SA1-M009	7 1	22° 25.445' N	807158.8E	6.8	1205	WEPII				
5/12 11/005	,. <u>_</u>	113° 53.648' E	831662.7N	0.0	1200	Pipeline				
SA1-M010	7.1	22° 25.446' N	807159.9E	6.7	907	WEPII				
		113° 53.648' E	831664.9N			Pipeline				
SA1-M011	7.1	22° 25.395' N	807188.0E	8	383	Yacheng				
		113° 53.665' E	831571.8N	-		Pipeline				
SA1-M012	7.1	22° 25.396' N	807189.0E	7.9	195	Yacheng				
		113° 53.666' E	831572.2N			Pipeline				
SA1-M013	7.1	22° 25.460' N	807254.4E	6.7	288	WEPII				
		113° 53.704' E	831691.6N			Pipeline				
SA1-M014	7.1	22° 25.462' N	807254.9E	6.5	241	WEPII				
		113° 53.704° E	831694.3N			Pipeline				
SA1-M015	7.1	22° 25.412' N	807283.0E	7.7	603	Yacheng				
		113° 53.720° E	831602.4N			Pipeline				
SA1-M016	7.1	22° 25.412° N	807283.8E	7.7	657	Yacheng				
		113 53.721 E	831601.5N			Pipeline				
SA1-M017	7.1	22 25.474 N	80/355./E	6.9	853	VVEPII				
		115 55.705 E	051715.0N			Pipelille				
SA1-M018	7.1	22 23.420 N	00/3//.4E	6.3	292	Dipolino				
		115 55.775 L	007/E0 EE			MEDI				
SA1-M019	7.1	22 23.464 N	821727 2N	6.6	1765	Dipeline				
		22° 25 / 39' N	807/70 OF			Vacheng				
SA1-M020	7.1	113° 53 829' F	831652 1N	6.2	569	Pineline				
		22° 25 489' N	807560 3F			WEDII				
SA1-M021	7.1	113° 53 882' F	831744 4N	6.4	367	Pineline				
		22° 25 449' N	807569 8F			Yacheng				
SA1-M022	7.1	113° 53.887' F	831670 ON	6	1074	Pineline				
		22° 25,492' N	807662.7F			WEPII				
SA1-M023	7.1	113° 53.941' F	831749.0N	7	7	7	7	7	594	Pipeline
		22° 25.453' N	807665.8F			Yacheng				
SA1-M024	7.1	113° 53.943' E	831677.5N	6.2	298	Pipeline				



Contact	Chart	Latitude	Easting	Water depth	Anomaly	
number	number	Longitude	Northing	(m)	(nT)	Description
644 44005	7.4	22° 25.454' N	807762.1E		445	Yacheng
SA1-IVI025	7.1	113° 53.999' E	831678.5N	5.7	445	Pipeline
644 44036	7.4	22° 25.490' N	807768.2E	6.2	645	WEPII
SA1-M026	7.1	113° 54.003' E	831745.3N	6.2	615	Pipeline
		22° 25.452' N	807860.8E		222	Yacheng
SA1-M027	7.1	113° 54.057' E	831675.3N	5.8	332	Pipeline
644 44000	7.4	22° 25.485' N	807869.4E	5.0	200	WEPII
SA1-M028	7.1	113° 54.062' E	831735.1N	5.9	300	Pipeline
	- 4 - 2 - 2	22° 25.445' N	807959.7E		100	Yacheng
SA1-M029	/.1, /.2	113° 54.115' E	831662.2N	5.8	422	Pipeline
		22° 25.473' N	807969.2E			WEPII
SA1-M030	7.1, 7.2	113° 54.120' E	831714.4N	5.6	862	Pipeline
		22° 25.435' N	808051.9E			Yacheng
SA1-M031	7.1, 7.2	113° 54.168' E	831642.5N	5.4	652	Pipeline
	7.0	22° 25.462' N	808065.0E		10.5	WEPII
SA1-M032	7.2	113° 54.176' E	831693.7N	6.7	126	Pipeline
		22° 25.419' N	808151.8E			Yacheng
SA1-M033	7.2	113° 54.227' E	831613.6N	5.3	86	Pipeline
		22° 25.443' N	808164.8E			WEPII
SA1-M034	7.2	113° 54.234' E	831658.6N	5.7	201	Pipeline
		22° 25.403' N	808243.9E			Yacheng
SA1-M035	7.2	113° 54.280' E	831584.0N	5.6	141	Pipeline
		22° 25.424' N	808260.8E		100	WEPII
SA1-M036	7.2	113° 54.290' E	831622.9N	5.5	189	Pipeline
	7.0	22° 25.381' N	808335.9E		570	Yacheng
SA1-M037	7.2	113° 54.334' E	831543.6N	5.7	570	Pipeline
	7.0	22° 25.401' N	808355.1E	6.0	24.2	WEPII
SA1-M038	1.2	113° 54.345' E	831580.6N	6.2	319	Pipeline
644 44000	7.2	22° 25.356' N	808422.9E	c	115	Yacheng
SAT-IM039	1.2	113° 54.385' E	831496.2N	6	116	Pipeline
644 44040	7.2	22° 25.374' N	808442.4E	6.2	025	WEPII
SA1-IVI040	1.2	113° 54.396' E	831529.3N	6.3	925	Pipeline
644 14044	7.2	22° 25.327' N	808507.4E	5.0	00	Yacheng
SA1-IVI041	1.2	113° 54.434' E	831443.8N	5.9	99	Pipeline
644 44040	7.2	22° 25.342' N	808526.4E	6.4	005	WEPII
SA1-M042	1.2	113° 54.445' E	831471.7N	6.1	805	Pipeline
CA1 M042	7.2	22° 25.295' N	808585.0E	6.2	202	Yacheng
SA1-IVI043	1.2	113° 54.479' E	831384.6N	0.3	392	Pipeline
644 14044	7.2	22° 25.310' N	808605.2E	F 7	664	WEPII
SA1-IVI044	1.2	113° 54.491' E	831411.6N	5.7	664	Pipeline
	7.2	22° 25.272' N	809107.8E		252	Possible
SA1-IVI045	1.2	113° 54.784' E	831340.9N	5.5	353	power cable
	7.2	22° 25.285' N	809106.4E	F 0	104	Possible
SAT-IM046	1.2	113° 54.783' E	831363.9N	5.ð 104	164	power cable
	7.2	22° 25.359' N	809109.6E	E 1	140	Possible
SAT-INIO41	1.2	113° 54.785' E	831500.9N	5.1	142	power cable

APPENDIX G

Positions of High Magnetic Gradients



Contact	Chart	Latitude	Easting	Water	Quasi-analytic	Description
number	number			depth (m)	Signai (n1/m)	
SA1-MC001	14.1	22° 25.512° N	806869.9E	9.7	18	Debris
		113°53.479°E	831/88.3N			
SA1-MC002	14.1	22° 25.584' N	806968.0E	7.7	22	Unknown
		113° 53.536° E	831920.5N			
SA1-MC003	14.1	22° 25.459' N	807089.3E	6.6	16	Unknown
		113° 53.607' E	831689.0N			
SA1-MC004	14.1	22° 25.615' N	80/238.6E	5.6	16	Unknown
		113° 53.694' E	831977.5N			
SA1-MC005	14.1	22° 25.583' N	807283.5E	5.7	12	Unknown
		113° 53.720° E	831918.0N			
SA1-MC006	14.1	22° 25.626' N	80/315.8E	5.9	11	Unknown
		113°53./39°E	831998.1N			
SA1-MC007	14.1	22° 25.459' N	807504.8E	6	19	Unknown
		113° 53.849° E	831689.1N			
SA1-MC008	14.1	22° 25.616° N	807642.5E	5.3	18	Unknown
		113° 53.929° E	831978.1N			
SA1-MC009	14.1	22° 25.528° N	807805.5E	5.8	26	Debris
		113° 54.025° E	831814.7N			
SA1-MC010	14.2	22° 25.601° N	808247.8E	5.3	31	Unknown
		113° 54.282° E	831949.1N			
SA1-MC011	14.2	22° 25.524° N	808278.4E	5.4	11	Unknown
		113° 54.300° E	831807.8N			
SA1-MC012	14.2	22° 25.563° N	808433.8E	5.3	34	Unknown
		113 54.391 E	831878.2N			
SA1-MC013	14.2	22 25.530 N	808447.0E	5.3	27	Unknown
		115 54.596 E	001017.4N			
SA1-MC014	14.2	22 23.434 N	000400.9E	5.6	11	Unknown
		22° 25 410' N	000/12 EE			
SA1-MC015	14.2	22 23.410 N 112° 57 270' F	821507 2N	5.7	26	Unknown
		22° 25 502' N	808578 7E			
SA1-MC016	14.2	113° 54 458' F	831932 1N	5.2	13	Unknown
		22° 25 574' N	808616 7F			
SA1-MC017	14.2	113° 54 497' F	831899 1N	5.3	47	Unknown
		22° 25 562' N	808567 6F			
SA1-MC018	14.2	113° 54 469' F	831876 2N	5.3	12	Unknown
		22° 25 557' N	808568 9F			
SA1-MC019	14.2	113° 54 469' F	831868 2N	5.3	11	Unknown
		22° 25 519' N	808597 9F			
SA1-MC020	14.2	113° 54.486' F	831798.0N	5.5	16	Unknown
		22° 25 509' N	808583 4F			
SA1-MC021	14.2	113° 54.478' E	831779.1N	5.5	5 11	Unknown
		22° 25.469' N	808590.3E			
SA1-MC022	14.2	113° 54.482' E	831704.5N	5.7	37	Unknown
		22° 25.461' N	808600.7E	_		
SA1-MC023	14.2	113° 54.488' E	831690.7N	5.7	5.7 15	Debris
		22° 25.472' N	808644.3E			
SA1-MC024	14.2	113° 54.514' E	831710.3N	5.9	23	Unknown

Positions of High Magnetic Gradients

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Contact	Chart	Latitude	Easting	Water	Quasi-analytic	Description
namber	number	22° 25 400' N	909660 6E	acpair (iii)	Signal (III/III)	
SA1-MC025	14.2	22 23.488 N 113° 54 523' F	831739 3N	5.5	26	Unknown
		22° 25 387' N	808603.4F			
SA1-MC026	14.2	113° 54 490' F	831554 1N	6	20	Unknown
		22° 25 408' N	808639 9F			
SA1-MC027	14.2	112° 5/ 511' F	821502 ON	5.9	26	Unknown
		22° 25 421' N	808756 6F			
SA1-MC028	14.2	113° 5/ 570' F	831616 2N	5.4	13	Unknown
		22° 25 267' N	808787 OF			
SA1-MC029	14.2	112° 5/ 507' F	821517 2N	5.7	154	Unknown
		22° 25 367' N	808816 6F			
SA1-MC030	14.2	113° 54 614' F	831517 ON	5.7	13	Unknown
		22° 25 346' N	808820 6F			
SA1-MC031	14.2	113° 54 617' F	831477 3N	5	22	Unknown
		22° 25 331' N	808741 7F			
SA1-MC032	14.2	113° 54 571' F	831450 8N	5.8	15	Unknown
		22° 25 319' N	808765 3F			
SA1-MC033	14.2	113° 54 584' F	831428 3N	5.7	26	Unknown
		22° 25 314' N	808749 3F			
SA1-MC034	14.2	113° 54.575' F	831418.7N	5.9	26	Unknown
		22° 25.298' N	808766.3F			
SA1-MC035	14.2	113° 54.585' E	831390.0N	6	22	Unknown
		22° 25.298' N	808776.1E			
SA1-MC036	14.2	113° 54.591' E	831390.0N	5.9	18	Unknown
		22° 25.374' N	808875.2E			
SA1-MC037	14.2	113° 54.648' E	831529.4N	5.6	16	Unknown
644 846030	44.2	22° 25.370' N	808891.5E		22	
SA1-IVIC038	14.2	113° 54.658' E	831521.1N	5.5	33	Unknown
5A1 MC020	14.7	22° 25.376' N	808923.8E	E A	21	Unknown
SAT-INICOSS	14.2	113° 54.677' E	831533.9N	5.4	21	UTIKITUWI
SA1 MC040	14.2	22° 25.362' N	808964.3E	E /	51	Unknown
3A1-101C040	14.2	113° 54.700' E	831507.8N	5.4	51	UTIKITUWI
SA1-MC041	1/1 2	22° 25.354' N	808932.7E	5 /	13	Unknown
371-1010041	14.2	113° 54.682' E	831491.5N	5.4	15	Onknown
SA1-MC042	1/1 2	22° 25.346' N	808914.8E	5 /	10	Unknown
5A1 WIC042	14.2	113° 54.671' E	831478.4N	5.4	10	Onknown
SA1-MC043	14.2	22° 25.347' N	808877.9E	5.3	13	Unknown
		113° 54.650' E	831479.2N	0.0		
SA1-MC044	14.2	22° 25.335' N	808875.0E	5.4	12	Unknown
		113° 54.648' E	831457.4N	_		
SA1-MC045	14.2	22° 25.319' N	808904.8E	5.3	124	Unknown
		113° 54.666' E	831428.0N			
SA1-MC046	14.2	22° 25.276' N	808837.0E	6	13	Unknown
		113° 54.626' E	831348.8N			
SA1-MC047	14.2	22° 25.270° N	808935.6E	5.5	17	Unknown
		113 54.084 E	831337.1N			
SA1-MC048	14.2	22 25.205 N	000903.5E	5.3	39	Unknown
		115 54./12 E	00102010			
SA1-MC049	14.2	113° 54 710' F	831356 QN	5.5	18	Unknown
		22° 25 287' N	809047 8F			
SA1-MC050	14.2	113° 54.749' F	831368.1N	5.3	22	Unknown
		0 10 E		1	1	l.

Task Order GE/2021/03.23

Appendix F

Development of Integrated Waste Management Facilities Phase 2 – Investigation, Design and Construction (SA1) Marine Geophysical Surveys (GS)



Contact	Chart	Latitude	Easting	Water	Quasi-analytic	Description
number	number			ueptii (iii)	Signal (11711)	
SA1-MC051	14.2	22 25.303 N	809026.9E	5.4	10	Unknown
		113 54./3/ E	831397.2N			
SA1-MC052	14.2	22° 25.308° N	809031.6E	5.5	12	Unknown
		113° 54.740° E	831407.1N			
SA1-MC053	14.2	22° 25.319' N	809033.0E	5.3	15	Unknown
		113° 54.740' E	831428.3N			
SA1-MC054	14.2	22° 25.314' N	809078.8E	5.9	17	Unknown
		113° 54.767' E	831418.5N			
SA1-MC055	14.2	22° 25.332' N	809114.8E	55	300	Unknown
5/12 11/0055	12	113° 54.788' E	831452.0N	5.5		
SA1-MC056	1/1 2	22° 25.354' N	809052.5E	5 1	55	Unknown
SAT-WIC050	14.2	113° 54.752' E	831491.7N	5.1	55	UTIKITOWIT
	14.2	22° 25.352' N	809075.6E	5.2	27	Navigation
SAT-INICOS7	14.2	113° 54.765' E	831488.1N	5.2	27	beacon
	14.2	22° 25.364' N	809072.6E	Г 1	25	Dobric
SAT-IVICUS8	14.2	113° 54.763' E	831510.1N	5.1	35	Debris
	14.2	22° 25.373' N	809068.4E	47	26	Unknown
SAT-IVIC059	14.2	113° 54.761' E	831526.6N	4.7	20	Unknown
	14.2	22° 25.367' N	809101.7E	Г 1	10	Linkansum
SAT-IVICU60	14.2	113° 54.780' E	831515.7N	5.1	13	Unknown
644 146064	11.2	22° 25.366' N	809114.5E	F 4		Links are set
SAT-IVICU61	14.2	113° 54.788' E	831513.3N	5.1	11	Unknown
644 146060	11.2	22° 25.362' N	809103.7E	F 4		Links are set
SAT-INIC062	14.2	113° 54.781' E	831507.0N	5.1	11	Unknown
644 446969	442.442	22° 25.352' N	809207.7E	5.0	22	
SAT-INIC063	14.2, 14.3	113° 54.842' E	831487.6N	5.2	22	Unknown
644 446964	442 442	22° 25.331' N	809214.0E	<u> </u>	10	
SA1-MC064	14.2, 14.3	113° 54.846' E	831448.5N	6.4	10	Unknown
	442 442	22° 25.299' N	809163.3E	6.4	22	Navigation
SA1-MC065	14.2, 14.3	113° 54.816' E	831389.9N	6.1	23	beacon
		22° 25.283' N	809150.3E		105	
SA1-MC066	14.2	113° 54.809' E	831360.6N	5.4	405	Unknown
		22° 25.276' N	809105.8E			Possible
SA1-MC067	14.2	113° 54.783' E	831348.4N	5.7	13	power cable
		22° 25.254' N	809099.0E			
SA1-MC068	14.2	113° 54.779' E	831307.0N	5.7	12	Unknown

APPENDIX H

Borehole Records







SITE INVESTIGATION REPORT JOB NO. 955

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CASTLE PEAK POWER STATIONS SITE INVESTIGATION STUDY TSANG TSUI TO URMSTON ROAD VOLUME III TSANG TSUI MARINE SURVEY AREA

CLIENT

005718

no

005.718

y Kong) Limited

CHINA LIGHT & POWER CO. LTD. 8/F., TSIM SHA TSUI CENTRE 6 CHING YEE ROAD TSIM SHA TSUI KOWLOON MAIN CONTRACTOR KIER-GAMMON JOINT VENTRE P.O.BOX 163 TUSN MUN SAN HUI POST OFFICE, N.T.

SUB-CONTRACTOR GAMMON (HONG KONG) LIMITED 33rd HOPEWELL CENTRE 183 QUEEN'S ROAD EAST HONG KONG

Boreholes plotted by Geological Survey

Job Met Maa Hole	No & hod:z hine: dia.	Local Wash Dig Dig Dig	Hopewall Can 11 Cable tion: (5 Bar) - Mac - 160	astland ng/se ng/se Bomm	Part Poet	i cast for Telex: Ling 	beabeo riento	Level	en, Tse	11ce 20 g Ta 3.12 m Venti 27.5	ical sm	y Area Coord	H 5 Sheet of ds E. <u>9800.01</u> N. <u>31670.78</u> from <u>2.6</u> to <u>3.6</u>	3
Drilling progress	Casing depth size	Water Level	Water recovery %	Core recovery %	R.Q.D. %	Fracture index	Tests	Samples	Depth metres	Reduced Level	Legend		Description	Grade
	5x						↓ <i>N=0</i>	•/	10.55	-3.13	, , , , , , , , , , , , , , , , , , ,	Very dark	grey. Sitty	
							↓ N=0	• 2	11111111111111111111111111111111111111			CLAY Shell : Some &	With occasional fragments 1 Sand below 2.B INE DEPOSIT)	
1984						·	¥=1.0, 1.2,2 = 39	•3	4.55 5.0 5.55	9.12	× . × . × . × . × . × . × . × .	Firm, Silty GRAYE Multi- fine Gra	Brownish yell. CLAY and find L with firm coloured CLAY well at 555m. CLUVIUM)	vitts
*	B.om					2 4 U B	4.6. 53.7 16 =10	•5	6.35 7.0 7.55		× • · · · · · · · · · · · · · · · · · ·	Loose Light g. Silty = (Brownish yell ray + light yell SAND + fine Grav ALLUVIUM) Firm, dark gr	and the state
-	рх 2.0А					×0 = 0	= 1.1. .1.2.2. 9 = <u>11</u>	□ • 7 • 8 ** • 9	9.0 9.55	-13.12	x x x x x	Slightly CLAY. (Loose, Sirty Sh of orga As sh	ALLUYIUM) dark gray ALLUYIUM) dark gray ADD with traces ALLUVIUM 1 RRX 2 2 3	<i>y</i>
Legend Sam ● Sma ● Larg	ples: Il distu je distu	rbed	Star	ndard per meability	netrat	ion te			Rema	rks ¥	No I Taker	recovery at g.s	in uron Sampi ss m to room	10

Job Met Mac Hole	No & hod: hine: dia.	Gamr Civil EA Stad Floor, Tu: 5 2300 Loca Wash Fran : DA : D	non (H GINEERS Noorwell Car Ition:_ Bori Mari 160 	Cast TS44 Market Bank	Dong) Li LACTORS IN Road, East So Tele Ple P Bailin Age - B	imited A, Hong Kons. ex: HX 73828 Deak Seabaa Oriento Dom	Clie Dowe Surve Level	Con ent Off r 3 + e 4 6 i	tract	(PPS 	<u>B'- (6</u> <u>p.</u> <u>3ang</u> <u>0.</u> Coor Date	Borehole/Drillhole A 5 Sheet <u>2</u> of <u>3</u> ds E. <u>9800.01</u> N. <u>31670.18</u> from <u>2.6</u> to <u>3.6</u> .	No.
Drilling progress	Casing depth size	Water Level	Water recovery %	Core recovery %	R.Q.D. % Fracture	x Tests	Samples	Depth metres	Reduced Level	Legend		Description	Grade
3. 6. 900	PX					$ \begin{array}{c} & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 2.2, \\ & 2.3, 3, \\ & = 11 \\ & 3 \\ & 3 \\ & 1 \\ & 3 \\ & 1 \\ & 3 \\ & 5 \\ & 1 \\ & $	• 10 • 10 • 11 • 12 • 13 • 13 • 13 • 15 • 16 • 16 • 17 • 18 • 18	10.99 11.55 12.0 12.55 12.7 13.0 13.55 14.0 15.0 16.55 16.55 16.55 16.55 16.55 16.55	-13.12 -13.12 -15.82 -16.67 -17.67 -19.67		Medium 1 fine grey + matri grey is: very 3 baso. Medium Light Ba SAND a in Siky Canse brown and Fi GRAVE (Medium light yellow Medium light (Medium light (C	n to coarse SAND GRAVEL in light white sinty CLA x. Becoming h white sandy Sity CLAY near (ALLUVIUM) m dense / dense sh brown. Sight ND. (ALLUVIUM) rown Fine to medi clay matrix 	
Legend Sam Sma Larg U40 U100 Maz	ples: Il distu e distu undist D undist iet comple	rbed rbed urbed turbed	V Star Perr U 76 B A	ndard per meability undisturb fas. of	netration test Blee.7	i test		Remar	ks C. No 1 at	D. 6.	GRAN GRAN ery in m to n	ulotely Decomp NTE. Ulov sample to 4.0m.	obsza

Contract CPP5 B- 66 Borehole/Drillhole No. Gammon (Hong Kong) Limited CIVIL ENGINEERS & CONTRACTORS 33rd Floor, Hopewell Centre, 183 Queen's Road, East, Hong Kong. Tel: 5-283941 Cables: GAMMONCO Telest: HX 73836 A5 Client Office C. L. P. 1 Job No & Location: Marine Survey area Mash Boring Bailing Method: from Marine Barge Scobed Level: _____ 3.12 m P.D. Coords E. ___ Sheet 3 3 of 9800.01 Orientation: Vertical 31070.18 N.___ Machine: DA- 160 Hole dia .: _____ 180mm ____ 8.0m ___ 140 mm 22.55 11 Date: from 2. 6 to 3. 6. 1984 Core recovery % Casing depth size Water Depth Water recovery % Reduced Drilling Fracture index à Level Tests Samples matres Level Legend Description Zone Grade ö ~ -23.12 · × Px . 20.55 Medium dense to dense =21.0 \$ 20 brownish yellow N= 2, 5, 7.8.8.13 light pink + light = 26 grey, Sitty GAND .0 with fine Gravel. 22.55 m × · ¥ E22.55 (C. D. G.) , . W=7. 7 -26.12 53.0 021 3.11.1120 = 51 Operation stopped at 23.0 m. Legend Remarks Samples: C. D. G. : Completely Decomposed Small disturbed Standard penetration test GRANITE Large disturbed · Permeability test U40 undisturbed U 76 undisturbed U100 undisturbed Mation Liner sample Water semple





and the	1	Gamr crvil EN 33rd Floor, Tel: 6 26394	non (H Igineers Hopewell Cen 11 Cable	ONG K a CONT tre, 183 Quan a: GAMMON	Ong RACTO In's Rose) Lin DAS 1, East, I Telex:	nited Iong Kong. HX 73828	P.W. Clie	D. Con nt Off	tract(ice	CLF	<u>`B'-C6</u>	Borehole/Drillhole 1 B4	10.	
Job Met Mac Hole	No & hod: ; hine: dia.:	Location A	tion G Bor Marine 1-16 0m _1	ASILE ing / Le Barg O Bomm	PBAK Bail	- PO 	ABED Irienta	Level	SANG 1 MARIN 	541 E Sur 3.36 Vert.	WEY mp. D cal	AREA Coor Date	Sheet <u>3</u> of <u>3</u> ds E. <u>9600.17</u> N. <u>31569.73</u> from <u>23-5</u> to <u>24-5</u>	1984	1
Drilling progress	Casing depth size	Water Level	Water recovery %	Core recovery %	R.Q.D. %	Fracture index	Tests	Samples	Depth metres	Reduced Level	Legend		Description	Grade	
	0								200	-23.36					1
	ΥX						N=3.3, 4.5.7.9	-14	E2045	-7/1 36	$\frac{X}{X}$ X = X X = X	As s	SHEET 2 OF 3	N	111111
24-5-1984	26.0m						= 25 $N = 4.4, 5.7, 8.10 = 30$ $= 30$ $N = 6.9, 12, 13.16, 9$ $= 70$ $N = 5.11, 11.16, 22, 43 [11, 16, 12]$	- 16 17	22.0 22.49 22.0 22.49 22.0 22.0 22.0 22.0 22.0 22.0 22.0 22.	-29.81	$\begin{array}{c} \mathbf{x} \\ $	Media dens & br Claye Some & fi Pense Claye Inttle	um dense to ie, greyish grea awnish yellow, ey SILT with e coarse sand ine gravel. (C.D.G.) 	n Y	
									27.0 28.0 29.0			~ pera:	TION STOPPED AT		
Sam Sma Larg U40	oples: all dista ge dista) undist 0 undist	bed rbed urbed bedruf	V Sta	meabilit meabilit	enetra ly tes bed	ition :	test		Remark	.G. :	COM GRA	PLETEL	F DECOMPASED		

Gar

Job No Method: Machine Hole dia	Gam CIVIL E 33rd Floor Tel: 5283 & Locca Wash Farm : D.A.	mon (H NGINERS HOOTWIL CA HI CACH HI CACH HI - Bor Maria 160 	Hong K a CONTIN IS CAMMON Cas HA Maring / B a Barge DATA	00000) RACTOR mar Road 1 200 1 200 1 200 1 200 1 300 1000 10	Limited 18 East, Hong Kong. Teles: HX 73828 Def Def W Scint Ley Mag Scint Ley Scint Le	Clie er 3 A Level	Cor ent Of <i>tatio</i> <i>rea</i>	fice - 4.08 Var - 7m	CPP5 C Sang MP.D tica.	'B'-c6 Borehole/Drillhole No. L. P B-5 P 7547 Sheet of Coords E 97 99.84	34
Drilling progress Casing depth size	Water Level	Water recovery %	Core recovery %	R.O.D. %	Tests	Samples	Depth metres	Reduced Level	Legend	d Description	
× 5					$\begin{array}{c} X \\ B5-1 \\ X \\ B5-1 \\ X \\ B5-2 \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	· 2 · 3 · 4 · 5 · 6 · 7 · 8 · 7 · 8 · 7 · 8	4.55 5.54 6.0 5.55 6.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7	-7-48 -8-08 -10-63 -10-63		Very soft, dark gray, Sitty CLAY with Some shell fragments. (MARINE DEPOSIT) Dark gray, Sitty fine SAND with some shell fragments. Loose, gray and brownish yellow, medium to coarse SAND and fine GRAVEL. (ALLUYIUM) Firm to Stiff, multi-coloured Sitty CLAY with some fine Gravel + Sand. (ALLOYIUM) Ganerally, Soft + firm, gray, Sitty Gravelly (RESIDUAL BOIL?)	
ogend Samples: Small distui Large distui U100 undist Mazier	bed bed urbed	Stance Permi	dard pene eability t ndisturbed 5 <i>fo n</i>	tration Pest	test Patie		Remarks	* ?TE :	No ra at Ty	S.65 - 6.0m. YPE 'A' BOREHOLE	



Job No A Method: Machine Hole dia	Tu: 62830 Loca Wash Area : DA .: 0.0	tion: - Bor Mar - 160	a: GAMMON (ast Mar ng/B ing /B ing B	ne ine ail augu	Totax: HX 73828 Deak p Seak p Orient p Sea p Orient p Sea p	Level	sta F. CRA : 4 : 4 : 4 : 4	. o B lertic	Tsan, Gel - 31.3	g Tsui g Tsui Coord	B 5 Sheet <u>3</u> of <u>6</u> ds E. <u>97 98 84</u> <u>N. 2, 578 13</u> from <u>30.5</u> to <u>7 9</u>	g 6. 1%	784
Drilling progress Casing depth size	Water Level	Water recovery %	Core recovery %	R.Q.D. %	e top top top	Samples	Depth metres	Reduced Level	Legend		Description	Grade	701.0
PX PX PX PX PX PX PX PX PX PX	bed bed	Stand	ard penet	ratio	N=3, u, f. 6. 8, 12 = 31 $N=4, 6. 9, 10, 419 = 52$ $N=5, 10, 10, 1419 = 52$ $N=5, 10, 10, 10, 10$		20.55 22.55 22.55 22.55 23.0 24.55 -25.0 = 26.55 -27.0 28.55 -27.0 -28.55 -27.0 -28.55 -27.0 -29.0 -29.0	- 29-08	x · · · · · · · · · · · · · · · · · · ·	Mediu Genera Sand Some fi U Dens brown dark and p Sirty o Graves below below	e, Sh yellow, g SILT with ne Gravel. C. D. G.) e, sh yellow, greyish green sink, SAND with fine P, E C. D. G.) ng (C. D.G./HDG 28.5 m. ataly Decompose ITE		

Job Met Maa Hold	No & hod: ; chine: e dia.	Gami Civil EF 33d Floor, Tel: 52339 Loca Was- Dig 	tion:	Hon ts & C Centre, 18 tota: GAU Ca. ring Ban Boni Boni	g Ka on The Ba strain /Ba	Pine Pilin 9.0	Lin East, F Tolex: DEA 1 S S S S S S S S S S S S S	nited hong Kong. HX 73828 <i>F Po Co</i> <i>CarVe</i> Rabed riente	Clie Clie Clie Clie Clie Clie Clie Clie	Cor nt Of rea : Y	fice	(PP5 (. L ang p.p. al	<u>'B'-C6</u> <u>P</u> 7501 Coord	Bereh , Sheet _ ds E N : from <u>3</u>	B 5 <u>A</u> of <u>8789.84</u> <u>31570.13</u> <u>2.5 to</u> <u>1.</u>	ole No 4	98	24
Drilling progress	Casing depth size	Water Level	Water recovery	% Core	racovery %	R.Q.D. %	Fracture index	Tests	Samples	Depth metres	Reduced Level	Legend		Descriptio	on		Grade	-
1.6.1924	Px 30.7m			1.11	121	100	0	N=264/ 120	• 24	31.3	-34.08 -34.78 -36.38	+++++++++++++++++++++++++++++++++++++++	Yery de 4 dark 6arsosa Very greyis	stron	GRAVEL green, lig	4ellow H.DG) k ht	IN IN	
													Opera coarse to slig GRANI spaces Opera at 31.	tion 3m	stopp	Fresh posed		
e gend Sam Sma Larg Uloc Maz	ples: Il distur je distur O undist iet	rbed bed vrbed	↓ SI ▼ Pe	andaro ermeab 76 undi	d pen pility sturbe	etrati test ed	ion te	st	•	Remark	No at ;	rec. 20.55	overy i. - 30.67	т 5р Гт	T Line,	r Sa.	-pl	. 4





Hold	e dia.	:	0m -			 T	1.0m	_1401	<u>mm</u>	- 24 T	1.55m	Date: from 24-6 to 27-6-	-198
Drilling progress	Casing depth size	Water Level	Water recovery %	Core recovery %	R.Q.D. %	Fracture index	Tests	Samples	Depth metres	Reduced Level	Legend	Description	Grade
27-6-1984	24.55m						h = 3.3, 7.9, 11, 12 = 3.9 h = (0.12, 13, 14) = 5.4 h = 2.05	□ 17	21.0 22.0 23.0 24.5 25.0 26.0 26.0 26.0 28.0 28.0 28.0	-29.64	× » × » * ×	Medium dense to dense, brownish yellow, Sitty SAND with fine gravel. (C.D.G.) becoming H.D.G. below 24.0m Operation stopped. At 24.5m	





Water somiBis

Job Met Mac Hole	No & hod: / hine: e dia.:	Locat DIS- DIS- DIS- DIS-	non (H GINEERS In Coblee In Co	ong Ka contra Gaumon Cast Mar Bar Mar Bar	ine Bai/	Lim RS East, Ho Toles: 1 De Se Se O	ited me Kong ix 73828 a k k a c v e c a bed riento	Clien Dower Are Level: ation:	Cont nt Offi 37-7 2-3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -	ract C ce	PPS : (. (. 75c m p. p. al . 55m	<u>B'- 66</u> <u>P.</u> <u>Ang 7341</u> Coort	Borchole/Drillhole No. <u>C</u> 3 Sheet <u>3</u> of <u>3</u> ds E. <u>9399.72</u> <u>N. 31469.95</u> :from: <u>6.5</u> to <u>7. C.1</u>	984
Drilling progress	Casing depth size	Water Level	Water recovery %	Core recovery %	R.Q.D. %	Fracture index	Tests	Samples	Depth metres	Reduced Level	Legend		Description	Grade
17. 5 .784	106 24.55m						N=11, 15, 5 $= 92$ $= 92$ $= 92$ $= 92$ $= 90$ $= 90$ $= 90$ $= 90$ $= 90$ $= 90$ $= 90$	- 13 3'. 3'. 3'. 3'. 3'. 3'. 3'. 3'. 3'. 3'	20.35	-24.11	9 × 9 × 7 • × • × • × • × • × • × • × • ×	Der bron light gheen with (Dpere 25.0	nse, inish yellow, pink + greyish Silty SAND fine Gravel C. D. G. 1 ton stopped at m	I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.
	nd iamples: imall di arge di J40 und J100 und	sturbed Hill bed Sturbed Sturbed		Standard Permeab J 76 undis	penet	tration	ntest		Remo	arks _C .	D. 6	· · · Co, G	mpletely Drcompo RANITE	sed

Job Met	No &	Loca Wasi	mon (H wgineers Hopewwil Can 41 Cable tion: 6 - Boi Macin	Long K a cont tre, 183 Que a SAMMON (a S t) Mac n s/t a Ban	Ong RACTO M'S ROAC VICO) Lin ORS d. East, H Telex: Dea M Sc 1: + 9 Sc	horns Kons HX 73828 K Do K Do K RC R Do R DO	Clie Verso Are Level	Cor ent Of tation	fice	(PPS (.) 2-19 7. 5 m P.	<u>'8'-66</u> <u>P</u> . Seri	Borohole/Drillhole No C 4 Sheet <u>1</u> of <u>2</u> ds E. <u>96 00.08</u>	o.
Mad	hine:	DA.	160			_ 0	rient	ation:		Yer	tica	l	N. 31469.91	
Hole	e dia.	0.0	180 m		.0 m	_14	io mm	- 18.55	5 M			Date	from 25.5 to 28.5.	924
Drilling progress	Casing depth size	Water Level	Water recovery %	Core recovery %	R.O.D. %	Fracture index	Tests	Samples	Depth metres	Reduced Level	Legend		Description	Grade
5. 1984 25. 5. 1984	5x 5.0m Dx						$X = 4 - 1$ $X = 4 - 2$ $\downarrow = 1, 2, 4$ $\downarrow = 1, 2, 4$ $\downarrow = 1, 2, 4$	• 1 • 2 • 3 • 4	0.5 1.0 1.6 2.5 3.0 4.0 4.55 5.0	-3.55 -4.75 -7.55		Loose yeilow and GR Yery dark with s and be with (MARI) Brow, grave, (ALL Firm,	, gray + brownish), coarse SAND AVEL with Shell'S Sobt, grey, Sitty CLAY ome Shell fragments coming more depth NE DEPOSIT) nish yellow, ly Sandy CLAY UVIUM) Multi-coloured	
· · · · · · · · · · · · · ·	ples: II distui e distui o undist	rbed béd urbed	Stan Pern X ∨. Q ∪ 76	udard per neability ane undisturb	netrat i test Sha sed Sa;	2 8 A 4 - - ion te 22 mph	13. 4.4, = 13 = 20 13. 4.4, 15 51 7.252 4.4 15	• 7 • 8 • 9	7:55 8:0 8:55 9:0 9:7 Remark Pe	-8.25 * neti nrie ; ace	No taken	Sitty with 3 Grave (A. (A. recover at 7.5 Vane t at 1 Ste 6	CLAX Some fine & below B.5m LLUVIUM) CY in LICO Sampl S5 - B.0m Shear Tests we 9m and 2.9m ORCHole	

lole	dia.:	0.0		30 mm		5.0	om	40 -	18.	55 m		Date	from <u>25.5</u> to <u>28.5</u> .	<i>AB</i>	*
progress	Casing depth size	Water Level	Water recovery %	Core recovery %	R.Q.D. %	Fracture index	Tests	Samples	Depth metres	Reduced Level	Legend		Description	Grade	
	ρx		-			-	N=2, 2. 2, 3. 3. 4,	• 10	9.7 9.8 10.55	-12.25	× × ×	Firm, very (RESIL	white gravelly Silty CLAY DUAL SOIL)	 - -	
5. 1984							N=2,3, 3,4,4,5, = 16	• 12	12.55		x x x x x x x x x x x x x	Med light yell gray with	dium dense, t brownich iow + light , Clayey SIL some fine Graves	T	
26.							N=3.4. 46,7.8, = 25	• 13	-14.55	- 19:55	× × × × × × × ×	((.D.6.)		in the function of the
5.1984	,8151						N=3.6, 5,6.7.4 = 27	• 14	16.55		× × • × × • × × · ×	Med light + lig. Claye fine	ium dense, pink, light gri ht brownish yell y SILT with so Gravel.	ey 54, 3 ne	V
28.							N= 4.4. 6.6, 8, 11 = 30	•#	-JB.50	->2 55	• ×	oper ot	(. D. G.) eation stopped		



Gammon Construction Limited.



(TERM CONTRACT) WORKS ORDER NO. PW 7/2/34.2 TUEN MUN PORT DEVELOPMENT STUDY FINAL REPORT VOLUME I

HAU HOI WAN

SITE INVESTIGATION - MARINE WORKS

CESD CONTRACT NO. GC/91/08

										CONTR	RACT	NO.: G	C/91/08	······	DR		F N(
		Gan	mon	Co	na	tru		Lin	hted	CLIEN	Γ:	G	.E.O			90830	/1D		
		Geot	ecnnic		ont		ing D	epartr 	nent						SH	EET 1	OF	2	2
JOB	NO. a	LOC		N: J	1134	0 F	2/7/2	34.2 1	UEN NU	N PORT	DEVEL	OPMENT	STUDY	·····					
MAC	HINE	R0	TARY/	BORIN	G		GRO		LEVEL:	-5.	.50 mP	Ď			809)158.44			
HOL	E DIA	GA	210-mm	17			URIE		IUN:	VER	RTICAL			N N	. 831	377.23			
8		0.00m	219IUU	-10.00r 	<u>אן ה</u>	<u>mm</u> _1	12.70m ¹⁴	Homm 15	<u>5.30m^{101r}</u>	19.50m	n 1	<u>l</u>	DA IE:	13/02	TC) 13/0	12/92	2	
Drilling progres	Casing depth size	Water level	Total co recovery	Solid co recovery	R.O.D.	Fracturi Index	Tests	Sampler	Depth (m)	Reduced	Legend			Description			- 	800 JO	Zone
13/0 (Overnight)	ZX		700				V H.V = 0.00 H.V = 3.50 V H.V =		- 1.00 - 2.00 - 3.00 - 3.50 - 4.00	-9.50	┡┯┯┯┯┯┯┯┯┯┯┯┯┯┯┯┯┿╋	Very : CLAY shell (MARI	soft dark with occa fragments NE DEPOS	grey silty isional					
							5.00 H.V == 16.0 (1 1.22,3) N=8	5 •	5.95	1200	가격과 가려 가려가 다. 가기가 가기가 가기가 다. 가기가 가기가 다.	Very s yellowi grey s with a gravel (ALLU)	soft to so sh brown andy silty i little find vIUM)	ft dark mottled r CLAY e subangular					
· · · · · · · · · · · ·			teo					•	7.00	13.50	1 	Soft II sandy (ALLU)	ght reddis silty CLA' VIUM)	sh brown Y.					
Leger St	id amples: Small d Lorge d	îsturbe	0 J	Star	ndar	d pe	1[22 11114) N=13	7 B B B	8.45 - 9.00 - 10.00 Remark H.V = Field w	-15.50 s: Hand va		Soft t mottle with s angula (ALLU)	o firm yel d grey sa ome fine r gravel. NUM) Pa grried gut	llowish brown indy silty CLA subongular ti	\Y p				
	U76 un U100 ur Mazier Liner so Piston Water s	disturbe ndisturb ample eample ample		Piez Star Wat Field	rome ndpij er t d vo	ot or pe te able ine s	test est shear te	est	1.00m	and 3.50	Dm.		_		Lc)gged by necked t	/ : 5 by : H	500 (SL	;

		Gam	mon	Co	ne	tru	ction	l In		CONTR	ACT N	10.: GC/91/08	(DRILLHOLE I	10.:	
		Geote	echnic	al C	ont	ract	ing De	partr	nent	CLIENT	•	G.E.O				 `
JOB	NO. 8	k LOC	ATION	l: J	1340) F	W7/2/	34.2 T	UEN MU	I IN PORT	DEVELO	PMENT STUDY				L
METH	IOD:	RO	TARY/	BORIN	Ģ		GRO	UND	LEVEL:	-5.	50 mP	D OO	E. 4	809158.44		
MAC	HINE:	GA	MMON	17			ORIE	NTAT	10N:	VER	TICAL		N. R	831377:23		
HOLE	DIA:	0.00m	219mm	10.00n	<u>168</u>	<u>mm </u>	2.70m14	Omm 15	.30m 101	<u>mm 19.50</u> п	I	DATE: 13,	/02	TO 13/02/	′92	
Driiling progress	Casing depth size	Water level	Total care recovery 3	Solid core recovery 7	R.Q.D. X	Fracture Index	Tests	Samples	Depth (m)	Reduced	Legend	Des	cription		Grade	Zone
00 (0vernight)	<u>-</u> 5X - 12.70m PX		0	 	29	NA NR 10.0	(36 10,11,13,15 N=49		10.00 10.80 11.95 11.95 12.70 13.00 13.11 13.49 14.09 14.09 14.09 14.09 14.09 14.00 14.00 14.00 14.00 14.00 14.00 14.00 14.00 14.00 14.00 13.11 13.00 14) -15.50) -16.30) -18.20) -18.61) -18.99] -19.59		As sheet 1 of 2. Extremely weak gree mottled pink comple coarse grained GRAI (Very silty medium Strong greyish pink moderately to highly coarse grained MET/ (Corestone?) Weak? greenish grey completely to highly coarse grained MET/	enish grey etely decomp NITE. to coarse S streaked gr y decompose A GRANITE. y mottled pir decompose A-GRANITE.	posed AND) een ed nk	V 111/11 V /	
	<u>15.30m</u>		38 99 100 180	$ \begin{array}{c c} & & & \\ &$	73 89 37 86 72 65 81	1 13 0 15.0 9.6 7.5 6.0		T2101	15.00 15.30 16.00 16.60 17.00 17.39 18.67 18.67 19.00		· + + + + + + + + + + + + + + + + + + +	Strong greyish pink green slightly decon coarse grained MET/ with closely to med widely spaced limon rough joints, dipping 45° and 60°. Granite has laminat	streaked nposed A-GRANITE, lum, locally ite stained g at ed structure	• /s • *		
Legen Sc	d Small o Large o U76 un U100 u Mazier Liner s Platon Water	disturbe diaturb idiaturb ndistur ample sample	nd d nd d bed a	Sto Per Pie Sto	anda rmec zom andp	rd p bilit; eter ipe 1	enetratic y test test test	xn test	Rema Core core NA: N NR: N	> -25.00 rks: loss in 1: runs assu Not applic No recove	2.70m Imed to able ry	End of hole at 19.5 to 13.90m and 13.90n be Grade V/IV grani	iOm n to 14.30m Ite.	Logged by	: 54	

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	RA4	CH	v					_ D	RIL	LH(DLE	RE	C	OF	RD w. o
18	I.F	AM	HE	BAC	HY SOL	ETAN	NCHE GRO								HOLE NoODB/3
				SOIL				" - C(ON TR	ACT	PAA5/	90			DATE from <u>25/5/91</u> to <u>26/5/91</u>
PRO	JECT:	CHI	ΕΚΙ	_AP	KOK		IEW A	IRPC	RT	MAR	INE	S.I.	V.().	SHEET 1 OF 4
		NO	. 01	/91	DEE	P	BAY	AND	00	IER	DEFI	P BY	λΥ 	A	REA
MET	HOD						C0-0	RDINA	TES					205	K COREBIT
CAI	BLE TO	OL BO	RING/	ROTAF	Y			E	8071	68.90				/	
MAC	HINE	& N	٥.					Ν	8318	79.30				HOL	E DIA.
HEL	EN		<u></u>				0.0151								0.00m-35.50m SX
FLU	SHING	MEL	JIUM				ORIEN	OITAT	N					5RU	
SE/	WATE	R	r		1		VERTI		،	<u></u>	1			1	
	epth		к	م	ж а		; ·			_					
ng ress	p Su	Water level/	sr Svery	l cor	l cor	d	× true	Tests	nples	iuceo el	Depth	and	ęp		Description
Prog	Casl alze	time/ date	Wate Reco	Tota Recc	Solid		Frac		Sar	Rec	(m)	Leg	Gra	Zon	
È		7.30m				1		HV=	1-1-1-	†	<u></u>	파파파			
F		00.00		100				0.560			Ē				
E.								HV=			E	ЧŢЧ			
È.									+•		-	비비			
Ē											F	비가가 비미네			
E.			:						2		E	HITH			
É								HV= 2.5Kpa	╽┍┓╸		- <u>2.00</u> -	비니네			
Ē				100							Ē	╵┤┘┥┶╢ ┠ <u>┨</u> ┃┠┨║			
E.								HV=			E	Ц <u>Г</u> Ц			
Ę								0.000	U¥		<u>5.00</u>	김년			
F										[Ē	비비비 네니네			
E.									4		E	НŢН			
L 5					-			HV=	╵┍┷╸		<u>- 4.00</u>	비뷰			
25/				100				0.000			Ē	비니다 비나다			Very soft, dark greenish grev clavev SILT
Ē.								HV −	5						
Ē					ł			10.0Kp	a Ļļ≩ 	[C 2.00	바바			(MARINE DEPOSIT)
Ē												┶┧╧┨┶╢ ┝┫╻┃┝┫║			
Ē,									6						
E								HV= 12.5Kov	! † •		<u>- 6,00</u> -	비니비			
Ē				100				12.010	i -						
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E'								15.0Kp	i Ļí		<u>- 7.00</u> -	비니비			
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Ē									10		Ē	山山			
- 10			SAMPI	Ε	I			1	├	L	<u>F 10.00</u>	لأبتينا		L.	REMARKS
11	ULK DIS	TURBED	SAMPLE	_		ATER	LEVEL		LOGGED	M.Y.LI	<u>EE</u> _0	ATE _28	3/5	/91	
	LP.T. LIN	er sami			L ST	AND	ARD PENET	RATION	СНЕСКЕ	D	0				HV= Hand Vane Shear Value
0.	100 UN	DISTURB	ED SAM	PLE		ST.									
	76 UNC	ISTURBE	D SAMP	ΥE	PK T -	STON	SAMPLE	_							
1 18 1	AZIER S	AMPLE (76mm)		I PE	RME	VARIATE S	st.							

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E	BAG	CH	Y	BACK	IY SOLE	TANCI	HE GROU	, D	RIL	LH	JLE	RE	J.C	OF	(D w. o
50	LET	ANC	HE	SOIL			SPECIALIS	тз			/				HOLE No. $0008/3$
000	EAT.	0.11		10	KOK	N 11	147 A 1					<u>80</u>	V	<u>م</u>	UAIE from 23/3/91(B26/3/91
PRUL	ECI	NO.	<u>-</u> K L . 01	_AP /91	DEE	NE P E	.wai 1877	AND	R I OU	mar TER	DEEI	S.I. P BA	ν.ι \Υ	J. AF	REA ^{SHEET} 2 OF 4
METH	IOD						0-0F	DINA	TES				F	205	K COREBIT
CAB	LE TO	OL BO	RING/	ROTAR	Y			Ε	8071	58.90				1	
MAC	HINE	& N	٥.					N	8318	70 30			F	IOLI	E DIA.
HEL	EN								0010	3.30					0.00m-35.50m SX
FLUS	HING	MEE	MUIC				RIENT	IOITA	4				Ģ	GRO	UND-LEVEL
SEA	WATE	R					VERTIC	CAL						-5.9	J3mPD
	th /	•									T				
Drilling Progress	Casing dep size	Water level/ time/ date	Water Recovery X	Total core Recovery X	Solid core Recovery X	R. Q. D.	Fracture Index. /m	Tests	Samplea	Reduced Level	Depth (m)	Legend	Grade	Zone	Description
-								HV= 21.5Kpa			E				
Ē				100							Ę	<u>FITT</u>			
E,			i					HV=			E 11.00	민빈			(MARINE DEPOSIT)
Ē								12 00 hg			E				See sheet 1 of 4
- 12 -								8 81.0WS		2-17.93	F 12.00				
Ē			•	100				2,3,3.	E	5	12.45				Loose, light greyish brown
E								1.2.	1		+ 12.50				eldycy fine <u>SAND</u> .
<u>-</u> 13 ត								N=8			- 13.00				(ALLUVIUM)
2/2/											Ē				
F X											Ē				
E_14						۰.		11		5	E 14.00	্ <u>-</u>			
E				100				BLOWS 3,4,4,		5	14.45				
Ē								2,2, 3,3,			- 14.50				
E15											- 14.95	<u>ון ו</u>			Medium dense, light brown
											Ę				silty fine to coarse <u>SAND</u> with subangular fine aravel.
Ē		7.30m									Ę				
- 16		19:00						19		3	<u>= 16.00</u>	i [i i			(ALLOYIOM)
E				67				BLOWS 5,7,7		e	16,45				
								2.2, 3.4	Ĩ		- 16.50				
E17								10.9, N≈22	2	-22.9	3 - 16.95			<u> </u>	
E											Ę'	비나니			
Ë =											E				
E18 5				ļ	4		1	7		1	<u> 18.00</u>	비니			Soft, dark grey clayey <u>SILT</u>
25				100				BLOWS 2,2,3,	_2	2	L E 18.45	비니			with organic material.
Ē								1,1, 1,1,	Ī		18.50	궤出			(SWAMP DEPOSIT)
E19								1,2, N=5	. 2	3	- 18.95				
E			ţ								E 19.00	柏村			
ŧ											Ę	밊뷥			
20					<u> </u>	<u> </u>	1	1		4	F 20.00		1		
• S	MALL DI	STURBET	SAMPL	£	▲ ₩/	ATER S			LOGCE	о <u>м.ү.</u> L	<u>EE </u> 1		<u>8/5</u>	/91	REMARKS
	DLK DIS	ER SAM	PLF	-	т ¥% si		D PENET	RATION	CHECK	ED	1	DATE			
	100 U	NDISTURE	BED SAN	IPLE	• TE	ST							-		
đυ	76 UN	DISTURB	ED SAM	PLE	[] рг	ston s	SAMPLE								
ØM	AZIER S	AMPLE ((76mm)		Ξ PE	RMEAB	IUTY TES	5T							

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					<u></u>			In		Ц		PF	$\overline{\mathbf{C}}$	q	
	A)H	Y	BACH	iy sole	TANCH	E GROU	יטן	1L			ΛĽ		υπ	
80	LE I	ANC	HD	SOIL		TIONS :5	PECIALIST					จก			DATE from 25/5/91to 26/5/91
PROJ	ECT:	СНЕ	-K I	AP	KOK	NF	W AI	RPOF	RT N		INE S	S.I. \	V.C).	
		NO.	01	/91	DEE	P B.	AY A	AND	OUT	ER	DEEF	BA	Y	AR	EA ^{SHEET 3 OF 4}
METH				·			0-OR	DINAT	ES				R	OCK	COREBIT
CABI	E TO	DL BO	RING/	ROTAR	Y			Ε	80716	58.90				/	
MACH	IINE	& N	٥.					N	83183	79 30			F	IOLE	DIA.
HELE	N									3.50					0.00m-35.50m SX
FLUS	HING	ME	MUIC			0	RIENT	ATION	1				0	ROL	JND-LEVEL
SEA	WATE	R					VERTIC	CAL			.			-5.9	3mPD
	>th/		*		ж		_								
Drilling Progress	Casing del size	Water level/ time/ date	Water Recovery 3	Total core Recovery 3	Solid core Recovery	R. Q. D	Fracture Index. /m	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Zone	Description
21				100				7 BLO₩S 2,2,3, 1,1, 1,1, ₩2,2, N=6	25	-27.9	20.45 20.50 20.95 21.00 3 22.00	╄╼┦┯╢┯╢┯╢┯╢┯┨┯┨ ╕╼╕╼╷╼╷╼╷╼╷╼╷╼╷╼┨ ┥╼╷╼╷╼╷╼╷╼╷╼╷╼╷╼			(SWAMP DEPOSIT) See sheet 2 of 4
23				78				22 BLOWS 5,8,9, 3,3, 4,5, 5,8, N=22	22		22.45 22.50 22.95 23.00				Medium dense, light pink and brown clayey fine <u>SAND</u> . (ALLUVIUM)
16/5/52				100				B BLOWS 2,3,3, 1,7, 2,3, ↓3,4, N=12	33	2	24.45				Medium dense, light yellowish brown to brawn very clayey fine to coarse <u>SAND</u> with subangular fine gravel. (ALLUVIUM)
26 27				100				9 BLOWS 2,3,4, 1,1, 2,3, ↓3,3, N=11	3	5	26.95 26.95 26.95				Firm, light grey sandy clayey <u>SILT.</u> (ALLUVIUM) Medium dense, light yellowish brown to brown very clayey fine to coarse <u>SAND.</u>
- 28 - 28 - 29 - 29				100				11 BLOWS 3,4,4, 2,2, 3,3, 4,4, N=14		6 7 8	28.0 28.4 28.5 28.9				(ALLUVIUM) Firm, light grey clayey <u>SILT.</u> (ALLUVIUM) Medium dense, light grey very clayey fine to coarse <u>SAND</u> with subangular fine
E		7 10-									Ē				gravel. (ALLUVIUM)
- 30		07:00								9	F 30.0	ol	•		
	SMALL (STURB	ED SAMP	°LE	▲ \ ₩ .	WATER S			LOGGE	р <u>М.Ү</u>	LEE	DATE_2	28/	5/91	REMARKS
	SULK DI	NER SA	J SAMPL MPLE	r	×	TANDAR	LVCL RD PENE	TRATION	CHECH	œ		DATE			
	U 100 L	INDISTUI	RBED SA	MPLE	•	EST									
8	U 76 U	DISTUR	BED SA	PLE		NOTEIS	SAMPLE								
Ø	MAZIER	SAMPLE	(76mm)	ΞI	PERMEA	BILITY TE	EST							

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	SAC I.ET	ch` 'Ang	HE	BACH	IY SOLE	TANCH		["] ₽ ´´ '					-	`	HOLE No. ODB/3
				SOIL	E FOUND	ATIONS S	PECIALIS	[™] CO	NTRA	ACT F	PAA5/	90			DATE from <u>25/5/91</u> to <u>26/5/91</u>
PRO.	JECT:	CHE	EKL	AP	KOK		W AI					S.I.	V.C). ^ D	TASHEET 4 OF 4
METH		NO.		/91	DEE		$A \uparrow /$			ER	DEER	- BF			
CAR			RING /		Y					200				/	
MAC	HINE	& N	0.							5.90			F	ÍOLE	DIA.
HEI	FN		•••					Ν٤	331879	9.30					0.00m-35.50m SX
FLUS	SHING	MED	MUIC			0	RIENT	ATION	1				0	ROI	JND-LEVEL
SEA	WATE	R					VERTIC	CAL			.	.		-5.	93mPD
	pth∕		ж			-	-								
Drilling Progress	Casing de size	Water level/ time/ date	Water Recovery	Tatal core Recovery	Solid core Recovery	2 2	Fracture Index. /m	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Zone	Description
		8.80m 08:00		100				7 BLOWS 2,2,3, 1,1, 2,3, 4,4,	40		- <u>30,45</u> - <u>30,50</u> - <u>30,95</u>	0 0 0 0			See sheet 3 of 4
31				100				N=13 29 BLOWS 7 10 12			31.00	0 0 0 0			Medium dense to dense light yellowish brown slightly clayey fine to coarse <u>SAND</u> with subangular fine gravel.
- [- 1 - 1 - 1 26/5/91								3,4, 5,8, 10,1 N=36	3, 44		- 32.45 - 32.50 - 32.95 - 33.00				(ALLUVIUM)
34						2		18	↓45 ●●		- - - 34.00	8 6 0 8 6 0 8 6 0 9 6 0			fine to coarse <u>SAND</u> with subangular fine gravel. (ALLUVIUM)
35				100				BLOWS 2,6,10,	44		- <u>34,45</u> - <u>34.50</u> -				Medium dense, light green spotted white clayey fine to coarse <u>SAND</u> with subangular fine gravel and occasional medium gravel.
Ē									4	-41.4	5 <u>3 - 35.50</u>				
_36 															Medium dense, dark grey and red silty fine to coarse <u>SAND</u> with some subangular fine gravel. (ALLUVIUM) End of the drillhole at 35.50m
- 38 - 38 											<u></u>				
- 39											<u></u>				
- 40	SMALL (I	D SAMP	 יLE	ـــــــــــــــــــــــــــــــــــــ	MATER S									REMARKS
1	BULK DI	STURBED	SAMPL	£	X 1	WATER L	EVEL		LOGGE	о <u>м. Ү.</u>			<u>.8/</u>	<u>191 c</u>	-
0	S.P.T. U U 100 U U 76 UI	NER SAN	MPLE RBED SA BED SAN	MPLE		STANDAR TEST PISTON :	O PENE	TRATION	CHECK	ED		DATE			
0	MAZIER	SAMPLE	(76mm)	± F	PERMEAE	ILLITY TE	ST							

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Registered Office: 2304-6 World Trade Centre, 280 Gloucester Road, Causeway Bay, Hong Kong. Office Tel: 2882-3939 Fax: 2882-3331 Laboratory Tel: 2897-3282 Fax: 2897-5509

ľ	1					С		СТ	NO	GF	/200	3/14			SHEET 1 of 4
JOB	TITLE	E Ag	reement	No.	CE 2	8/20	003 (EP) S	ludg	e Trea	tmer	nt Faci	ities	- Feas	ibility	Study - Marine Ground Investigation
	10. 10 102 (105	1/2/201	Sec. Constant		Č.	÷								0.000	
MET	HOD	W+	RC					cc	D-ORD		ES 72.60			WOF	RKS ORDER No. GE/2003/14.9
MAC	HINE	& No.	BR4						N 8	33167	71.90	Ŷ		DAT	E from 22/11/2005 to 05/12/200
FLUS	SHING	6 MED	IUM S	Sea W	/ater			OF	RIENTA	NOITA	N V€	ertica	[SEA	BED LEVEL -2.90 mPD
Urilling Progress	Casing Depth/Size	Water Depth (m)	Water Recovery % Total Core Recovery %	Solid Core Recovery %	R.Q.D.	Fracture Index	Tests		Sam	ples		0 Depth 8 (m)	Legend	Grade	Description
211/2005	Sw	3.80m at 08:00	108				8			e Depti	-	-	7-10 -1		Very soft, dark grey (N4), sandy silty CLAY wi some shell fragments (MARINE DEPOSIT)
< a				1			V = 10.0 k	N/m²	2	9:8	j				à.
		8								⊐ 2.0¢		-			
															A
							V = 132 ki	N/m²	4	388		1			# 5
								ł							35
			708						5 ===	a 4.00	-6.90	4.00			Dark grou (NA) alougu alku Franka gagar OAA
		1: -											-6-1		with some shell fragments (MARINE DEPOSI
o anal		4.70m at											그건		
1/2005		3.80m at 08:00							6 📼	≠ 5:88					
								8	þ)			1	<u>7</u> 0		
			100				27 bis -		7	6.00	-8.90	6,00		-	Medium dense, yellow (2.5Y7/6), clayey silty f
				8			3,5		៖ កំ	8:55					to coarse SAND (ALLUVIUM)
							0.0.4.5 N=21		10 •	6.99					
												0			
			108			3	12 bls		11	8.00	-10.90	8.00			Soft, grey (2.5Y6/1), silty CLAY (ALLUVIUM)
		4 800	KA				1,0 1,1,1,1	T	12 13	8.58			문민		
1/2005		at 18:00 3,80m					N=4		14 •	8.89		ē,			
a tana 1979 Ang	8	at 08:00								1202		8	프		
							43	1		8.50					
Sma	all Distur	bed Sam	nple Ţ	Pack	er Test			1			-12.90	10,00 F	EMAR	KS	
Wat SPT	er Samp Liner S	ole ample	₫ ↓	Piezo Stano	ometer dard Pe	/ Stan enetra	dpipe Tip tion Test		LOGGE[0 H.K	Fung	- 1.	Consta 8.50-9 Impres	nt head 50m de sion pao	t permeability tests carried out at 3.00-4.00m and epths. cker tests carried out at 32,20-33.70m and
U76 U10	Undistu 0 Undist	irbed Sar lurbed Sa	mple I ample I	Press Perm	surerne eability	eter Te v Test	st		CHECKE	D M.D	avies	3.	33.40-3 Vane s 3.00m	34.90m hear tes	depths. st carried out adjacent to drillhole at 1.00m and
Maz	ier Sam	ple	Ţ	Impre	ssion	Packe	r / Televiewer T	est	DATE	09/1	2/2005	4	Drillhol	e backfi	illed with bentonite cement grout.

MET	HOD	W+	RC		11,	2003		CO-(E	ORDIN 81	NATE 0 987 :	.S 2.60		-	wo	ORKS ORDER No. GE/2003/14.9
MAC FLUS	HINE	& No. 6 MED	BR4	Sea V	/ater			N ORII	8: ENTA	3167 TION	1.90 Ve	ertical		DA1 SEA	TE from 22/11/2005 to 05/12/2005 ABED LEVEL -2.90 mPD
Progress	Casing Depth/Size	Water Depth (m)	Water Recovery % Total Core	Solid Core Recovery %	R.Q.D.	Fracture Index	Tests		Samp	les	E Reduced	6 Depth 8 (m)	regend	Grade	Description
11/2005		4,70m at 18:00 3.90m at 08:00	. 70			127 34 b 5.7 (N=2	bis is 35	1 1 1	а. Түре 5 6 7 8	0.45 10.45 10.50	<u>-13.40</u> <u>-13.90</u>	<u>10.00</u>			Light grey (N7), coarse SAND with many fine gravel sized quartz fragments (ALLUVIUM) Medium dense, yellow (2.5Y7/6), clayey very silty fine to coarse SAND (ALLUVIUM) 11.00-12.50m: light grey (N7)
(a))						52 b 2.2 1.1.4 N=1	s ,7	2 22 2	0 1 2 3	12.50 13.88 13.48	<u>-15.40</u>	<u>12.50</u> 13.00	$ \frac{1}{1} = 1$		Firm, light grey (N7), slightly clayey SILT (ALLUVIUM) 13.00-14.50m: yellow (2.5Y7/6)
		1	70			18 b 2.1 2.22 N=8	s ,2	222	4 5 5 7	14.50 16.85 16.49	<u>-17 40</u>	<u>14.50</u> <u>15.00</u>			Soft to firm, grey (N6), silty CLAY (ALLUVIUM) 14.50-15.00m: with wood fragments
		ł	79			33 bi 0,0 1,1,1 N=5	2	21 21 30 31		16.50 16.80 15.90 17.00			<u>╶</u> ┥┥┙┙┙┙┙┙┙		10 pr 70 10 10 10 10 10 10 10 10 10 10 10 10 10
12005		4.90m at 18:00 3.90m at 08:00	90			84 bi 2:2 3:2:4 №16	7	3: 34 35		18 50 - 18 53 18 49	-21.40	18.50			Medium dense, yellow (10YR7/8), slightly claye very silty fine to coarse SAND (ALLUVIUM)

DRILLHOLE RECORD am CONTRACT NO. GE/2003/14

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DRILLHOLE No. STF-B1

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SHEET

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3 of

JOB TITLE Agreement No. CE 28/2003 (EP) Sludge Treatment Facilities - Feasibility Study - Marine Ground Investigation

METHOD W+RC	CO-ORDINATES	WORKS ORDER No. GE/2003/14.9
MACHINE & No. BR4	E 809872.60 N 831671.90	DATE from 22/11/2005 to 05/12/2005
FLUSHING MEDIUM Sea Water	ORIENTATION Vertical	SEABED LEVEL -2.90 mPD

Drilling Progress	Casing Depth/Size	Water Depth (m)	Water Recovery % Total Core Recovery %	Solid Core Recovery %	R.Q.D. Fracture Index	Tests	Sampl	les Depth	Level 22.90	o Depth (m)	Legend	Grade	Description
	2		708			78 bis 3.4 5.5.6.6 №=22	36 37 36 39	20.50 29.85 21.49	<u>-23,40</u> -23,90	20.50	$\frac{1}{ \mathbf{o}_1 } = \frac{ \mathbf{b}_1 }{ \mathbf{o}_1 } = \frac{ \mathbf{b}_1 }{ \mathbf{b}_1 } = \frac{ \mathbf{b}_1 }$		As sheet 2 of 4 Yellow (2.5Y7/6), very silty fine SAND (ALLUVIUM) Medium dense, yellowish brown (10YR5/8), slightly clayey silty fine to coarse SAND with some angular to subangular fine to coarse gravel sized strong rock and quartz fragments (ALLUVIUM)
- - - - - - - - - - - - - - - - - - -	23.00 Pw	4.90m at 18:00 3.60m at 08:00	<u>^</u>			312 bis 6.9.4.4 N=23	40 41 42 43 •	22 50 23,88 23,48			$\frac{\mathbf{e} \left[-\frac{\mathbf{e}}{2} \right] \mathbf{e} \left[-\frac{\mathbf{e}}{2} \right] -\frac{\mathbf{e}}{2} \left[-\frac{\mathbf{e}}{2} \right] -\frac{\mathbf{e}}{2} \left[-\frac{\mathbf{e}}{2} \right] \mathbf{e} \left[-\frac{\mathbf{e}}{2} \right] \mathbf{e}$		
- - - - - - - - - - - - - - - - - - -	Pw 24.50 Hw	4.10m at 18:00 3.70m at 08:00 4.40m at 18:00 3.70m at	759 []			494 bls 236 bls 11.12.15.27 N=65	44 45 46 47 48	24.50 24.95 25.00 25.55 25.99	<u>-27,40</u> -28,40	24.50 		v	Extremely weak, light greenish grey (5G8/1) spotted white, red and brown, completely decomposed coarse grained GRANITE (Firm, slightly clayey fine sandy SILT) Extremely weak, yellowish brown (10YR5/8) spotted grey and pink, completely decomposed MYLONITE (Stiff, slightly clayey sandy SILT with some fine gravel sized moderately strong rock fragments)
		08:00	78			6.9 11,10,12,16 N=49	50 51 52 53 •	27.00 28.00 28.10 28.59	- 31 90	29.00			
			758 				54	29.00	-32.90	30.00		V	Extremely weak, yellowish brown (10YR5/8) spotted grey and pink, completely decomposed mylonitic GRANITE (Stiff, slightly clayey sandy SILT with some fine gravel sized moderately strong rock fragments)
Sr W SF U	nall Distu ater Sam PT Liner S 76 Undist	rbed San ple Sample urbed Sa sturbed S	nple I mple I ample I	Packe Piezor Stand Press Perme	er Test meter / Sta ard Penetr uremeter 1 eability Tes	Indpipe Tip ation Test Test it	LOGGED DATE CHECKEE	<u>H.K.</u> 09/1: 09/1:	Fung 2/2005 avies	- R	EMAR	KS	
Ma Pit	azier Sam ston Sam	ple ple	I V	Impre: In-situ	ssion Pack Vane She	er / Televiewer Test ar Test	DATE	09/1:	2/2005	-			

		~					D	RILLH		ECO	RD			DRILLHOLE No. STF-B1
	1						С	ONTRA	CT NO. GE	E/2003	3/14			SHEET 4 of 4
JOB	TITLE	Agr	reen	nent	No.	CE 2	8/20	03 (EP) Slu	udge Treatme	nt Facil	ities -	Feas	ibility	/ Study - Marine Ground Investigation
MET	HOD	W+	RC		12				CO-ORDINAT	TES			wo	RKS ORDER No. GE/2003/14.9
MAC	HINE	& No.	Bł	₹4			<u></u>	11	E 8098 N 8316	72.60 71.90			DAT	TE from 22/11/2005 to 05/12/2005
FLU	SHING	MED	IUM	s	ea V	/ater			ORIENTATIO	N Ve	rtical		SEA	ABED LEVEL -2.90 mPD
[1					
Drilling Progress	Casing Depth/Size	Water Depth (m)	Water Recovery %	Total Core Recovery %	Solid Core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	6 Level	00 00 (m)	Legend	Grade	Description
	32°61			0				1 29.21/15mm 100/15mm 100bis/15mm	56 9 31 57 9 31	10 10 20 20 20 20 20 20 20 20 20 20 20 20 20	32.01	r 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1		As sheet 3 of 4
		4.20m at 17:00 3.40m at 08:00		88 80 80 80 80 80 80 80 80 80 80 80 80 8	8r 100 100 94	64 0 80 97 79 71	4.3 17.3 2.6 16.7 5.9		- 32 T2IOI 32 T2IOI 33 - 33 - 34 T2IOI 34 - 35 T2IOI 35 - 36 T2IOI 36		32.87 33.22 33.22 36.32 36.32 36.60 36.69	\\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		Strong, grey mottled pink, streaked black, slightly decomposed mylonitic GRANITE with closely to medium, locally very closely spaced, smooth and rough, planar and undulating, kaolin and chlorite coated joints, dipping at 0°-10°, 30°-40°, 50°-60° and 65°-75° 32.01-33.22m: moderately strong to strong and moderately to slightly decomposed 32.01-32.87m: with subvertical to vertical joints 32.01-32.05m: highly fractured 36.32-36.92m: moderately strong to strong and moderately to slightly decomposed 36.60-36.65m: highly fractured
		3.001 at 18:00						J	32	<u>-40.39</u>	- 37,49 	- + -		End of investigation hole at 37.49m
● Sr ▲ W ① SF ② U7 ◎ Ma ■ Pit	nall Distu ater Sam PT Liner S 76 Undist 100 Undis azier San ston Sam	rbed Sar ple Sample urbed Sa sturbed S sturbed S ple	mple ample Sample		Pac Piez Star Pre: Perr Imp	ker Tes zomele ndard F ssurem meabili ression ilu Van	st Penetra heter Tr ty Test h Packe e Shea	ndpipe Tip ation Test est er / Televiewer T ar Test	LOGGED H DATE O CHECKED M DATE O	H.K.Fung 9/12/2005 1.Davies 9/12/2005		EMAF	RKS	~



DRILLHOLE RECORD DRILLHOLE No. STF-B2 am **CONTRACT NO. GE/2003/14** SHEET 2 of 5 JOB TITLE Agreement No. CE 28/2003 (EP) Sludge Treatment Facilities - Feasibility Study - Marine Ground Investigation GE/2003/14.9 WORKS ORDER No, METHOD W+RC CO-ORDINATES 809913.80 Е 08/12/2005 15/12/2005 MACHINE & No. BR4 DATE from to N 831684.10 FLUSHING MEDIUM Sea Water ORIENTATION Vertical SEABED LEVEL -2.80 mPD Water Recovery % \$ Reduced Level Casing Depth/Size Total Core Recovery % Solid Core Recovery % Wate Samples Drilling Progress (m) (m) Legend Depth Fracture R.O.D. Tests Description Grade (m) 10,00 -12,80 No Type Dept As sheet 1 of 5 26 bis 19 11:55 30 20 21 Medium dense, grey (10YR6/1), slightly clayey silty fine to coarse SAND (ALLUVIUM) 9,8 6,7,7,7 N=27 11.98 22 13.0 23 48 bi 日朝 24 25 | 3,5 | 6,6,8,8 | N=28 Medium dense, yellow (10YR7/6), slightly clayey 4.80m at 18:00 4,50m silty fine to coarse SAND with some angular to à subangular fine to coarse gravel sized quartz fragments (ALLUVIUM) 13.89 26 10/12/2005 at 08:00 15.0 167 bk 27 15:58 28 2,2 5,7,7,6 N=25 15.9 30 łc 17:0 50 bis 31 20.30 仔髮 32 Extremely weak, yellowish brown (10YR5/6) and pink (2.5YR8/4) spotted brown, green and white, 3,3 2,2,3,3 N=10 completely decomposed mylonitic GRANITE (Stiff, slightly clayey sandy SILT) 17.89 34 Sw 19.00 103 bis 35 Hw 18.58 36 5,9 11,12,15,18 N=56 18 98 22.80 20.00 REMARKS Small Disturbed Sample Packer Test ð LOGGED H.K.Fung Piezometer / Standpipe Tip ۸ Water Sample Standard Penetration Tesl 1 Π SPT Liner Sample DATE 19/12/2005 U76 Undisturbed Sample I Pressuremeter Test 2 ł U100 Undisturbed Sample Permeability Test CHECKED M.Davies \square Impression Packer / Televiewer Test Mazier Sample 1

DATE

Pision Sample

V

In-situ Vane Shear Test

21/12/2005
METHOD WHRC CO.ORDINATES WORKS ORDER No. GE/2003/14.9 MACHINE & No. BR4 0 N 831684.10 DATE from 08/12/2005 to 15/12/200 FLUSHING MEDIUM Sea Water ORIENTATION Vertical SEABED LEVEL -2.80 mPD mg 00 m	JOB	TITLE	Agr	reement	No. C	CE 28	8/20	03 (EP) SI	udge	e Treatmen	t Faci	lities -	Feasi	bility	Study - Marine	Ground Inve	estigation
MACHINE & No. BR4 E BUU913X0 BS1684.10 DATE from 08/12/2005 to 15/12/200 FLUSHING MEDIUM Sea Water ORIENTATION Vertical SEABED LEVEL -2.80 mPD mage group of the sea Water ORIENTATION Vertical SEABED LEVEL -2.80 mPD mage group of the sea Water ORIENTATION Vertical SEABED LEVEL -2.80 mPD mage group of the sea Water ORIENTATION Vertical Seameles group of the sea Water Description mage group of the sea Water Group of the sea Water Group of the sea Water ORIENTATION Vertical Seabel 2 of 5 mage group of the sea Water Description mage group of the sea Water mage group of the sea Water group of the sea Water group of the sea Water group of the sea Water Group of th	MET	HOD	W+	RC					со	ORDINATI	ES			wo	RKS ORDER No.	GE/2	003/14.9
PLUSHING MEDIUM Sea Water ORIENTATION Vertical SEABED LEVEL -2.80 mPD 2000 0000 <td< th=""><th>мас</th><th>HINE</th><th>& No.</th><th>BR4</th><th></th><th></th><th>-</th><th></th><th>E</th><th>E 80991 N 83168</th><th>3.80 4.10</th><th></th><th></th><th>DAT</th><th>E from 08/12</th><th>2/2005 to</th><th>15/12/200</th></td<>	мас	HINE	& No.	BR4			-		E	E 80991 N 83168	3.80 4.10			DAT	E from 08/12	2/2005 to	15/12/200
Big Water Water Big Description and big	FLUS	SHING	MED	IUM S	ea W	ater	6		OR		l Ve	ertical		SEA	ABED LEVEL	-2.80	mPD
3.700 (0.000) 3.700 (0.000) 700 (0.000)	Progress	Casing Depth/Size	Water Depth (m)	Water Recovery % Total Core Recovery %	Solid Core Recovery %	R.Q.D.	Fracture Index	Tests		Samples	Level -22.80	(m) 20.00	Legend	Grade		Description	
370m		0												~	As sheet 2 of 5		
				700						39						2	ξ.
$\frac{1}{222006} = \begin{pmatrix} 1 \\ 1 \\ 2 \\ 3 \\ 3 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$			3.70m	90				4,4 6,9,10,14	0.000	40 41 22 10 22 10	1						
3.70m 43 24.00 1118 3.1.2.045mm 46 24.00 1118 3.1.2.045mm 46 24.00 47 25.00 1114 1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1	12/2005 12/2005	5	at 18:00 4:30m at 08:00		6			14-35		42 • 225	8				° 2	11.	
$ \frac{3.700}{4500} $ $ \frac{3.700}{4500} $ $ \frac{4}{4500} $ $ \frac{3.700}{4500} $ $ \frac{4}{550} $ $ \frac{3.700}{550} $ $ \frac{4}{55} $ $ \frac{3.700}{550} $ $ \frac{5}{50} $ $ \frac{5}{50$				793						43		-					8
$ \begin{array}{c} 3.70m \\ 46 \\ 47 \\ 70 \\ 11 \\ 12 \\ 12 \\ 12 \\ 12 \\ 12 \\ 12 \\ 12$		•						11,16 20,25,31,24/45n	٦m	44 45 24.0 24.1	2						
$\frac{1200006}{11000}$ $\frac{3.70m}{11000}$ $\frac{3.70m}$								1000/6/27 0111/1		46 • 34	5						
$\frac{1}{122006}$ $\frac{3.70m}{4t}$ $\frac{3.70m}{4t}$ $\frac{49}{49}$ $\frac{2800}{2810}$ $\frac{1}{1}$ \frac			RI	<u>[2</u>]						47							
$\frac{1}{1222005} \begin{array}{c} 3.70 \text{m} \\ \text{at} \\ 3.70 \text{m} \\ \text{at} \\ 06:00 \end{array} \begin{array}{c} 3.70 \text{m} \\ \text{at} \\ 06:00 \end{array} \begin{array}{c} 79 \\ 100 \\ 11:6.27 \\ 100 \\ 11:6.27 \\ 100 \\ 100 \\ 11:6.27 \\ 100 \\ 10$	4	5 10		68						48 26.0 49 26.1	8						
$\begin{array}{c} 3.70m \\ at \\ 18:00 \\ 4.50m \\ 08:00 \\ \hline \end{array} $ \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ \hline \bigg \\ \hline \bigg \\ \\ \rule \\ \rule \\ \rule \\ \\ \hline \bigg \\ \\ \hline \bigg \\ \\ \rule \\ \bigg \\ \rule \\ \rule \\ \bigg } \\ \bigg } \\ \bigg \\ \bigg \\ \bigg \\ \bigg \\ \bigg									Ī	26.7							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	12/2005		3.70m at 18:00					7,9 10,11,16,27 №=64		50 27.1 51 27.2 52 • 22							
34 35 54 55 55 29.10 11 11 12 11 14 11 15 11	12/2005		4.50m at 08:00	65				64 20	-	53 28.1							
										54 29 11		-					
				745						55							

				909-000-0		<u></u>				<u> </u>	<u></u>	-				
	91	m			න 		D	RILL	-10	LE	RE	ECC	R)	_	DRILLHOLE No. STF-B2
						8	С	ONTRA	СТ	NO.	GE	/200	3/14			SHEET 4 of 5
JOB	TITLE	E Ag	reen	nent	No.	CE 2	28/20	003 (EP) SI	ludge	e Treat	tmen	t Faci	lities	- Feas	ibility	Study - Marine Ground Investigation
MET	HOD	W+	RC						со	-ORDI	NATE	ES			WO	RKS ORDER No. GE/2003/14.9
MAC	HINE	& No.	в	R4					E	E 8	0991 3168	3.80		ľ	DAT	E from 08/12/2005 to 15/12/2005
FLU	SHING	MED	NUI	s	ea W	/ater	04 		OR	IENTA	TION	l Ve	ertica	1	SEA	BED LEVEL -2.80 mPD
l	r	1	1.1				1		18			T		I		
Drilling Progress	Casing Depth/Size	Water Depth (m)	Water Recovery %	Total Core Recovery %	Solid Core Recovery %	R.Q.D.	Fracture Index	Tests		Samp	Denti	Reduced 86 Level	30.00 (III) 80.00	Legend	Grade	Description
				_			-	14.3		56 57	30.20 30.30	-33.10	30.30	日		As sheet 2 of 5
-13/12/2005 -14/12/2005 		4.10m at 18:00 4.10m at 08:00						5,8,12,18 N=43		58 •	38.79	24.00				greyish green (5G4/2), completely decomposed BASALT DYKE (Stiff, clayey SILT)
-				148						59	31.20	-34.00			V	Extremely weak, yellowish brown (10YR5/8) spotted grey and pink, completely decomposed MYLONITE (Stiff, slightly clayey sandy SILT)
				/48			5			60 61	32 20 32 30					
										V						
								1 1		52 V	33.30					
								15,28 50,50/55mm 100bls/130mm		63 [] 64 •	HO					
			-	760						65 77	34 30					
	27							0		U						
						E				66	35,30	-38.20	- - - 35.40			÷
				145						67	35.40		Ę	- - - - - - - - - - - - - - - - - - -	VIV	Extremely weak to very weak, yellowish brown (10YR5/8), completely to highly decomposed MYLONITE (Slightly clayey silty fine to coarse
													Ē	-9		SAND with some fine to coarse gravel sized weak to medium weak rock fragments)
1 - WERKS								50/60mm 100/50mm 100bls/50mm	-	68 • 69 •	36.40 36550 36651	n j		0		387
									5							
										70	37.40			0		
4/12/2005	Hw 38.26	4.20m at 18.00			89	88	NI	20		71	38.16 38.26	-41-99	- <u>38.39</u>	- <u>à</u>		Madarataly atrange state as the description of the
-9 12/2003		4,30m at 08:00				3	6.1					-41.45 -41.56	38.65 38.76			MyLONITE with closely to medium spaced,
		6					3.0			T2IO1			-		m	limount and rough, plantal and undulating, limonite and manganese oxide stained joints, dipping at 30°-40° and 40°-50°
				108	100	100		*		T2101	39.57 39.80					38.65-38.76m: weak to moderately weak, highly decomposed and non-intact
• Sm	all Distur	bed Sam	 1ple		Pack	er Tes	 t	I	1		J9 0U	-42.80	40,00 F	EMAR	KS	
▲ Wa [] SP	iter Samp T Liner S	ole ample		∆ ↓ ~	Piezo Stan	ometer dard P	/ Stan enetra	dpipe Tip tion Test	l	.OGGED	H.K.	Fung 2/2005	-			
2 U70	6 Undistı. 00 Undis	rbed Sa turbed S	mple ample	I I	Pres: Perm	sureme ieabilit	eler To y Test	sl		HECKE	D M.D.	avies	_			
Ma:	zier Sam ton Samp	ple ble		I V	Impre In-sili	ession u Vane	Packe Shea	r / Televiewer ⊤ r Test	est [DATE	21/1	2/2005	-			

DRILLHOLE RECORD CONTRACT NO CE/2003/14

DRILLHOLE No. STF-B2

lam DRILLE	IOLE RECORD	DRILLHOLE No. SIF-B2
CONTRA	CT NO. GE/2003/14	SHEET 5 of 5
JOB TITLE Agreement No. CE 28/2003 (EP) SI	ludge Treatment Facilities - Feasibilit	y Study - Marine Ground Investigation
METHOD W+RC	CO-ORDINATES WO	RKS ORDER No. GE/2003/14.9
MACHINE & No. BR4	E 809913.80 N 831684.10 DAT	TE from 08/12/2005 to 15/12/2005
FLUSHING MEDIUM Sea Water	ORIENTATION Vertical SEA	ABED LEVEL -2.80 mPD
Progress Progress Casing Casin	Samples Sample	Description Moderately strong, pink spotted and streaked
100 100 95 6.0 Å	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	grey and green, moderately decomposed mylonitic GRANITE with closely to medium spaced, smooth and rough, planar and undulating, limonite and manganese oxide stained joints, dipping at 30°-40° and 40°-50° 40.07-40.47m: moderately weak to moderately strong and moderately decomposed 40.70-40.97m: moderately weak to moderately strong and moderately decomposed
4.20m at 18:00	+++++ TZIO1 +++++ +++++ ++++++++++++++++++++++++++++++++++++	42.22-43.74m. suong and signuy decomposed
		End of investigation hole at 43.74m.

			0.00
Small Disturbed Sample Water Sample SPT Liner Sample U76 Undisturbed Sample U100 Undisturbed Sample Mazier Sample Piston Sample	I Packer Test ID Piezometer / Standpipe Tip IJ Standard Penetration Test II Pressuremeter Test II Permeability Test II Impression Packer / Televiewer Test V In-situ Vane Shear Test	LOGGED <u>H.K.Fung</u> DATE <u>19/12/2005</u> CHECKED <u>M.Davies</u> DATE <u>21/12/2005</u>	REMARKS

DRILLHOLE RECORD DRILLHOLE No. STF-B3 am **CONTRACT NO. GE/2003/14** SHEET 1 of 4 JOB TITLE Agreement No. CE 28/2003 (EP) Sludge Treatment Facilities - Feasibility Study - Marine Ground Investigation W+RC METHOD CO-ORDINATES WORKS ORDER No. GE/2003/14.9 Е 809976.70 MACHINE & No. BR8 DATE from 20/12/2005 24/12/2005 to Ν 831700.80 FLUSHING MEDIUM Sea Water ORIENTATION Vertical SEABED LEVEL -3.90 mPD \$ Casing Depth/Size Water \$ Solid Core Recovery % Reduced Level Total Core Recovery % Samples Water Recovery 9 Drilling Progress (m) Depth Legend ROD Tests Description Fractu Index Grade (m) -3.90 0.00 Sw 4.90m Very soft, dark grey (N4), silty CLAY (MARINE DEPOSIT) • 1 13:00 2 78 ī 5.90 26 Dark greenish grey (N4), clayey silty fine to coarse SAND with occasional angular to subangular fine gravel sized rock and some shell fragments (MARINE DEPOSIT) 3.88 10 -7.90 34 bis Yellow (10YR7/8), silty clayey fine to coarse 5.30m at 18:00 4.20m Ţ SAND with some subangular to subrounded fine gravel sized quartz fragments (ALLUVIUM) ظ 0/12/2009 15 8.40 Stiff, light grey (N7/1) mottled yellow, silty CLAY (ALLUVIUM) 1,2,2,3 N=8 - 1 at 08:00 - 13 - 1 138 1 1 1 - 1 1. 1.5 - 1 ÷ - 1 -9.90 6.00 108 6.0 37 bis Firm, dark grey (N4/1), slightly sandy silty CLAY (ALLUVIUM) - 1 -10 8.45 1,1 2,1,2,1 N=6 8-89 12 4 -11.90 13 132 bis φ Stiff, light grey (N7/1) mottled yellow, sandy silty CLAY with occasional subangular fine gravel - 1 10-1 sized quartz fragments (ALLUVIUM) 848 12.40 14 15 7-Stiff, grey (N6/1), silty CLAY with occasional subangular fine gravel sized quartz fragments (ALLUVIUM) 1,3,4,4 N=12 φ . . . 101 н. 16 83 1 1Q · 1 9 . , 4 10 13 90 10.00 REMARKS Small Disturbed Sample Packer Test LOGGED C.M.Ting Piezometer / Standpipe Tip Water Sample ð 1. Constant head permeability test carried out at 16.20-17.20m depth. Standard Penetration Test Π SPT Liner Sample 2. Impression packer tests carried out at 34.10m-35.60m and 35.30-36.80m depths. DATE 29/12/2005 Ι Pressuremeter Test 2 U76 Undisturbed Sample

CHECKED M Davies

03/01/2006

DATE

9

U100 Undisturbed Sample

Mazier Sample

Piston Sample

Ŧ

Ι

V

Permeability Test

In-situ Vane Shear Test

Impression Packer / Televiewer Test



DRILLHOLE RECORD DRILLHOLE No. STF-B3 an **CONTRACT NO. GE/2003/14** SHEET 3 4 of JOB TITLE Agreement No. CE 28/2003 (EP) Sludge Treatment Facilities - Feasibility Study - Marine Ground Investigation METHOD W+RC CO-ORDINATES WORKS ORDER No. GE/2003/14.9 Е 809976.70 MACHINE & No. BR8 DATE from 20/12/2005 24/12/2005 to Ν 831700.80 FLUSHING MEDIUM Sea Water ORIENTATION Vertical SEABED LEVEL -3.90 mPD % Water Recovery % Total Core Recovery % Solid Core Recovery % Reduced Level Casing Depth/Size Water Samples Drilling Progress (m) (m) Depth Legend Tests Description R.Q.D. Grade Fractur (m) 20.00 -23.90 As sheet 2 of 4 20.20 20.30 36 37 3,5 9,11,13,16 N=49 <u> 28.79</u> 38 -25.10 21 21.20 0 No recovery inferred to be completely decomposed mylonite GRANITE 22.20 22.30 39 40 26.20 22 30 Extremely weak, pinkish brown (7.5YR6/2), completely decomposed mylonitic GRANITE 10 (Stiff, sandy clayey SILT with occasional fine gravel sized rock fragments) 23.30 23.40 41 3,7 9,13,15,17 №=54 23.89 43 ٠ ð 70 Extremely weak, yellowish brown (10YR5/8), completely decomposed mylonitic GRANITE with quartz veins (Slightly clayey silty fine to coarse SAND with many fine to coarse gravel or draw the forements) 243 0 .0 sized quartz fragments) 25,30 44 0 10 26. 45 46 -30.40 Extremely weak, pinkish brown (7.5YR6/2) mottled grey and dappled white, completely decomposed MYLONITE (Stiff, sandy clayey SILT with occasional fine gravel sized rock 1 6,13 18,23,30,29/260mm 100bls/260mm 19 10 47 28.9 0 fragments) li 27 49 50 28.40 28.50 lo 29 50 29 60 51 52 12,23 37,40,23/170mm 100bls/170mm 53 鵎婜 3.90 30.00 1 REMARKS Small Disturbed Sample Packer Test ð LOGGED C.M.Ting Piezometer / Standpipe Tip Water Sample ۸ T Standard Penetration Test Π SPT Liner Sample DATE 29/12/2005 I U76 Undisturbed Sample Pressuremeter Test 0 Ŧ 2 U100 Undisturbed Sample Permeability Test CHECKED M.Davies Ø 1 Mazier Sample Impression Packer / Televiewer Tesl

DATE

Piston Sample

V

In-situ Vane Shear Test

03/01/2006

											0120020				
MET	HOD	W+	RC		272				CO-OR	DINA ⁻ 8099	FES 976 70			WC	ORKS ORDER No. GE/2003/14.9
MAC	HINE	& No.	BR	88	-	S - 1			N	8317	700.80			DA	TE from 20/12/2005 to 24/12/200
FLU	SHING	6 MED	IUM	S	ea W	ater			ORIEN	TATIC	N V	ertica	l I	SE	ABED LEVEL -3.90 mPD
Drilling Progress	Casing Depth/Size	Water Depth (m)	Water Recovery %	Lotal Core Recovery %	Solid Core Recovery %	R.Q.D.	Fracture Index	Tests	Sa	amples Type De	Fevel Level 1933-0410	00 05 (m)	Legend	Grade	Description
						9					34.40	- 30.5			As sheet 3 of 4
1920005	1	5.40m at		58					54	30	⁵⁰ -35 50	- 31.6			Extremely weak, grey (10YR6/1) streaked wh and brown, completely decomposed MYLONI (Clayey silty fine to coarse SAND with occasional fine gravel sized rock fragments)
/12/2005	Hw 32 10	4.40m at 08:00		1.2					56 57	2 31 32	92 92 -36 00	- 32.10	000		Extremely weak to weak, brown (10YR4/3) mottled black, completely to highly decompos MYLONITE (Sandy fine to coarse GRAVEL a
	1			9	70	63	NI >20 6,7			32	-36.15	- 32.2	5		COBBLE sized rock fragments) Strong to very strong, mottled pink and streak black, slightly decomposed MYLONITE with
;		ŝ					0.8			2101	-36.60 36.69 36.60	- 32.70 - 32.70 - 32.90	2 		closely to medium, locally very closely to extremely closely spaced, rough undulating, limonite stained joints, dipping at 0°-10°, 30°-
				100	97	83			-	33.	-37.45	- 33,50	5		and 70°-80° 32.10-32.25m: moderately weak and highly to moderately decomposed
		4 - F 1					10.0	8	,	2101 2101	-				32.25-32.70m: moderately strong to strong, pinkish brown and moderately decomposed 32.70-32.78m: weak, brown and highly
							2.5	Ŧ		34	55				32.78-32.90m: moderately strong to strong, pinkish brown and moderately decomposed Strong to your strong, motified pick and strong
				100	100	100			T	2101	30				black, slightly decomposed mylonitic GRANIT with closely to medium, locally very closely to extremely closely spaced, rough undulating, limonite stained joints, dipping at 0°-10°, 30° and 70°-80°
					100	100		Ŧ		35	60				
		8							T	1		h			Э
			Y	108	85	44	>20 7.9			36	53 80				
2/2005		5.40m at 18:00							T	37.	-41.00	37.10		m	37.10-37.41m: moderately strong to strong, brownish pink and moderately decomposed
	8						l.								End of investigation hole at 37.41m
Sm	all Distur	bed Sam	nple	Ţ	Pack	er Tes	L t			:ED C	MTing	F 40.00 F	REMAR	RKS	
VVa SP ⁻ U7P	ier samp ELiner Si Undistu	ample ample Sau	mple	↓ I	Stand	Jard Post	enetration eter Test	on Test	DATE	29	/12/2005	_			
U10 Maz	0 Undist	lurbed Si ple	ample	Ī	Perm Impre	eability ession	/ Test Packer /	/ Televiewer T	est CHEC	KED M	Davies	_			
Pist	on Samp	ole		V	In-situ	u Vane	Shear	Test	DATE	03	/01/2006	_			

Γ	ภ	m				D	RILLI	Ю	LE	RE	CO	R)		DRILLHOLE No. STF-B4
	12					C	ONTRA	CT	NO.	GE	/2003	3/14			SHEET 1 of 4
JOB	TITLE	Agr	eeme	nt No	o. CE	28/20	003 (EP) S	ludge	e Treat	men	t Facil	ities	- Feas	ibility	/ Study - Marine Ground Investigation
MET	HOD	W+	RC					CO			ES 4 ED			WOI	RKS ORDER No. GE/2003/14.9
MAC	HINE	& No.	BR8		19	_		۲ N	- 8 1 8	3170	4.80 9.10			DAT	TE from 10/12/2005 to 16/12/2005
FLU:	SHING	MEDI	UM	Sea	Wate	r		OR	IENTA	TION	l Ve	ertica	I	SEA	ABED LEVEL -2.80 mPD
Drilling Progress	Casing Depth/Size	Water Depth (m)	Water Recovery % Total Core	Kecovery % Solid Core	Recovery % R.Q.D.	Fracture Index	Tests		Samp	Depth	k Reduced 8 Level	o Depth (m)	Legend	Grade	Description
0/12/2005	Sw	5.00m at 13:00	9				V = 4,5 kh	J/m²	2	9:83					Very soft, dark grey (N4), silty CLAY (MARINE DEPOSIT)
<u>0/12/2005</u> 2/12/2005		5.30m at 18:00 5.50m at 08:00			58 10			a a	4	2.00 3.55		- 2.00			Greenish grey (5GY5/1), clayey silty fine to coarse SAND with some shell fragments (MARINE DEPOSIT)
2 			79	A			48 bis 2,3 3,6,9,11 N=29	2	5 6 7	4.00 1:55 1:92	-6.80	4.00			Medium dense, light bluish grey (5PB8/1), clayer silty fine to coarse SAND (ALLUVIUM)
	-	j.	19	LINA			11 bls 1,1 1,0,0,1 N=2		9 10 11 12	6.00 8.53	-8 80	<u>6.00</u>	-11-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-		Soft, bluish grey (10B6/1), silty CLAY with some decayed plant fragments (ALLUVIUM)
			79				178 bls 2.2 2.4.4.5 N=15		13 14 • 15 [] 16 •	8 00 8 55 8 89	<u>-10.80</u>	8.50			Medium dense, light bluish grey (10B7/1), slightly clayey silty coarse SAND (ALLUVIUM) 8.50-10.00m: dark bluish grey (10B4/1)
, Sm Wa] SP [*] U76 U10 Ma:	all Distur ter Samp F Liner S 5 Undistu 20 Undist zier Sam	bed Sam ble ample irbed Sar turbed Sa	ple nple ample		acker Te iezomele tandard ressurer ermeabi	est Penetra neter Te lity Test n Packe	ndpipe Tip Ition Test est * er / Televiewer T	L C Fest	OGGED DATE CHECKEI	<u>H.K.</u> <u>19/1</u> D <u>M.D</u>	Fung 2/2005 avies	- 1 - 2 - 3 -	Consta depth Impres 35 50- Vane s	KS int head sion pa 37.00m hear te	d permeability test carried out at 10.00-11.00m acker tests carried out at 34.30-35.80m and n depths. est carried out adjacent to drillhole at 1.00m depth.

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METHOD W+RC CO-ORDINATES WORKS ORDER No. GE/2003/14.5 MACHINE & No. BR8 DATE F 810014.60 DATE from 10/12/2005 to 16/12 FLUSHING MEDIUM Sea Water ORIENTATION Vertical SEABED LEVEL -2.80 mPD Tests Samples 90 90 00 00 00 00 00 00 00 00 00 00 00 0	JOB TITLE	E Agı	reement	No. C	CE 2	8/20	03 (EP) SI	udge	Trea	itmer	ıt Faci	lities ·	Feasi	ibility	y Study - Marine Ground Investigation
MACHINE & No. BR8 E B031709.00 DATE from 10/12/2005 to 16/12 FLUSHING MEDIUM Sea Water ORIENTATION Vertical SEABED LEVEL -2.80 mPD g <	METHOD	W+	RC					co-	ORD		ES			wo	ORKS ORDER No. GE/2003/14.9
FLUSHING MEDIUM See Water ORIENTATION Vertical SEABED LEVEL -2.0 mPD 9 9 0	MACHINE	& No.	BR8					N		B3170	9.10			DAT	TE from 10/12/2005 to 16/12/200
State Samples	FLUSHING	G MED	IUM S	ea W	ater			OR	ENT		I Ve	ertical		SEA	ABED LEVEL -2.80 mPD
100 100 <th>Progress Casing Depth/Size</th> <th>Water Depth (m)</th> <th>Water Recovery % Total Core Recovery %</th> <th>Solid Core Recovery %</th> <th>R.Q.D.</th> <th>Fracture Index</th> <th>Tests</th> <th></th> <th>Sam</th> <th>iples</th> <th>peonced -12.80</th> <th>00 Depth (m)</th> <th>Legend</th> <th>Grade</th> <th>Description</th>	Progress Casing Depth/Size	Water Depth (m)	Water Recovery % Total Core Recovery %	Solid Core Recovery %	R.Q.D.	Fracture Index	Tests		Sam	iples	peonced -12.80	00 Depth (m)	Legend	Grade	Description
2000 14.80 12.00 14.80 12.00 1-1 Yellow (10/R8/6), silly fine to coarse SA some fine to coarse gravel sized quartz fragments (ALLU/IUM) 25 12.66 15.00 12.00 1-1 1 26 12.86 12.00 1-1 1 V 27 12.86 12.86 12.90 1.90 1000 28 14.80 12.46 12.90 1.90 1000 28 14.80 14.80 14.10 1.10 1.10 28 14.80 14.80 1.10 1.10 1.10 28 14.80 1.10 1.10 1.10 1.10 28 14.80 1.10 1.10 1.10 1.10 28 14.80 1.10 1.10 1.10 1.10 28 14.80 1.10 1.10 1.10 1.10 14.80 1.10 1.10 1.10 1.10 1.10 28 12.86 1.10 1.10 1.10 1.10 14.80 1.10 1.10 1.10 1.10 1.10 28 12.86 1.10 1.10 1.10 1.10 15 1.10 1.10 1.10 1.10 </td <td></td> <td><u>.</u></td> <td>108</td> <td></td> <td></td> <td>5</td> <td>19 bis 1,2 1,0,1,1 N=3</td> <td>•</td> <td>18 19 20</td> <td>18:5</td> <td></td> <td></td> <td>+=</td> <td></td> <td>Soft, light bluish grey (5PB8/1), slightly sandy silty CLAY (ALLUVIUM)</td>		<u>.</u>	108			5	19 bis 1,2 1,0,1,1 N=3	•	18 19 20	18:5			+=		Soft, light bluish grey (5PB8/1), slightly sandy silty CLAY (ALLUVIUM)
20005 1500 1400 25 1400 1 1 1 20005 1500 1600 25 1405 1 1 1 20005 1500 1600 0 26 1455 1 1 20005 1600 0 0 25 1455 1 1 20005 1800 0 0 0 0 0 0 20005 1800 0 0 0 0 0 0 1800 0 0 0 0 0 0 0 1800 0 0 0 0 0 0 0 1800 0 0 0 0 0 0 0 1800 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			789		W		51 bls 5,8 4,3,4,14 N=25		21 22 23 24	12.00 12.9 1 2.9	-14.80	12.00		V	Yellow (10YR8/6), silty fine to coarse SAND w some fine to coarse gravel sized quartz fragments (ALLUVIUM) Extremely weak, yellow (10YR7/6) mottled green, completely decomposed medium grain GRANITE (Firm, slightly clayey sandy SILT)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	22005 15.00 22005 Hw	4.40m at 18:00 5.60m at 08:00	708				48 bis 2.2 3,3,6,9 N=21		25 26 27 28	14.00 14.61 14.61	2)		a
33 18:10 1.1 1.1 1.1 V Extremely weak, yellow (10YR7/6) mottle green, completely decomposed mylonitic GRANITE (Firm, slightly clayey sandy Slightly	1947 1947 1947		0						29	16.0	-20.00				D.
$ \begin{array}{c} 70 \\ 70 \\ $			70 78 78 78				22 34 4.8 N=19		31 32 33 34 35	17.20 17.20 18.10 19.10 19.20			البنين المحمد المحم والمحمد المحمد المحم والمحمد المحمد المحم	V	Extremely weak, yellow (10YR7/6) mottled green, completely decomposed mylonitic GRANITE (Firm, slightly clayey sandy SILT)

	6 1	m			D	RILL	10	LE RE	CC	RD			DRILLHO	LE No.	S	TF-B4
					C	ONTRA	СТ	NO. GE	/200	3/14			SHEET	3	of	4
JOB	TITLE	Agi	reement	No. C	E 28/20	003 (EP) SI	ludge	e Treatmen	t Faci	lities -	Feas	ibility	Study - Marine	Ground I	nvest	igation
MET	HOD	W+	RC	¥			со	-ORDINATE	ES			WOF	RKS ORDER No.	G	E/2003	3/14.9
MAG	HINE	& No.	BR8				E	E 81001 N 83170	4.60 9.10		-	DATI	E from 10/12	2/2005	to '	16/12/2005
FLU	SHING	MED	IUM S	ea Wa	ater		OR	IENTATION	i Ve	ertical		SEA	BED LEVEL	-2.80	r	mPD
Drilling Progress	Casing Depth/Size	Water Depth (m)	Water Recovery % Total Core Recovery %	Solid Core Recovery %	R.Q.D. Fracture Index	Tests		Samples	Pequced Level -22.80	00 Depth (m)	Legend	Grade	- 1996	Descriptic	on	
	-		799			4,5 8,11,15,28 N=62		36 20 20 37 20 30 38 20 37 39 21.20					As sheet 2 of 4			ie.
- - - - - - - - - - - - - - - - - - -		4.50m at 18:00 5.20m at 08:00				5,6 10,11,10,11 N=42		40 22 20 41 2 23 30 42 23 23 30 42 23 23 30 43 77 23 20	-25.10	- 22.30		V	Extremely weak, spotted green, cc GRANITE (Stiff,	yellowish b ompletely de slightly clay	rown (ecomp ey san	10YR5/8) osed mylonitic dy SILT)
والمتعادية والمتعادية						34 7.9,11,20 N=47	2	44 45 46 • 24.20 24.30					9 16 15			ā.
			100 A		2	20.27 33,67/65mm 100bls/140mm		47 25 20 48 26 20 49 26 20 50 27 20 27 20	-28.00	25.20			Extremely weak, spotted brown, cr mylonitic GRANI to coarse SAND)	reddish yell ompletely dd TE (Slightly	ow (5) ecomp clayey	(R7/6) osed very silty fine
. Sr ▲ W	nall Distu aler Sam	rbed San	nple	Packe Piezor	r Test neter / Sta	11,17 53,47/35mm 100bis/110mm		51 28.20 53 9.30 54 29.60 54 29.66 54 29.66	-32.80	30.00 R		RKS	9 8 			
	PT Liner S 76 Undisti 100 Undis azier Sam ston Sam	ample urbed Sa turbed S ple ple	mple I ample I I V	Pressu Perme Impres	ard Peneter aremeter T ability Test ssion Packa Vane Shea	est est l er / Televiewer T ar Test	[[[[[DATE <u>19/</u> CHECKED <u>M.E</u> DATE <u>22/</u>	2/2005 avies 2/2005	-						5 4 0) ar

DRILLHOLE RECORD DRILLHOLE No. STF-B4 am **CONTRACT NO. GE/2003/14** 4 SHEET 4 of JOB TITLE Agreement No. CE 28/2003 (EP) Sludge Treatment Facilities - Feasibility Study - Marine Ground Investigation WORKS ORDER No. GE/2003/14.9 **CO-ORDINATES** W+RC METHOD Ε 810014.60 16/12/2005 10/12/2005 DATE from to MACHINE & No. BR8 Ν 831709.10 -2.80 mPD FLUSHING MEDIUM Sea Water ORIENTATION Vertical SEABED LEVEL % % % Solid Core Recovery % Reduced Level Casing Depth/Size Water Total Core Recovery 9 Core Samples Water Recovery Fracture Index (m) (m) Drilling Progress Legend Depth R.Q.D. Tests Description Grade (m) 30,00 -32.80 Type Dept As sheet 3 of 4 1 33.10 30.30 30.3 00 55 000 V/IV Extremely weak to very weak, brown (10YR5/3), 4.80m at 18:00 5.10m completely to highly decomposed mylonitic GRANITE (Fine to coarse GRAVEL sized moderately weak to moderately strong rock 0 30.70 30.80 56 Ż 14/12/2005 0 30.93 31.03 31.13 57 o fragments) Hw 31.13 at 08:00 33.93 00 Moderately strong, pink spotted grey, moderately decomposed mylonitic GRANITE with very closely to medium spaced, smooth and rough, N 79 13 Ū + 31.46 34.26 + >20 + 31.66 -34.46 planar and undulating, iron oxide and IV NI manganese oxide stained, chlorite and kaolin coated joints, dipping at 30°-40°, 40°-50° and 60°-70° -34.70 31.90 ш >20 T2101 34.94 32.14 N 31.13-31.46m: non-intact 35.30 32,50 31.66-31.90m: weak to moderately weak and 32.4 61 23 10 12.2 highly decomposed **T2IO** 32.14-32.50m: non-intact 33.0 44 48 36 12 33 32 N 33.32-33.57m: non-intact 1210 36.37 33.57 >20 64 34:36 54 10 7210 14 34.93 10 T210 35.5 10 01 57 5.6 T210 4.70m at 18.00 5.03m 15/12/2005 70 at 08:00

37.0

LOGGED H.K.Fung

CHECKED M.Davies

DATE

DATE

19/12/2005

22/12/2005

40.17

-40.38

37.37

.00

REMARKS

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+

37.58 +

37.37-37.58m: brown, with slickensided

undulating joints End of investigation hole at 37.58m

7.0

143

Packer Test

Piezometer / Standpipe Tip

Standard Penetration Test

Impression Packer / Televiewer Test

Pressuremeter Test

In-situ Vane Shear Test

Permeability Test

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T.

V

5.13m

at

13:00

Small Disturbed Sample

U76 Undisturbed Sample

U100 Undisturbed Sample

Water Sample

Mazier Sample

Piston Sample

SPT Liner Sample

Π

2

1

	UG	R) 9 c		PO				VIB	RO	COF	RE F	REC	OR	D	HOLE No.		MS2		
		$\hat{\sim}$		GEC SER		CHN ES		AL (CON	TRAC	T No.	: GE/	2005/	28		SHEET:	1	of		1
PRC	JECT:	Agr Wes	eem st Ne	ent N ew Te	lo. Cl errito	E 43/. ries (2006 WEN	(EP) T) Landf	ill Ext	ensio	ns - Fe	asibili	ty Stu	ły						
MET	HOD:	Vik	oroc	oring	3				C	D-ORI	DINATI	ES:	_		v	ORKS ORDER	No. GE /	2005/28	18	
MAC	HINE	& No.:	W	harf						E N	809 831	410.04 421.77	4 7			ATE from: 1	5/01/2008	to	15/0	1/2008
FLU	SHING	MED	IUM:	w	ater				0	RIENT		1: V	ertica		s	EABED LEVEL	-4.0	0	mPD)
Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR%	SCR%	RQD%	FI	Tests	3	San	nples	 Reduced Level 	g Depth (m)	Legend	Grade		Descrip	ion		
15/01/2008 		5.20m at 10:00		108						VX	0.60					Very soft, dark occasional fine DEPOSIT)	grey(5YR/4 shell fragm	/1), silty C ents. (MA	RINE	with
										2	<u>1.45</u> 1.50	-5.50	- - - <u>1.50</u> -			End of investig	ation hole a	t 1.50m.		
3																				
5 6 7																				
- 10 ↓ ■ ☑	Small Dis Piston sa U76 Undi Vibrocore	turbed Simple	ample Sampl	e		Star In-s Peri	ndard F itu Van meabilit ression	Penetration Tr e Shear Test ty Test Packer Test	est	LOG DAT	GED <u>P</u> E <u>2</u>	. Zhang 3/01/200	<u>+ 10.00</u> 8	REN 1. 20 2. 16 3. Vit	IARK L of s 75L o procol	l S ediment grab samp of water sample was re sample was deliv	oles were col s collected c vered to labo	ected on 7 n 15/1/200 ratory on 1	15/1/2 18. 5/1/2	008. 008.
	Vibrocore SPT Line Water Sa	e sub-san r Sample Imple	nple		1 1 1	Pac Piez Stai	ker Tes zomete ndpipe	st r Tip		DAT	CKED <u>s</u> E <u>2</u>	. C. Wor 4/01/200	1 <u>g</u> 8							

	UG	R) M		RO			`	VIE	BROCO	RE F	REC	OR	D	HOLE No. MS3
		\approx		GEC GER		CHN ES	NICA LTD		CON	NTRACT No.	: GE/	/2005/:	28		SHEET: 1 of 1
PRO	JECT:	Agr Wes	eem st Ne	ent N w Te	lo. Cl rrito	E 43// ries (2006(WEN	EP) T) Landfi	ll Ex	xtensions - Fe	asibili	ity Stud	dy		
MET	HOD:	Vit	oroc	oring	3				C	CO-ORDINATI	ES:			V	WORKS ORDER No. GE/2005/28.18
МАС	HINE	& No.:	W	harf						E 809 N 831	498.99 532.5(9 0			DATE from: 15/01/2008 to 15/01/2008
FLU	SHING	MED	IUM:	W	ater				C	ORIENTATION	1: V	ertical		5	SEABED LEVEL -4.60 mPD
Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR%	SCR%	RQD%	Ξ	Tests	i	Samples	-4.60 Level	ö Depth (m)	Legend	Grade	Description
15/01/2008		6.10m at 12:00		100						V00	-6.10	- 1.50			Very soft, dark grey(5YR/4/1), sandy CLAY with some fine shell fragments. (MARINE DEPOSIT)
4													* <i>(</i>)		End of investigation hole at 1.50m.
7 8 9 10	O Small Disturbed Sample												REM	ARk	<
∔ s 目 ⊧	Small Dist Piston sar	turbed Sa mple	ample		¥	Stan In-si	dard Pe tu Vane	netration Test	st	LOGGED P.	Zhang		1. 20L	. of s 75L a	sediment grab samples were collected on 15/1/2008. of water sample was collected on 15/1/2008.
2 ∪ [] [] \	J76 Undi /ibrocore	sturbed S sample	Sample	9	⊥ 1	Pern Impr	neability ression l	Test Packer Test		DATE 10	/01/2008	8	3. Vib	rocoi	re sample was delivered to laboratory on 15/1/2008.
	/ibrocore SPT Liner	sub-sam Sample	nple			Pack Piez	ker Test cometer	Tip		CHECKED <u>S</u>	C. Won	1 <u>g</u> 8			

	UG	RU)					VIB	ROCO) DF	RE F	REC	OR	D	HOLE No.		MS6		
		\approx	FU GE SE					CON	TRACT	<u>ا</u> م.:	GE/	2005/	28		SHEET	1	of	1	
PRC	JECT:	Agre West	emen t New	No. (Territ	CE 43	/2006 (WEN	(EP) IT) Landfi	ll Ext	ensions -	Fea	asibili	ty Stu	dy		1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -				
МЕТ	HOD:	Vib	ocori	ng				С	O-ORDIN/	٩TE	S:	-	-	\	WORKS ORDER No.	GE/20	05/28.1	8	
МАС	HINE &	& No.:	Wha	f					E 8 N 8	097 315	746.52 528.30	2			DATE from: 16/01/2	2008	to 1	6/01/2	2008
FLU	SHING	MEDIL	JM:	Wate	r			0	RIENTATI	ON	: V	ertica		5	SEABED LEVEL	-3.70	r	nPD	
Drilling Progress	Casing depth/size	Water Level (m) Shift start/	rvater Return % T.C.R.%	SCR%	RQD%		Tests	1	Samples	3	keduced Level	g Depth (m)	Legend	Grade	D	escriptio	n		
_15/01/2008 		end 4.70m at 10:00	19						VICO	epth .00	-5.70				Very soft, dark grey(occasional shell fragi	5YR/4/1) ments. (i, silty CL MARINE	AY with DEPO	ו SIT)
2 3 4 5 6 7 8										145	-5.20				End of investigation h	nole at 1	.50m.		
F <u>10</u> ‡ \$	Small Distu	urbed San	nple		, Star	ndard P	enetration Te	st				E <u>10.00</u>	REM		 (S				
	Piston sam J76 Undis	nple turbed Sa	mple	\ 	/ In-s Per	itu Vane meabilit	e Shear Test y Test			<u>P. 2</u>	Zhang		1. 20L 2. 16. 3. Vib	_ of s 75L (rocol	earment grab samples we of water sample was collec re sample was delivered to	re collec cted on 1 b laborate	ted on 16 6/1/2008 ory on 16	/1/2008. /1/2008.	
	/ibrocore :	sample	le	:	lmp Pac	ression :ker Tes	Packer Test			<u>יאר</u> ייפר	C. Word	<u> </u>					•		
	SPT Liner Nater San	Sample	2	1	Piez Star	zometer ndpipe	Tip		DATE	<u>24/</u>	/01/2008	<u></u>							

_f	UG	R			200			\ \	/IB	RC	C	OF	REI	REC	OR	D		HOLE N	Э.		MS7		
		$\hat{\sim}$		GEC		CHI ES	NICA LTD	L c	ON	ΓRA	CTN	۱o.	GE	/2005/2	28			SHEET:		1	of		1
PRO	JECT:	Agı We	reen st N	nent N ew T	No. C errito	E 43/ pries	2006(E (WEN	EP) T) Landfil	l Ext	tensi	ions	- Fe	easibi	lity Stu	ıdy								
MET	HOD:	Vil	oroc	oring	9				СС	D-OF	RDINA	٩ΤΕ	S:				W	ORKS ORDE	R No.	GE/2	005/28.	18	
MAC	HINE &	& No.:	W	'harf						E N	8 8	309 331	787.2 612.5	2 2			DA	ATE from:	15/01/	2008	to	15/0	1/2008
FLU	SHING	MEDI	UM:	v	/ater				OF	RIEN	ΤΑΤΙ	ON	: V	/ertica	I		SE	EABED LEVEL	_	-5.00		mPD)
Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR%	SCR%	RQD%	Ē	Tests		Sa No.	ample:	S	Reduced Level	0. Depth (m)	Legend	Grade			C	escriptic	n		
_ 15/01/2008 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _		7.00m at 15:00		12						1	VIDO).00	6.50					Very soft, dai occasional fir DEPOSIT)	rk grey(£ ne shell	5YR/4/1), fragment	sandy (s. (MAR	CLAY	with
2												<u>145</u> 1.50	6.50					End of invest	igation f	nole at 1.	50m.		
t s ■ P ■ U	mall Dist iston san 76 Undis	urbed S nple sturbed S	ample Sampl	e	↓ ∨ ⊥	Stan In-sit Perm	dard Per u Vane S neability	netration Tes Shear Test Test	t	LOG	GED	<u>Р.</u> 10	Zhang		REM 1. 20L 2. 16. 3. Vib	AR _ of 75L proc	KS sed of ore	liment grab sar water sample v sample was de	nples we vas colle livered t	ere collec cted on 2 o laborat	ted on 1 15/1/200 ory on 1	5/1/20 8. 5/1/20)08. 108.
I v	ibrocore ibrocore	sample sub-san	nple		î I	Impro Pack	ession P er Test	acker Test) <u>S.</u>	C. Won	9							-		
[] s ▲ w	PT Liner /ater Sar	Sample nple			≜	Piezo Stan	ometer T dpipe	īp		DAT	E	24	/01/2008										

_f							VIBROCORE RECORD					HOLE No. MS9										
		\approx		GEC		CHI ES	NIC/ LTE	AL D	C	ONT	[RA	СТІ	No.	GE/	2005/2	28		SHEET:	1	of		1
PRO	JECT:	Agı We	reen st N	nent N ew T	No. C errito	E 43/ pries	/2006 (WEN	(EP) NT) Lai	ndfill	l Ext	ensi	ons	- Fe	easibil	ity Stu	ıdy						
MET	HOD:	Vil	oroc	orinę	9					СС	D-OR	DIN	ATE	S:			١	WORKS ORDER No.	/ORKS ORDER No. GE/2005/28.18			
MAC	HINE &	& No.:	W	harf						E 809971.26 N 831671.12 DA				DATE from: 16/0	/2008	to	16/0 ⁻	1/2008				
FLU	FLUSHING MEDIUM: Water						ORIENTATION: Vertical SE				SEABED LEVEL	-5.9	5	mPD								
Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR%	SCR%	RQD%	Ε	Te	ests		Sa	mple	es	Peduced ²⁶⁻ 28-	00 00 Depth (m)	Legend	Grade		Descriptio	on		
15/01/2008 		7.30m at 12:00									1 I	/100	0.00	7.40				Very soft, dark grey occasional fine she DEPOSIT)	(5YR/4/1) I fragmen	, sandy (ts. (MAR	CLAY	with
2													146	-7.40 -7.45				Light yellowish brov grey(10YR/5/6), cla some fine quartz gr End of investigation	vn(2.5Y/6 yey, fine t avel. (ALL hole at 1	/4) to yel o coarse <u>.UVIUM</u>) .50m.		D with
↓ s	mall Dist	urbed S nple	ample	2	↓ ∨ ⊤	Stan In-sit Perm	dard Pe tu Vane neability	enetratio e Shear T y Test	n Test Гest	t	LOG	GED	<u>P.</u>	Zhang	<u> 10.00</u>	REM 1. 20L 2. 16.	ARK	L S ediment grab samples were collected on 16/1/2008. of water sample was collected on 16/1/2008.				
	ibrocore	sample sub-san	pampl	e	î ĭ	Impro Pack	ession er Test	Packer 1 t	Fest		DAT	E	<u>10/</u> D S	01/2008 C. Wonr		3. VID	10001	e sample was delivered	io iadora	iory on 1	0/1/20	υŏ.
[s ▲ w	PT Liner /ater Sar	Sample nple				Piezo Stan	ometer dpipe	Tip			DAT	E	24/	01/2008	<u> </u>							

DIGITAL DATA DVD

Digital Copy of Survey Report

DRAWINGS



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+ + +2 ³⁴⁰	ı	-1205	+ +2350	+2355++++++++	2360	12365	1335' 12370	
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+2085	+ + + + 20 ⁹⁰ + + + + + 20 ⁹⁵ + +	+ + +2100, + + +2105, + +	+ +2115	-
12010	+ + 2005 + + + 2000 + + + 1995	N1-S280_001 <u>1986 1985</u> 1987 N1-S280	+1980 + + 1975	-
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	legend :
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	+ + 1.35 Seismic track (EdgeTech 3400) with fix positions
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	Sheets Index
	Project : CONTRACT NO GE/2021/03
	TASK ORDER NO. GE/2021/03.23
#	AGREEMENT NO. CE 26/2022 (EP)
ff -	DEVELOPMENT OF INTEGRATED WASTE MANAGEMENT FACILITIES
+48	PHASE 2 - INVESTIGATION, DESIGN AND CONSTRUCTION (SA1)
	MARINE GEOPHYSICAL SURVEY (GS)
	CHART NUMBER : 5.1
N \$31600	Drawing Title :
#	
#	UTILITY SURVEY TRACK PLOT
#480	
<i>‡</i> ‡78	Notes :
+325	1. Survey Date : 26-29 June and 03-06 July 2023 2. Survey Vessel : GEO1 / WH2
	3. Survey Grid : Hong Kong 1980 Grid System
	4. Vertical Datum : Hong Kong Principal Datum
	5. Positioning FieldeTech 6205s combined bathymetry and
	side scan sonar system
	Odom Echotrac MK III single beam echo sounder system Kongsborg EA440 single beam echo sounder system
	C-Boom low voltage boomer (LVB) system
	EdgeTech 3400-OTS sub-bottom profiler
	Innomar SES-2000 medium-100 sub-bottom profiler Geometrics G-882 marine magnetometer
N 831400	7. Tide Gauge : Hong Kong International Airport West
	8. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office,
	Lands Department
	Revision No. Date Drawn by Checked by Approved by Remarks
	0 <u>31/07/2023</u> Agnes Siu Howard Wang Margie Chen Preliminary
	I IZ/U9/ZUZ3 Agnes SIU Howard Wang Margie Chen Final
	METRIC SCALE 1:2000
	Client :
	Civil Engineering and
	Development Department
	Surveyor
	Surveyor : EGS (ASIA) LIMITED 15th FLOOR, NORTH POINT INDUSTRIAL BUILDING,
m	499 KING'S ROAD, NORTH POINT, HONG KONG Tel: (852) 28948622
808	Fax: (852) 25763590 EARTH SCIENCES & SURVEYING Web: www.egssurvey.com JOB NO · HK268623





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9_7 9_c 9_4 9_1 8_8 8_5 8_2 8_2 8_2 7_8 106 10 10 97 96 93 92 8_8 8_7 8_3 8_4 8_3 8_6	7_{8} 7_{5} 7_{7} 7_{9} 7_{9} 7_{9} 7_{7} 7_{9}	$7_{9} 7_{7} 97_{8} 7_{0} 7_{2} 7_{1} 6_{8} 6_{5} 6_{4} 6_{3} 6_{3} 6_{3} 6_{3} 6_{2} 6_{2} 5_{6} 5_{7} 8_{0} 6_{$	$\begin{pmatrix} 6_0 & 6_1 & 6_1 \\ 5_9 & 5_9 & 5_9 \\ 5_9 & 6_0 & 6_0 & 6_0 \\ & & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & $	5_9 5_9 5_8 5_8 5_9 6_0 5_9 5_9 6_0° 6_0 5_9 5_{\circ} 6_{\circ} 5_8 5_8 5_9 6_{\circ} 6_0 5_9 5_0	$5_9 6_0 \overbrace{6_{0}}^{\bullet} 6_0 5_9 6_0 5_9 5_8 5_9 5_9 6_0 5_9 5$	5 ₉ 5 ₉ 5 ₉ 5 ₈ 6 ₈ 5	5_9 5_8 5_7 5_7 5_8 5_8 5_7 5_9 6_0 5_8 5_8 5_8 5_8 5_9 5_7	5_6 5_6 5_7 5_6 5_6 5_6 5_6 5_7 5_7 5_7 5_7 5_7 5_8 5_6 5_6
10_{6} 10_{2} 10_{6} 9_{8} 9_{7} 9_{6} 9_{6} 9_{4} 9_{6} 8_{8} 8_{5} 8_{3} 8_{3} 8_{6}	8 7 ₆ 7 ₇ 7 ₈ 7 ₈ 7 ₈ 7 ₇	7_7 7_5 7_6 7_6 7_2 6_8 6_7 6_9 6_7 6_4 6_4 6_6 6_4 6_3 6_2 6_1 6_2 6_1 6_0	$-\sqrt{6}$ 6_0 6_1 6_1 5_9 6_0 7_0	5_9 5_8 5_5 5_8 6_0 5_9 5_9 5_9 5_9 5_9 5_8	$5_9 6_0 6_0^2 5_9 5_$	5_9 5_9 5_9 5_8 5_9 5_8 5_8 5_8 5_8	² 5 ₈ ⁱ 5 ₈ 5 ₈ 5 ₈ 5 ₈ 5 ₈ 5 ₇	5_7 5_7 5_7 5_7 5_7 5_7 5_7 5_6
10_4 10_2 10_1 10_2 9_7 9_6 9_5 9_3 9_0 9_6 8_6 8_3 8_1 6_6	$\mathbf{\tilde{8}}_{0}$ 7_{9} 7_{7} 7_{8} 7_{7} 7_{7} 7_{7} 7_{7} 7_{9} 7_{9} 7_{9} 7_{7} 7_{7} 7_{7} 7_{8} 7_{6} 7_{7}	7_7 7_6 7_6 7_5 7_1 6_6 6_6 6_6 6_6 6_5 6_6 6_5 6_4 6_4 6_3 5_8 6_0 6_1 6_1 6_0 7_8 6_0 6_1 6_0 7_7 7_7 7_5 7_4 7_1 6_7 6_5 6_6 6_6 6_5 6_5 6_4 6_4 6_3 6_2 6_1 6_1 6_0 6_1 6_0 6_1 6_0 7_7 7_8 7_4 7_1 6_7 6_6 6_6 6_6 6_7 6_5 6_7 6_7 6_7 6_9 6_0 6_1 6_0 6_0 6_1 6_0 6_1 6_0	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	5_9 , 6_0 , 6_0 , 5_9 , 5_9 , 5_9 , 5_9 , 6_0 , 6_0 , 5_9 ,	5 ₉ 5 ₉ 5 ₉ 5 ₈	5_8 5_8 5_8 5_7 5_8 5_7 5_7 5_8 5_8 5_8 5_8 5_8 5_8 5_7	5_7 5_7 5_7 5_7 5_7 5_7 5_7 5_7 5_7 5_7 5_7 5_7 5_7 5_7 5_7
0_2 10_0 10_1 10_1 0_2 9_9 9_7 9_4 9_2 8_8 8_7 8_4 8_1 7_9	7 ₉ 7 ₈ 7 ₇ 7 ₇ 7 ₈ 7 ₇ 7 ₇	$7_{7} 7_{7} 7_{5} 7_{4} 7_{3} 6_{7} 6_{5} 6_{5} 6_{5} 6_{5} 6_{4} 6_{4} 6_{4} 6_{2} 6_{2} 6_{2} 6_{1} 6_{1} 6_{2} 6_{2} 6_{2} 6_{1} 6_{1} 6_{2} 6_{2} 6_{1} 6_{1} 6_{2} 6_{2} 6_{1} 6_{2} 6_{2} 6_{2} 6_{1} 6_{2} 6_{2} 6_{2} 6_{1} 6_{2$	6_0 6_1 6_1 6_1 5_9 6_1 6_1	5_{9} 6_{0} 6_{0} 6_{0} 5_{9} 5_{9} 5_{9} 5_{9} 5_{9} 5_{9} 6_{0}	$b_{1}, b_{6}, b_{6}, b_{6}, b_{5}, b_{5}, b_{5}, b_{5}, b_{6}, $	5_9 5_9 5_9 5_8 5_8 5_8 5_8 5_8 5_8	5_8 5_8 5_8 5_9 5_8 5_8 5_7	5_7 5_7 5_7 5_7 5_7 5_7 5_7 5_7
10_{7} 10_{2} 10_{2} 10_{2} 9_{8} 9_{7} 9_{4} 9_{1} 8_{9} 8_{7} 8_{3} 8_{0} 7_{9} 10_{7} 10_{4} 10_{4} 10_{1} 9_{8} 9_{7} 9_{7} 9_{1} 9_{0} 8_{7} 8_{4} 8_{2} 8_{0}	7_9 7_7 7_7 7_6 7_5 7_6 7_8 8_0 7_8 7_7 7_7 7_6 7_5 7_7	7_8 7_7 7_4 7_5 7_1 7_0 6_6 6_5 6_5 6_5 6_3 6_3 6_3 6_2 6_2 6_4 6_1 6_1 6_1 6_1 6_2 5_8 6_0 6_0 6_0 7_2 7_2 7_6 7_5 7_3 7_2 7_1 6_8 6_6 6_6 6_6 6_3 6_3 6_3 6_3 6_2 6_2 6_4 6_1	$6_1 6_1 6_0 6_1 6_0 $	$6 \int _{-6}^{-6} \int _{-6}^{-6} \int _{-6}^{-6} \int _{-6}^{-6} \int _{-5}^{-6} \int _{-5}^{-5} \int _{-5}^{-6} \int$	$A = \frac{1}{2} \left(\frac{1}{2} \right) \left($	5 ₉ 5 ₉ 5 ₉ 5 ₉ 5 ₈ 5 ₈ 5 ₈ 5 ₈ 5 ₉ 5 ₉ 5 ₉ 5 ₉ 5 ₉ 5 ₈ 5 ₉ 5 ₉	5_8 5_8 5_8 5_8 5_7 5_7 5_8 5_9 5_8 5_8 5_8 5_8 5_8 5_8 5_8 5_8	5_8 5_7 5_7 5_7 5_6 5_6 5_7 5_8 5_8 5_7 5_7 5_7 5_7 5_7 5_7 5_7
10_4 10_5 10_3 10_1 9_9 9_7 9_6 9_4 9_0 8_7 8_6 8_1 8_2	8_2 7_9 7_8 7_7 7_6 7_5 7_6	7_6 7_6 7_4 7_0 7_3 7_2 7_6 6_8 6_5 6_4 6_4 6_4 6_3 6_3 6_3 6_2 6_2 6_1 6_0 6_1 6_1 6_1 6_1 6_1 6_0 6_0	$ \left. \begin{array}{cccc} & & & \\ & & & \\ & & & \\ \end{array} \right\} \begin{array}{cccc} 6_1 & 6_1 & 6_0 & 6_1 & 6_1 & 6_0 \\ \hline \end{array} \right) \begin{array}{ccccc} 6_1 & 6_1 & 6_0 & 6_1 \\ \hline \end{array} $	3 $3 $ $3 $ $3 $ $3 $ $3 $ $3 $ 3	$\left\{ 5_{5_{9}} 5_{9} \right\} = \left\{ 5$	5 ₉ 5 ₈	5_9 5_9 5_8 5_8 5_9 5_8 5_8	5_8 5_8 5_8 5_7 5_8 5_8 5_7
N 831800 0_{2} 10, 10, 9, 9, 9, 9, 9, 9, 9, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8,	8_1 6_{8_0} 7_7 7_7 7_6 7_5 7_4	7_4 7_4 7_4 7_4 7_3 6_8 7_6 6_9 6_7 6_4 6_4 6_4 6_3 6_3 6_4 6_3 6_2 6_3 6_2 6_2 6_1 6_1 6_1 6_1 6_1 6_0 6_0 6_0 6_1 6_2 6_3 6_2 6_3 6_2 6_3 6_3 6_4 6_4 6_4 6_4 6_4 6_5 6_5 6_5 6_5 6_5 6_5 6_5 6_6	$\begin{cases} 6_1 & 6_1 & 6_1 & 6_2 & 6_1 & 6_1 & 6_2 \\ 6_1 & 6_2 & 6_2 & 6_2 & 6_2 & 6_2 & 6_2 \\ \end{cases}$	5_{2} 5_{3} 6_{0} 5_{3} 5_{3} 6_{0} 5_{3} 5_{3} 5_{3} 5_{5	5_6 5_9 5_9 6_0 6_0 6_0 6_0 6_0 6_0 6_0 6_0 6_0 6_0 5_9 5_9 5_9	5 ₉ 5 ₉ 5 ₉ 5 ₈ 5 ₈ 5 ₈ 5 ₈ 5 ₈	5_8 5_8 5_8 5_8 5_8 5_7 5_8	5_8 5_7 5_7 5_7 5_7 5_7 5_7 5_7 5_7
$10_{5} 10_{4} 10_{2} 10_{5} 9_{9} 9_{7} 9_{4} 9_{1} 8_{9} 8_{5} 8_{2} 8_{2}$	8 ₂ 8 ₂ 7 ₉ 7 ₈ 7 ₆ 7 ₄ 7 ₆	$\begin{bmatrix} 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 $	$6_2 6_2 6_3 6_2 6_2 6_1 6_1$	$6_0 6_1 (6_0 (6_0)) (6_0) $	En	5_9 5_9 5_9 5_9 5_9 5_9 5_8 5_9 5_8	5_8 5_8 5_9 5_8 5_9 5_8 5_9 5_9 5_9 5_8	5_9 5_8 5_8 5_8 5_8 5_8 5_8 5_8
10_{4} 10_{4} 10_{12} 9_{9} 9_{9} 9_{6} 9_{3} 9_{0} 8_{8} 8_{6} 8_{7} 7_{9}	7_9 8_0 7_9 7_6 7_5 7_5 7_3	$7_{3} 7_{1} 7_{0} 7_{0} 6_{8} 6_{6} 6_{7} 6_{6} 6_{5} 6_{4} 6_{3} 6_{3} 6_{3} 6_{3} 6_{3} 6_{4} 6_{3} 6_{2} 6_{3} 6_{2} 6_{2} 6_{3} 6_{3} 6_{2} 6_{3} 6_{2} 6_{3} 6_{2} 6_{3} 6_{3} 6_{2} 6_{3} 6_{3} 6_{2} 6_{3} 6_{3} 6_{2} 6_{3$	6_2 6_2 6_2 6_3 6_2 6_1 6_1	$6_1 6_0 6_0 6_0 6_0 6_0 5_9 5_9 5_8 5_8 6_0 $	$\int 6_{1} - 6_{0} - 2_{0} \frac{5_{0}}{5_{0}} + \frac{5_{0}}{5_{0}} = 6_{1} - \frac{5_{0}}{5_{0}} + \frac{5_{0}}{5_{0}} = 6_{0} - \frac{5_{0}}$	5 ₉ 5 ₉ 5 ₈ 5 ₈ 5 ₉ 5 ₈ 5 ₈ 5 ₈	5_8 5_8 5_9 5_8 5_8 5_8 5_8	5_8 5_8 5_8 5_8 5_8 5_8 5_8 5_7
10_5 10_2 10_9 9_9 9_7 9_4 9_2 8_9 8_7 8_3 7_9	7_9 7_5 7_8 7_8 7_5 7_3 7_3	$7_3 7_1 7_1 7_2 6_7 6_5 6_6 6_4 6_4 6_3 6_3 6_1 6_1 6_1 6_1 6_1 6_1 6_2 $	$6_1 6_2 6_3 6_1 6_2 6_3 6_1 6_2 6_3 6_1 6_2 6_3 $	$6_{0} - 6_{0} - 6_{2} = 6_{1} - 6_{0$	$6_2 6_6 6_6 \cancel{8_3} 6_6 6_6 \cancel{5_1} 6_5 6_4 \cancel{5_1} 5_$		60/61-61-61-50-59-60	5_8 5_8 5_9 5_8 5_8 5_8 5_7
10_5 10_3 10_6 9_8 9_6 9_4 9_7 8_8 8_7 8_4 8_3 10 10 10 9 9 9 9 9 9 9 8 8 8 8 8 8	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	7_3 7_2 7_2 6_9 6_9 6_7 6_6 6_5 6_5 6_4 6_3 6_2 6_1 6_2 6_2 6_2 6_2 6_4 6_0 6_2 6_4 6_3 6_2 6_1 6_1 6_1 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_1 6_1 6_1 6_2 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_2 6_4 6_3 6_4 6_5	$6_1 6_2 6_7 6_6 6_2 6_2 6_1 6_2 6_2 6_3 6_4 $	$6_1 6_2 6_1 6_5 6_7 6_4 6_1 6_4 6_9 6_6 6_4$	6_4 6_0 6_5 5_4 6_0 6_2 6_4 6_4 6_3 6_3 5_8 6_0 6_1 6_8	$6_{1} = 6_{1$		6_3 5_7 5_9 5_9 5_9 5_8 5_8 5_8
10_{6} 10_{3} 10_{0} 10_{0} 9_{7} 9_{3} 8_{9} 8_{7} 8_{5} 8_{3}	83 8p 79 76 74 74 73	$7_{3} 7_{1} 6_{9} 6_{9} 6_{8} 6_{6} 6_{5} 6_{6} 6_{5} 6_{4} 6_{3} 6_{3} 6_{3} 6_{2} 6_{2} 6_{3} 6_{2} 6_{1} 6_{1} 6_{2} 6_{3} 6_{4} 6_{3} 6_{3} 6_{3} 6_{2} 6_{2} 6_{3} 6_{2} 6_{1} 6_{1} 6_{2} 6_{3$	$6_6 6_5 6_9 6_8 6_5 6_8 6_6 $	$6_2 6_1 6_2 6_2 6_4 6_2 6_2 6_3 6_2 6_3 6_2$	$6_2 6_2 6_1 6_2 6_2 6_2 6_1 $	$\begin{bmatrix} 6 \\ 6 \end{bmatrix} \begin{bmatrix} 6 \\ 6 \end{bmatrix} \begin{bmatrix} 5 \\ 9 \end{bmatrix} \begin{bmatrix} 6 \\ 5 \end{bmatrix} \begin{bmatrix} 6 \\ 6 \end{bmatrix} \begin{bmatrix} 6 \\ 6 \end{bmatrix} \begin{bmatrix} 5 \\ 9 \end{bmatrix} \begin{bmatrix} 5 \\ 9 \end{bmatrix} \begin{bmatrix} 6 \\ 5 \end{bmatrix} \begin{bmatrix} 6 \\ 7 \end{bmatrix} \begin{bmatrix} 7 $	5_9 6_0° 6_1 6_1 6_1° 6_0 5_9 6_0°	~ 59 58 69 6 57 60
$10_4 \ 10_1 \ 10_0 \ 9_8 \ 9_4 \ 9_1 \ 8_9 \ 8_8 \ 8_6 \ 8_4$	8_4 8_1 7_9 7_8 7_5 7_3 7_2 8_4 8_2 9_2 7_2 7_2 7_5 7_7 7_7	7_2 7_1 7_2 7_3 7_2 7_4 7_2 7_6 7_6 7_7 7_6	6_{9} 6_{5} 6_{5} 6_{4} 6_{3} 6_{4} 6_{5}	$6_2 6_1 6_1 6_3 6_1 6_1 6_1 6_1 6_2 6_2 6_1$	6_1 6_2 6_2 6_2 6_1 6_1 6_1 6_1 6_1 6_1 6_1 6_1 6_0 6_0	$e_{0}(\gamma_{0}), e_{1}(e_{1}) + e_{1}(\gamma_{0}) + e_{1}$	6_{0} 5_{9} 6_{0} 6_{0} 6_{0} 5_{9} 6_{0}	5_8 5_8 6_0 5_9 5_9 5_9 6_1
$10_3 \ 10_1 \ 40_0 \ 9_6 \ 9_5 \ 9_2 \ 9_3 \ 9_1 \ 8_8 \ 8_4$	84 83 80 77 77 75 72	$7_{2} 7_{1} 7_{6} 6_{9} 6_{8} 6_{7} 6_{6} 6_{6} 6_{5} 6_{4} 6_{3} 6_{4} 6_{3} 6_{4} 6_{5} 6_{7} 6_{8} 7_{6} 6_{9} 6_{7} 6_{6} 6_{5} 6_{3} 6_{5$	$6_5 6_4 6_4 6_1 6_1 6_2 6_3$	$6_4 6_3 6_2 6_2 6_2 6_3 6_2 6_3 6_1 6_2 5_9$	b_{9} c_{1} c_{1} c_{1} b_{0} c_{1} c_{1} c_{1} c_{2} c_{2} c_{1} c_{0} b_{9} b_{9} b_{1} c_{1} c_{2} c_{2} c_{1} c_{0} b_{1} b_{1} b_{1} b_{1} b_{1} b_{1} b_{1} b_{1} b_{2} b_{2	5_{9} 5_{8} 6_{0} 5_{8} 6_{0} 5_{9} 5_{1} 6_{1} 6_{1}	6_{05} 5_{9} 5_{8} 5_{8} 6_{0} 5_{9} 5_{9}	5_9 5_9 5_8 5_8 5_8 5_8 5_7
$10, 10, 10, 9_8, 9_7, 9_3, 9_1, 8_9, 8_7, 8_5$ $10, 10, 10, 9_7, 9_6, 9_7, 9_8, 8_8, 8_8, 8_8$	8_5 8_3 8_2 8_9 7_7 7_4 7_4 8_6 8_3 8_1 8_9 7_8 7_4 7_4	7_4 7_2 7_2 7_2 7_2 7_2 7_3 7_4 7_2 7_5 7_6 7_7 7_6 7_7 7_6 7_7 7_6 7_7	6_5 6_5 6_4 6_3 6_3 6_3 6_5 6_6 6_5 6_6 6_4 6_3 6_4 6_5	6_4 6_3 6_3 6_4 6_3 6_3 6_2 6_3 6_3 6_2 5_9 6_5 6_5 6_4 6_4 6_3 6_3 6_3 6_3 6_3 6_3 6_1 6_3 6_1	$3_8 \cdot 5_8$ $5_8 \cdot 5_8 $	6_{0} 5_{9} 5_{8} 5_{9} 5_{8} 5_{9} 5_{8} 5_{9} 5_{9} 5_{9} 5_{9} 5_{9} 5_{9} 5_{9} 5_{9} 5_{9} 5_{9} 5_{9} 5_{9}	5_8 5_9 5_9 5_9 5_8 5_8 5_8 5_9 5_8 5_8 5_9	6_1 6_0 5_9 6_0 5_9 6_0 5_9 5_9 5_9 5_9 5_9 5_9 5_9
10_2 9_9 9_6 9_4 9_2 9_1 8_9 8_5 8_6	86 83 80 79 78 76 73	7_3 7_1 6_8 6_5 6_5 6_5 6_6 6_4 6_5 6_7 6_9 7_0 7_0 6_6 6_6 6_5 6_5 6_5 6_6 6_7 6_{9} 7_0 6_9 0 7_0 6_9 6_8	6_7 6_6 6_6 6_5 6_4 6_3 6_7	$6_3 6_3 6_3 6_3 6_3 6_2 6_3 6_3 6_3 6_1 6_1$	$6_0 6_1 6_0 5_9 5_9 5_9 5_9 5_9 5_9 5_9 6_0 $	δ ₂ * ₆ 5 ₉	5_8 5_9 5_8 5_9 5_9 5_9 $5_9 \cdot \bigcirc 6_0$	5 ₉ 5 ₈ 5 ₈ 5 ₈ 5 ₉ 5 ₈ 5 ₇
10_2 9_9 9_6 9_3 9_2 9_0 9_0 8_9 8_6 10_2 9_8 9_6 9_4 9_1 9_1 9_2 9_2 8_6	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$7_{0} 7_{0} 7_{0} 7_{0} 6_{6} 6_{9} 6_{6} 6_{7} 6_{5} 6_{7} 6_{8} 6_{9} 6_{7} 6_{6} 6_{7} 6_{6} 6_{8} 6_{7} 6_{8} 6_{8} 7_{9} 7_{1} 7_{2} 7_{1$	7_{1} 6_{9} 6_{8} 6_{6} 6_{3} 6_{2} 6_{3} 7_{3} 7_{2} 7_{0} 6_{8} 6_{6} 6_{4} 6_{4}	6_2 6_4 6_3 6_3 6_3 6_3 6_3 6_2 6_2 6_6 6_4 6_4 6_3 6_3 6_3 6_3 6_3 6_2 6_3 6_3 6_3	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$6_0 6_{0} 6_0 5_9 5_9 5_9 5_9 5_9 5_9 5_9 5_9 -5$	⁶ 5 ₉ 5 ₉ 5 ₉ 5 ₉ 5 ₉ 5 ₉ 5 ₉ 5 ₉ 5 ₈ 5 ₉ 5 ₈ 5 ₉ 5 ₉ 5 ₉	5_9 5_9 5_8 5_8 5_8 5_8 5_8 5_8 5_9 5_9 5_9 5_8 5_8 5_8 5_8 5_8 5_8 5_9
10_2 9 ₉ 9 ₇ 9 ₅ 9 ₂ 78_0 10_2 9 ₉ 9 ₇ 9 ₅ 9 ₂ 78_0 10_2 10	87 86 84 82 78 83 85	B_5 B_0 7_4 7_1 C_7 C_8 C_6 C_7 C_8 C_8 C_8 C_8 C_8 C_9 C_9 C_9 C_9 C_7	73 73 71 71 69 66 6	6_5 6_5 6_4 6_4 6_3 6_3 6_3 6_3 6_3 6_3 6_3 6_2	$6_2 6_2 6_1 - - 0 0 0 0 0 0 0 0$			58 58 58 58 57
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	8_7 8_9 8_8 8_2 6_6 8_6 8_4 8_9 9_3 9_6 8_9 7_5 19 8_9	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	7_6 7_4 7_4 7_2 6_8 6_7 6_8 7_7 7_6 7_1 6_8 6_6 6_6 6_9	6_5 6_5 6_4 6_4 6_4 6_4 6_3 6_3 6_3 0_3 6_5 6_5 6_5 6_4 6_4				
102 + 102 + 98 + 95 + 94 + 92 + 95 + 94	94 94 89 88 84 77 77	7_7 7_5 7_3 7_4 7_2 6_8 6_6 6_7 6_8 6_8 6_9 7_3 7_4 7_7 7_9 7_9 7_9 7_9 8_0 8_0 8_0 8_0 7_9 7_9 7_7 7_7	74 715 68 67 66 65 6	05				+ + +
$\begin{array}{c} 103 & 102 & 98 & 97 & 95 & 95 & 93 \\ 106 & 105 & 102 & 98 & 94 & 94 & 94 \end{array}$	93 94 91 86 84 78 75 94 94 93 87 84 87 87	7_5 7_4 7_2 7_3 6_7 6_7 6_7 6_9 6_9 7_9 7_3 7_6 7_9 8_0 8_1 8_2 8_2 8_1 8_1 8_1 8_1 8_1 8_1 8_2 8_2 8_1						- - -
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$10, 10_2, 9_8, 9_4, 9_2, 8_6$	8 ₆ 8 ₈ 8 ₈ 8 ₆ 8 ₅ 8 ₅ 8 ₅	$8_5 8_4 8_3 8_2 8_2 8_2 8_2 8_1 8_1 8_1 8_1 8_1 7_8 7_9 7_3 7_5$						+ + + + + + + + + + + + + + + + + + + +
105 102 - 98 97 95 90	9_{6} 9_{3} 9_{3} 9_{3} 9_{3} 9_{2} 8_{9} 8_{e}	3_7 3_5 3_2 3_2 3_1 3_1 $y = 7_8$ 7_8 7_5 3_6 3_5 3_3 3_2 3_1 7_9 7_7 7_5						+ + + + + + + + + + + + + + + + + + + +
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5_6 5_6 5_6 5_7 5_6 5_6 5_7 5_6 5_6 5_6	5_6 5_6 5_5 5_5 5_6 5_6 5_5 5_5 5_6	5_4 5_4 5_5 5_5 5_4 5_4 5_4 5_4 5_3 5_4 5_4 5_4 5_5 5_5 5_5 5_4 5_4 5_4 5_4 5_4 5_3 5_3 5_3	$b_3 b_2 b_4 b_3 b_3 b_2 b_2 b_2 b_2 b_2 b_3 b_1 b_1 $	5_{10} 5
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		* * * *	5_7 5_7 5_8 5_9 5_9 5_9 5_9 5_9 5_9 5_8 5_9 5_8 5_8 5_8 5_8 6_0 5_9 5_9 5_9 6_0	$\begin{bmatrix} 6_0 & 6_0 & 6_1 & 6_1 & 6_2 & 6_1 & 6_0 & 7_0 & 6_$
		+ - - -	5_8 5_8 5_9	$\begin{cases} 6_0 & 6_1 & 6_1 & 6_0 & 6_9 & 5_9 & 5_9 & 6_0 & 6_2 & 6_2 & 6_1 & 5_9 & 6_1 & 6_1 \\ \hline & & & & & & & & & & & & & & & & & &$
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	E 809800	E 810200	E 810400
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3; 3; 4; 5; 4; 3; 4; 3; 4; 5; 5; 4; 5;	3 3 3 3 3 3 3 3	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$		
	Ash Lagoon (Nim Wan)		
	E 8098000	E 810000	E 810400




E 800		
8000	Leaend :	
	5718_A5	Existing borehole position
	\odot	Depression / Pockmark
	SA1-SEI002 ■1.3 Top of backfill/	Seismic contact with reference number, burial depth (metres below ambient seabed from the top of hyperbolic reflection) and description
	protection layer SA1-SC015 ▲1.2x0.5x0.3 Debris	Sonar contact with reference number, dimension (length x width x height in metres where measurable; nmh = no measurable height), and description
N 832200	SA1-SC012 ∕9x<0.5x0.5 Unknown object	Linear sonar contact with reference number, dimension (length x width x height in metres where measurable; nmh = no measurable height) and description
	SA1-M044 ◉664 WEPII Pipeline	Cable/pipeline position, as determined by magnetometer, with reference number and anomaly size (in nano-Tesla)
		Fine sediments (SILT/CLAY)
		ROCK
		Dumped materiale
with scattered debris/boulders ight: <0.3m), scattered		Dumped materials
s (diameter: <3m, depth: alised patches of dumped		Scar
only prominent ones were id scattered to numerous scars		Limit of side scan sonar coverage
		Sediment boundary
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	As-found cable position
		As-found pipeline position
N 832000		Survey boundary
		Existing pipe from marine chart
		Existing pipe norn manne chart
	sssss	As-laid power cable from EGS job number HK197505
_	A / I	Conical buoy / Beacon in general
		Chart overlap
		×
		She Boundar
	N +	
1		Black Point New Territories
Ý V	+	
	+	Castle Peak
N 831800	+	Chau Power Station
	+   +	Sha Chau
AY/SILT with scattered pressions (diameter: <3m,	+	The Brothers
5m) and debris/tyres eight: <0.3m)	/ /	
0	* / *	Hong Kong International
beline		Tide Gauge Airport
	Project :	
9 0 0 0 0 0 0		TASK ORDER NO. GE/2021/03.23
Pipeline SA1-M031 652		AGREEMENT NO. CE 26/2022 (EP)
Yasheng Pipeline	PHASE 2 - IN	IVESTIGATION, DESIGN AND CONSTRUCTION (SA1)
		MARINE GEOPHYSICAL SURVEY (GS)
N 831600	CHART NUMBER	: 7.1
	Drawing Title :	
		SEABED FEATURES
CLAY/SILT with scattered to		(SHEET 1 OF 3)
ter: <1.5m, depth: <0.3m)	Notoo :	(
	1. Survey Date	: 26-29 June and 03-06 July 2023
	2. Survey Vessel 3. Survey Grid	: GEO1 / WH2 : Hong Kong 1980 Grid System
	4. Vertical Datum 5. Positionina	<ul> <li>Hong Kong Principal Datum</li> <li>NovAtel PwrPak7 GNSS system/C-Nav 3050 GNSS system</li> </ul>
	6. Equipment	EdgeTech 6205s combined bathymetry and
		side scan sonar system Odom Echotrac MK III single beam echo sounder system
		Kongsberg EA440 single beam echo sounder system C-Boom Iow voltage boomer (LVB) system
		EdgeTech 3400-OTS sub-bottom profiler
N 831400		Geometrics G-882 marine magnetometer
	7. Tide Gauge 8. Coastline taker	: Hong Kong International Airport West from 1:1,000 Survey Sheets. Survey and Mapping Office
	Lands Departm	ent
	Revision No. Do	12023 Agnes Sill Howard Wang Margia Chan Brainsry
	<u> </u>	/2023Agnes SiuHoward WangMargieChenFreiminary/2023Agnes SiuHoward WangMargieChenFinal
		METRIC SCALE 1:2000
	100 80 60 40	20     0     100     200
	Client :	
		Civil Engineering and
	Surveyor :	EGS (ASIA) LIMITED 15th FLOOR, NORTH POINT INDUSTRIAL BUILDING.
E 80	Surveyor :	EGS (ASIA) LIMITED 15th FLOOR, NORTH POINT INDUSTRIAL BUILDING, 499 KING'S ROAD, NORTH POINT, HONG KONG Tel: (852) 2874622 Fax: (852) 25763590

N 831200













































5718_A5
Existing borehole position

MC002 © 5 Debris	Magnetic anomaly with reference number and gradient (in nano-Tesla/meter)		
00	As-found pipeline		
	Survey boundary		
	Existing pipe from marine chart		
	As-laid power cable from EGS job number HK197505		
. / .	Conical buoy / Beacon in general		
	Chart overlap		

Quasi-analytic Signal (nT/m)



Notes : 1. Survey Date : 26-29 June and 03-06 July 2023 2. Survey Vessel : GEO1 / WH2 3. Survey Grid : Hong Kong 1980 Grid System 4. Vertical Datum : Hong Kong Principal Datum 5. Positioning : NovAtel PwrPak7 GNSS system/C-Nav 3050 GNSS system 6. Equipment : EdgeTech 6205s combined bathymetry and side scan sonar system Odom Echotrac MK III single beam echo sounder system Kongsberg EA440 single beam echo sounder system C-Boom low voltage boomer (LVB) system EdgeTech 3400-OTS sub-bottom profiler Innomar SES-2000 medium-100 sub-bottom profiler Geometrics G—882 marine magnetometer 7. Tide Gauge : Hong Kong International Airport West 8. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department Date Drawn by Checked by Approved by Remarks Revision No. 0 31/07/2023 Agnes Siu Howard Wang Margie Chen Preliminary 12/09/2023 Agnes Siu Howard Wang Margie Chen Final 1 METRIC SCALE 1:2000 100 80 60 40 20 0 100 Client : Civil Engineering and Development Department EGS (ASIA) LIMITED 15th FLOOR, NORTH POINT INDUSTRIAL BUILDING, 499 KING'S ROAD, NORTH POINT, HONG KONG Tel: (852) 28948622 Tel: (852) 28948622 Web: www.egssurvey.com Surveyor



