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Civil Engineering and Development Department
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(Attn: Mr. Clarence Chan)

By fax: 2714 0103

(Total: 1 page)
11 August 2009

Dear Sir,

Agreement No. CE 63/2008 (CE)
Dredging Works in Kwai Tsing Container Basin and its Approach Channel –
Investigation, Design and Construction – EIA Study Brief No: ESB-198/2008 – Section 3.4.6.2
(iii) and 3.4.3.5 (viii) - Sediment Sampling and Testing Plan (Final)

I refer to your above-referenced letter by your consultant dated 31 July 2009 with the captioned reference attaching the said plan for our comment.

We have no further comment on the revised plan except that the parameter ammonia should be included in the testing suite (i.e. Table 4.1) for interstitial water and elutriate samples as per required in section 3.4.3.5. (viii) of the Study Brief.

Yours faithfully,

(Fiona C H CHEUNG)
Environmental Protection Officer
for Director of Environmental Protection

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OUR REF: (27) in EP2/N3/57 pt. 2
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15 September 2009

Dear Sir,

Agreement No. CE 63/2008 (CE)
Dredging Works in Kwai Tsing Container Basin and its Approach Channel –
Investigation, Design and Construction – EIA Study Brief No: ESB-198/2008 – Section 3.4.6.2
(iii) and 3.4.3.5 (viii) - Sediment Sampling and Testing Plan (Final)

I refer to your above-referenced letter by your consultant dated 2 September 2009 with the captioned reference attaching the said plan for our comment.

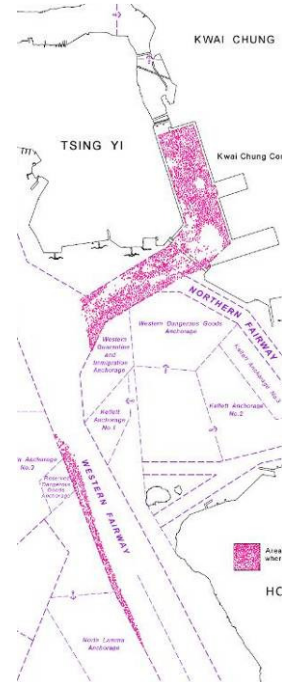
Please be advised that we have no further comments on this plan and would be providing our reply to the revised "Methodology Paper on Water Quality Modelling and Impact Assessment" shortly.

Yours faithfully,

(Fiona C H CHEUNG)
Environmental Protection Officer
for Director of Environmental Protection

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Agreement CE63/2008 (CE) Dredging Works in Kwai Tsing Container Basin and its Approach Channel – Investigation, Design and Construction

Sediment Sampling and Testing Plan (Final)

September 2009

Civil Engineering and Development Department

Agreement CE63/2008 (CE)
Dredging Works in Kwai Tsing
Container Basin and its Approach
Channel – Investigation, Design and
Construction


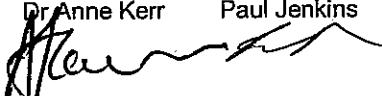

Sediment Sampling and Testing Plan (Final)

September 2009

Civil Engineering and Development Department

3/F Civil Engineering and Development Building 101 Princess Margret Road
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Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
A	26 Jun 09	Benny Liu / Joseph Chan	Dr Anne Kerr	Paul Jenkins	Draft to EPD
B	2 Jul 09	Benny Liu / Joseph Chan	Dr Anne Kerr	Paul Jenkins	Revised Draft to EPD
C	27 Jul 09	Benny Liu / Joseph Chan	Dr Anne Kerr	Paul Jenkins	Final to EPD
D	2 Sept 09	Benny Liu 	Dr Anne Kerr 	Paul Jenkins 	Final to EPD

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1. Introduction

Mott MacDonald Hong Kong Ltd. (MMHK) was commissioned by the Civil Engineering and Development Department (CEDD) on 26 May 2009 under Agreement No. CE 63/2008 (CE) to provide professional services in respect of the Dredging Works in Kwai Tsing Container Basin and its Approach Channel (hereinafter called “the Project”).

The purpose of the Project is to dredge the seabed of Kwai Tsing Container Basin, as well as portions of Northern Fairway and Western Fairway to achieve the seabed level of at least -17 mCD (where the existing seabed levels are in the range of -15.5 mCD and -16.5 mCD) in order to provide sufficient depth of container basin and approach channel to Kwai Tsing Container Terminal (KTCT) for the safe navigation of the Ultra Large Container Ships (ULCS). The locations of the proposed dredging works areas are shown in **Figure 1.1**.

To achieve the enhanced navigation depth, CEDD intends to dredge the seabed concerned to within the range of -17.5mCD and -18.0mCD (i.e. dredge 0.5m to 1.0m deeper than the functional least depth of -17.0mCD for siltation allowance). According to the data of the bathymetric survey provided by Marine Department (MD), it is preliminarily estimated that around 5.5Mm³ of sediment has to be dredged under this Project.

This sediment sampling and testing plan is prepared to address the requirements of the EIA Study for this Project. The sample locations are abstracted from a comprehensive proposal for sediment sampling to determine the sediment quality in accordance with the requirements of the Dumping at Sea Ordinance (DASO), which has been prepared following the rationale given in Technical Circular *ETWB TCW no. 34/2002 Management of Dredged/Excavated Sediment* and which will be submitted separately to Territorial Control Office, Marine Dumping Section of EPD. The laboratory testing for the EIA is in accordance with the Technical Circular.

Based on the existing marine ground investigation (G.I.) records, it is anticipated that the dredged material would mainly be marine mud and potentially a mixture of contaminated and uncontaminated deposits. The proposed dredging is planned to commence in Jan 2011.

A Sediment Quality Assessment will be undertaken under the EIA study for the dredged material at Kwai Tsing Container Basin and its Approach Channel. Details of the sampling locations are outlined in **Sections 3**.

The Kwai Tsing Container Basin and its Approach Channel has been deemed a Designated Project (DP) under item C.12 of Schedule 2 of Environmental Impact Assessment Ordinance (EIAO) (Cap.499). An Environmental Impact Assessment Report is therefore required to be submitted and approved by the Director of Environmental Protection under the EIAO before an Environmental Permit can be issued. To meet the requirements of the EIA Study Brief of the Project (No. ESB-198/2008), the scope and description of the works are given below.

Geotechnical Investigation (G.I.) and laboratory testing proposed in this Plan will cover the requirements of Technical Circular *ETWB TCW No. 34/2002 Management of Dredged/Excavated Sediment* as well as the requirements of the Waste Management Implications and Water Quality Impact as specified in Sections 3.4.6.2 (iii) and 3.4.3.5 (viii) of the EIA Study Brief.

The purpose of this Sediment Sampling and Testing Plan is to seek the agreement of EPD on the following:

- the ranges of parameters to be analyzed, the number, type and methods of sampling; sample preservation; chemical and biological laboratory test method to be used for dredged sediment sampling and testing as specified in 3.4.6.2 (iii) of the EIA Study Brief (ESB-198/2008)
- the ranges of parameters to be analyzed; the number, location, depth of sediment, type and methods of sampling; sample preservation; and chemical laboratory test methods to be used for elutriate tests as specified in Sections 3.4.3.5 (viii) of the EIA Study Brief (ESB-198/2008)

Details of the above which cover the requirements of Waste Management Implications specified in 3.4.6.2 (iii) and Water Quality Impact specified in Sections 3.4.3.5 (viii) of the EIA Study Brief (ESB-198/2008) are outlined in Sections 3 and 4 respectively of this Sediment Sampling and Testing Plan.

2. Review of Historical Data

The nearest EPD sediment monitoring station to the proposed dredging location is VS9. The results of bottom sediment testing conducted between 2002 to 2006 indicated that a number of heavy metals such as Lead, Nickel, Silver and Zinc exceeded the Lower Chemical Exceedence Limits while Copper exceeded the Upper Chemical Exceedence Limit as per ETWB TCW No. 34/2002.

Preliminary review on geological information at the boundary of dredging area was carried out. Drillhole records showed that material with marine deposit was present at seabed levels in the range of -15.5 mCD and -18 mCD.

From the above quoted results, it is believed that sediment deposit is present and a proportion of the proposed dredged/excavated deposit volume may be considered as Category M or H sediment that require chemical and biological screening.

3. Sediment Sampling and Testing

3.1 Details of Testing

Based on the results of the previous studies discussed above, the dredged sediment from the Project could be contaminated with heavy metals. According to *ETWB TCW No. 34/2002 Management of Dredged/Excavated Sediment*, Tier II Chemical Screening would be required. The proposed marine ground investigation works is presented in **Figures 3.1** and **3.2**. As detailed in Section 2, the chemical characteristics of the proposed dredged material may be contaminated.

The existing seabed levels of the project site are largely in the range between -15.5 mCD and -16.5 mCD, it is necessary to deepen the seabed to at least -17 mCD to facilitate safe navigation of new generation of ULCS to KTCT. As CEDD aims at dredging the seabed concerned to within the range of -17.5mCD and -18.0mCD, the approximate depth for the dredged sediment is ranging from 1m to 3m.

In this respect, and with reference to *ETWB TCW No. 34/2002*, the proposed marine ground investigation would be vibrocore sampling on an approximately 250m by 250m to 350m by 350m grid spacing with 100mm subsamples taken at seabed, 0.90m down, 1.9m down and 2.9m down and then every 3 m to the bottom of the dredged layer (up to -18mCD) where appropriate. However, grab sample is proposed if the dredging depth is less than 1m. The locations of the proposed vibrocores / grab sampling locations are presented in **Table 3.1**.

Grab samples from Sai Kung Port Shelter would also be obtained as a Reference Sediment for laboratory testing.

Table 3.1: Proposed Vibrocore / Grab Sampling Locations

Vibrocore / Grab Sample No.	Easting	Northing	Sample taken at depth (m)**	No. of Sub-Sample(s)
S1-1a/b*	829744.57	823002.78	0m~0.9m	1
S2a/b*	830324.4	823159.01	0m~0.9m & 0.9m~1.9m	2
S3a/b*	829842.24	822692.8	0m~0.9m & 0.9m~1.9m	2
S4a/b*	830414.58	822872.88	0m~0.9m & 0.9m~1.9m	2
S5-3a/b*	829948.78	822438.03	0m~0.9m	1
S6a/b*	830504.76	822586.76	0m~0.9m & 0.9m~1.9m & 1.9m~2.9m	3
S7a/b*	830022.61	822120.55	0m~0.9m & 0.9m~1.9m	2
S8a/b*	830594.95	822300.63	0m~0.9m & 0.9m~1.9m & 1.9m~2.9m	3
S9a/b*	830112.79	821834.42	0m~0.9m & 0.9m~1.9m	2
S10a/b*	830685.13	822014.51	0m~0.9m & 0.9m~1.9m & 1.9m~2.9m	3
S11a/b*	830202.98	821548.3	0m~0.9m	1
S12a/b*	830775.31	821728.38	0m~0.9m & 0.9m~1.9m	2
S14a/b*	830483.94	821322.2	0m~0.9m & 0.9m~1.9m	2
S15a/b*	830865.49	821442.26	0m~0.9m & 0.9m~1.9m	2
S16a/b*	830574.12	821036.08	0m~0.9m	1
S17a/b*	830955.68	821156.14	0m~0.9m & 0.9m~1.9m	2
S19a/b*	831008.51	820988.37	0m~0.9m & 0.9m~1.9m	2
S18a/b*	830759.69	820779.97	0m~0.9m	1
S13a/b*	830191.52	821219.89	0m~0.9m	1
S21a/b*	830542.11	820515.82	0m~0.9m & 0.9m~1.9m	2
D174a/b*	830312.8	820534.52	0m~0.9m	1
D176a/b*	830032.99	821050.77	0m~0.9m	1
D196a/b*	829811	820795.97	0m~0.9m & 0.9m~1.9m	2
D202a/b*	829983.9	820247.42	0m~0.9m & 0.9m~1.9m	2
D214a/b*	829797.81	820172.37	0m~0.9m & 0.9m~1.9m	2
D221a/b*	829443.28	820632.07	0m~0.9m & 0.9m~1.9m	2
D234a/b*	829298.79	820425.13	0m~0.9m & 0.9m~1.9m	2
D238a/b*	829419.03	820043.63	0m~0.9m & 0.9m~1.9m	2
S30a/b*	829217.67	819804.95	0m~0.9m & 0.9m~1.9m	2
S29a/b*	828919.48	820298.08	0m~0.9m	1
D272a/b*	828736.48	820213.24	0m~0.9m	1
S32a/b*	828909.36	819664.72	0m~0.9m & 0.9m~1.9m	2

Vibrocore /Grab Sample No.	Easting	Northing	Sample taken at depth (m)**	No. of Sub-Sample(s)
D298a/b*	828405.01	819934.24	0m~0.9m & 0.9m~1.9m	2
S34a/b*	828579.5	819380.51	0m~0.9m & 0.9m~1.9m & 1.9m~2.9m	3
S35a/b*	828214.24	819874.22	0m~0.9m & 0.9m~1.9m	2
D320a/b*	828449.97	819126.15	0m~0.9m & 0.9m~1.9m	2
D330a/b*	827847.07	817208.64	0m~0.9m & 0.9m~1.9m	2
D337a/b*	827990.99	816835.43	0m~0.9m & 0.9m~1.9m	2
S40a/b*	828134.92	816462.22	0m~0.9m & 0.9m~1.9m	2
D355a/b*	828278.85	816089.01	0m~0.9m & 0.9m~1.9m	2
D362a/b*	828422.78	815715.81	0m~0.9m & 0.9m~1.9m	2
S44a/b*	828566.7	815342.6	0m~0.9m	1
D374a/b*	828713.84	814974.12	0m~0.9m	1
S47a/b*	828842.4	814645.08	0m~0.9m & 0.9m~1.9m	2
D378a/b*	828950.32	814365.16	0m~0.9m & 0.9m~1.9m	2
D381a/b*	829103.93	814052.77	0m~0.9m & 0.9m~1.9m	2
S50a/b*	829285.36	813694.03	0m~0.9m	1
D386a/b*	829451.19	813329.26	0m~0.9m	1
Ref. Sediment	850234.00	820057.00	-	-

Notes :-

* Vibrocores denoted 'a' & 'b' are to be carried out in close proximity to each other, where 'a' vibrocores are for laboratory testing samples while 'b' vibrocores are to be split for logging purposes.

** Sampling locations and depth is referenced to the submission by Port Works Division, CEDD made in November 2008. Exact sampling locations and sub-sample depth will be subject to on site confirmation during sampling.

On recovery of the vibrocore / grab samples, the required subsamples shall be taken, bagged, labelled and stored as set out in ETWB TCW No. 34/2002. Geological logging should be undertaken as per Geoguide 3. All soil subsamples should be tested for the suites of tests again following the conditions and procedures set out in ETWB TCW No. 34/2002. Tier II Chemical Screening shall be undertaken for the parameters using the analytical methods and reporting limits described in the **Table 3.2**.

Table 3.2: Parameters Proposed for Chemical Screening for Sediment Samples

Parameter	Preparation Method	Determination Method	Reporting Limit
Metals (mg/kg dry wt.)			
Cadmium (Cd)	3050B	6020A or 7000A or 7131A	0.2
Chromium (Cr)	3050B	6010C or 7000A or 7190	8
Copper (Cu)	3050B	6010C or 7000A or 7210	7
Mercury (Hg)	7471A	7471A	0.05
Nickel (Ni)	3050B	6010C or 7000A or 7520	4
Lead (Pb)	3050B	6010C or 7000A or 7420	8
Silver (Ag)	3050B	6020A or 7000A or 7761	0.1
Zinc (Zn)	3050B	6010C or 7000A or 7950	20
Metalloid (mg/kg dry wt.)			
Arsenic (As)	3050B	6020A or 7000A or 7061A	1
Organic-PAHs (µg/kg dry wt.)			
Lower Molecular Weight PAHs+	3550B or 3540C and 3630C	8260B or 8270C	55
High Molecular Weight PAHs++	3550B or 3540C and 3630C	8260B or 8270C	170
Organic-non-PAHs (µg/kg dry wt.)			
Total PCBs+++	3550B or 3540C and 3665A	8082	3
Organometallics (µg TBT/L in interstitial water)			
Tributyltin*	Krone et al. (1989)* - GC/MS UNEP/IOC/IAEA**	Krone et al. (1989)* - GC/MS UNEP/IOC/IAEA**	0.015

+ Low molecular weight PAHs include acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene

++ High molecular weight PAHs include benzo[a]anthracene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-c,d]pyrene and benzo[g,h,i]perylene

+++ The reporting limit is for individual PCB congeners. Total PCBs include 2,4' diCB, 2,2',5 triCB, 2,4,4' triCB, 2,2',3,5' tetraCB, 2,2',5,5' tetraCB, 2,3',4,4' tetraCB, 3,3',4,4' tetraCB, 2,2',4,5,5' pentaCB, 2,3,3',4,4' pentaCB, 2,3',4,4',5 pentaCB, 3,3',4,4',5 pentaCB, 2,2',3,3',4,4' hexaCB, 2,2',3,4,4',5' hexaCB, 2,2',4,4',5,5' hexaCB, 3,3',4,4',5,5' hexaCB, 2,2',3,3',4,4',5 heptaCB, 2,2',3,4,4',5,5' heptaCB, 2,2',3,4',5,5',6 heptaCB (ref: the "summation" column of Table 9.3 of Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual (The Inland Testing Manual) published by USEPA).

* Krone et al. (1989), A method for analysis of butyltin species and measurement of butyltins in sediment and English Sole livers from Puget Sound, Marine Environmental Research 27 (1989) 1-18. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.

** UNEP/ICO/IAEA refers to IAEA's Marine Environment Laboratory reference methods. These methods are available free of charge from UNEP/Water or Marine Environmental Studies Laboratory at IAEA's Marine Environment Laboratory. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.

As Category M material is expected, Tier III Biological Screening is expected to be required after the chemical screening to determine the disposal option under *ETWB TCW No. 34/2002 Management of Dredged/Excavated Sediment*. The technical circular recommends all samples should be promptly analysed although, under proper storage (4°C in dark but not frozen), a maximum holding time of 2 weeks and 8 weeks for chemical test and biological test, respectively, is considered valid. The species to be used for each type of test will be selected from species listed in **Table 3.3**.

Table 3.3: Species Proposed for Biological Screening for Sediment Samples

Test Types	Species	Reference Test Conditions
10-day borrowing amphipod toxicity test	Ampelisca abdita	U.S. EPA (1994) / PSEP (1995)
	Leptocheirus plumulosus	U.S. EPA (1994)
	Eohaustorius estuarius	U.S. EPA (1994) / PSEP (1995)
20-day burrowing polychaete toxicity test	Neanthes arenaceodentata	PSEP (1995)
48-96 hour larvae (bivalve or echinoderm) toxicity test	Bivalve:	
	Mytilus spp.	PSEP (1995)
	Crassostrea gigas	PSEP (1995)
	Echinoderm:	
	Dendraster excentricus	PSEP (1995)
	Strongylocentrotus spp.	PSEP (1995)

If Biological Screening is required, reference sediment will be collected from Sai Kung Port Shelter using surface grab sampler.

Details for arrangement for test endpoints & decision criteria was described in **Table 3.4**.

Table 3.4 Test Endpoints and Decision Criteria for Tier III Biological Screening

Test Types	Endpoints measured	Failure criteria
10-day borrowing amphipod toxicity test	Survival	Mean survival in test sediment is significantly different ($p \leq 0.05$) ¹ from mean survival in reference sediment and mean survival in test sediment < 80% of mean survival in reference sediment.
20-day burrowing polychaete toxicity test	Dry Weight ²	Mean dry weight in test sediment is significantly different ($p \leq 0.05$) ¹ from mean dry weight in reference sediment and mean dry weight in test sediment < 90% of mean dry weight in reference sediment.

Test Types	Endpoints measured	Failure criteria
48-96 hour larvae (bivalve or echinoderm) toxicity test	Normality Survival ³	Mean normality survival in test sediment is significantly different ($p \leq 0.05$) ¹ from mean normality survival in reference sediment and mean normality survival in test sediment < 80% of mean normality survival in reference sediment.
1	Statistically significant differences should be determined using appropriate two-sample comparisons (e.g., t-tests) at a probability of $p \leq 0.05$.	
2	Dry weight means total dry weight after deducting dead and missing worms.	
3	Normality survival integrates the normality and survival end points, and measures survival of only the normal larvae relative to the starting number.	

3.2 Sediment Samples and Interstitial Water Tests

For each sediment sample, the Sediment Sampling and Testing Plan included the testing of 9 heavy metals and metalloids, low and high molecular weight PAH, total PCBs as listed in **Table 3-2**. For interstitial water, the testing for organometallics TBT was also included as listed in **Table 4-1**. Testing of the following additional parameters for all sediment samples as shown in **Figures 3.1** and **3.2** should be carried out to allow evaluation of contamination by chlorinated pesticides and nutrient of the sediment as listed in **Table 3.4**.

Table 3.4: Parameters Proposed for Sediment Samples

Parameter	Determination Method	Reporting Limit (mg/kg)	
Chlorinated Pesticides			
Aldrin	USEPA 8082 & 8270	0.05	
Alpha-BHC		0.05	
Beta BHC & Gamma BHC		0.1	
Delta-BHC		0.05	
Heptachlor		0.05	
Heptachlor epoxide		0.05	
Endosulfan 1		0.05	
Endosulfan sulphate		0.05	
p, p'-DDT		0.2	
p, p'-DDD		0.05	
p, p'-DDE		0.05	
Nutrient			
Ammonia Nitrogen (NH ₃ N)		APHA 4500-NH3	0.1
Sediment Oxygen Demand (SOD, 20 Days)	In house method*	5	

*Method shall be submitted for approval prior to testing.

4. Elutriate Tests

To facilitate the assessment of likelihood of release of contaminants from the marine mud during dredging, it has been specified in the EIA Study Brief to perform elutriate tests on sediment samples to simulate and quantify the degree of mobilization of various contaminants.

The sediment sub-samples from grab sampling / vibrocore sampling taken at seabed, 0.9m down, 1.9m down and 2.9m down and then every 3 m to the bottom of the dredged layer (up to -18mCD) where appropriate as shown in **Figures 4.1** and **4.2** will also be used for elutriate test where grab sample / sections of vibrocore tube are cut, sealed and capped, labelled, stored in a dark environment in a cool box below 4°C immediately after collection on site. On transfer from site to laboratory, samples are kept at below 4°C, by regularly replacing the ice packs. The elutriate test is a procedure developed to simulate the release of dissolved contaminants from a dredged disposal operation in open waters, and may be considered a laboratory simulation of release of dissolved contaminants from a mechanical dredged disposal operation (USEPA and USACE 1998). The *in situ* composite water and sediment samples of the same station will be mixed in a ratio of 1:4 sediment:water. The mixture is mechanically shaken vigorously for 30 minutes and allowed to settle undisturbed for 1 hour. The liquid filtrate phase is then centrifuged or filtered through a 45 µm filter to remove all suspended particulate matter. The extracted liquid filtrate is the elutriate to be used for further test.

The elutriate samples discussed above would be tested for a suite of contaminants as presented in Table 4.1 which are similar to the sediment samples. The test will also be performed on a blank sample (marine waters) for comparison.

Table 4.1: Parameters Proposed for Elutriate Samples

Parameter	Analytical Method	Reporting Limit
Heavy Metals		
Cadmium (Cd)	USEPA 6010/6020	0.2 ug/L
Chromium (Cr)	USEPA 6010/6020	10 ug/L
Copper (Cu)	USEPA 6010/6020	1 ug/L
Mercury (Hg)	USEPA 7470/7471	0.5 ug/L
Nickel (Ni)	USEPA 6010/6020	1 ug/L
Lead (Pb)	USEPA 6010/6020	1 ug/L
Silver (Ag)	USEPA 6010/6020	1 ug/L
Zinc (Zn)	USEPA 6010/6020	10 ug/L
Metalloid		

Parameter	Analytical Method	Reporting Limit
Arsenic (As)	USEPA 6010/6020	10.0 µg/L
Trace Organic Contaminants		
Polychlorinated Biphenyls (PCBs)	USEPA 8082 & 8270	1µg/L
Polynuclear Aromatic Hydrocarbons (PAHs)	USEPA 8270	2µg/L
TBT	Krone et al	0.015µg/L
Chlorinated Pesticides		
Aldrin	USEPA 8082 & 8270	0.5 µg/L
Alpha-BHC		0.5 µg/L
Beta BHC & Gamma BHC		1 µg/L
Delta-BHC		0.5 µg/L
Heptachlor		0.5 µg/L
Heptachlor epoxide		0.5 µg/L
Endosulfan 1		0.5 µg/L
Endosulfan sulphate		0.5 µg/L
p, p'-DDT		2 µg/L
p, p'-DDD		0.5 µg/L
p, p'-DDE		0.5 µg/L
Nutrient		
Unionized Ammonia-Nitrogen (NH ₃ N)	APHA 4500-NH ₃	0.010 mg NH ₃ -N/L

The laboratory testing of samples collected will be carried out by an appropriate laboratory which is HOKLAS (Hong Kong Laboratory Accreditation Scheme) accredited. The Laboratory should conduct the required analyses which fall under her accredited test categories according to standard method and technique used as specified in her scope of accreditation under HOKLAS while the remaining required analyses should be conducted according to in-house or other approved international standard methods.

Standard elutriate preparation will be in accordance with USEPA 823/B-98-004 Dredged Material – Inland Testing Manual.

For the sampling stations, ambient marine water samples shall be collected using Niskin sampler from 1m below the surface, mid-depth and 1m above the seabed and pooled to form a composite water sample. The water sample collection shall commence prior to the sediment collection to avoid disturbance to the seabed affecting the water samples. The composite water samples shall then be poured into pre-labelled sample storage containers supplied ready for use by the analytical laboratory.

Prior to use, all lab-ware will be thoroughly cleaned as appropriate for the contaminant analysis. At a minimum, lab-ware should be washed with detergent, rinsed with acetone, five times with tap water, placed in a clean 10% HCl acid bath for a minimum of 4h, rinsed five times with tap water, and then thoroughly flushed with either distilled or deionised water

The elutriate will be prepared by using marine water from the excavation site. Enough elutriate should be prepared for the chemical analyses and for the water column toxicity tests in Tier III.

The elutriate will be prepared by sub-sampling approximately 1 L of the excavated material from the well-mixed original sample. The dredged material and unfiltered water should then combine in a sediment-to-water ratio of 1:4 on a volume basis at room temperature ($22 \pm 2^\circ\text{C}$). This is best accomplished by volumetric displacement. After the correct ratio is achieved, the mixture is stirred vigorously for 30 min with a mechanical or magnetic stirrer. At 10 min intervals, the mixture is also stirred manually to ensure complete mixing. After the 30 min mixing period, the mixture should be allowed to settle for 1 hour. The supernatant should then be siphoned off without disturbing the settled material, and centrifuged to remove particulates prior to chemical analysis (approximately 2,000 rpm for 30 min, until visually clear).

5. Quality Assurance /Quality Control

Chemical Testing

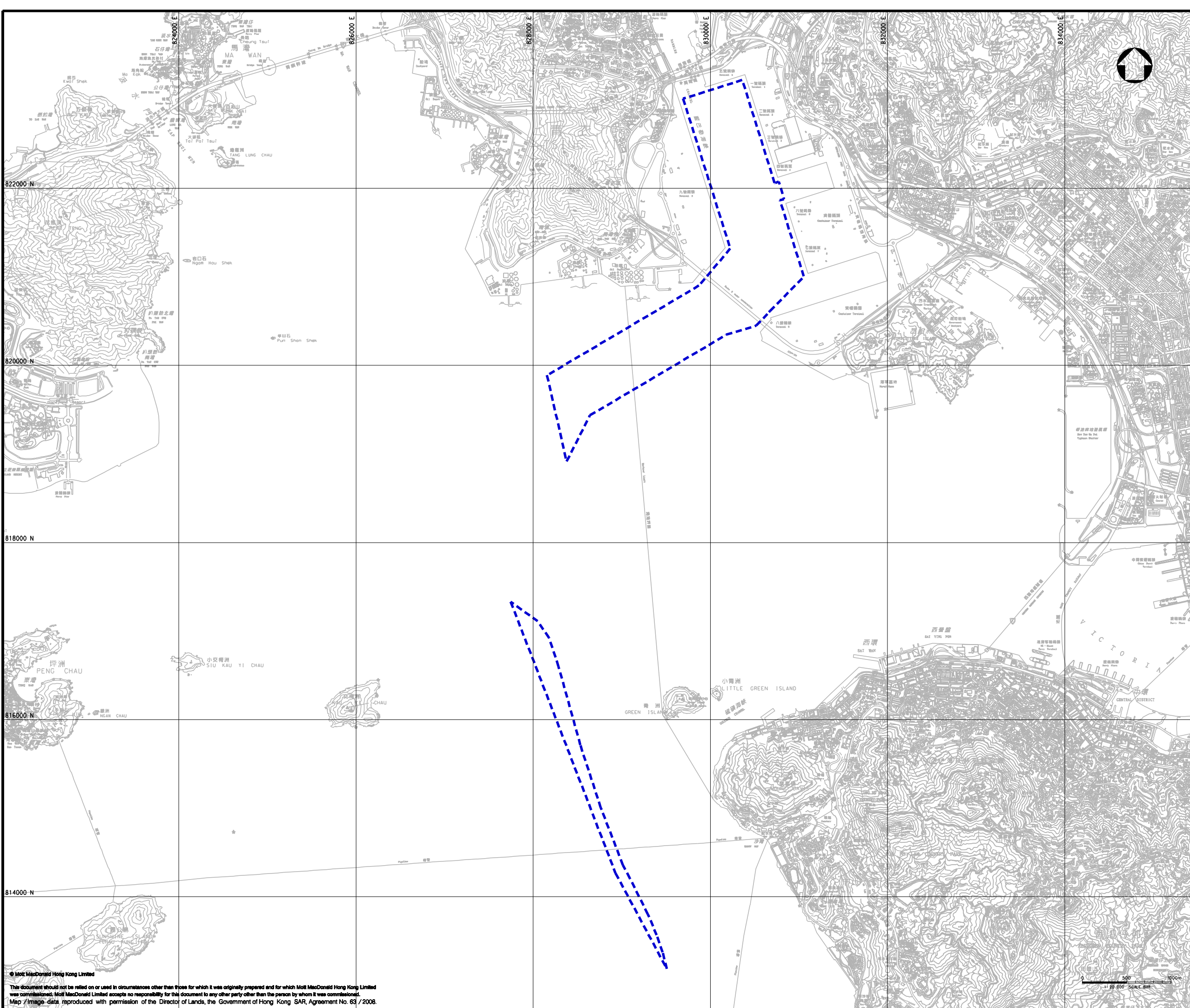
The laboratory testing of samples collected will be carried out by an appropriate laboratory which is HOKLAS (Hong Kong Laboratory Accreditation Scheme) accredited or its Mutual Recognition Arrangement partners.

The laboratory Quality Assurance /Quality Control (QA/QC) schedule as required by HOKLAS shall be as follows:

- **Method Blank**
For each batch of 20 samples, at least 1 method blank will be analysed together with the samples.
- **Sample Replicate**
For each batch of 20 samples, at least 1 sample replicate will be tested.
- **Method Analyte Spike**
For each batch of 20 samples, at least 1 method analyte spike will be conducted.

Biological Testing

All biological tests must be conducted by laboratories with appropriate accreditation; The QA/QC control in biological testing will be based on the application of the negative and positive control.




LEGEND:
 PROPOSED DREDGING AREA

P2	JUL 09	MING	TITLE BLOCK REVISED	BL	AFK
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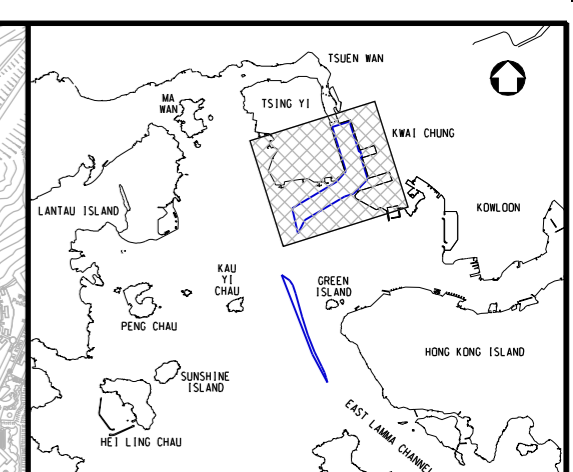
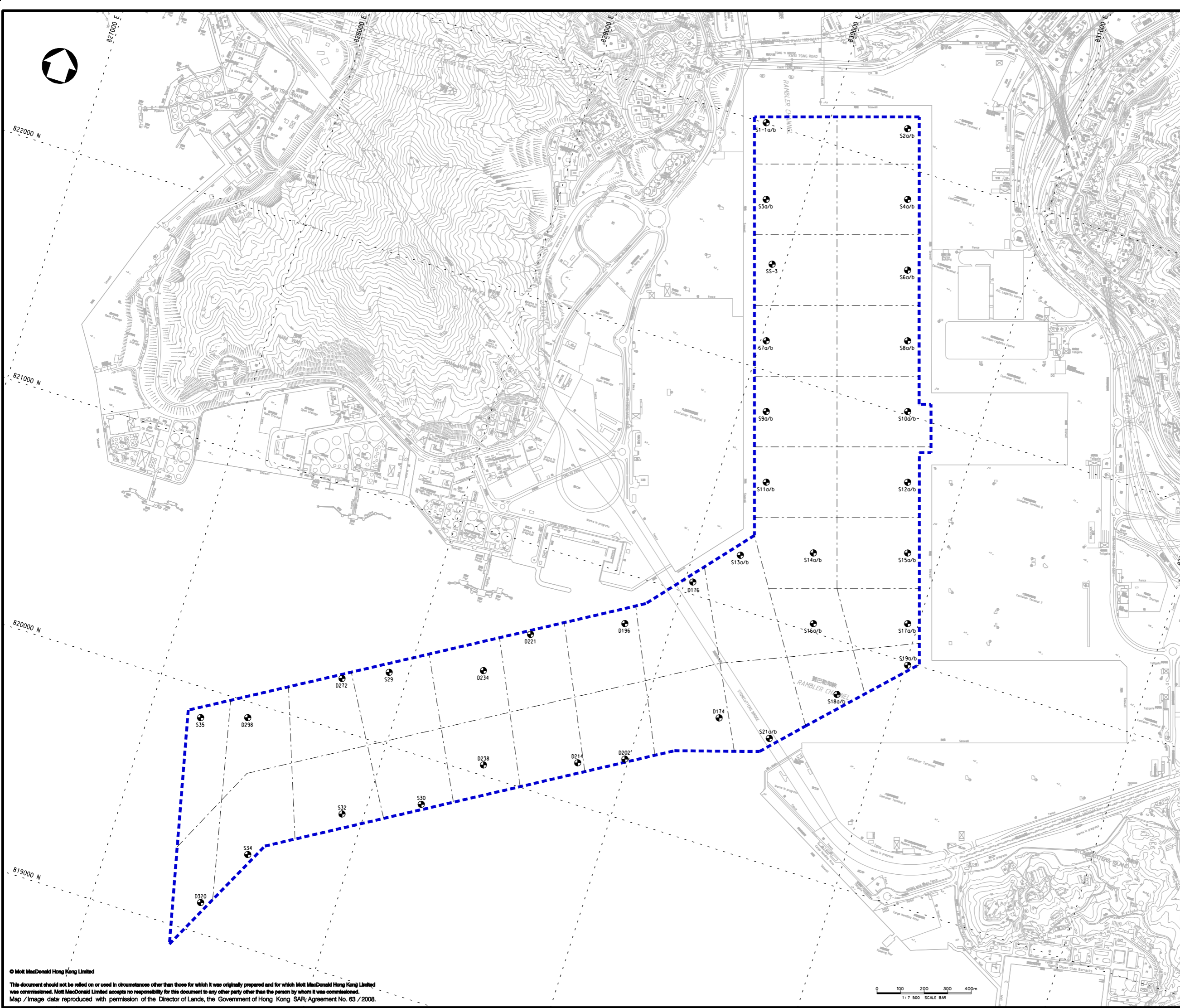
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Project
**DREDGING WORKS IN KWAI TSING
 CONTAINER BASIN AND ITS
 APPROACH CHANNEL - INVESTIGATION,
 DESIGN AND CONSTRUCTION**

Title
**LOCATIONS OF PROPOSED
 DREDGING AREAS**

Designed	JC	Eng check	JC
Drawn	MING	Coordination	JC
Dwg check	JC	Approved	AFK
Scale at A1	Status	Rev	
1:20000@A1	PRE	P2	

Drawing Number **FIGURE 1.1**



KEY PLAN
SCALE 1:150 000

- LEGEND:**
- PROPOSED DREDGING AREA
 - GRAB / VIBROCORE SAMPLING LOCATION

CO-ORDINATE OF GRAB/VIBROCORE SAMPLING LOCATION

POINT	EASTING	NORTHING	POINT	EASTING	NORTHING
S1-1a/b	829744.57	823002.78	S19a/b	831008.51	820988.37
S2a/b	830324.40	823159.01	S21a/b	830542.11	820515.82
S3a/b	829842.24	822692.80	D174	830312.80	820534.52
S4a/b	830414.58	822872.88	D176	830032.99	821050.77
SS-3	829948.78	822438.03	D196	829811.00	820795.97
S6a/b	830504.76	822586.76	D202	829983.90	820247.42
S7a/b	830022.61	822120.55	D214	829797.81	820172.37
S8a/b	830594.95	822300.63	D221	829443.28	820632.07
S9a/b	830112.79	821834.42	D234	829298.79	820425.13
S10a/b	830685.13	822014.51	D238	829419.03	820043.63
S11a/b	830202.98	821548.30	D272	828736.48	820213.24
S12a/b	830775.31	821728.38	D298	828405.01	819934.24
S13a/b	830191.52	821219.89	D320	828449.97	819126.15
S14a/b	830483.94	821322.20	S29	828919.48	820298.08
S15a/b	830865.49	821442.26	S30	829217.67	819804.95
S16a/b	830574.12	821036.08	S32	828909.36	819664.72
S17a/b	830955.68	821156.14	S34	828579.50	819380.51
S18a/b	830759.69	820779.97	S35	828214.24	819874.22

P3	SEP 09	MING	GENERAL REVISION	BL	AFK
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Project
**CONTRACT NO. CV/2009/13
KWAI TSING CONTAINER BASIN -
MARINE GROUND INVESTIGATION**

Title
**PROPOSED GRAB / VIBROCORE
SAMPLING LOCATIONS FOR
MARINE GROUND INVESTIGATION
WORKS (SHEET 1 OF 2)**

Designed	JC	Eng check	JC
Drawn	MING	Coordination	JC
Dwg check	JC	Approved	AFK
Scale at A1	1:7500@A1	Status	PRE
Drawing Number		Rev	P3

FIGURE 3.1



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828000 E

829000 E

830000 E

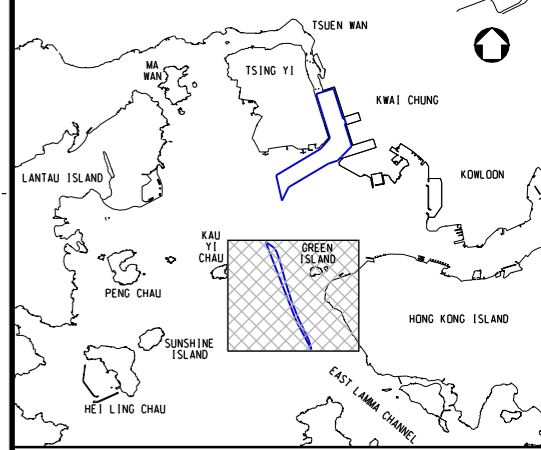
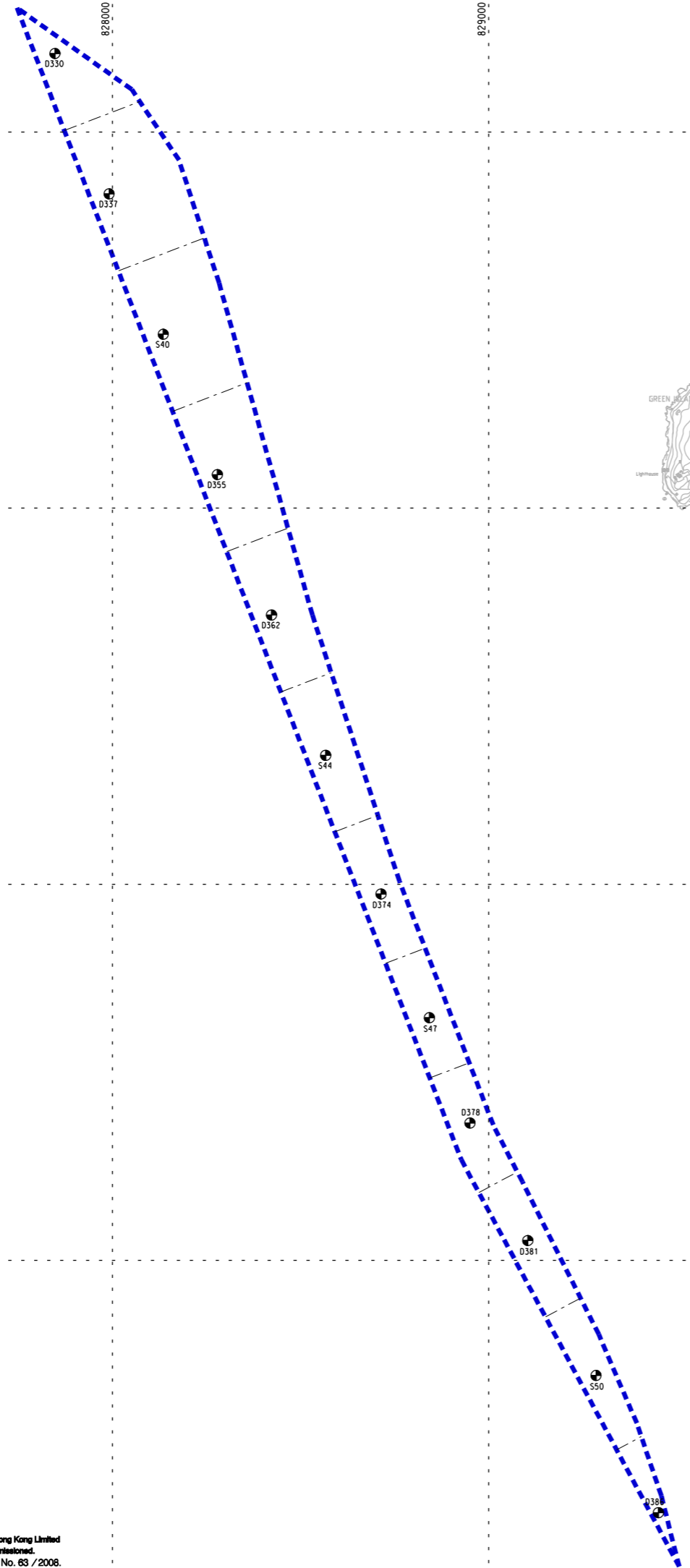
831000 E

817000 N

816000 N

815000 N

814000 N



KEY PLAN
SCALE 1:150 000

- LEGEND:
- PROPOSED DREDGING AREA
 - GRAB / VIBROCORE SAMPLING LOCATION

CO-ORDINATE OF GRAB/VIBROCORE SAMPLING LOCATION

POINT	EASTING	NORTHING
D330	827847.07	817208.64
D337	827990.99	816835.43
D355	828278.85	816089.01
D362	828422.78	815715.81
D374	828713.84	814974.12
D378	828950.32	814365.16
D381	829103.93	814052.77
D386	829451.19	813329.26
S40	828134.92	816462.22
S44	828566.70	815342.60
S47	828842.40	814645.08
S50	829285.36	813694.03

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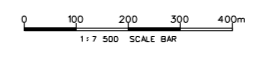
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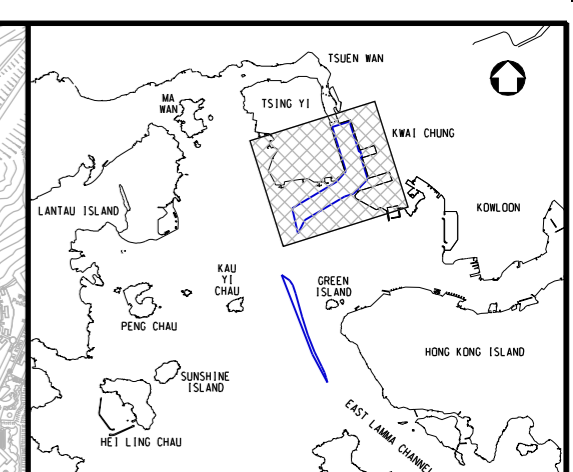
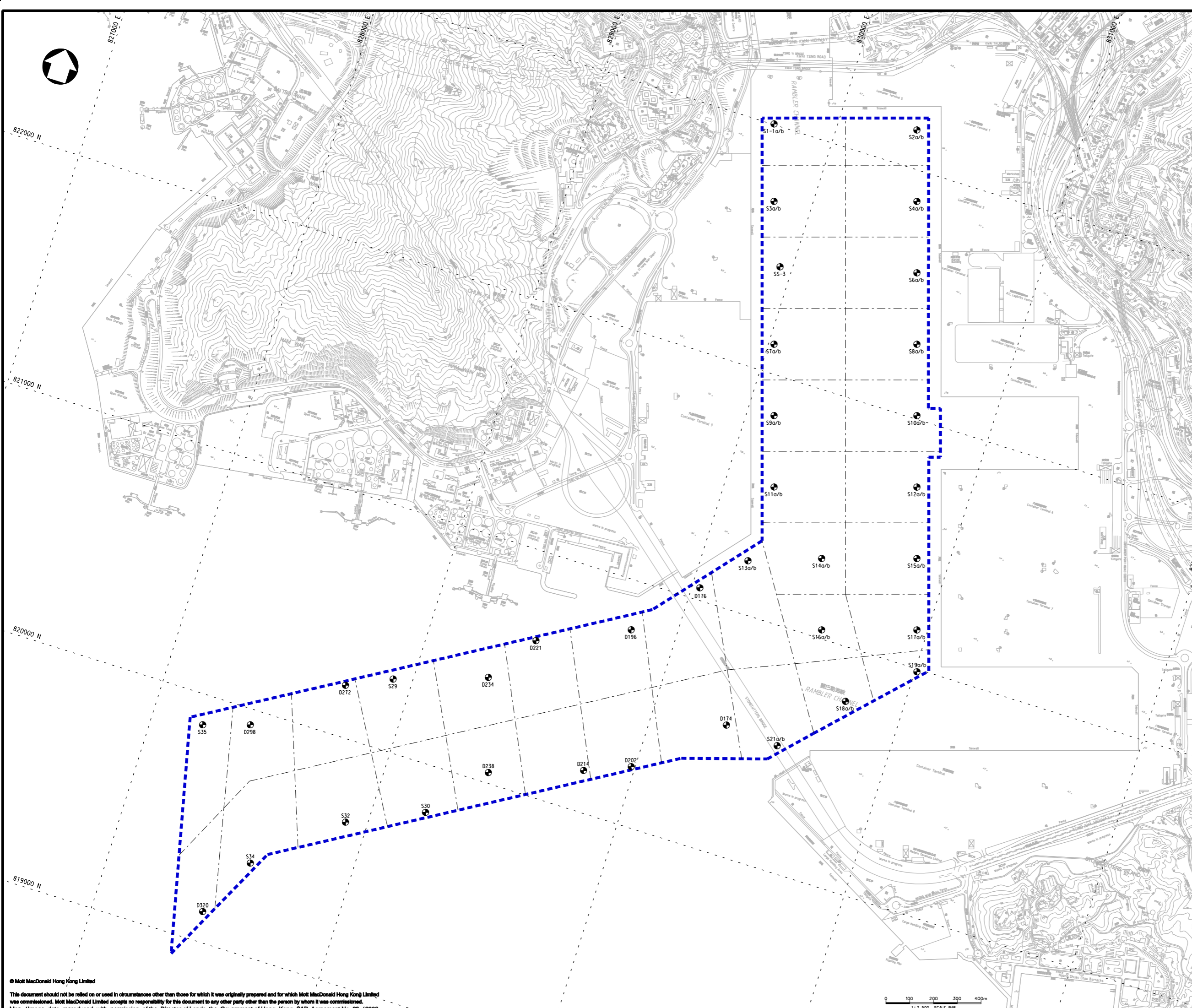
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MARINE GROUND INVESTIGATION**

Title
**PROPOSED GRAB / VIBROCORE
SAMPLING LOCATIONS FOR
MARINE GROUND INVESTIGATION
WORKS (SHEET 2 OF 2)**

Designed	JC	Eng check	JC
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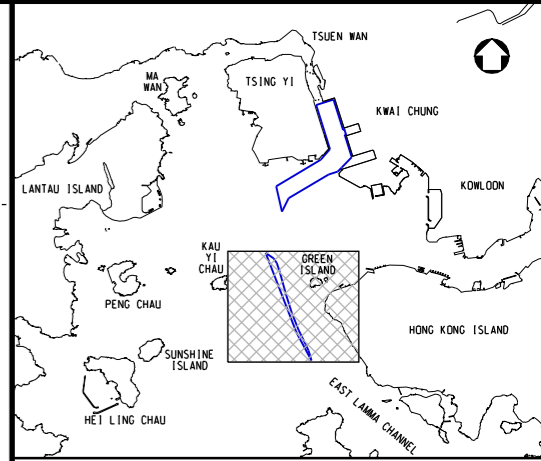
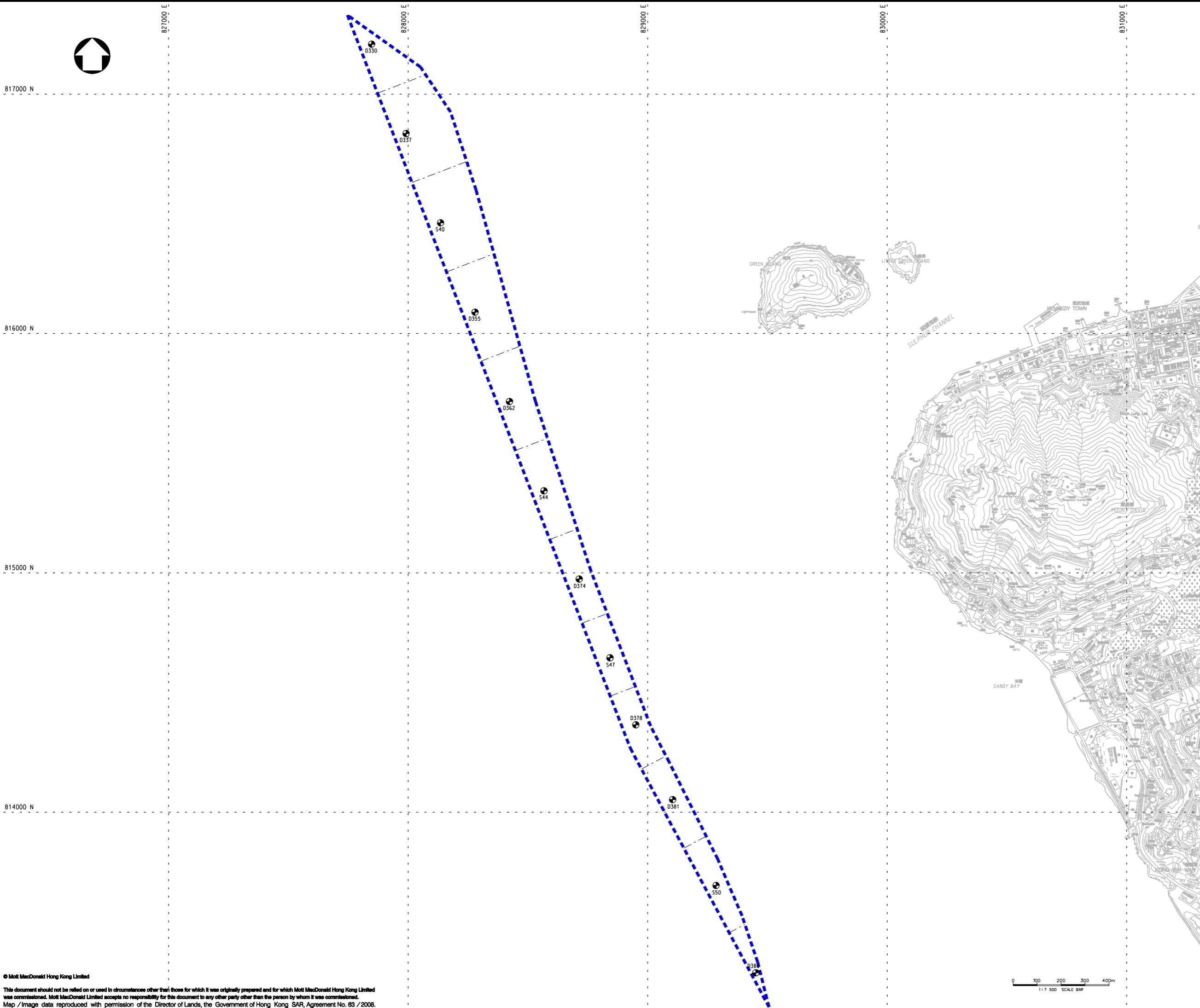
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KWAI TSING CONTAINER BASIN -
MARINE GROUND INVESTIGATION**

Title

**PROPOSED GRAB / VIBROCORE
SAMPLING LOCATIONS FOR
ELUTRIATE TESTS
(SHEET 1 OF 2)**

Designed	JC	Eng check	JC
Drawn	MING	Coordination	JC
Dwg check	JC	Approved	AFK
Scale at A1	1:7500@A1	Status	PRE
Drawing Number		Rev	P3

FIGURE 4.1



KEY PLAN
SCALE 1:150 000

- LEGEND:**
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CO-ORDINATE OF GRAB/VIBROCORE SAMPLING LOCATION

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S50	829285.36	813694.03

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PROPOSED GRAB / VIBROCORE
SAMPLING LOCATIONS FOR
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(SHEET 2 OF 2)

Designed	JC	Eng check	JC
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FIGURE 4.2

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