本署檔號
OUR REF: EP2/K19/A/21
來函檔號
YOUR REF:
電話
TEL. NO.: 2835 1845
圖文傳真
FAX NO.: 2591 0558
電子郵件
E-MAIL:
網址
HOMEPAGE: http://www.epd.gov.hk

Environmental Protection Department
Branch Office
28th Floor, Southorn Centre,
130 Hennessy Road,
Wan Chai, Hong Kong.

環境保護署分處
香港灣仔
軒尼詩道
一百三十號
修頓中心廿八樓

FAX

22 Oct 2010

Hyder-Meinhardt Joint Venture
47th Floor, Hopewell Centre
183 Queen's Road East
Wan Chai
Hong Kong

Fax: 2805 5028
(Attn: Mr James Penny)

25 OCT 2010
2010-66626
SBS
TC

B1681-EB000560-EPD-HKT-00

Dear Mr Penny,

Agreement No. CE 38/2008 (HY)
Kai Tak Development – Trunk Road T2
and Infrastructure at South Apron
- Investigation, Design and Construction

Working Paper on Waste Management – Marine Sediment Sampling Proposal for EIA Study (MSSP-EIA)

I refer to your letter dated 27 Sept 2010 and we have no further comment on the submitted working paper.

(Vincent Tin)
for Director of Environmental Protection

cc: E(MA)51, E(RA)41

Hyder-Meinhardt Joint Venture
47th Floor, Hopewell Centre
183 Queen's Road East
Wanchai
Hong Kong
Tel: +852 2911 2233
Fax: +852 2805 5028
hyder.hk@hyderconsulting.com
www.hyderconsulting.com

Hyder MEINHARDT
Hyder-Meinhardt JV

27 September 2010

BY FAX (2591-0558) AND POST

Environmental Protection Department
Environmental Assessment Division
Metro Assessment Group
Kowloon Section (2)

Your Ref: EP2/K9/A/21
Our Ref: A0472-EB000560-MIEL-HKL-00

For the attention of Mr. David Cox / Vincent Tin

Dear Sir,

Agreement No. CE 38/2008 (HY)
Kai Tak Development – Trunk Road T2 and Infrastructure at South Apron
-Investigation, Design and Construction

Working Paper On Waste Management – Marine Sediment Sampling Proposal for EIA Study (MSSP-EIA)

Further to your confirmation of no comments on the captioned Marine Sediment Sampling Proposal (MSSP-EIA) dated 1st April 2010, we have proceeded with the procurement of sampling and testing services and project specific details on the testing methodology and accreditation status is now available. Section 4.1 on the implementation agents and Appendix B of the MSSP-EIA, thus, are revised accordingly.

Please be advised that we also propose to slightly revise the sampling stations with the addition of a few stations bringing it to a total of 21 marine stations and 6 land stations. The additional is the result of a better definition of the works area through the progress of the design works.

Regarding your suggestion to look for a silver standard in Table 3.7, we propose to adopt the USEPA criterion as has been put forward in the "Working paper on water quality mathematical model study and water quality impact assessment" submitted in July 2010.

The contractor is to start taking samples this week (late September 2010) and perform samples testing next week (early October 2010). Should you have any comments on the proposed amendment, we would appreciate you would write to us by 4 October 2010. We confirm this submission is made under Clause 3.4.7.6 (g) and 3.4.8.2 (iii)(a) of the EIA Study Brief No. ESB-203/2009.

By copy of this letter, could all the recipients in the distribution also confirm if you have any comment on the MSSP-EIA Rev2. A nil reply is required.

Yours faithfully,
for Hyder-Meinhardt Joint Venture

James Penny
Deputy Project Manager

Encl.

JP/tl

c.c.	KDO, CEDD	(Attn: Mr. C. B. Mak – w/e)
	Meinhardt	(Attn: Mr. Jason Wong – w/e)
	Territorial Control Office / EPD	(Attn: Mr. Patrick Cheung – w/e)

Registered office: 47th Floor, Hopewell Centre, 183 Queen's Road East, Wanchai, Hong Kong

土 木 工 程 拓 展 署
CEDD Civil Engineering and Development Department

Hyder MEINHARDT
Hyder-Meinhardt JV

Civil Engineering and Development Department

Agreement No. CE 38/2008 (HY)

Kai Tak Development - Trunk Road T2 and Infrastructure at South Apron Investigation, Design and Construction

Working Paper On Waste Management – Marine Sediment Sampling Proposal for EIA Study – Revision 2 (MSSP-EIA Rev2)

Hyder-Meinhardt Joint Venture
Company Number 126012
47th Floor, Hopewell Centre
183 Queen's Road East
Wanchai
Hong Kong
Tel: +852 2911 2233
Fax: +852 2805 5028
hyder.hk@hyderconsulting.com
www.hyderconsulting.com

Civil Engineering and Development Department

Agreement No. CE 38/2008 (HY)

Kai Tak Development - Trunk Road T2 and Infrastructure at South Apron Investigation, Design and Construction

Working Paper On Waste Management – Marine Sediment Sampling Proposal for EIA Study – Revision 2 (MSSP-EIA Rev2)

Author Y H Hui

Checker Helen Cochrane

Approver James Penny

Report No F0029-EB000560-MIEL-HKR-02

Date 27 September 2010

CONTENTS

List of Tables

List of Figures

1 SECTION 1 – INTRODUCTION

1.1 General

1.1.1 On 31st July 2009, Civil Engineering and Development Department (CEDD) of the Government of the Hong Kong Special Administrative Region appointed Hyder-Meinhardt JV (HMJV) under Agreement No CE38/2008 (HY) to provide professional services in respect of Kai Tak Development – Trunk Road T2 and Infrastructure at South Apron Investigation, Design and Construction. The date for commencement of the Assignment was 31st July 2009.

1.1.2 Trunk Road T2 involves the construction and operation of highways and the associated link roads and, thus, consists of designated project elements including Items A.1, A.7 and F.6 Part I under Schedule 2 of the EIAO. The Project may also include changes to associated roads and other facilities that constitute material change(s) to exempted project(s) including relocation of existing breakwaters, and other designated project(s), e.g. dredging, temporary reclamation, to be identified during the course of this study. According to Section 5(1) of the EIAO, a project profile was submitted to the Environmental Protection Department (EPD) on 24 March 2009 for application of an EIA Study Brief, which was subsequently issued to CEDD pursuant to Section 5(7)(a) of the EIAO (EIA Study Brief No: ESB-203/2009 dated 30 April 2009).

1.1.3 Section 1.2 provides a preliminary description of the marine works likely to be required for Trunk Road T2 assuming the submarine tunnel between the south apron and Cha Kwo Ling will be constructed using immersed tube tunnel (IMT). This working paper is to propose a marine site investigation (SI) and sediment quality testing parameters and methodology for the purpose of EIA study for the Trunk Road T2 based on an IMT tunnel. A working paper proposing the sediment sampling and testing scheme for the Dumping at Sea Ordinance (DASO) permit application following the ETWB TCW No. 34/2002 is submitted separately.

1.1.4 Clause 3.4.7.6 (g) of the EIA Study Brief ESB-203/2009 requires that "Field investigation, sampling and chemical laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. …. Appropriate laboratory tests including elutriate tests and sediment pore water (interstitial water) analyses shall be performed on the sediment samples to simulate and quantify the degree of mobilization of various contaminants such as metals, ammonia, trace organic contaminants (including PCBs, PAHs, TBT and chlorinated pesticides) into the water column during dredging. The ranges of parameters to be analysed; the number, location, depth of sediment, type and methods of sampling; sample preservation; and chemical laboratory test methods to be used shall be subject to the approval of EPD".

1.1.5 Clause 3.4.8.2 (iii)(a) of the EIA Study Brief also requires that "Field investigation, sampling and chemical and biological laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. The ranges of parameters to be analyzed; the number, type and methods of sampling; sample preservation; chemical and biological laboratory test methods to be used shall be agreed with the Director (with

reference to Section 4.4.2(c) of the TM) prior to the commencement of the tests and document in the EIA report for consideration. The categories of sediment/mud which are to be disposed of in accordance with a permit granted under the Dumping at Sea Ordinance (DASO) shall be identified by both chemical and biological tests and their quantities shall be estimated".

1.1.6 This marine SI, sediment quality sampling and testing proposal partially fulfil the abovementioned clauses of the EIA Study Brief. It should note that the engineer is still reviewing the alignments. It may, therefore, be necessary to adjust the exact sampling locations if the preferred alignment is substantially different from the schemes described in Section 1.2. If the scale of proposed sampling and testing works are substantially reduced due to the change of construction methods, a revised proposal would be submitted to EPD for approval prior to the commencement of sampling work.

1.2 Descriptions of Marine Works

1.2.1 As a part of the strategic road network within the South East Kowloon Development, Route 6 forms an east west express link between West Kowloon and Tseung Kwan O. Route 6 comprises the Central Kowloon Route (CKR), Trunk Road T2 and Tseung Kwan O – Lam Tin Tunnel (TKO-LTT). This Assignment covers the provision of Trunk Road T2. The main elements of the works comprise the construction of Trunk Road T2 (T2), connecting with the Central Kowloon Route (CKR) at the north apron area and the Tseung Kwan O - Lam Tin Tunnel (TKO-LTT) to the south.

1.2.2 Trunk Road T2 is planned to be a dual 2-lane highway of about 3.6 km connecting CKR and TKO-LTT. According to the KTDES, about 2.6km of T2 will be in the form of tunnel and about 2 km of the tunnel will be submarine and is likely in the form of immersed tube (IMT) tunnel. The CKR and TKO-LTT are planned to complete in 2016. Trunk Road T2, being the middle section of Route 6 connecting the CKR and TKO-LT Tunnel, is therefore targeted to complete in 2016.

1.2.3 The main elements of marine works for the Project for the conforming option described in the project study brief include:

- dredging a trench for the IMT tunnel;
- the demolishment of two breakwaters to make way for the IMT tunnel;
- building up temporary breakwaters to substitute the temporarily removed breakwaters;
- diversion of initial section of KTPTW submarine outfall to make way for the IMT tunnel;
- dredging of access channel for IMT units; and
- demolition of quay walls and temporary reclamation at both ends of the landing for the construction of IMT tunnel.

1.2.4 The indicative alignment and the location of marine facilities involved are illustrated in **Figure 1.1**. **Figure 1.2** shows the layout of the two alignment schemes H2 and H4 under consideration while further details about the temporary reclamations are shown in **Figures 1.3** to **1.5**. The typical cross-section of IMT Tunnel and the dredging trench are presented in **Figure 1.6** whereas **Figure 1.7** shows the typical cross-section at landfall. The indicative long profile of the alignment scheme H2 is shown in **Figure 1.8.**

1.3 Rationale for Dredging

1.3.1 Being part of the Kai Tak Development, the dredging rationale together with the preliminary estimated dredged sediment quantity for the immersed tunnel sections of Trunk Road T2 was approved by the Marine Fill Committee in August 2008 together with other elements of Kai Tak Development where marine dredging and disposal are predicted. The approval letter as presented in Appendix 9.2 of the KTD EIA is reproduced in **Appendix D** of this working paper.

1.4 Abbreviations

1.4.1 The following key abbreviations are used in this report:

CEDD	Civil Engineering and Development Department
COC	Chain of Custody
CT	Cruise Terminal
DASO	Dumping at Sea Ordinance
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
EPD	Environmental Protection Department
ETWB	Environment, Transport and Works Bureau (the former Environment Bureau, Development Bureau, Transport and Housing Bureau)
GEO	Geotechnical Engineering Office
GI	Ground Investigation
HATS	Harbour Area Treatment Scheme
HOKLAS	The Hong Kong Laboratory Accreditation Scheme
IMT	Immersed Tube
KTAC	Kai Tak Approach Channel
KTD	Kai Tak Development
KTDES	Kai Tak Development Engineering Study
KTPR	South East Kowloon Development Comprehensive Planning and Engineering Review Stage 1 Planning Review.
KTPTW	Kwun Tong Preliminary Treatment Works

KTTS	Kwon Tong Typhoon Shelter
LCEL	Lower Chemical Exceedances Level
PTW	Preliminary Treatment Works
RL	Reporting Limit
SEKD	South East Kowloon Development
SEKDCFS	Comprehensive Feasibility Study for the Revised Scheme of South East Kowloon Development
SI	Site Investigation
SPR	Stores and Procurement Regulations
TBM	Tunnel Boring Machine
TKO-LTT	Tseung Kwan O – Lam Tin Tunnel
TKWTS	To Kwa Wan Typhoon Shelter
UCEL	Upper Chemical Exceedances Level

Chemicals

Ag	Silver
As	Arsenic
AVS	Acid Volatile Sulphide
Cd	Cadmium
Cr	Chromium
Cu	Copper
Hg	Mercury
HMW	High Molecular Weight
LMW	Low Molecular Weight
NH_4-N	Ammonia Nitrogen
Ni	Nickel
NO_2-N	Nitrite Nitrogen
NO_3-N	Nitrate Nitrogen
PAHs	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PCBs	Polychlorinated Biphenyls
PO_4-P	Orthophosphate

SOD	Sediment Oxygen Demand
TBT	Tributyltin
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
Total-P	Total Phosphorus
TS	Total Sulphide
Zn	Zinc

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2 SECTION 2 – REVIEW OF HISTORICAL DATA

2.1 1997 SEKD EIA

2.1.1 The EIA report for Agreement No. CE 69/94 *Feasibility Study for South East Kowloon Development* (SEKD EIA Report) studied the sediment contaminants level in waters around the Kwun Tong – Kowloon Bay – To Kwa Wan area. The assessment was based on the old sediment classification frame work (TC No. 1-1-92) which divided sediment quality into three classes: Class A is uncontaminated material, Class B is moderately contaminated material and Class C (Cd $\geq$ 1.5, Cr $\geq$ 80, Cu $\geq$ 65, Hg $\geq$ 1.0, Ni $\geq$ 40, Pb $\geq$ 75, Zn $\geq$ 200; all values in mg/kg dry wt.) is seriously contaminated material. The study involved sediment sampling and testing between 1996 and 1997 in several phases.

2.1.2 In phase 1 SI, 18 vibrocore locations generating 93 sediment samples were analysed for heavy metal content cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb) and zinc (Zn). In addition, grab samples were also taken for analysis of organic micro-pollutant polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and tributyltin (TBT). The study indicated that sediment of the area was generally contaminated with heavy metals exceeding the criteria for Class C, especially for Cu and Pb and to a lesser extent by Cr, Zn and Hg, and finally Ni and Cd. It estimated that at Kwun Tong area, Class C sediment was about 2-3m thick (**Figure 2.1**). None of the samples have the organic micro-pollutants detected. Subsequent phases of the SI were to refine the mapping of the extent of heavy metal distribution and the findings was consistent with phase 1 (**Figure 2.2**).

2.2 2001 SEKDCFS EIA

2.2.1 The approved EIA Report for *Agreement No. CE 32/99 Comprehensive Feasibility Study for the Revised Scheme of South East Kowloon Development* (SEKDCFS EIA Report; EIA Register AEIAR-044/2001) also assessed the sediment quality of Kwun Tong – Kowloon Bay – To Kwa Wan area. The site investigation (SI) was based on a simple grid system (220 m) to allocate the sediment sampling points. Seven sampling points were selected for the Kai Tak Approach Channel (KTAC; AC1 to AC7), four in Kwun Tong Typhoon Shelter (KTTS; KT1 to KT4) and seven in To Kwa Wan Typhoon Shelter (TKWTS) / Kowloon Bay (KB1 to KB7) (**Figure 2.3**).

2.2.2 Vibrocore samples were collected at the sampling points. The vibrocore penetrated into the unconsolidated mud layer until the more compact consolidated sand layer was encountered. Vertical profile of the sediment core was taken at each sampling point. Three sediment samples were collected at the top 1 m layer, middle 1 m layer and bottom 1 m layer of each vibrocore sample when the sediment length was greater than 3 m. For sediment length between 900 mm and 3 m, three equal sections were divided from the top of the vibrocore samples. For sediment length less than 900 mm, three equal sections of 300 mm were divided from the top of vibrocore samples.

2.2.3 The sediment samples were analysed for a suit of chemical parameters including heavy metals Cd, Cr, Cu, Hg, Ni, Pb, Zn and Ag, metalloid arsenic (As) and organic micro-pollutants including PCBs, PAHs and TBT in interstitial water. Other parameters analysed included total organic carbon (TOC), sediment oxygen demand (20 days; SOD_{20}), total sulphide and acid volatile sulphide (AVS) for determination of potential biogas generation. The metals, metalloid and organic micro-pollutants results were evaluated using criteria stipulated in both the TC NO. 1-1-92 and WBTC No 3/2000 (which was similar to the current ETWB TCW No 34/2002 with respect to testing parameters and classification criteria). Overall, all the sediment were Category H material based on WBTC No. 3/2000 and for AC1 to AC6, at least one layer showed contaminant concentrations exceeding 10x LCELs. Further details on the results of KTAC and KTTS in the vicinity of Trunk Road T2 are discussed below. As the sampling points of TKWTS/Kowloon Bay were farther away from the marine works of Trunk Road T2, these are not further discussed.

2.2.4 The results of the KTAC sediments showed that concentrations of most of the tested parameters were very high, except arsenic. The sediments in the KTAC were considered seriously contaminated. The contamination in the KTAC sediments was dominated by Cu, Ag, Cr, Ni, Zn and to a lesser extent by Pb, Hg and Cd. The sediments at sampling points AC1 to AC5 located near the entrance of Kai Tak Nullah showed higher contamination levels. The contamination levels at sampling points AC6 and AC7 located farther away from the entrance of Kai Tak Nullah were comparatively lower. The organic micro-pollutants (PCBs, PAHs and TBT) were generally high in concentrations especially the PCB levels at AC2 and AC5. The TBT levels at AC6 and AC7 were found to be higher than that of the other sampling points in the KTAC.

2.2.5 For the Trunk Road T2 project, the results of KTTS are particularly relevant as the sampling points are adjacent to the proposed alignment. KT1 and KT2 are near the south apron landing while KT3 and KT4 are close to the Cha Kwo Ling landing (**Figure 2.3**). The results indicate KT1 to KT4 are Category H material and the contamination level are summarised in **Tables 2.1** and **2.2** below. As indicated in **Table 2.1**, the sediments samples are Category H and the contamination in the KTTS sediments (KT1 and KT2) showed similar characteristics as that in the KTAC. The Cu concentrations in the sediments were the highest and exceeded 10xLCEL. The contamination was dominated to a lesser extent by Pb, Cr, Zn, Cd and Ni. Some of the Ag and Hg contents were several times higher than their LCELs. The As levels at all the sampling points were below the LCEL except the lower sediment layer (1.49–2.05m) at KT2. The measured organic micro-pollutant concentrations (PCBs, PAHs and TBT) were high at KT1 and KT2 and with the total PCBs also exceeding the 10x LCEL. The contamination levels were found to be higher mostly in the upper and middle layers of the sediments. The sediments collected at sampling points KT3 and KT4 located near the exit of Tsui Ping Nullah were found to be less contaminated.

Table 2.1 KTTS Sediment Quality (DASO parameters) and Classification

Stat	Depth (m)	Ag	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	PAHs (LMW)	PAHs (HMW)	Total PCBs	TBT	Cat
	UCEL	2	42	4	160	110	40	110	270	1	3163	9 600	180	0.15	
	UCEL	1	12	1.5	80	65	40	75	200	0.5	550	1 700	23	0.15	
KT1	0.30-0.60	**4.24**	6.0	2.68	**369**	**1 600**	**81.3**	**224**	**449**	**1.33**	166	1 397	**340**	<0.015	H
KT1	0.60-0.90	**3.62**	6.3	2.85	**361**	**1 570**	**84.3**	**159**	**493**	**1.29**	197	1 381	**430**	-	H
KT1	0.90-1.20	**2.02**	6.1	1.35	98	**382**	29.8	94.2	213	**1.02**	90	668	100	-	H
KT2	0.35-0.92	**4.79**	5.9	3.59	**567**	**2 959**	**136**	**180**	**589**	**1.37**	315	1 883	**270**	<0.015	H
KT2	0.92-1.49	**5.18**	4.8	**6.37**	**645**	**1 104**	**87.7**	**398**	**502**	**1.77**	305	1 858	**1 600**	-	H
KT2	1.49-2.05	0.35	11.9	0.13	27	39	17.8	**129**	177	**2.62**	200	1 191	11	-	H
KT3	0.10-1.10	**3.49**	5.9	1.08	108	**436**	26.9	76.8	267	0.69	209	1 499	22	-	H
KT3	1.40-2.40	**2.20**	4.5	1.62	113	**587**	26.9	80.3	193	0.68	84	142	94	-	H
KT3	2.70-3.70	**2.67**	4.8	3.01	134	**628**	30.5	102	226	0.93	47	55	110	-	H
KT4	0.00-1.00	1.59	3.4	0.34	34	**117**	9.9	64.7	82.2	0.22	50	247	14	0.017	H
KT4	1.40-2.40	1.31	4.0	0.73	101	**234**	28.0	59.5	157	0.70	132	1 270	130	-	H
KT4	2.80-3.80	**2.10**	6.0	0.54	142	**187**	30.8	76.6	208	**1.02**	132	1 056	**360**	-	H

All metals and metalloid are in mg/kg dry wt., except organic metal TBT which is in ugTBT/L; All PAHs and PCBs are in ug/kg dry wt.
Grey cell = values exceeded LCEL; Bold value = values exceed UCEL; Underline value = values exceed 10x LCEL.
Cat: Category of material based on ETWB TCW No. 34/2002.

Table 2.2 KTTS Sediment Quality (None-DASO parameters)

Stat	Depth (m)	Total Sulphide	AVS	Moisture	TOC	SOD_{25}
unit	m	mg/kg dry wt.	mg/kg dry wt.	%	% (dry wt.)	mg/kg dry wt.
KT1	0.30-0.60	2.0	2272	50.7	2.03	8010
KT1	0.60-0.90	0.5	1902	48.2	3.51	6470
KT1	0.90-1.20	0.5	880	41.6	1.03	2960
KT2	0.35-0.92	0.5	3968	50.6	5.57	8760
KT2	0.92-1.49	3.0	5433	61.9	3.67	8840
KT2	1.49-2.05	0.5	9	43.5	1.59	1060
KT3	0.10-1.10	0.5	1265	52.1	1.67	3960
KT3	1.40-2.40	0.5	614	38.3	1.13	3390
KT3	2.70-3.70	0.5	144	41.7	1.37	3400
KT4	0.00-1.00	0.5	282	30.8	1.16	1290
KT4	1.40-2.40	0.5	339	37.7	3.21	3540
KT4	2.80-3.80	0.5	821	45.9	1.66	2430

2.2.6 .

Table 2.3 KTTS Surface Sediment Elutriate (DASO parameters) Results

Stat	Cd	Cr	Cu	Hg	Ni	Pb	Zn	Ag	As	Total PCBs	PAHs (LWM)	PAHs (HWM)	TBT
Unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
KT1	0.2	<10	<2	0.052	3	<1	20	<1	6	<1	<<12	<<20	5.6
KT2	<0.2	<10	<2	0.042	7	<1	<10	<1	6	<1	<<12	<<20	1.96
KT4	<0.2	<10	<2	0.021	3	<1	<10	<1	8	<1	<<12	<<20	0.083
mean	<0.2	<10	<2	0.038	4.3	<1	<13.3	<1	6.7	<1	<<12	<<20	2.55

Elutriate tests were done for surface grab sediment samples only. TBT in ugTBT/L.

Table 2.4 KTTS Surface Sediment Elutriate (None-DASO parameters) Results

Stat	TKN	NO_3-N	NO_2-N	NH_4-N	Total-P
Unit	mg/L	mg/L	mg/L	mg/L	mg/L
KT1	12.5	<0.01	0.01	13.9	1.2
KT2	15.9	<0.01	0.01	18.1	4.1
KT4	4.1	<0.01	<0.01	4.25	0.8
Mean	10.8	<0.01	<0.01	12.1	2.0

Elutriate tests were done for surface grab sediment samples only.

2.2.7 As reclamation was one of the options considered during the SEKDCFS EIA study, contaminants in pore water samples were also tested to evaluate the potential of release when non-dredged reclamation methods were considered. Surface grab samples were collected at the 9 sampling stations in the KTAC, KTTS and To Kwa Wan / Kowloon Bay to test the contaminant levels in pore water. For the Trunk Road T2 project where the main marine works are dredging for the IMT tunnel, pore water release shall not be the main concern. Nonetheless, the results of KTTS which is within the project area summarised in **Tables 2.5** and **2.6**.

Table 2.5 KTTS Surface Sediment Porewater Test (DASO parameters) Results

Stat	Cd	Cr	Cu	Hg	Ni	Pb	Zn	Ag	As	Total PCBs	PAHs (LWM)	PAHs (HWM)	TBT
Unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
KT1	0.4	22	<1	0.099	14	<1	30	<1	<10	<1	<<12	<<20	<0.015
KT2	<0.2	14	<1	0.058	36	<1	30	<1	<10	<1	<<12	<<20	<0.015
KT4	<0.2	2	<1	0.060	4	<1	10	<1	30	<1	<<12	<<20	<0.015
Mean	0.27	13	<1	0.072	18	<1	23	<1	<17	<1	<<12	<<20	<0.015

Porewater tests were done for surface grab sediment samples only. TBT in ugTBT/L.

Table 2.6 KTTS Surface Sediment Porewater Test (None-DASO parameters) Results

Stat	TKN	NO_3-N	NO_2-N	NH_4-N	Total-P
Unit	mg/L	mg/L	mg/L	mg/L	mg/L
KT1	30.1	0.16	0.04	29.4	7.1
KT2	36.1	0.02	<0.01	37.6	6.6
KT4	16.1	2.86	<0.01	14.1	3.1
Mean	27.4	1.01	0.02	27.0	5.6

Porewater tests were done for surface grab sediment samples only.

2.3 2007 Cruise Terminal Dredging EIA / 2008 Kai Tak Development EIA

2.3.1 Additional SI, sediment sampling and testing was carried out around the proposed cruise terminal south of the ex-runway in 2007 under Agreement No. KDO 01/2006 *Site Investigation and Contamination Assessment at Remaining Area of Former Kai Tak Airport and Proposed Cruise Terminal*. The results were adopted in the schedule 3 EIA for *Kai Tak Development* (KTD EIA) and schedule 2 EIA for *Dredging Works for Proposed Cruise Terminal at Kai Tak* (CT Dredging EIA) prepared under Agreement No. CE 35/2006. The 2007 SI, sampling and testing of sediment quality is at the dredging footprint of the proposed cruise terminal (CT). As the contamination levels at the CT dredging area was expected to be high, the sampling plan was based on 100 x 100m grid scheme following the current ETWB TCW No 34/2002. Since, the anticipated CT dredging depth was only down to -12mCD requiring removal of the top few meters of sediment, both grab sampler for surface sediments and vibrocores for vertical profiling were used. The sediment sampling plans and sampling methods are summarised in **Figure 2.4**.

2.3.2 At total of 73 stations were sampled and 167 sediment sub-samples tested. The sediment samples were tested for the full list of chemical parameters stipulated in ETWB TCW No 34/2002 including TBT in interstitial water and chlorinated pesticides (12 components including DDT and DDE). The sediment were also tested for other parameters like ammonia nitrogen (NH_4N), total Kjeldahl nitrogen (TKN), nitrate nitrogen (NO_3-N), nitrite nitrogen (NO_2-N), total phosphorus (Total-P), TOC, SOD_{20}, total sulphide and AVS.

2.3.3 The chemical analysis results indicated that heavy metals were generally detected but organic contaminants (TBT, PAHs and PCBs) were generally non-detected (0 – 10% above reporting limits) indicating contamination by organic compounds should not be the key concerns. Among the 167 sediment sub-samples, 12 (7%) samples were Category H with contaminant concentrations exceeding the UCELs (Cu, Ni, Hg or Ag) but all were below the x10 LCEL criteria, 13 (8%) samples were Category M with contaminant concentrations exceeding the LCELs (As, Cu, Pb, Hg, Ag or Total PCBs). The remaining 142 (85%) samples were non-contaminated materials and have contaminants concentrations below the LCELs.

2.3.4 The 13 Category M material were subject to further biological tests following ETWB TCW No 34/2002. 7 sediment samples passed the biological screening while the remaining 6 sediment samples failed the biological screening. The testing results for the CT Dredging works are summarised in **Figure 2.5**. Since none of the samples fall within the present study area, the numerical results are not tabulated here.

2.4 Bioremediation Pilot Scale Field Test at KTAC

2.4.1 Under Agreement No. CE 4/2004 (TP) *South East Kowloon Development Comprehensive Planning and Engineering Review Stage 1 Planning Review* (KTPR), a pilot scale field test was commenced in January 2006 to ascertain the effectiveness of bioremediation at KTAC with post-remediation performance monitoring. About 1ha at the KTAC near Kai Tak Nullah (KTN) was injected with calcium nitrate solution and the site layout is presented in **Figure 2.6**. Based on the previous site investigation in the SEKDCFS EIA, the filed test site was considered as one of the locations with relatively high contamination levels. Core sediment samples (down to 0.3m; c.f., nitrate injection down to 0.5m) were analysed for a suit of parameters including those of ETWB TCW 34/2002 before and after the nitrate injection to verify bioremediation performance. The details of the monitoring results were reviewed and reported in the "*Final Report on Bioremediation Pilot Scale Field Test at Kai Tak Approach Channel (Issue 2)*" dated October 2007 and a summary of key finding are presented below.

Post-1-Month Monitoring

2.4.2 The results of post-1-month monitoring shown that bioremediation to remove odour and reduce sediment toxicity at KTAC were acceptable and key findings are:

- The sediment AVS were reduced by 86-98%;
- Residual nitrate level in sediment samples were between 35-76% of total application;
- There was no obvious removal of TOC as up to the post-1-month monitoring;
- The total heavy metal contents show no obvious trend of increase or decrease. There were some apparent decreases in the metal contents of the elutriated water samples. Results of heavy metals in pore-water of sediments show no trend of change.

- TBT were not detected (RL=0.015 ug/L) before and after injection;
- Within the 18 groups of PCBs analyzed, an average reduction in PCB concentrations of 62% was observed in 11 groups. All results (pre- and post-treatment) were below analytical limits for the remaining 7 groups;
- A big decrease (-65%) in LMW PAH concentrations was recorded for low molecular weight PAHs as compared to the baseline results. Similarly, a decrease of ~33% was calculated for HMW PAHs;
- Reduction in sediment toxicity was also reported by Microtox testing by direct sediment contact technique. After treatment, the averaged EC50 value had increased to over 5 times with respect to that of pre-treatment. Similarly, the Microtox testing showed an increase (over 54%) in luminescence ratio (L.R.) with the saline extract technique; and
- Sediment bioassays results (i.e. amphipod, bivalve larvae and polychaete) showed slight improvements in survival rate starting from all zero at the beginning.

Post-3-Month Monitoring

- Post-3-month monitoring was conducted in June 2006 and an apparent continues improvement was noted. The key results were:
- The AVS levels in sediment samples continued to decline in the post-3-month monitoring event The AVS removal rates with reference to the baseline data were between 95% to almost 100%;
- The residual nitrate levels in sediment samples shown both increases and reduction but the increase were considered dubious and further monitoring recommended. Additional monitoring in August 2006 confirmed that there was a decrease in nitrate concentrations in all treatment areas;
- The mean TOC value recorded in post-3-month monitoring was 5% while 7.7% of mean TOC value was recorded in the pre-treatment measurement. However, the trends observed were considered likely be due to natural fluctuation in the field environment. Additional monitoring in August 2006 recorded mean TOC level of 7% comparable to the pre-treatment level. Longer period of monitoring was considered required to observe the process of TOC breakdown in the sediments;
- Heavy metal concentrations in sediment did not show an obvious trend in the post-3-month monitoring when compared with the pre-treatment and post-1-month values. On the other hand, a generally increasing trend for copper and zinc concentrations were observed in the pore water. No obvious trends were observed for the heavy metals in elutriate;
- TBT were not detected (RL=0.015 ug/L) before and after injection;

- For PCBs, its concentrations continued to decrease in all treatment areas and an average reduction of 70% was recorded in the post-3-month monitoring with reference to the pre-treatment values. The results revealed that degradation of PCBs has been carried out continuously;

- The LMW PAHs concentrations had a great reduction of 69% in the post-3-month monitoring when compared with the pre-treatment value. However, for HMW PAHs, its concentrations fluctuated and maintained at about 30% reduction after post injection;

- Microtox results showed further reduction in sediment toxicity when compared with the post-1-month results. The mean EC50 value in the post-3-month monitoring results was 2.83% which was over one hundred times less toxic than the pre-treatment value (0.02); and

- The survival rate of organisms (i.e. amphipod, bivalve larvae and polychaete) in the sediment bioassays were in general increasing, which demonstrated that the sediment is becoming less toxic, though a longer period of time was considered required for more obvious improvements.

Post-6-Month Monitoring

- Post-6-month monitoring was conducted in September 2006 and apparent continues improvement was noted. The key results were:

- The AVS level in sediment was significantly declined to below the detection limit (1 mg/kg dry wt.) for all four areas in the post-6-month monitoring event after the 2nd injection, which reach a notable AVS removal rates of above 99.9% with reference to the baseline data;

- The residual nitrate levels in sediment samples for all four areas showed a general decrease by 50% compared to the levels recorded in the post-3-month monitoring;

- The mean TOC value recorded in post-6-month monitoring was 7.2% while that recorded in the pre-treatment monitoring was 7.7%. Similar to previous observations, trends was likely to be due to the natural fluctuation in the field environment;

- TBT were not detected (RL=0.015 ug/L) before and after injection;

- Heavy metal concentrations in sediment did not show an obvious trend in the post-6-month monitoring. Furthermore, no obvious trends were observed for the heavy metals in elutriate;

- For PCBs, after a trend of continuous decreasing, the monitoring results showed a slight increase in three treatment areas (A1, A2 and A3; increase with a range of 1% to 8%). However, a 3% decrease in PCB concentration was noted at the 4th area. The results revealed that degradation of PCBs might have slowed down;

- When compared to the post-3-month monitoring results, both LMW and HMW PAHs concentrations were found to have increased for treatment areas A1, A2 and A3 for the post-6-month monitoring. However, both LMW and HMW PAHs concentrations were measured to have decreased for treatment area A4;

- Microtox results showed further reduction in sediment toxicity when compared with the post-3-month results. The mean EC50 value in the post-6-month results was 6.15% which was over one hundred times less toxic than the pre-treatment value (0.02); and

- The survival rate of organisms (i.e. amphipod, bivalve larvae and polychaete) in the sediment bioassays were in general increasing, which demonstrated that the sediment is becoming less toxic, though a longer period of time is required for more obvious improvements.

Post-12-Month Monitoring

2.4.3 Post-12-month monitoring was conducted in March 2007 and the key findings were:

- The AVS levels in sediment remained low for treatment areas A1 and A2 (area A1: 9.9 mg/kg dry wt. and area A2: < 1 mg/kg dry wt.). However, AVS revival was observed for areas A3 and A4, with concentration of 1,700 mg/kg dry wt. and 1,300 mg/kg dry wt. respectively. The revival of AVS might be caused by the newly deposited contaminated sediments from the upstream pollution sources and the observed nitrate depletion as discussed below;

- The residual nitrate levels had greatly dropped to less than 20 mg/NO3-N/L for areas A3 and A4 while for areas A1 and A2, levels of less than 2000 mg/NO3-N/L were recorded. The residual nitrate levels in sediment samples for treatment areas A3 and A4 can reasonably explain the revival of AVS as discussed above;

- The mean TOC value recorded in post-12-month monitoring was 4.8% while that recorded in the pre-treatment monitoring was 7.7%. The decrease in TOC level properly indicates that the organics has started to degrade;

- TBT were not detected (RL 0.015 ug/L) before and after injection;

- Heavy metal concentrations in sediment have shown a general decrease on all parameters for all four treatment areas over the treatment period. However, no obvious trends were observed for the heavy metals in elutriate;

- The PCBs levels start to decrease again in the post-12-month monitoring. The degradation of PCBs might have been picked up again during the post-treatment period. An overall decrease of more than 80% was achieved from the bioremediation treatment;

- When compared to the post-6-month monitoring results, both LMW and HMW PAHs concentrations were found to have decreased for all treatment areas for the

post-12-month monitoring. However, an increase in HMW PAHs concentrations was measured in treatment area A4;

- As the AVS level had risen significantly, the Microtox results showed increase in sediment toxicity when compared with the post-6-month results. The mean EC50 value in the post-12-month results was 1.17% which was still over one hundred times less toxic than the pre-treatment value (0.02); and

- The survival rate of organisms (especially amphipod) in the sediment bioassays has boosted from a mean value of 3.5%-4.0% (post-6-month monitoring) to 59.5%-72% (post-12-month monitoring) in treatment areas A1 and A2 while increases in area A3 and A4 were also noted (from a mean value of 2.5%-30.5% to 12%-79%).

Summary of Results and Further Works

2.4.4 The pilot scale bioremediation works and subsequent monitoring indicated that bioremediation works can effectively reduced the organic pollutants including PCBs and PAHSs which were two of the major class of persistent contaminants in the sediment deposited at KTAC and KTTS. The KTD EIA has been recommended local improvement including both localised dredging and in-situ bioremediation to be applied to a wilder scale covering the entire KTAC and KTTS as shown in **Figure 2.7**. The bio-remediation works could have an overall beneficial effect on the sediment quality, especially on the reduction of organic pollutants, of the KTAC and KTTS area including the study area for Trunk Road T2.

2.4.5 Depending on the actual scale of application (e.g., depth) and also the implementation schedule, this could have some bearing on the sediment quality of the study area. As the improvement works can be concurrent with the Trunk Road T2 project rendering the potential beneficial not materialised during the early stage of Trunk Road T2 construction, and also possibility covering the shallow sediment, for the purpose of this working paper, SI is considered still necessary.

2.5 Submarine Outfall of Kwun Tong Preliminary Treatment Works

2.5.1 There is a submarine outfall (twin 2100 mm diameter pipes; KTPTW Outfall) emerged from the Kwun Tong Preliminary Treatment Works (KTPTW) crossing the project alignment. DSD previously advised that the KTPTW Outfall was operated between 1985 and late 2001 and it was subsequently put aside as KTPTW emergency bypass as the effluents is diverted to HATS. DSD was not able to provide details on the discharge quality. The discharge licence (Licence No. KTE-997A) for the plant prior to the switch did not impose restriction on the quality of the effluents although the flow was restricted to 944,000 m^3/day. It should be noted that the discharge point of this outfall is at the high flow area of Victoria Harbour and effluent released should be rapidly dispersed rather than accumulated in the study area.

2.5.2 While this outfall is presently at standby mode for emergency use only, its crossing with the Trunk Road T2 tunnel represent a constraint to the proposed SI works. In order to

prevent any accidental damages to it, a safety buffer of 40m from the central line of the outfall will have to be allowed and no drilling and/or vibrocore shall be conducted within this safety buffer zone without DSD's approval. The other constrains to the SI works are further discussed in Section 4 below.

2.6 EPD Sediment Quality Monitoring

2.6.1 EPD maintains a sediment quality monitoring programme covering the open waters and typhoon shelters of Hong Kong. The nearest EPD open water sediment monitoring station is VS3 in Victoria Harbour while the KTTS monitoring station is VS14. The locations of these two monitoring stations are shown in **Figure 2.8**.

2.6.2 The surface sediment testing results conducted between 2003 to 2007 are summarised in **Table 2.7**. As indicated in the **Table 2.7**, the KTTS sediment is generally Category H material contaminated with high level of metals and to a lesser extent organic pollutants PCBs and PAHs and levels as high as >10x LCELs were recorded. The open water o Victoria Harbour (VS3) was comparatively clean although contamination with copper, mercury, silver and zinc were also evident. VS3, however, is closer to North Point on Hong Kong Island and the results were likely to reflect the sediment condition on the Hong Kong side rather than the Project Area.

Table 2.7 EPD Sediment Quality Monitoring 2003 – 2007 Results

Contaminants	Unit	LCEL	UCEL	VS3 (Open Water)	VS14 (KTTS)
Cd	mg/kg dry wt	1.5	4	0.2 - 0.6	2.0 - **4.4**
Cr	mg/kg dry wt	80	160	18 - 59	**210 - 490**
Cu	mg/kg dry wt	65	110	57 - **190**	**1 400 - 2 500**
Hg	mg/kg dry wt	0.5	1	0.21 - 0.72	0.58 - **1.20**
Ni	mg/kg dry wt	40	40	10 - 27	**63 - 110**
Pb	mg/kg dry wt	75	110	39 - 65	75 - **140**
Zn	mg/kg dry wt	200	270	93 - 250	**370 - 550**
Ag	mg/kg dry wt	1	2	1.7 - **6.0**	6.3 - **12.0**
As	mg/kg dry wt	12	42	5.2 - 9.0	5.5 - 8.6
Total PCBs	µg/kg dry wt	23	180	18 - 22	150 - **470**
PAHs (LWM)	µg/kg dry wt	550	3 160	90 - 140	110 - 170
PAHs (HMW)	µg/kg dry wt	1 700	9 600	90 - 670	750 - 2 000
TKN	mg/kg dry wt	--	--	350 - 1 200	410 - 890
NH_4N	mg/kg dry wt	--	--	0.4 - 20.0	11.0 - 51.0
Total-P	mg/kg dry wt	--	--	130 - 430	160 - 310
Total Sulphide	mg/kg dry wt	--	--	24 - 590	25 - 2,500

Vales are presented as min-max.
Grey cell = values exceeded LCEL; Bold value = values exceed UCEL; Underline value = values exceed 10x LCEL.

2.7 Summary of Previous Finding

2.7.1 The sediment of KTAC/KTTS is well known to be heavily contaminated with heavy metals and micro-organic contaminants like PAHs and PCBs. Previous sediment quality studies and EPD monitoring data confirmed that the contamination levels were very high and exceeding UCEL and 10xLCEL stipulated in the latest technical circular ETWB TCW No. 34/2002 for sediment classification and management.

2.7.2 The 2001 SEKDCFS EIA report provides the most relevant information for this Project with four stations (KT1, KT2, KT3 and KT4) along Trunk Road T2 alignment and associated facilities (**Figure 2.3**). The SEKDCFS EIA have the sampling depth down to 3.8m below seabed level and the results indicated the KTTS sediment were all Category H material (due to Cd, Cr, Cu, Hg, Ni, Pb, Zn, Ag, PAHs and PCBs, but not As or TBT). Copper and Total PCBs were also found to be above 10xLCEL in 5 sub-samples out of a total of 12 total sub-samples. Sediment pore-water and elutriate test, however, indicated the contaminants were mostly firmly sediment bound and have a low potential to dissociate into the water columns.

2.7.3 EPD's KTTS monitoring station (VS14) is also along Trunk Road T2 alignment (**Figure 2.8**) although only the surface samples were studied. The monitoring results were generally consistent with other sediment quality studies and the surface sediment were also found to be Category H material (due to Cd, Cr, Cu, Hg, Ni, Pb, Zn, Ag, PAHs and PCBs, but not As).

2.7.4 KTD EIA recommended improvement of sediment quality of KTAC/KTTS including localised dredging (down to –4 mPD) and in-situ bioremediation. These efforts should improve the sediment quality of the KTAC/KTTS area within the Kwun Tong breakwater. However, this is primary to address the odour problem and localised dredging would be on the shallow waters and on site trial of bioremediation suggested the method would have limited effect on the metallic contaminations.

2.8 Geotechnical Information of the Site

2.8.1 There is only limited project specific ground investigation along the T2 alignment and geotechnical GI is being planned together with the environmental GI. An extract of the general geotechnical information from the Preliminary Design Report and Design Memorandum of Trunk Road T2 (Final) prepared under the KTDES is presented below.

2.8.2 Fill: A layer of fill, which generally varied from approximately 0m to 15m thick, was encountered in drillholes along T2. The material was generally described as:

a) Grey, pinkish grey and yellowish brown angular fine to course GRAVEL, COBBELS and BOULDERS of moderately strong to strong Granite and Tuff.

b) Greyish brown, angular COBBLES (MDG) with some angular course gravel sized moderately decomposed rock fragments.

c) Greyish brown sandy fine to coarse GRAVEL with occasional angular cobbles / boulders.

d) Medium dense grayish brown, silty fine to coarse SAND with some angular to subangular fine quartz gravel and occasional shell fragments.

e) Medium dense grey dappled dark grey silty fine to medium SAND with occasional subangular fine quartz gravel and shell fragments (FILL / DISTURBED MARINE DEPOSITS).

f) Firm, grey dappled brown CLAY with some subangular fine gravel sized quartz and moderately decomposed rock fragments.

2.8.3 Marine Deposit: A layer of marine deposits, which varied from approximately 2m to 14m thick, was encountered in drillholes along T2. The material was generally described as: Soft to firm, dark grey, sandy, silty CLAY/SILT with occasional shell fragments.

a) Soft, dark grey, silty CLAY.

b) Grey andd dark grey, angular

c) Very soft, dark grey, silty CLAY.

d) Very soft to soft, light grey, silty CLAY

e) Very soft, grey becoming light grey, slightly sandy CLAY with occasional fine shell fragments.

2.8.4 Alluvium: A layer of alluvium, which varied from approximately 5m to 25m thick, was encountered in drillholes along T2. The material was generally described as:

a) Light brown grey sandy angular fine GRAVEL (QUARTZ).

b) Dense to medium dense, silty clayey fine to coarse SAND and brown silty fine to coarse SAND with much angular fine quartz gravel and occasionally with some surrounded cobbles of moderately decomposed Tuff.

c) Soft to stiff, light grey and brown silty CLAY/SILT with occasional angular fine quartz gravel.

2.8.5 The saprolitic soil stratum, comprising grade V to IV material, was encountered in drillholes. The thickness varied from less than 10m to over 40m. The saprolitic soils primarily consisted of completely to highly decomposed, medium to coarse grained granite.

2.8.6 The bedrock, which was encountered in most of the current drillholes as well as some of the previous drillholes along T2, lied at the shallowest level of about -15mPD at Cha

Kwo Ling side to the deepest level of about -60mPD in the marine area. Fine to coarse grained granite was encountered which was the predominant bedrock in the study area.

2.8.7 Granite was generally described as strong, pinkish grey, spotted dark green, dappled brown, slightly decomposed fine to coarse grained granite. Joints were closely to medium spaced, locally very closely and widely spaced, rough stepped and rough planar, occasional rough undulating, extremely narrow to very narrow, iron and manganese stained, occasional kaolin chlorite coated.

Soil and Rock Properties and Design Parameters

2.8.8 The soils and rock design parameters proposed under KTDES for soils and rocks are indicated on **Tables 2.8 - 2.10**.

Table 2.8 Preliminary Geotechnical Design Parameters

Geological Unit	Effective Stress Shear Strength Parameter		Bulk Unit Weight
	c' (kPa)	Φ' (Degrees)	γ (kN/m^3)
Compact Fill	0	37	19
Fill – Sand	0	33	19
Fill – Rock	0	45	19
Marine Clay	0	28	16
Marine Sand (loose)	0	34	19
Alluvium Clay	2	27.5	19
Alluvium Sand (dense)	0	37	20
CDG	5	37	19

Table 2.9 Preliminary Geotechnical Design Parameters

Geological Unit	Permeability		Preliminary Bearing Capacity
	Min (m/s)	Max (m/s	(kN/m^2)
Fill – Sand (loose)	5×10^{-5}		750
Fill – Sand (dense)	5×10^{-5}		150
Fill – Course	1×10^{-3}		150
Marine Clay	1×10^{-6}		10
Marine Sand (loose)	2.7×10^{-5}		75
Alluvium Clay	2.439×10^{-7}	4.53×10^{-5}	75
Alluvium Sand (dense)	2.4×10^{-5}	5.4×10^{-5}	150
CDG	4.1×10^{-7}	3.28×10^{-5}	300

Table 2.10 Preliminary Geotechnical Design Parameters

Geological Unit	Consolidation Characteristics				
	Initial Void Ratio e_0	**Comp. Index c_c**	**Coeff. of Vertical Consolidation c_v (m^2/yr)**	**Coeff. of Horizontal Consolidation c_h (m^2/yr)**	**Coeff. of Secondary Compression c**
Compacted Fill (dense)	-	-	-	-	0.001
Fill – Sand	-	-	-	-	0.002
Fill – Course	-	-	-	-	0.002
Marine Clay	2.0	0.8	1	1.5	0.008
Marine Sand	-	-	-	-	-
Alluvium Clay	0.4	0.2	5	7.5	0.003
Alluvium Sand	-	-	-	-	-
CDG/HDG (Granite)	0.71	0.18	8	12	-

Seabed Level and Bathymetry

2.8.9 The marine charts HK0801 and HK0802 provide the general bathymetry of the study area. To provide a better resolution of the seabed level of the study area, sounding data of Kowloon Bay area was collected directly from the Hydrographic Office of Marine Department which is a compilation of sounding data collected between 2003-08 (**Figure 2.10**).

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3 SECTION 3 – PROPOSED SEDIMENT QUALITY SAMPLING AND TESTING

3.1 The Necessity of Site Specific Sediment Quality Sampling and Testing

3.1.1 The previous sediment quality studies have five stations that are along the Project works and provides site specific information about the sediment quality along the project alignment. However, these studies focused on the surface and top layers of the sediment which could be more heavily contaminated than the underneath layers and could thus over-estimated the potential environmental risk as the dredging works for the submarine tunnel can go as deep as ~ -20mPD. There were generally no site specific sediment quality data for level below -4mPD. Furthermore, the stations were mostly along the two end of the tunnel landing and information was not generally available for the middle section of the alignment. It is therefore considered desirable to collect further site specific information about sediment quality along the project alignment to enable a better characterisation of the contamination status for the purpose of EIA study. To allow re-using the EIA data for subsequent DASO permit application, SI and sediment quality sampling and testing shall also take note of the requirement of technical circular ETW TCW No. 34/2002.

3.2 Sediment Sampling and Testing Scheme

3.2.1 The marine disposal of dredged/excavated spoil is regulated by the Dumping at Sea Ordinance (DASO). The technical circular for the *Management of Dredging/Excavated Sediment* (ETWB TCW 34/2002) provides, among the others, guidelines for waste characterisation and dump site selection to permit application under DASO. This circular is referred in designing the sampling and testing scheme to characterise the marine mud of the study area possibly affected by the project and thus requiring dredging/disposal. Reference are also made to the marine sediment sampling and testing scheme for the CTD EIA and other EIA studies involving sediment contaminations in the region.

Sampling Grid

3.2.2 A general sampling grid of approximately 200m x 200m is adopted following the CTD EIA. For an IMT tunnel with the twin tunnel width of about 30m, a dredging trench of approximately 50m from each side would be required for an average side slope of 3.4 and a trench depth of about 20m. Hence the total width of the dredged trench would be about 136m which is within 200m grid spacing. Hence, sediment samples collected at about 200m interval along the alignment will be sufficient. The tentative sampling locations are shown in **Figures 3.1- 3.5** and the coordinates of the sampling locations shown in **Appendix A**.

Sampling Gears and Vertical Sub-sampling

3.2.3 In general, the sediment samples will be collected with 100mm diameter vibrocore continued down to the bottom of the dredged trench which would be about -20mPD. The sediment core samples shall than vertically split into 1m sub-samples sections on

site. According to ETWB TCW No. 34/2002, chemical testing will be conducted for the following sections of the vibrocore sub-sample: 0-0.9m (seabed), 0.9-1.9m, 1.9-2.9m, 2.9m down, 5.9m down, 8.9m down, 11.9m down, 14.9m down, 17.9m down, and 20.9m down. Based on the marine charts, the seabed level is about -4 mPD to -10mPD along the marine works area and the previous SI suggested that the base of marine deposit is at -10mPD to -15mPD in general and down to -20mPD locally near quay wall at Cha Kwo Ling side. Hence, sampling depth over 20m is not anticipated. Anthropogenic pollution below the marine deposit is also generally not expected.

3.2.4 As recovery of surface sediment by vibrocore can often be low resulting in insufficient amount of sediment samples for subsequent biological testing if need, surface sediment will also be collected using grab sampler as spare for the surface stratum of vibrocore (0-0.9m). If the surface stratum of vibrocore sample is deemed insufficient for the full suit of chemical and biological testing, testing of the stratum will be based on the surface grab sample instead of vibrocore sample.

3.2.5 While vibrocoring will be the main sampling technique, drill holes (e.g., U100) may also be used if there hard substrate at shallow is encounter. There are some known facilities along the alignment and for the safety of these facilities which would constraints the sampling as a safety buffer distance is generally required. To avoid potential safety issue, the sampling point shall be outside the safety buffers of the known. Details about these constraining facilities are discussed in Section 4 below.

3.2.6 As indicated in **Figure 1.8,** the "cut-and-cover tunnel section" and/or "depressed road section" of the roadway on the reclaimed land portion at South Apron and Cha Kwo Ling would also require excavation down to about -20mPD at South Apron, but could be to a deeper level of about -27mPD at Cha Kwo Ling. Temporary works like pipe pile walls, however, may require a further 18m excavation. Hence, marine sediment may be encountered during the land side construction. Thus, in addition to marine based sediment sampling stations, land based sediment sampling stations will also be arranged to collect marine sediment samples below reclamation fill.

3.2.7 For land based sediment sampling, sediment samples will be collected from the top of marine deposit to the bottom of excavation level (or to the hard substrate level such as alluvium). The fill material (about 10m to 14m thick at South Apron, but much more variable at Cha Kwo Ling side) above the marine deposit will not be collected or analysis. Vertical sub-sampling of the sediment will start from the top of marine deposit as the following 0-0.9m, 0.9-1.9m, 1.9-2.9m, 2.9m down, 5.9m down, 8.9m down, 11.9m down, 14.9m down, 17.9m down, 20.9m down, 23.9m down and 26.9m down. The land based stations will be conducted using drill holes (e.g., U100). The land side collected sediment samples will be handled in the same manner as the samples collected from the marine side.

Chemical Testing Schedule

3.2.8 The sediment samples collected will be tested for the suit of parameters as recommended in ETWB TCW No. 34/2002 within 2 weeks of sampling. The proposed chemical testing parameters primarily following the ETWB TCW No. 34/2002

requirement are listed in **Table 3.1** below while the reference analytical methodology is in **Appendix B**. It shall be noted, however, that **Appendix B** shall be updated with testing laboratory which is yet to be procured.

Table 3.1 Sediment Testing Parameters

Contaminants	**Reporting Limit**[2]
Metals and Metalloid	
Cadmium (Cd)	0.2 mg/kg dry wt.
Chromium (Cr)	8 mg/kg dry wt.
Copper (Cu)	7 mg/kg dry wt.
Mercury (Hg)	0.05 mg/kg dry wt.
Nickel (Ni)	4 mg/kg dry wt.
Lead (Pb)	8 mg/kg dry wt.
Silver (Ag)	0.1 mg/kg dry wt.
Zinc (Zn)	20 mg/kg dry wt.
Arsenic (As)	1 mg/kg dry wt.
Organic Pollutants	
Low Molecular Weight PAHs[1]	
Naphthalene	55 µg/kg dry wt.
Acenaphtylene	55 µg/kg dry wt.
Acenaphtene	55 µg/kg dry wt.
Fluorene	55 µg/kg dry wt.
Phenanthrene	55 µg/kg dry wt.
Anthracene	55 µg/kg dry wt.
High Molecular Weight PAHs[1]	
Benzo(a)anthracene	170 µg/kg dry wt.
Benzo(a)pyrene	170 µg/kg dry wt.
Chrysene	170 µg/kg dry wt.
Dibenzo(ah)anthracene	170 µg/kg dry wt.
Fluoranthene	170 µg/kg dry wt.
Pyrene	170 µg/kg dry wt.
Benzo(b)fluoranthene	170 µg/kg dry wt.
Benzo(k)fluoranthene	170 µg/kg dry wt.
Indeno(1,2,3-cd)pyrene	170 µg/kg dry wt.
Benzo(ghi)perylene	170 µg/kg dry wt.
Total PCBs[1]	
2,4' diCB (PCB 8)	3 µg/kg dry wt.
2,2',5 triCB (PCB 18)	3 µg/kg dry wt.
2,4,4' triCB (PCB 28)	3 µg/kg dry wt.
2,2',3,5' tetraCB (PCB 44)	3 µg/kg dry wt.
2,2',5,5' tetraCB (PCB 52)	3 µg/kg dry wt.
2,3',4,4' tetraCB (PCB 66)	3 µg/kg dry wt.
3,3',4,4' tetraCB PCB 77)	3 µg/kg dry wt.
2,2',4,5,5' pentaCB (PCB 101)	3 µg/kg dry wt.
2,3,3',4,4' pentaCB (PCB 105)	3 µg/kg dry wt.

Contaminants	**Reporting Limit[2]**
2,3',4,4',5 pentaCB (PCB 118)	3 µg/kg dry wt.
3,3',4,4,5 pentaCB (PCB 126)	3 µg/kg dry wt.
2,2',3,3',4,4' hexaCB (PCB 128)	3 µg/kg dry wt.
2,2',3,4,4',5' hexaCB (PCB 138)	3 µg/kg dry wt.
2,2',4,4',5,5' hexaCB (PCB 153)	3 µg/kg dry wt.
3,3',4,4',5,5' hexaCB (PCB 169)	3 µg/kg dry wt.
2,2',3,3',4,4',5 heptaCB (PCB 170)	3 µg/kg dry wt.
2,2',3,4,4',5,5' heptaCB (PCB 180)	3 µg/kg dry wt.
2,2',3,4',5,5',6 heptaCB (PCB 187)	3 µg/kg dry wt.
Organometallics	
Tributyltin (interstitial water)	0.015 µg TBT/L
Tributyltin (whole sediment)[3]	10 µg/kg dry wt.

Notes:
1 Details of the congeners and components are included in **Appendix B**.
2. Suggested upper limit. The accredited reporting limit is to be confirmed by the laboratory contractor.
3. Not a parameter required under ETWB TCW No. 34/2002.

3.2.9 The chemical testing results of each sediment sub-sample will be compared to the sediment quality criteria as stipulated under ETWB TCW No. 34/2002 which is reproduced in **Table 3.2** below. Each sediment sub-sample and the content of the corresponding grid cell will be classified according to the **Table 3.2** below and be classified into Category L (low contamination level; all testing parameter below LCELs), Category M (medium contamination level; any parameter exceed LCEL but none exceed UCEL) or Category H (high contamination level; any parameter exceed UCEL).

Table 3.2 Sediment Quality Criteria for Classification of Sediment

Contaminants	Lower Chemical Exceedance Level (LCEL)	Upper Chemical Exceedance Level (UCEL)
Metals (mg/kg dry wt.)		
Cadmium (Cd)	1.5	4
Chromium (Cr)	80	160
Copper (Cu)	65	110
Mercury (Hg)	0.5	1
Nickel (Ni)*	40	40
Lead (Pb)	75	110
Silver (Ag)	1	2
Zinc (Zn)	200	270
Metalloid (mg/kg dry wt.)		
Arsenic (As)	12	42
Organic-PAHs (µg/kg dry wt.)		
Low Molecular Weight PAHs	550	3160
High Molecular Weight PAHs	1700	9600
Organic-non-PAHs (µg/kg dry wt.)		
Total PCBs	23	180
Organometallics (µg TBT/l in Interstitial water)		
Tributyltin*	0.15	0.15

* Contaminant level is considered to exceed UCEL if it is greater than the value shown.

Biological Testing Schedule

3.2.10 The site is known to be highly contaminated and Category H (>10x LCEL) samples have been previously recorded in the study area. Some Category M material may also be expected as the contamination level transit back to the ambient at depth. Both Category M and H (>10x LCEL) sample would require further biological testing to determine the treatment/disposal option, but not Category H (≤10x LCEL) nor Category L materials. To maximise the cost effectiveness of biological testing, composite samples will be prepared by mixing up to five samples of the same category which are continuous in vertical profile. For Category H (>10x LCEL), a portion of the composite sample will be diluted with 9 portion of reference sediment (i.e. dilution) before testing.

3.2.11 For each composite sample requiring biological test, a suite of 3 toxicity testing species as listed in **Table 3.3a** will be conducted. Fresh reference sediment samples will be collected from Port Shelter (820057N 850234E) using surface grab sampler. The reference sediment will also be tested for the suit of chemical parameters as listed in **Table 3.1** to ensure it is free from contamination. Any biological testing will be commenced within 8 weeks of sampling as recommended in ETWB TCW No. 34/2002.

Table 3.3a Biological Testing Species and Protocol

Test Type	Species[1]	Endpoint Measured	Reference Test Condition
10-day burrowing amphipod	*Ampelisca abdita* *Leptocheirus plumulosus* *Eohaustorius estuarius*	Survival	USEPA (1994)[4] / PSPE (1995)[5]
20-day burrowing polychaete	*Neanthes arenaceodentata*	Dry Weight[2]	PSPE (1995)[5]
48-96 hour larvae (bivalve or echinoderm)	Bivalve: *Mytilus* spp. *Crassostrea gigas* Echinoderm: *Dendraster excentricus* *Strongylocentrotus* spp.	Normality Survival[3]	PSPE (1995)[5]

Notes:
1. Only one species from each testing type is required.
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.
4. U.S.EPA (U.S. Environmental Protection Agency) 1994. *Methods for assessing the toxicity of sediment-associated contaminants with estuarine and marine amphipods*. Office of Research and Development. U.S. Environmental Protection Agency, Cincinnati, OH. EPA/600/R94/025.
5. PSEP (Puget Sound Estuary Program) 1995. *Recommended guidelines for conducting laboratory bioassays on Puget Sound sediments*.

3.2.12 In general, all biological tests should be conducted on composite samples. Composite sample is prepared by mixing up to 5 samples of the same category (M or H) which are continuous in vertical profile.

3.2.13 Sediment classified as Category M shall be subjected to the following three toxicity tests (to be considered as one set) on each composite sample:

- a 10-day burrowing amphipod toxicity test ;
- a 20-day burrowing polychaete toxicity test; and
- a 48-96 hour larvae (bivalve or echinoderm) toxicity test.

3.2.14 Sediment classified as Category H and with one or more contaminant levels exceeding 10 times LCEL shall also be subjected to the above three toxicity tests but in a diluted manner (dilution test). The samples shall be prepared prior to toxicity testing as **Table 3.3b**.

Table 3.3b Preparation of Samples for Biological Testing Species

Sediment characteristics	Preparation method
Category H sediment (> 10 x LCEL)	Sample to be mixed with 9 portions of reference sediment
Category M sediment or Category H sediment (> 10 x LCEL) suspected of ammonia contamination	Additional set of sample (after dilution for Cat. H sediment) to be purged# for ammonia removal (for amphipod test only).

If the ammonia concentration in the overlying water of the test system is ≥ 20 mg/L, purging of sediment is required. This is performed by replacing the overlying water at a rate of 6 volume replacements/24 h for 24 hours, and repeated once only if the ammonia level still exceeds 20 mg/L.

Further Sediment Chemical Testing Schedule

3.2.15 Apart from the testing of sediment parameters as listed in **Table 3.1**, additional testing of TBT, chlorinated pesticides and sediment nutrient contents are also recommended and the suggested parameters are listed in **Tables 3.4-3.5** below.

Table 3.4 Sediment Parameters Proposed for TBT, Chlorinated Pesticides and Nutrient

Contaminants	Reporting Limit[2]
Organometallics	
Tributyltin (whole sediment)	10 µg/kg dry wt.
Chlorinated Pesticides[1]	
Aldrin	0.5 µg/kg dry wt.
Alpha-BHC	0.5 µg/kg dry wt.
Beta-/Delta- BHC[3]	1 µg/kg dry wt.
Gamma-BHC	0.5 µg/kg dry wt.
Heptachlor	0.5 µg/kg dry wt.
Heptachlor epoxide	0.5 µg/kg dry wt.
Endosulfan 1	0.5 µg/kg dry wt.
Endosulfan sulphate	0.5 µg/kg dry wt.
p, p'-DDT	0.5 µg/kg dry wt.
p, p'-DDD	0.5 µg/kg dry wt.
p, p'-DDD	0.5 µg/kg dry wt.
Nutrient	
Ammonia Nitrogen (NH_4N)	0.1 mg/kg dry wt
Nitrate Nitrogen (NO_3-N)	1 mg/kg dry wt

Nitrite Nitrogen (NO_2-N)	1 mg/kg dry wt
Total Kjeldahl Nitrogen (TKN)	50 mg/kg dry wt
Total Phosphorus (Total-P)	10 mg/kg dry wt

Notes:
1. The proposed component followed the works of CTD EIA.
2. Suggested upper limit. The actual reporting limit achieved is to be confirmed with the laboratory contractor.
3. Beta-/Delta- BHC reported as co-elutriate.

Table 3.5 Sediment Parameters Proposed for Biogas Release, Bioavailability and Physicochemical Properties

Parameter	**Reporting Limit[1]**
Biogas Release Potential	
Total Organic Carbon (TOC)	0.05%
Sediment Oxygen Demand (SOD, 20 days)	100 mg O_2/kg dry wt
Bio availability / Physicochemical Properties	
Total Sulphide (TS)	4 mg/kg dry wt.
Acid Volatile Sulphide (AVS)	1 mg/kg dry wt.
Moisture Content	N/A
Particle Size Distribution	N/A

Note:
1. Suggested upper limit. The actual reporting limit achieved is to be confirmed with the laboratory contractor.

Ambient Water and Elutriate Test

3.2.16 The sediment samples (including vertical sub-samples) collected from marine based stations will also be used for elutriate test. The standard elutriate test (USEPA & USACE 1991, 1998) 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. The ambient water and sediment samples 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 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 testing of parameters as listed in **Table 3.6** below.

USEPA & USACE. 1991. *Evaluation of Dredged Material Proposed for Ocean Disposal – Testing Manual*. USEPA and US Army Corps of Engineers, EPA 503/8-91/001

USEPA & USACE. 1998. *Evaluation of Dredged Material Proposed for Discharge on Waters of the US – Testing Manual (Inland Testing Manual)*. USEPA and US Army Corps of Engineers, EPA 823-B-98/004

3.2.17 For each marine based sediment sampling station, ambient marine water shall also be collected using Niskin sampler from 1m below the surface, mid-depth and 1m above the sea-bed. Where the water depth is between 3m and 6m ($\geq$3 and $\leq$6m) then the mid-depth layer will be omitted. When the water depth is less than 3m (<3m), then only the

mid-depth sample will be collected. For the water samples collected from each station, a composite sample will be formed by pooling equal volume of water from each sampled depth in the laboratory for subsequent analysis and use. The water sample collection shall commence prior to the sediment collection to avoid disturbance to the seabed potentially affecting the water samples. The composited ambient water shall also be tested for the same suit of parameters as the elutriate.

3.2.18 It is anticipated that the land side earth works will be mainly by excavation rather than by dredging and this would unlikely lead to contaminant release into marine environment as could be the case of marine dredging. Hence, elutriate test and interstitial water test of the samples collected from the land side stations shall not be necessary. However, the details of the construction method is not yet confirmed and there is a possibility that the interfacing area adjacent to the seawall be constructed by mean of dredging. To allow for this possible scenario, elutriate test and interstitial water test will also be conducted for selected land based station close to the seawall. Under such a circumstance, the ambient marine water from the nearest marine station will be used for the elutriate test.

Table 3.6 Parameters Proposed for Interstitial Water, Marine Water and Elutriate Tests

Contaminants	**Reporting Limit[3]**
Metals and Metalloid	
Cadmium (Cd)	0.5 µg/L
Chromium (Cr)	1 µg/L
Copper (Cu)	1 µg/L
Mercury (Hg)	0.2 µg/L
Nickel (Ni)	1 µg/L
Lead (Pb)	1 µg/L
Silver (Ag)	1 µg/L
Zinc (Zn)	10 µg/L
Arsenic (As)	1 µg/L
Organic Pollutants	
Low Molecular Weight PAHs[1]	
Naphthalene	0.2 µg/L
Acenaphtylene	0.2 µg/L
Acenaphtene	0.2 µg/L
Fluorene	0.2 µg/L
Phenanthrene	0.2 µg/L
Anthracene	0.2 µg/L
High Molecular Weight PAHs[1]	
Benzo(a)anthracene	0.2 µg/L
Benzo(a)pyrene	0.2 µg/L
Chrysene	0.2 µg/L
Dibenzo(ah)anthracene	0.2 µg/L
Fluoranthene	0.2 µg/L
Pyrene	0.2 µg/L
Benzo(b)fluoranthene	0.2 µg/L

Contaminants	**Reporting Limit[3]**
Benzo(k)fluoranthene	0.2 µg/L
Indeno(1,2,3-cd)pyrene	0.2 µg/L
Benzo(ghi)perylene	0.2 µg/L
Total PCBs[1]	
2,4' diCB (PCB 8)	0.01 µg/L
2,2',5 triCB (PCB 18)	0.01 µg/L
2,4,4' triCB (PCB 28)	0.01 µg/L
2,2',3,5' tetraCB (PCB 44)	0.01 µg/L
2,2',5,5' tetraCB (PCB 52)	0.01 µg/L
2,3',4,4' tetraCB (PCB 66)	0.01 µg/L
3,3',4,4' tetraCB PCB 77)	0.01 µg/L
2,2',4,5,5' pentaCB (PCB 101)	0.01 µg/L
2,3,3',4,4' pentaCB (PCB 105)	0.01 µg/L
2,3',4,4',5 pentaCB (PCB 118)	0.01 µg/L
3,3',4,4,5 pentaCB (PCB 126)	0.01 µg/L
2,2',3,3',4,4' hexaCB (PCB 128)	0.01 µg/L
2,2',3,4,4',5' hexaCB (PCB 138)	0.01 µg/L
2,2',4,4',5,5' hexaCB (PCB 153)	0.01 µg/L
3,3',4,4',5,5' hexaCB (PCB 169)	0.01 µg/L
2,2',3,3',4,4',5 heptaCB (PCB 170)	0.01 µg/L
2,2',3,4,4',5,5' heptaCB (PCB 180)	0.01 µg/L
2,2',3,4',5,5',6 heptaCB (PCB 187)	0.01 µg/L
Organometallics	
Tributyltin	0.015 µg TBT/L
Chlorinated Pesticides[2]	
Aldrin	0.02 µg/L
Alpha-BHC	0.02 µg/L
Beta-/Delta- BHC[4]	0.04 µg/L
Gamma-BHC	0.02 µg/L
Heptachlor	0.02 µg/L
Heptachlor epoxide	0.02 µg/L
Endosulfan 1	0.02 µg/L
Endosulfan sulphate	0.02 µg/L
p, p'-DDT	0.02 µg/L
p, p'-DDD	0.02 µg/L
p, p'-DDD	0.02 µg/L
Nutrient	
Ammonia Nitrogen (NH_4N)	0.1 mg/L
Nitrate Nitrogen (NO_3-N)	0.05 mg/L
Nitrite Nitrogen (NO_2-N)	0.05 mg/L
Total Kjeldahl Nitrogen (TKN)	0.1 mg/L
Orthophosphate (PO_4-P)	0.05 mg/L
Total Phosphorus (Total-P)	0.1 mg/L

Notes:
1 Details of the congeners and components are included in Appendix B.
2 The proposed component followed the works of CTD EIA.
3. Suggested upper limit. The actual reporting limit achieved is to be confirmed with the laboratory contractor.
4. Beta-/Delta- BHC reported as co-elutriate.

3.2.19 There could be a possibility that the *in situ* ambient water was already contaminated rendering the elutriate test using the *in situ* ambient water not reflective of the worse case scenario during the dredging operation. To allows for evaluation of such a scenario should the ambient water be proven contaminated, it is proposed that a second elutriate test of the sediments using clean Reference Water collected from Lei Yue Mun (842400E, 816500N; within the Victoria Harbour Water Control Zone) shall be conducted. Depending on the actual number of sediment samples requiring elutriate test with Reference water, it could be that a substantial quantity (e.g., > 100L) of ambient water from the Reference Station be required. Under such circumstance, a peristaltic pump with non-contaminating tubing will be used for efficient water collection at different depth rather than a Niskin sampler.

3.2.20 Prior to the commencement of the second elutriate test, the ambient water quality of the selected six stations shall be ascertained to be contaminated. There are, however, currently no defined marine water quality objectives (WQO) for metals and metalloid in Hong Kong and the UK Environmental Quality Standards (EQS), prescribed for the protection of marine life for metals and the metalloid arsenic for which analysis has been carried out, is proposed to be as the reference criteria for assessing the status of the ambient water although it should be noted that the EQS refers to the annual average concentrations (Cole *et al.*, 1999). The EQS criteria are presented in **Table 3.7** below.

Cole, S., Codling, I.D., Parr, W. and Zabel, T. (1999). *Guidelines for Managing Water Quality Impacts Within UK European Marine Sites*. WRc, Swindon. Prepared for the UK Marine SAC Project.

Table 3.7 The UK Environmental Quality Standard (EQS) Values to Protect Marine Life

Metals and Metalloid	Water Quality Standard (as dissolved metal) (µg/L)
Arsenic	25
Cadmium	2.5
Chromium	15
Copper	5
Lead	25
Mercury	0.3
Nickel	30
Silver	1.9*
Zinc	40

* Salt water acute criterion of USEPA National Recommended Water Quality Criteria.

Interstitial Water Test

3.2.21 As described before, short section of temporary reclamation for the landing may be required. It is therefore desirable to conduct some interstitial water (pore water) testing of sediment collected for the marine based stations. As the interstitial water content at

deep layers can be low, interstitial water may be limited to the surface layers where the water content is high and sufficient amount of interstitial water can be extracted. Surface grab samples will be collected, however, to ensure sufficient sample for testing at the top layer. The recommended testing parameters is the same as the elutriate parameters listed in **Table 3.6** above.

Priority of Testing

3.2.22 A large quantity of the sediment sample from each depth will be required for chemical analysis and also the sub-sequent biological testing if required. Preliminary enquiry with a laboratory indicates that about 1L of sediment will be required for whole sediment chemical analysis, 5L for biological testing, 1L for each run of elutriate. Depending on the water content, about 1L of sediment will be required for interstitial water analysis of TBT. About 2L of liquid will be required for the chemical analysis, if assuming moisture content of the sediment is 50%, than about 4L of sediment will be required to provide sufficient interstitial water for chemical analysis. Thus, at least about 8L of sediment samples will be required for the chemical analysis of whole sediment, biological analysis and two elutriate runs. Further but unknown amount of sediment, however, is need for interstitial water analysis of TBT and other chemicals.

3.2.23 One meter section of a standard vibrocore with 100mm internal diameter yield 7.8L of sample on full recovery. This will not be sufficient for all the testing required. For sampling depth below 2.9m, the sampling interval is 3m which should be able to provide sufficient amount of sediment (~23.4L). For the surface level (0-0.9m), grab sample can be collected to provide the required quantity. For the (0.9-1.9)m and (1.9-2.9)m sections, however, two vibrocore sections will be required (to give about 15.6L of sediment) and will be collected. Despite of these calculations to provide large amount of sediment for the tests, field recovery and sample condition will determine the actual amount of sediment available and, for the interstitial water the amount of sediment needed. It is therefore necessary to prioritise the testing parameters in case of poor recovery or low moisture content. The following order of priority is proposed:

(1) ETWB TCW No. 34/2002 whole sediment chemical parameters (**Table 3.1**);

(2) ETWB TCW No. 34/2002 biological test (**Table 3.3a**);

(3) Other whole sediment chemical parameters (**Tables 3.4 - 3.5**);

(4) Elutriate Test with in-situ water (**Table 3.6**);

(5) Interstitial water test (**Table 3.6**); and

(6) Elutriate Test with Reference water (**Table 3.6**).

Sample Storages and QA/QC

3.2.24 Typically, a 6m long vibrocore with PVC inner liner tube will be used for the sampling. Provided that the PVC tube is thoroughly cleaned prior to deployment, the sediment

samples once contained inside the PVC tube, would be free from external contamination. However, to facilitate subsequent sample handling, storage and transportation, the tube will have to be cut into 1m sections on site. To ensure samples for organic analyses will be stored in compatible containers right after the sampling, for each target stratum, adequate amount (about 0.5L) of the sediment sub-sample from the top-end shall immediately be collected on-site and stored in laboratory pre-cleaned borosilicate glass bottle with Telfon lined lid. To prevent environmental contaminations, non-contaminating saw-blade shall be used, and once cut and subsamples collected, each open end shall be immediately sealed with a tin foil and plastic cap. For grab sampling, non-contaminating stainless steel grab sampler shall be used and food grade polyethylene bag shall be used for sample holding. Sub-sample of grab samples for organic analyses shall also be split on-site and stored in laboratory pre-cleaned borosilicate glass bottle with Telfon lined lid.

3.2.25 All the equipment and utensils that will have a direct contact with the samples shall be thoroughly cleaned with ambient marine water and/or distilled water before and between each use. In addition, for every 10 sampling stations, a rinsate water sample shall be collected for analysis of the same suit of chemicals listed in **Table 3.1** to ensure the cleansing procedures is adequate.

3.2.26 Once retrieved, the samples shall be maintained in a chilled (~ 0 - 4 °C) but not frozen condition and stored in the dark during on-site temporary storage and shipment to the testing laboratory. The retrieved samples shall be delivered to the testing laboratory as soon as possible and any temporary on-site storage shall not be longer than 24 hour. Chemical testing shall commence as soon as possible. If not analysed immediately in the testing laboratory, the samples shall also be maintained in a chilled (~ 0 - 4 °C) but not frozen condition and stored in the dark. For testing of ETWB TCW No. 34/21002 sediment parameters, the maximum 2 weeks of allowable holding time shall be observed. For other matrix and parameters, the allowable holding period as per the standard methods adopted shall be observed. The transfer and shipment of the collected samples shall be accompanied with a Chain of Custody (COC) form which shall be duly singed the relevant parties and faxed to the consulting engineer daily for checking. A sample of COC form to be used is presented in **Appendix C**.

3.2.27 The testing laboratory to be employed shall be HOKLAS accredited (or in case of overseas laboratories, by equivalent national accreditation) with the appropriate accreditation for the ETWB TCW No. 34/21002 sediment parameters. For other testing matrix/parameters, testing shall be performed by laboratory contractor accredited under the "environmental testing" category although the specific analytical methodology may not be accredited. Once the laboratory contractor is confirmed, the specific test methodology and accreditations status of each test will be updated and re-submitted to EPD for agreement. The testing laboratory shall has adequate QA/QC programme for the testing works which shall include at least the blank analysis, matrix spike, standard reference sample, etc. Further information about the contractors for the SI and laboratory testing are discussed in Section 4.

3.2.28 All the sediment sampling works will be supervised by on-site full time engineers/environmental scientists from the consulting engineer. The site staff will be supported by senior engineer/environmental professional from the consulting engineer who will also conducted part-time supervision. The supervisors will also inspect the testing laboratory and review the results of QA/QC.

4 SECTION 4 – WORKS IMPLEMENTATION AND SITE CONSTRAINTS

4.1 Implementation Agents

4.1.1 For this project, the SI and environmental sampling and testing is to be carried out under CEDD Contract No. KL/2009/02 Site Investigation For Trunk Road T2 and Infrastructure at South Apron (Sage 1). The Contract is awarded to Fugro Geotechnical Services Limited (Fugro). Fugro will be responsible for undertaking the sampling works and the geotechnical testing by the MaterialLab Division of Fugro which is HOKLAS accredited (HOKLAS Registration Number 015). Fugro has subcontract the environmental testing works to ALS Technichem (HK) Pty Ltd (ALS) which is HOKLAS accredited laboratory (HOKLAS Registration Number 066) although some of the specialist tests are to be done by Hong Kong Productivity Council (HOKLAS Registration Number 039) (TBT in intestinal water) and ALS Brisbane laboratory (TBT in sediment, marine water and elutriate). ALS Brisbane laboratory is accredited under the National Association of Testing Authorities (NATA), Australia. HOKLAS has concluded mutual recognition arrangements (MRA) with accreditation bodies including NATA.

4.1.2 The accreditation scope, reference sample preparation and testing methods, and reporting limits for the proposed tests offered by the contractor is given in **Appendix B**.

4.2 Known Site Constraints

4.2.1 As briefly discussed before, there are some known facilities along the alignment and the SI works need to avoid them for the safety of both the facilities and sampling team. Any needed sediment sampling within this area will be conducted by mean of surface grab and no vibrocore is proposed. These have been shown in **Figures 3.1-3.2** and their nature are discussed below.

HATS Protection Zone

4.2.2 The HATS tunnel is a deep tunnel system to convey the sewage from PTWs to the central STW at Stonecutters Island. The tunnel is generally located at more than 70m below the ground surface. In order to protect the sewage tunnels and associated structures against damage which might be caused by other construction works and ground investigation works in the vicinity of the sewage tunnel, there are specific restriction/requirement on such works. The restriction/requirement for works and GI around the HATS tunnel is stipulated in ETWB TCW No. 28/2003.

4.2.3 According to ETWB TCW No. 38/2003, a “ground investigation protection boundary” for the sewage tunnel is generally 50m from the centreline of the tunnel and the area within this boundary is otherwise known as “HATS Protection Zone”. Within the project study area, there are sections of HATS tunnel connecting the Shau Kei Wan PTW to KTPTW and also from KTPTW to To Kwan Wan PTW. The location of the HATS Protection Zone is presented in **Figures 3.1-3.2**.

Kwun Tong Preliminary Treatment Works (KTPTW) Outfall Safety Buffer

4.2.4 As described in Section 2.5, the KTPTW outfall emerged from the KTPTW to the Victoria Harbour. Based on the as-built record, the terminal plate of the outfall is at about -14 mPD and hence other section of the tunnel will be above this level. To prevent any accidental damage to the outfall, a 40m safety buffer from the centreline of the KTPTW outfall is required by DSD. The location of the KTPTW outfall buffer zone is also presented in **Figures 3.1 - 3.2**.

Kwun Tong Typhoon Shelter (KTTS)

4.2.5 Part of the project alignment is within the Kwun Tong Typhoon Shelter which by its function is a mooring area. Another part of the project alignment is at Cha Kwo Ling Public Cargo Handling Area. It could be that some of the planned stations be occupied by moored vessels rendering it not accessible. Special allowance for this has not been made as this shall be able to overcome by work scheduling. However, it could be possible that the designated stations be not accessible throughout the whole sampling period. The site staff shall discuss with the occupier in order the access the station as far as practicable. However, should this cannot be arranged within the sampling period, alternative location close the proposed stations will be sampled instead. The site supervisor shall seek senior engineer/environmental professional agreement prior to instructing the contractor to sample at alternate location.

Land Access

4.2.6 The land based sampling stations will be subject to land access issue as well as site condition constraints such as obtaining excavation permit from other government authorities, occupancy or close proximity to existing utilities. The land use status has been preliminary checked although Land Department's approval is being seeked. Excavation permit will be applied by the Contractor undertaking the services. While effort is taken to ensure the proposed land based stations will be accessible with adequate working space for drilling, it may still be that the planned stations not accessible rending relocation necessary although this shall be avoided as much as possible.

Figures

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APPENDIX A

SAMPLING LOCATIONS, ESTIMATED DEPTH AND VERTICAL SUB-SAMPLE PROFILE

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APPENDIX B

INDICATIVE ANALYTICAL METHODOLOGY AND QA/QC INFORMATION

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APPENDIX C

A SAMPLE OF COC FORM

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APPENDIX D

AGREEMENT OF MARINE FIELD COMMITTEE ON DREDGING RATIONALE FOR KAI TAK DEVELOPMENT

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A1. Sampling Coordinates and Sample Quantities Estimation for Indicative Alignments H2 and H4

Station	X	Y	App. Seabed Level (mPD)	App. Target Level (mPD)	Sediment Thickness (m)	stratum (m) 0.0 - 0.9	0.9 - 1.9	1.9 - 2.9	2.9 - 5.9	5.9 - 8.9	8.9 - 11.9	11.9 - 14.9	14.9 - 17.9	17.9 - 20.9	20.9 - 23.9
					start	0	0.9	1.9	2.9	5.9	8.9	11.9	14.9	17.9	20.9
					end	0.9	1.9	2.9	3.9	6.9	9.9	12.9	15.9	18.9	21.9
B02VG	839923	819399	-6.4	-20.6	14.2	1	1	1	1	1	1	1	0	0	0
B05VG	840021	819285	-5.6	-19.9	14.3	1	1	1	1	1	1	1	0	0	0
B09VG	840152	819136	-5.3	-20.2	14.9	1	1	1	1	1	1	1	0	0	0
B13VG	840281	818981	-5.9	-21.5	15.6	1	1	1	1	1	1	1	1	0	0
C17VG	840383	818805	-6.0	-22.8	16.8	1	1	1	1	1	1	1	1	0	0
B20VG	840510	818717	-5.6	-23.3	17.7	1	1	1	1	1	1	1	1	0	0
C23VG	840561	818563	-5.0	-22.6	17.6	1	1	1	1	1	1	1	1	0	0
C27VG	840683	818404	-1.5	-22.2	20.7	1	1	1	1	1	1	1	1	1	0
D32VG	840977	818384	-5.5	-10.0	4.5	1	1	1	1	0	0	0	0	0	0
B33VG	840834	818270	-7.1	-23.5	16.4	1	1	1	1	1	1	1	1	0	0
E36VG	840813	818052	-8	-24.9	16.9	1	1	1	1	1	1	1	1	0	0
B37VG	840955	818110	-8	-24.9	16.9	1	1	1	1	1	1	1	1	0	0
E39VG	840891	817921	-7.4	-25.5	18.1	1	1	1	1	1	1	1	1	1	0
B41VG	841075	817949	-8.1	-25.9	17.8	1	1	1	1	1	1	1	1	0	0
C44VG	841173	817836	-9.4	- 24.0	14.6	1	1	1	1	1	1	1	0	0	0
C47VG	841377	817815	-12.6	-24.6	12	1	1	1	1	1	1	1	0	0	0
C49VG	841481	817772	-12.9	-25.3	12.4	1	1	1	1	1	1	1	0	0	0
D66VG	840517	818305	-7.0	-10.0	3	1	1	1	1	0	0	0	0	0	0
C71VG	840732	818169	-7.0	-10.0	3	1	1	1	1	0	0	0	0	0	0
B58VG	841125	818192	-8.5	-25.5	17.0	1	1	1	1	1	1	1	1	0	0
B61VG	841258	818109	-4.7	-26.9	22.2	1	1	1	1	1	1	1	1	1	1
					sub-total	21	21	21	21	18	18	18	12	3	1

Summary of GI Quantities Estimation.

Shallow (0-2.9)	63
Deep (2.	91

A. Sediment Samples

Study	Type	Stat	Samples	Average Depth (m)
EIA Vibrocore + Grab	EV	21	154	15
Total		**21**	**154**	

B. Water Samples

Study	Stat	Samples
EIA Vibrocore + Grab	21	462
Ambient Water	21	21
Total	**21**	**483**

NOTES:

1. Reference Sediment Station = Port Shelter (850234E, 820057N).
2. Reference Water Station = Lei Yue Mun (842400E, 816500N).
3. The above esitmation did not inlcude Reference samples.
4. Elutirate samples = 2 x Sediment samples
5. "App. Target Level" is the defining criteria based on engineering need.
   "App. Seabed Level" and "Sediment Thickness" are for reference only.
6. Stations in Appendix 2 is incorporated here.

Last Update: 6 May 2010

A3. Land Based Sampling Station Coordinates and Sample Quantities Estimation for Indicative Alignments H2 and H4

								stratum (m)												
Station	X	Y	App. Ground Level (mPD)	App. MD Level (mPD)	App. Fill Thicknes s (m)	App. Works Level (mPD)	Sediment Thicknes s (m)	0.0 - 0.9	0.9 - 1.9	1.9 - 2.9	2.9 - 5.9	5.9 - 8.9	8.9 - 11.9	11.9 - 14.9	14.9 - 17.9	17.9 - 20.9	20.9 - 23.9	23.9 - 26.9	26.9 - 29.9	29.9 - 33.0
L102BH	839813	819498	3.9	-10.0	13.9	-38.5	28.5	1	1	1	1	1	1	1	1	1	1	1	1	0
L106BH	839666	819628	4.3	-7.5	11.8	-33.3	25.8	1	1	1	1	1	1	1	1	1	1	1	0	0
L110BH	839522	819767	4.1	-8.0	12.1	-27.3	19.3	1	1	1	1	1	1	1	1	1	0	0	0	0
L113BH	841606	817838	4.3	-5.2	9.5	-24.0	18.8	1	1	1	1	1	1	1	1	1	0	0	0	0
L115BH	841357	818135	4.7	-8.0	12.7	-30.0	22.0	1	1	1	1	1	1	1	1	1	1	0	0	0
							sub-total	5	5	5	5	5	5	5	5	5	3	2	1	0

Summary of GI Quantities Estimation.

A. Sediment Samples

Study	Stations	Samples
EIA Drillholes	5	51
Total	**5**	**51**

B. Elutriate Samples

Study	Stations	Samples
EIA Drillholes	3	31
Total	**3**	**31**

NOTES:

1 Reference Sediment Station = Port Shelter (850234E, 820057N).

2 Reference Water Station = Lei Yue Mun (842400E, 816500N).

3 "App. Excavation Level" is the defining criteria based on engineering need.
Other levels, depth and thickness are estimate for reference only.

4 Area near L102BH, L113BH and L115BH could be constructed by excavation of dredging and elutriate test allowed.

Last Update: 7 April 2010

Indicative Analytical Method and Quality Control Information

Item		Method Referenced Preparation	Method Referenced Determination	Reporting unit	Reporting Limit (RL)	Quality Control Procedures	Accreditation
Sediment							
S1	**Metals**					Blank, Duplicate, Spike, RM	
	Cadmium (Cd)	USEPA 3051A	USEPA 6020A	mg/kg dry wt.	0.2		HOKLAS
	Chromium (Cr)	USEPA 3051A	USEPA 6020A	mg/kg dry wt.	8		HOKLAS
	Copper (Cu)	USEPA 3051A	USEPA 6020A	mg/kg dry wt.	7		HOKLAS
	Mercury (Hg)	APHA 3112B	APHA 3112B	mg/kg dry wt.	0.05		HOKLAS
	Nickel (Ni)	USEPA 3051A	USEPA 6020A	mg/kg dry wt.	4		HOKLAS
	Lead (Pb)	USEPA 3051A	USEPA 6020A	mg/kg dry wt.	8		HOKLAS
	Silver (Ag)	USEPA 3051A	USEPA 6020A	mg/kg dry wt.	0.1		HOKLAS
	Zinc (Zn)	USEPA 3051A	USEPA 6020A	mg/kg dry wt.	20		HOKLAS
S2	**Metalloid**						
	Arsenic (As)	USEPA 3051A	USEPA 6020A	mg/kg dry wt.	1	Blank, Duplicate, Spike, RM	HOKLAS
S3	**Organic-PAHs**					Blank, Duplicate, Spike, RM	HOKLAS
	Low Molecular Weight PAHs	In house tumbler method	USEPA 8270D				
	Naphthalene	USEPA 3630C		µg/kg dry wt.	55		
	Acenaphtylene			µg/kg dry wt.	55		
	Acenaphtene			µg/kg dry wt.	55		
	Fluorene			µg/kg dry wt.	55		
	Phenanthrene			µg/kg dry wt.	55		
	Anthracene			µg/kg dry wt.	55		
	High Molecular Weight PAHs	In house tumbler method	USEPA 8270D				
	Benzo(a)anthracene	USEPA 3630C		µg/kg dry wt.	170		
	Benzo(a)pyrene			µg/kg dry wt.	170		
	Chrysene			µg/kg dry wt.	170		
	Dibenzo(ah)anthracene			µg/kg dry wt.	170		
	Fluoranthene			µg/kg dry wt.	170		
	Pyrene			µg/kg dry wt.	170		
	Benzo(b)fluoranthene			µg/kg dry wt.	170		
	Benzo(k)fluoranthene			µg/kg dry wt.	170		
	Indeno(1,2,3-cd)pyrene			µg/kg dry wt.	170		
	Benzo(ghi)perylene			µg/kg dry wt.	170		
S4	**Organic-non-PAHs**						
	Total PCBs	In house tumbler method	USEPA 8270D			Blank, Duplicate, Spike, RM	HOKLAS
	2,4' dichlorobiphenyl (PCB 8)	USEPA 3665A		µg/kg dry wt.	3		
	2,2',5 trichlorobiphenyl (PCB 18)			µg/kg dry wt.	3		
	2,4,4' trichlorobiphenyl (PCB 28)			µg/kg dry wt.	3		
	2,2',3,5' tetrachlorobiphenyl (PCB 44)			µg/kg dry wt.	3		
	2,2',5,5' tetrachlorobiphenyl (PCB 52)			µg/kg dry wt.	3		
	2,3',4,4' tetrachlorobiphenyl (PCB 66)			µg/kg dry wt.	3		
	3,3',4,4' tetrachlorobiphenyl PCB 77)			µg/kg dry wt.	3		
	2,2',4,5,5' pentachlorobiphenyl (PCB 101)			µg/kg dry wt.	3		
	2,3,3',4,4' pentachlorobiphenyl (PCB 105)			µg/kg dry wt.	3		
	2,3',4,4',5 pentachlorobiphenyl (PCB 118)			µg/kg dry wt.	3		
	3,3',4,4,5 pentachlorobiphenyl (PCB 126)			µg/kg dry wt.	3		
	2,2',3,3',4,4' hexachlorobiphenyl (PCB 128)			µg/kg dry wt.	3		
	2,2',3,4,4',5' hexachlorobiphenyl (PCB 138)			µg/kg dry wt.	3		
	2,2',4,4',5,5' hexachlorobiphenyl (PCB 153)			µg/kg dry wt.	3		
	3,3',4,4',5,5' hexachlorobiphenyl (PCB 169)			µg/kg dry wt.	3		
	2,2',3,3',4,4',5 heptachlorobiphenyl (PCB 170)			µg/kg dry wt.	3		
	2,2',3,4,4',5,5' heptachlorobiphenyl (PCB 180)			µg/kg dry wt.	3		
	2,2',3,4',5,5',6 heptachlorobiphenyl (PCB 187)			µg/kg dry wt.	3		

Indicative Analytical Method and Quality Control Information

Item		Method Referenced Preparation	Method Referenced Determination	Reporting unit	Reporting Limit (RL)	Quality Control Procedures	Accreditation
S5	**Organometallics**						
	Tributyltin (TBT) in whole sedimetn	UNEP/IOC/IAEA	UNEP/IOC/IAEA	µg TBT/kg dry wt.	10	Blank, Duplicate, Spike, RM	NATA
	Tributyltin (TBT) in interstitial water	see the water matrix					
S6	**Chlorinated Pesticides**	In house tumbler method	USEPA 8270D	µg/kg dry wt.		Blank, Duplicate, Spike, RM	HOKLAS
	Aldrin			µg/kg dry wt.	0.5		
	Alpha-BHC			µg/kg dry wt.	0.5		
	Beta-/Gamma- BHC			µg/kg dry wt.	1		
	Delta-BHC			µg/kg dry wt.	0.5		
	Heptachlor			µg/kg dry wt.	0.5		
	Heptachlor epoxide			µg/kg dry wt.	0.5		
	Endosulfan 1			µg/kg dry wt.	0.5		
	Endosulfan sulfate			µg/kg dry wt.	0.5		
	p, p'-DDT			µg/kg dry wt.	0.5		
	p, p'-DDD			µg/kg dry wt.	0.5		
	p, p'-DDE			µg/kg dry wt.	0.5		
S7	TOC	APHA 5310B	APHA 5310B	% dry wt.	0.05%	Blank, Duplicate, Spike, RM	HOKLAS
S8	Ammonia Nitrogen	APHA 4500 NH3:G	APHA 4500 NH3:G	mg N/kg dry wt.	0.1	Blank, Duplicate, Spike, RM	n/a
S9	Nitrate Nitrogen	APHA 4500 NO3:I	APHA 4500 NO3:I	mg N/kg dry wt.	1	Blank, Duplicate, Spike, RM	n/a
S10	Nitrite Nitrogen	APHA 4500 NO2: B&H	APHA 4500 NO2: B&H	mg N/kg dry wt.	1	Blank, Duplicate, Spike, RM	n/a
S11	Total Kjeldahl Nitrogen	APHA 4500 Norg:D	APHA 4500 Norg:D	mg N/kg dry wt.	50	Blank, Duplicate, Spike, RM	n/a
S12	Total Phosphorus	APHA 4500 P: B & H	APHA 4500 P: B & H	mg P/kg dry wt.	10	Blank, Duplicate, Spike, RM	n/a
S13	Total Sulphide	APHA 4500 S:D modified	APHA 4500 S:D modified	mg S/kg dry wt.	4	Blank, Duplicate, Spike, RM	n/a
S14	Acid Volatile Sulphide	USEPA 821-R-91-100	USEPA 821-R-91-100	mg S/kg dry wt.	1	Blank, Duplicate, Spike, RM	n/a
S15	Sediment Oxygen Demand (20 days)	APHA 5210 B modified	APHA 5210 B modified	mg O2/kg dry wt.	100	duplicate	n/a

Indicative Analytical Method and Quality Control Information

Item		Method Referenced Preparation	Method Referenced Determination	Reporting unit	Reporting Limit (RL)	Quality Control Procedures	Accreditation
Marine Water, Elutriate, Interstitial water (=porewater)							
W1	**Metals**					Blank, Duplicate, Spike, RM	
	Cadmium (Cd)	USEPA 3050A	USEPA 6020A	µg/L	0.5		HOKLAS *
	Chromium (Cr)	USEPA 3050A	USEPA 6020A	µg/L	1		HOKLAS *
	Copper (Cu)	USEPA 3050A	USEPA 6020A	µg/L	1		HOKLAS *
	Mercury (Hg)	APHA 3112B	APHA 3112B	µg/L	0.2		HOKLAS *
	Nickel (Ni)	USEPA 3050A	USEPA 6020A	µg/L	1		HOKLAS *
	Lead (Pb)	USEPA 3050A	USEPA 6020A	µg/L	1		HOKLAS *
	Silver (Ag)	USEPA 3050A	USEPA 6020A	µg/L	1		HOKLAS *
	Zinc (Zn)	USEPA 3050A	USEPA 6020A	µg/L	10		HOKLAS *
W2	**Metalloid**						
	Arsenic (As)	USEPA 3050A	USEPA 6020A	µg/L	1	Blank, Duplicate, Spike, RM	HOKLAS *
W3	**Organic-PAHs**					Blank, Duplicate, Spike, RM	
	Low Molecular Weight PAHs	USEPA 3510C	USEPA 8270D				
	Naphthalene			µg/L	0.2		n/a
	Acenaphtylene			µg/L	0.2		n/a
	Acenaphtene			µg/L	0.2		n/a
	Fluorene			µg/L	0.2		n/a
	Phenanthrene			µg/L	0.2		n/a
	Anthracene			µg/L	0.2		n/a
	High Molecular Weight PAHs	USEPA 3510C	USEPA 8270D				
	Benzo(a)anthracene			µg/L	0.2		n/a
	Benzo(a)pyrene			µg/L	0.2		n/a
	Chrysene			µg/L	0.2		n/a
	Dibenzo(ah)anthracene			µg/L	0.2		n/a
	Fluoranthene			µg/L	0.2		n/a
	Pyrene			µg/L	0.2		n/a
	Benzo(b)fluoranthene			µg/L	0.2		n/a
	Benzo(k)fluoranthene			µg/L	0.2		n/a
	Indeno(1,2,3-cd)pyrene			µg/L	0.2		n/a
	Benzo(ghi)perylene			µg/L	0.2		n/a
W4	**Organic-non-PAHs**						
	Total PCBs	USEPA 3510C	USEPA 8270D			Blank, Duplicate, Spike, RM	
	2,4' dichlorobiphenyl (PCB 8)			µg/L	0.01		n/a
	2,2',5 trichlorobiphenyl (PCB 18)			µg/L	0.01		n/a
	2,4,4' trichlorobiphenyl (PCB 28)			µg/L	0.01		n/a
	2,2',3,5' tetrachlorobiphenyl (PCB 44)			µg/L	0.01		n/a
	2,2',5,5' tetrachlorobiphenyl (PCB 52)			µg/L	0.01		n/a
	2,3',4,4' tetrachlorobiphenyl (PCB 66)			µg/L	0.01		n/a
	3,3',4,4' tetrachlorobiphenyl PCB 77)			µg/L	0.01		n/a
	2,2',4,5,5' pentachlorobiphenyl (PCB 101)			µg/L	0.01		n/a
	2,3,3',4,4' pentachlorobiphenyl (PCB 105)			µg/L	0.01		n/a
	2,3',4,4',5 pentachlorobiphenyl (PCB 118)			µg/L	0.01		n/a
	3,3',4,4,5 pentachlorobiphenyl (PCB 126)			µg/L	0.01		n/a
	2,2',3,3',4,4' hexachlorobiphenyl (PCB 128)			µg/L	0.01		n/a
	2,2',3,4,4',5' hexachlorobiphenyl (PCB 138)			µg/L	0.01		n/a
	2,2',4,4',5,5' hexachlorobiphenyl (PCB 153)			µg/L	0.01		n/a
	3,3',4,4',5,5' hexachlorobiphenyl (PCB 169)			µg/L	0.01		n/a
	2,2',3,3',4,4',5 heptachlorobiphenyl (PCB 170)			µg/L	0.01		n/a
	2,2',3,4,4',5,5' heptachlorobiphenyl (PCB 180)			µg/L	0.01		n/a
	2,2',3,4',5,5',6 heptachlorobiphenyl (PCB 187)			µg/L	0.01		n/a

Indicative Analytical Method and Quality Control Information

Item		Method Referenced Preparation	Method Referenced Determination	Reporting unit	Reporting Limit (RL)	Quality Control Procedures	Accreditation
W5	**Organometallics**						
	Tributyltin (TBT)	UNEP/IOC/IAEA	UNEP/IOC/IAEA	µg TBT/L	0.015	Blank, Duplicate, Spike, RM	HOKLAS/NATA
W6	**Chlorinated Pesticides**	USEPA 3510B	USEPA 8270B			Blank, Duplicate, Spike, RM	
	Aldrin			µg/L	0.02		n/a
	Alpha-BHC			µg/L	0.02		n/a
	Beta-/Gamma- BHC			µg/L	0.04		n/a
	Delta-BHC			µg/L	0.02		n/a
	Heptachlor			µg/L	0.02		n/a
	Heptachlor epoxide			µg/L	0.02		n/a
	Endosulfan 1			µg/L	0.02		n/a
	Endosulfan sulfate			µg/L	0.02		n/a
	p, p'-DDT			µg/L	0.02		n/a
	p, p'-DDD			µg/L	0.02		n/a
	p, p'-DDE			µg/L	0.02		n/a
W8	Ammonia Nitrogen	APHA 4500 NH3:G	APHA 4500 NH3:G	mg/L	0.1	Blank, Duplicate, Spike, RM	HOKLAS *
W9	Nitrate Nitrogen	APHA 4500 NO3:I	APHA 4500 NO3:I	mg/L	0.05	Blank, Duplicate, Spike, RM	HOKLAS *
W10	Nitrite Nitrogen	APHA 4500 NO2: B&H	APHA 4500 NO2: B&H	mg/L	0.05	Blank, Duplicate, Spike, RM	HOKLAS *
W11	Total Kjeldahl Nitrogen	APHA 4500 Norg:D	APHA 4500 Norg:D	mg/L	0.1	Blank, Duplicate, Spike, RM	HOKLAS *
W12	Orthophosphoate	APHA 4500P: B&F	APHA 4500P: B&F	mg/L	0.05	Blank, Duplicate, Spike, RM	HOKLAS *
W13	Total Phosphorus	APHA 4500P: B&H	APHA 4500P: B&H	mg/L	0.1	Blank, Duplicate, Spike, RM	HOKLAS *
Sediment Bioassay							
B1	10-Day Amphipod Survival Test	USEPA (1994) / PSPE (1995)	USEPA (1994) / PSPE (1995)	-	-	positive control, negative control	HOKLAS
B2	20-Day Polychaete Growth Test	PSPE (1995)	PSPE (1995)	-	-	positive control, negative control	HOKLAS
B3	48-96hour larave survival test	PSPE (1995)	PSPE (1995)	-	-	positive control, negative control	HOKLAS

Notes:

1 HOKLAS = Hong Kong Laboratory Accreditation Scheme; NATA = National Association of Testing Authorities, Australia.

2 For liquid matrix, accreditation is only applicable to marine water and this limitation is denoted with (*).

3 Last Update: 27 Sept. 2010.

Record of Water and Sediment Sampling, Collection and Delivery (COC Form) Sheet ____ of ____

Project Name: Agreement No. CE 38/2008 (HY) Contract No.:
Kai Tak Development - Trunk Road T2 and Infrastructure at South Apron I, D & C

Project Proponent: KDO / CEDD Telephone:
Address: Fax No.:
Contact Person: E-mail:

Sampling Date:											Analysis requested										
Sample ID.	Collelction Time	Station No.	Northing	Easting	Water Depth (m)	Sampling Depth (m)	Matrix *	Vertical Split	No. of Containers	Sampling Method *	Metals	Metalloid	PAHs	Total PCBs	TBT	Chlorinated Pesticides	Nutrient	Biogas Relase	Physico-chemical	Elutriate	Remarks
1							S / W	m		V / G / N											
2							S / W	m		V / G / N											
3							S / W	m		V / G / N											
4							S / W	m		V / G / N											
5							S / W	m		V / G / N											
6							S / W	m		V / G / N											
7							S / W	m		V / G / N											
8							S / W	m		V / G / N											
9							S / W	m		V / G / N											
10							S / W	m		V / G / N											
11							S / W	m		V / G / N											
12							S / W	m		V / G / N											
13							S / W	m		V / G / N											
14							S / W	m		V / G / N											
15							S / W	m		V / G / N											

Sampling Conducted by (Fieldwork Contractor):		Sampling Supervised by (Consultants):		Samples Received by (Laboratory Contractor):	
Company Name:		Company Name: Hyder-Meinhardt JV		Company Name:	
Person responsible:		Fieldwork supervisor		Person responsible:	
Name:	Signature:	Name:	Signature:	Name:	Signature:
Phone No.:	Date & Time:	Phone No.:	Date & Time:	Phone No.:	Date & Time:

Matrix and Sampling Method Code: S = Sediment; W = Water; V = Vibrocore; G = Grab; N = Niskin Sampler

Appendix D

Agreement of Marine Fill Committee on Dredging Rationale for Kai Tak Development

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土木工程拓展署
Civil Engineering and Development Department

土木工程處
Civil Engineering Office

Web site 網址 : http://www.cedd.gov.hk
E-mail 電子郵件: smlai@cedd.gov.hk
Telephone 電話 : 2762 5544
Facsimile 傳真 : 2714 0113
Our reference 本署檔號: (03BSP-01) in FM 5/6/20-253
Your reference 來函檔號: IWLH:ALSC:qc:60022408/08.2-1751

香港九龍公主道 101 號
土木工程拓展署大樓
Civil Engineering and
Development Building,
101 Princess Margaret Road,
Kowloon, Hong Kong.

Pt.

BY FAX (Fax No. 2691 2649)

Maunsell Consultants Asia Ltd.
8/F., Grand Central Plaza, Tower 2,
138 Shatin Rural Committee Road, Shatin,
N.T., Hong Kong.
(Attention: Mr. Igor HO)

13 August 2008

Maunsell Consultants Asia Ltd.
Received 12 AUG 2008
Reg. No. 4456
File No. 60022408/8.2
TS DLO EMS2 ML CW Sign
AKWL MCP SAR FSKY Off
SHRS TKH TKS YY HTS
WCKH JYL CWN PMC
Project Eng. IWLH/ALSC
Others
Copied To
Reply Date

Dear Sirs,

Agreement No. CE 35/2006(CE)
Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction

Rationale for Dredging Works for Kai Tak Development

I refer to your above submission of 25 July 2008 and would like to advise you that we have no further comment on the rationale for the subject works.

Yours faithfully,

(S.M. LAI)
for Secretary, Marine Fill Committee
Civil Engineering and Development Department

c.c. PM/K, CEDD – Attn.: Mr. Walter LEUNG

WHC/whc

興土木 利民生 齊拓展 創明天

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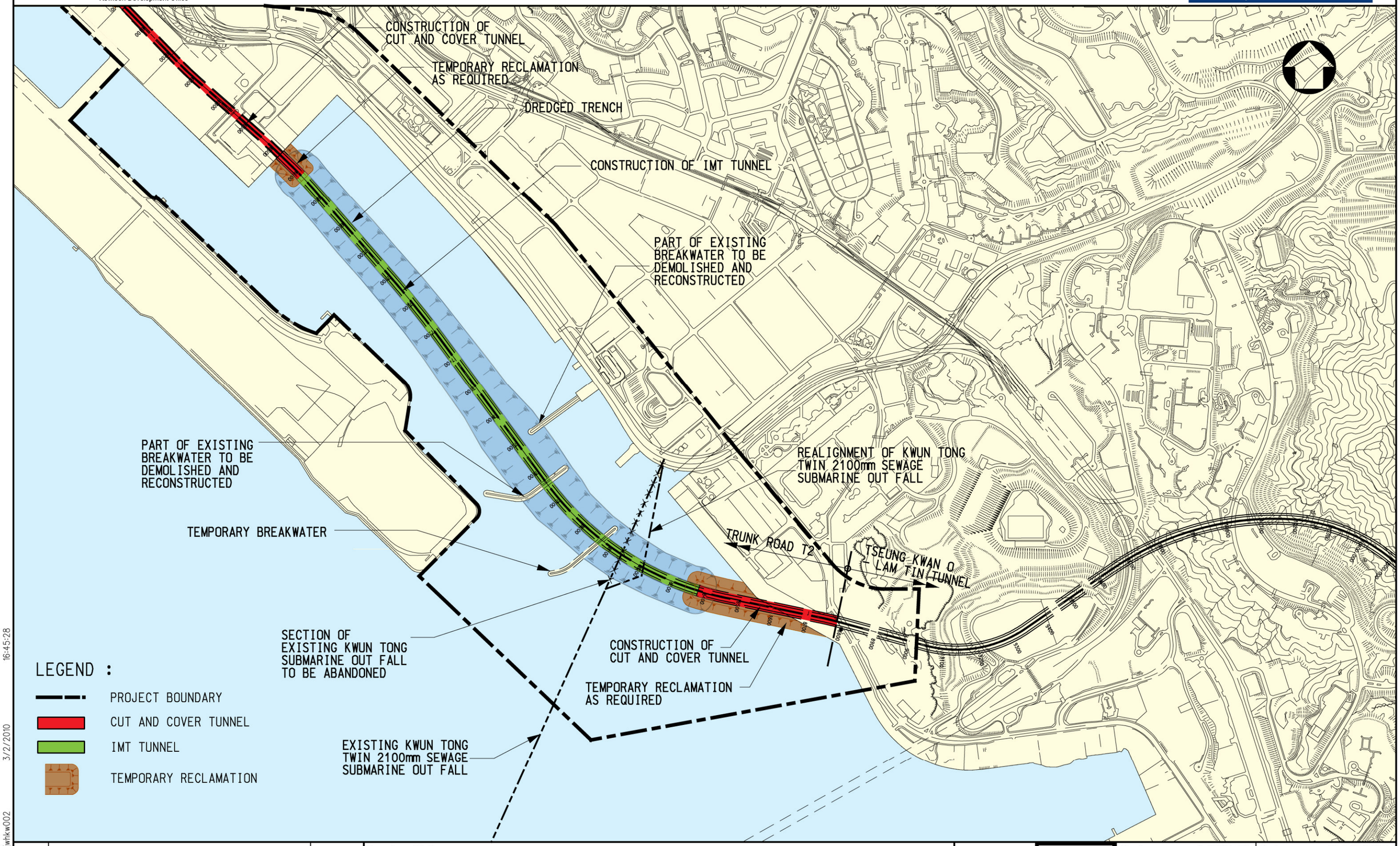
AGREEMENT NO. CE 38/2008(HY)
KAI TAK DEVELOPMENT - TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON - INVESTIGATION, DESIGN AND CONSTRUCTION

Hyder MEINHARDT
Hyder-Meinhardt JV



Rev.	Description	Date

Drawing title

INDICATIVE LAYOUT (H2) AND LOCATIONS OF MARINE WORKS

Original Size: A3

Scale: 1:1000 A3 | Date: 12/JAN/2010

File name: FIGURE 1-1.dgn

Drawing No.: FIGURE 1.1

Rev.: 00

PRINTED BY: jwhkw002 3/2/2010 16:45:28

http://eas.hybis.info/projects/ea/awarded/eb000560/f reports/F0025-EB000560-HCL-HKR-00

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KAI TAK DEVELOPMENT - TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON - INVESTIGATION, DESIGN AND CONSTRUCTION

Hyder-Meinhardt JV

KWUN TONG TYPHOON SHELTER
KWUN TONG
CHA KWO LING
TRUNK ROAD T2
TSEUNG KWAN O - LAM TIN TUNNEL
KOWLOON BAY
ALIGNMENT OPTION H2
ALIGNMENT OPTION H4
EASTERN HARBOUR CROSSING

LEGEND :
PROJECT BOUNDARY
TEMPORARY RECLAMATION

Rev.	Description	Date

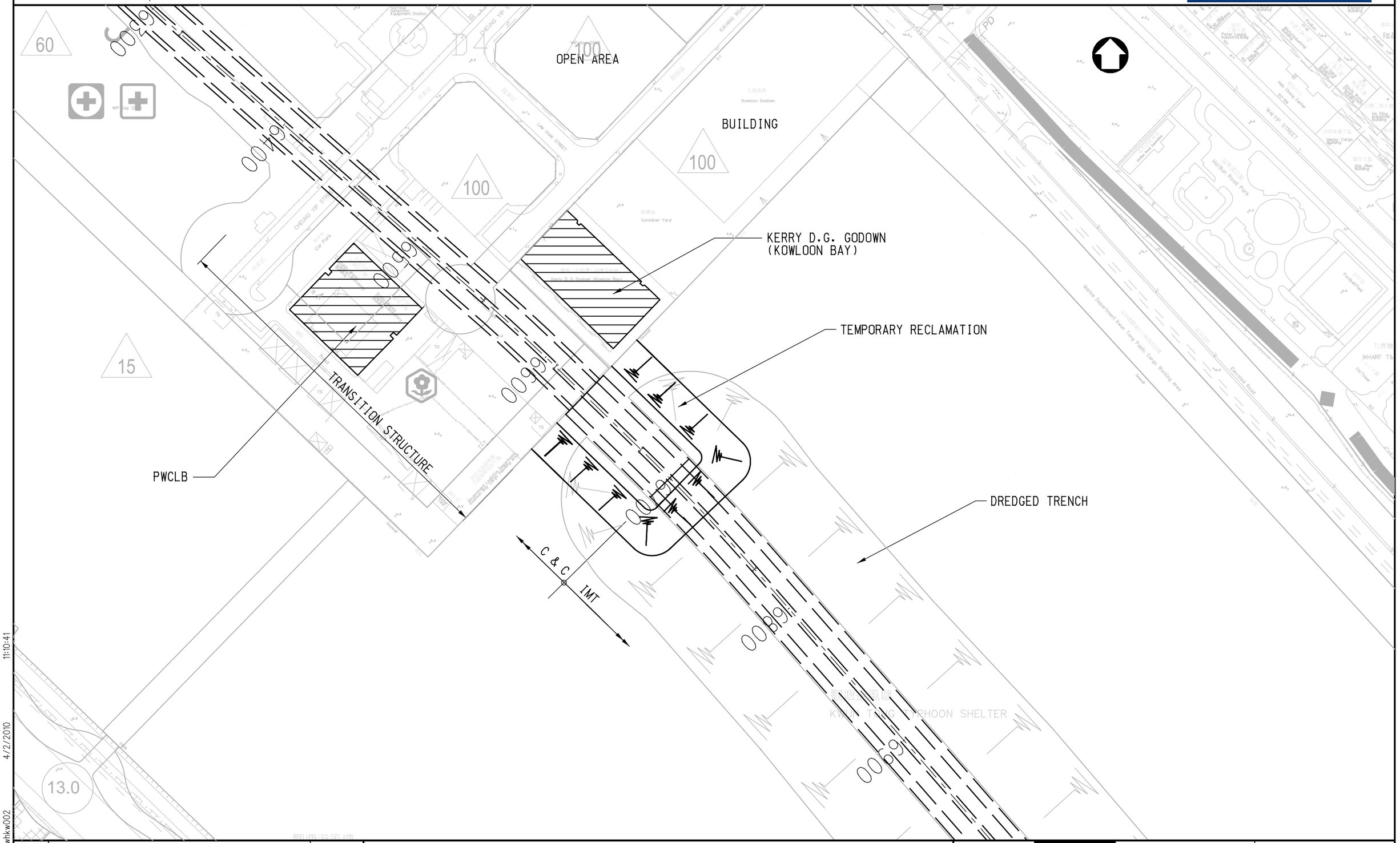
Drawing title
LAYOUT PLAN – HORIZONTAL ALIGNMENT OF OPTION H2 & H4

Original Size: A3
Scale: 1:10000
Date: 05/JAN/2010
File name: FIGURE 1-2.dgn

Drawing No.: FIGURE 1.2
Rev.: 00

PRINTED BY: jwhkw002 3/2/2010 17:07:31

http://eas.hybis.info/projects/ea/awarded/eb000560/f reports/F0025-EB000560-HCL-HKR-00



PRINTED BY: jwhkw002 4/2/2010 11:10:41

Rev.	Description	Date

Drawing title

TEMPORARY RECLAMATION AT SOUTH APRON AREA – INTERFACE
IMT OPTION H2 & H4

Original Size: A3

Scale 1 : 2000 | Date 06/JAN/2010
File name FIGURE 1-3.dgn
Drawing No. FIGURE 1.3 | Rev. 00

CAD FILE : K:\EB000560 Trunk Road T2 and Infrastructure at South Apron\F-Reports\GIpaper\Figure\Figure 1-3.dgn

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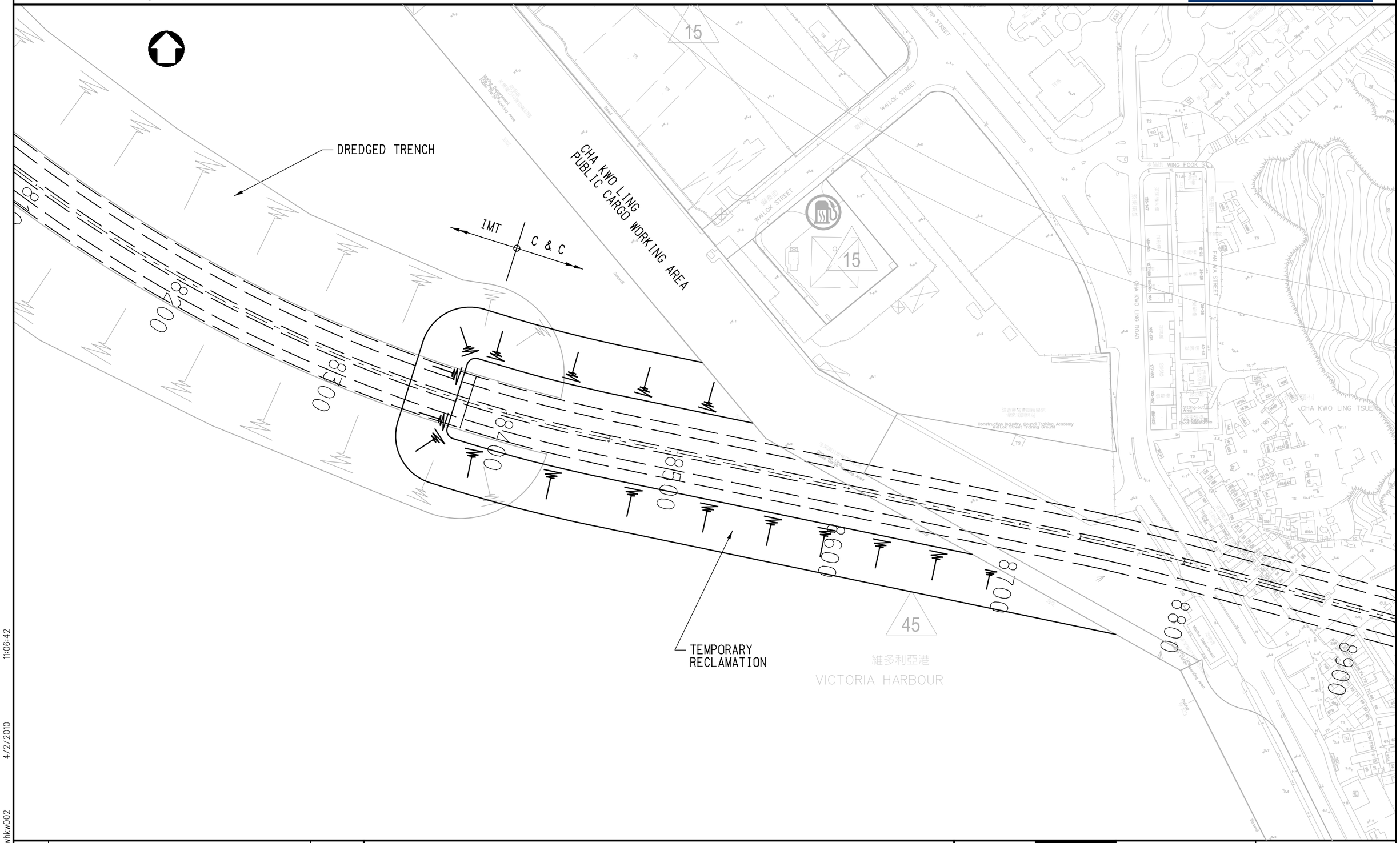
KAI TAK DEVELOPMENT - TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON - INVESTIGATION, DESIGN AND CONSTRUCTION

Hyder-Meinhardt JV



Rev.	Description	Date

Drawing title

TEMPORARY RECLAMATION AT CHA KWO LING - INTERFACES
IMT OPTION H2

Original Size: A3

Scale: 1 : 2000 | Date: 06/JAN/2010
File name: FIGURE 1-4.dgn
Drawing No.: FIGURE 1.4 | Rev.: 00

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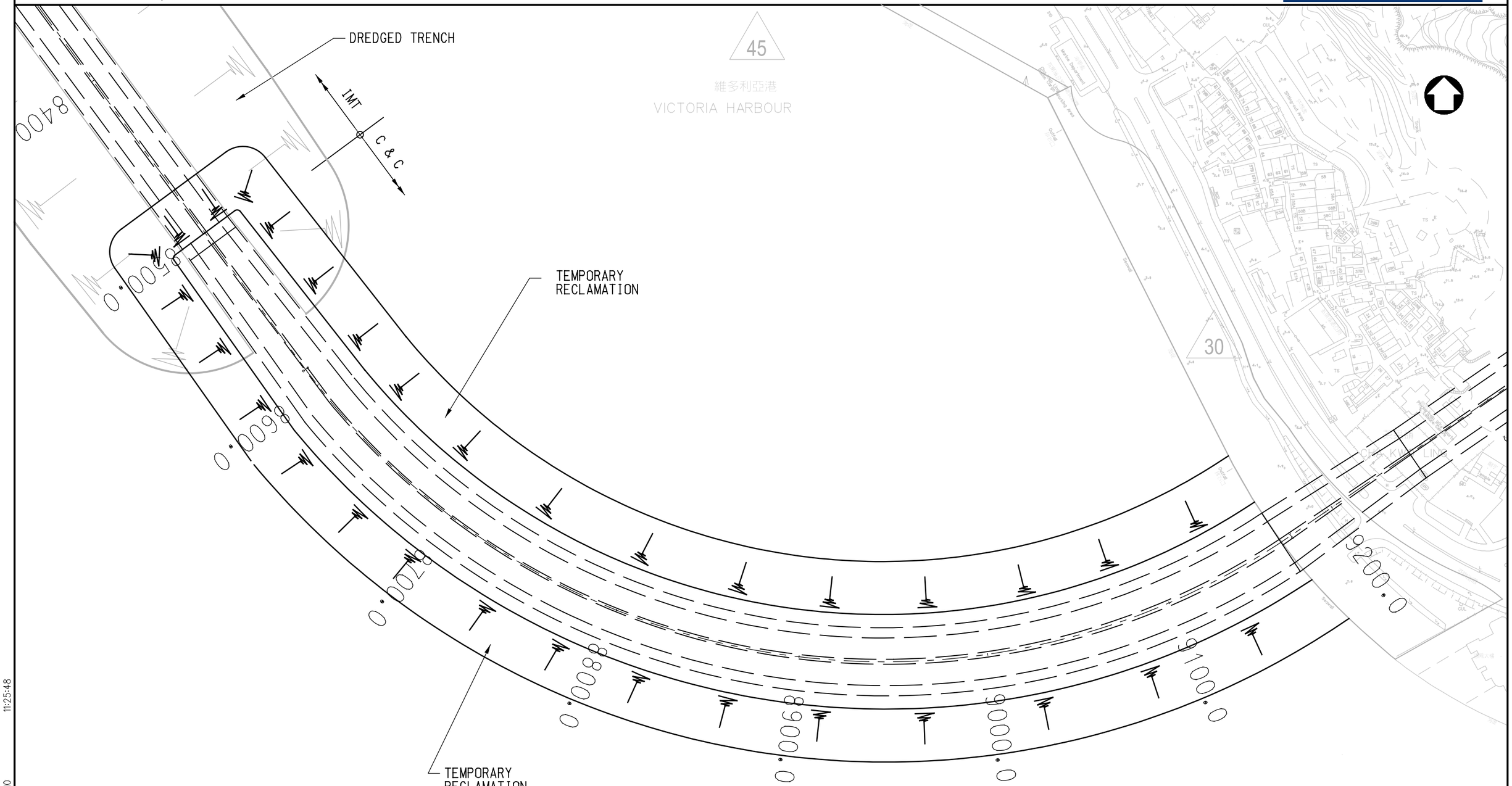
CAD FILE : K:\EB000560 Trunk Road T2 and Infrastructure at South Apron\F-Reports\GIpaper\Figure\Figure 1-4.dgn



維多利亞港
Victoria Harbour

Rev.	Description	Date

Drawing title

TEMPORARY RECLAMATION AT CHA KWO LING - INTERFACES
IMT OPTION H4

Original Size: A3

Scale: 1 : 2000 | Date: 06/JAN/2010

File name: FIGURE 1-5.dgn

Drawing No.: FIGURE 1.5 | Rev.: 00

PRINTED BY: jwhkw002 4/2/2010 11:25:48

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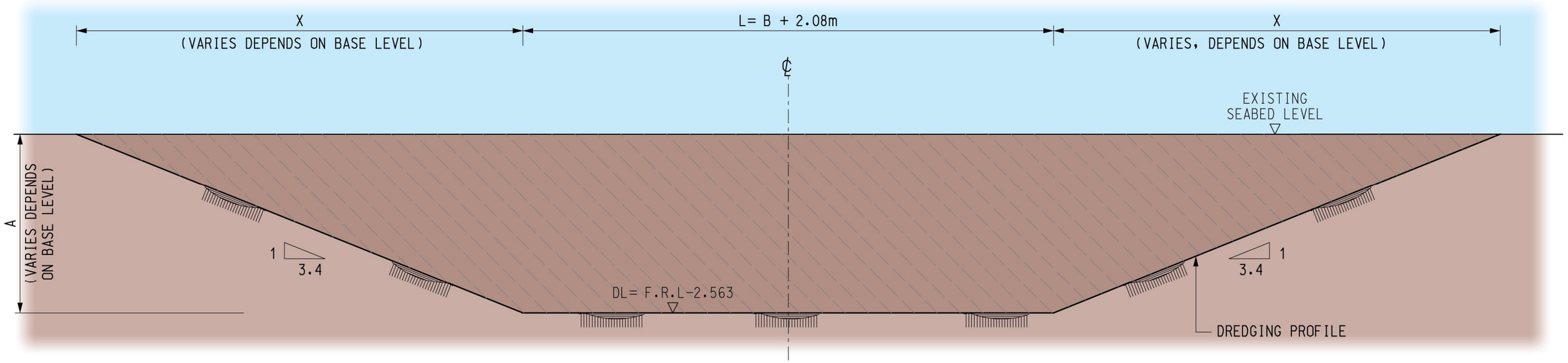
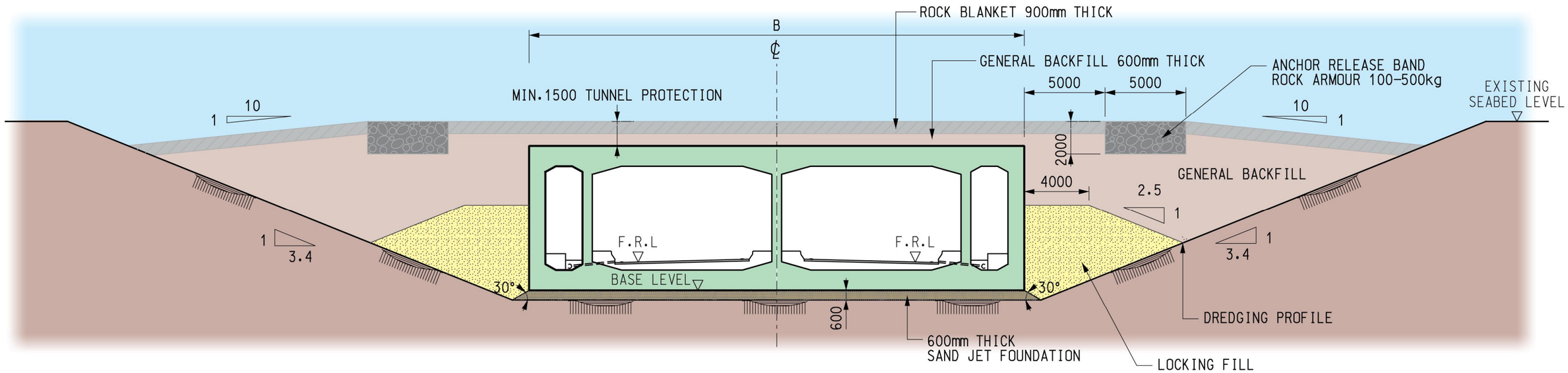


TYPICAL DREDGING CROSS SECTION

LEGEND :

DREDGING CROSS SECTION AREA



TYPICAL CONSTRUCTION SECTION

Rev.	Description	Date

Drawing title

TYPICAL DREDGING / CONSTRUCTION CROSS SECTION

Original Size: A3

Scale: N.T.S. | Date: 05/JAN/2010

File name: FIGURE 5-5.dgn

Drawing No.: FIGURE 1.6

Rev.: 00

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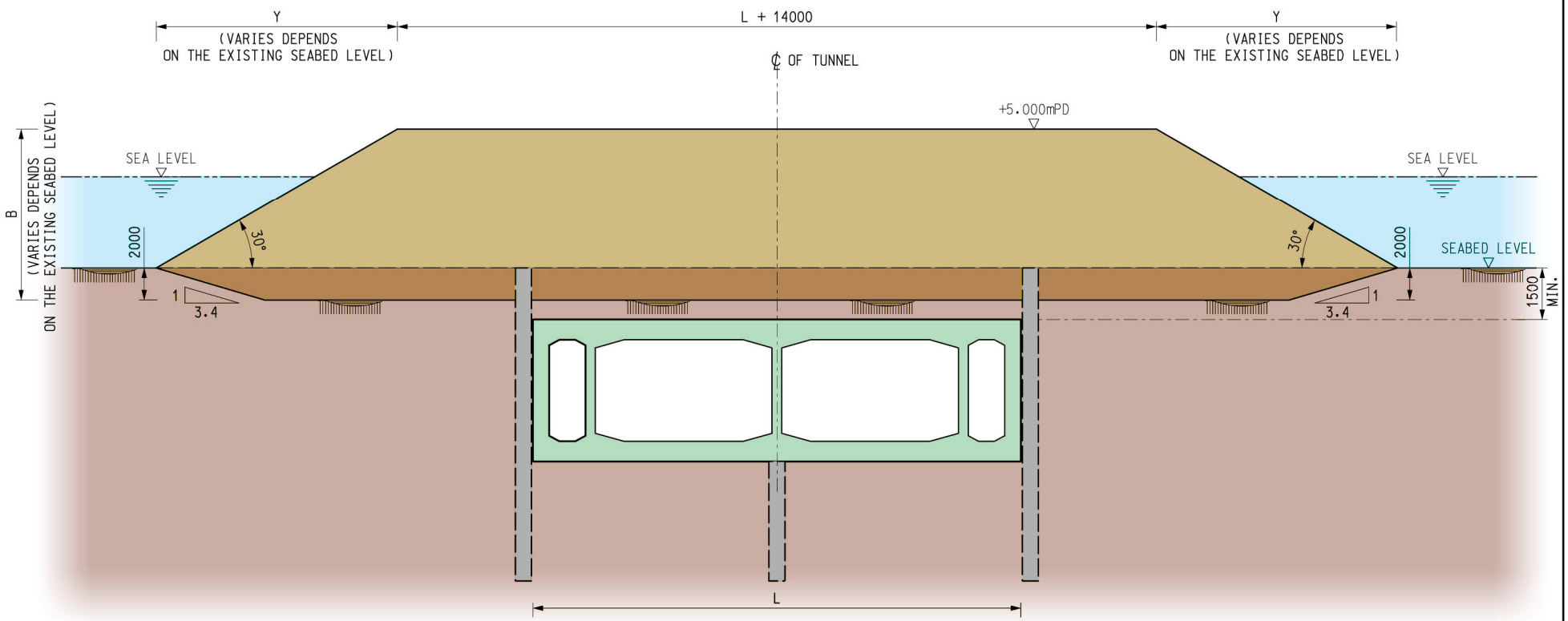
CAD FILE : K:\EB000560 Trunk Road T2 and Infrastructure at South Apron\E-OurDrawings\SKETCH\FIGURE 5-5.dgn



TYPICAL TEMPORARY RECLAMATION FOR CUT & COVER SECTION

LEGEND :

- AREA TO BE REMOVED AFTER CONSTRUCTION DOWN TO SEABED LEVEL
- AREA TO BE SAND FILL
- TEMPORARY WORKS – DIAPHRAGM WALL TO BE CUT DOWN BELOW SEABED LEVEL

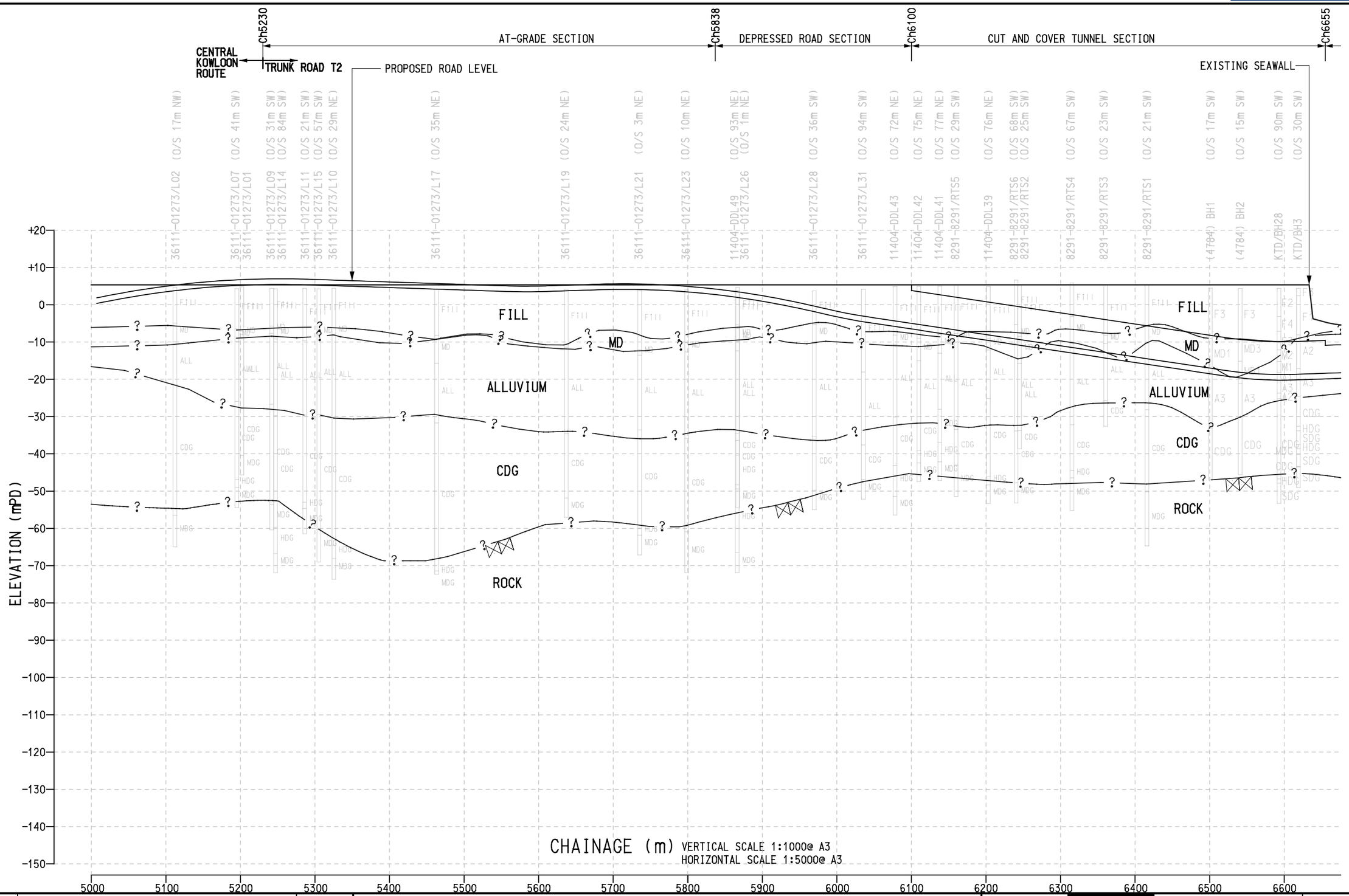
Rev.	Description	Date

Drawing title: TYPICAL TEMPORARY RECLAMATION FOR CUT & COVER SECTION

Original Size: A3 | Scale: 1 : 250 | Date: 06/JAN/2010

File name: FIGURE 6-1.dgn

Drawing No.: FIGURE 1.7 | Rev.: 00



PRINTED BY: jwhkw002 22/1/2010 16:44:11

Rev.	Description	Date

Drawing title

VERTICAL ALIGNMENT AND GEOLOGICAL PROFILE FOR H2 (OPTION 1) - IMT (SHEET 1 OF 3)

Original Size: A3

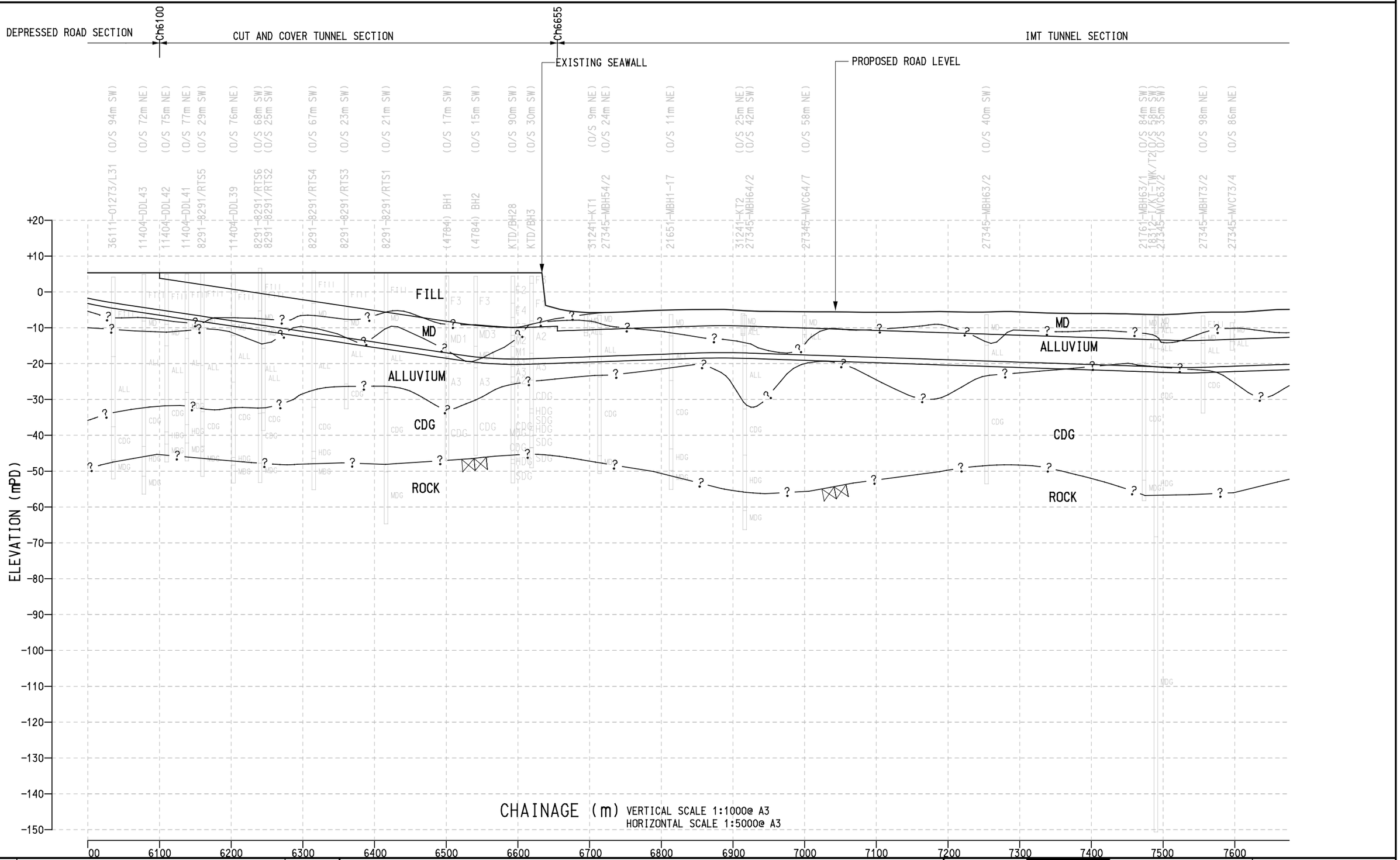
Scale: AS SHOWN | Date: 05/JAN/2010

File name: FIGURE 1-8-SH1.dgn

Drawing No.: FIGURE 1.8

Rev.: 00

CAD FILE : K:\EB000560 Trunk Road T2 and Infrastructure at South Apron\F-Reports\GIpaper\Figure\FIGURE 1-8-SH1.dgn



Rev.	Description	Date

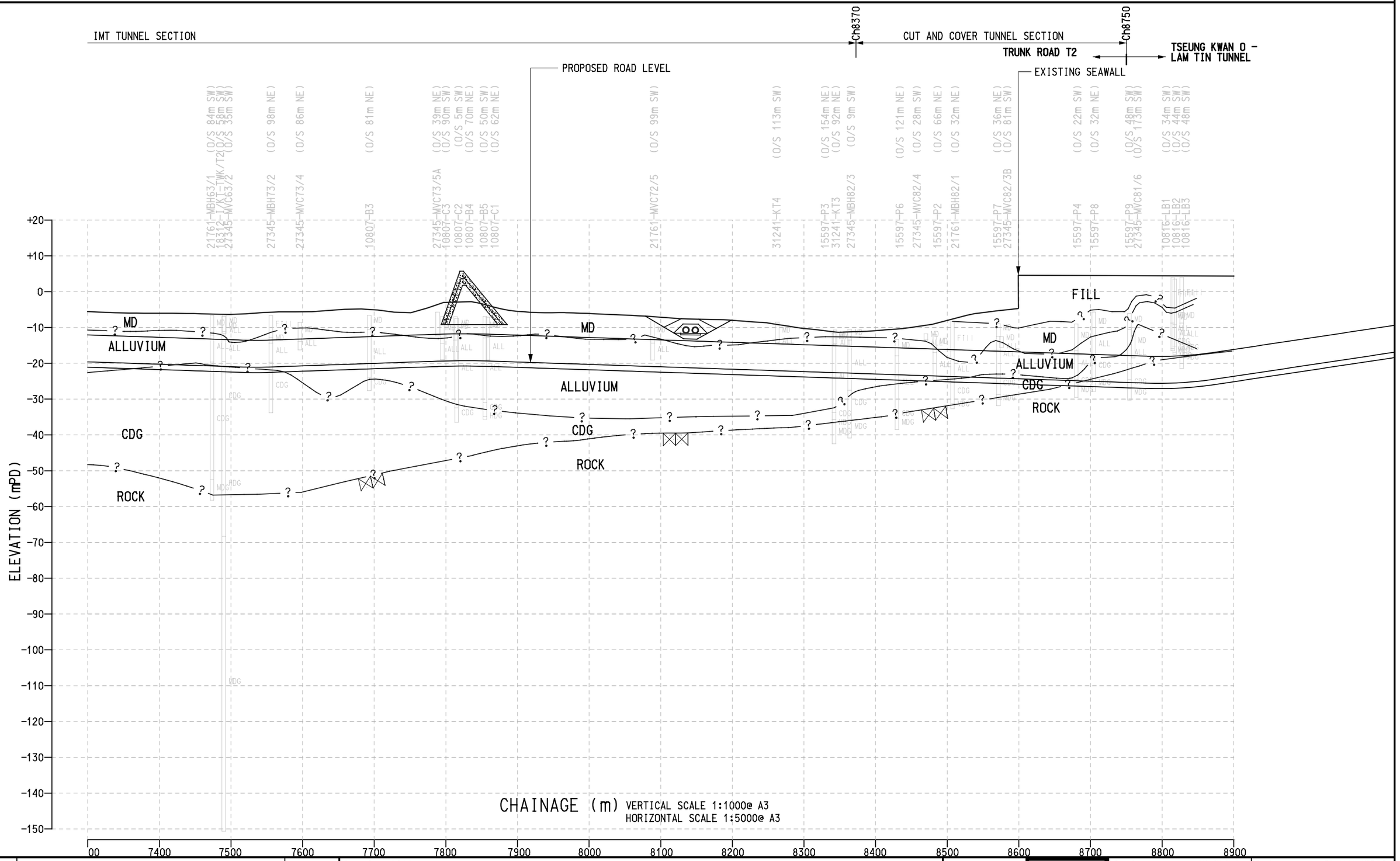
Drawing title

VERTICAL ALIGNMENT AND GEOLOGICAL PROFILE FOR H2 (OPTION 1) - IMT (SHEET 2 OF 3)

Original Size	A3	Scale	AS SHOWN
		Date	05/JAN/2010
		File name	FIGURE 1-8-SH2.dgn
© Copyright reserved		Drawing No.	FIGURE 1.8
		Rev.	00

PRINTED BY: jwhkw002 22/1/2010 16:41:55

CAD FILE : K:\EB000560 Trunk Road T2 and Infrastructure at South Apron\F-Reports\GIpaper\Figure\FIGURE 1-8-SH2.dgn



Rev.	Description	Date

Drawing title

VERTICAL ALIGNMENT AND GEOLOGICAL PROFILE FOR H2 (OPTION 1) – IMT (SHEET 3 OF 3)

Original Size	A3	Scale	AS SHOWN
		Date	05/JAN/2010
		File name	FIGURE 1-8-SH3.dgn
© Copyright reserved		Drawing No.	FIGURE 1.8
		Rev.	00

PRINTED BY: jwhkw002 22/1/2010 16:43:28

CAD FILE : K:\EB000560 Trunk Road T2 and Infrastructure at South Apron\F-Reports\GIpaper\Figure\FIGURE 1-8-SH3.dgn

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Civil Engineering and Development Department
九龍拓展處
Kowloon Development Office

AGREEMENT NO. CE 38/2008(HY)
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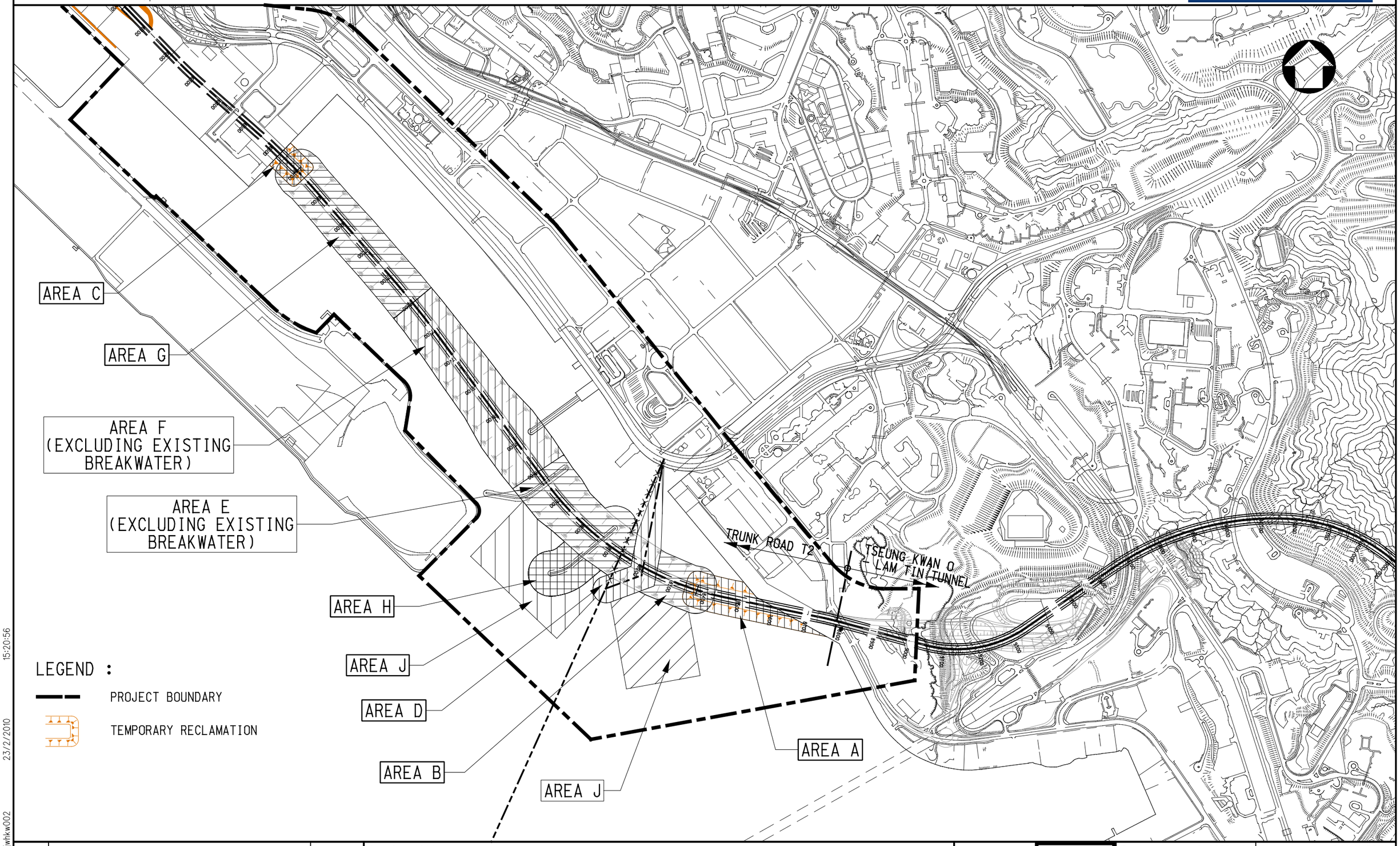
Hyder-Meinhardt JV



Rev.	Description	Date

Drawing title

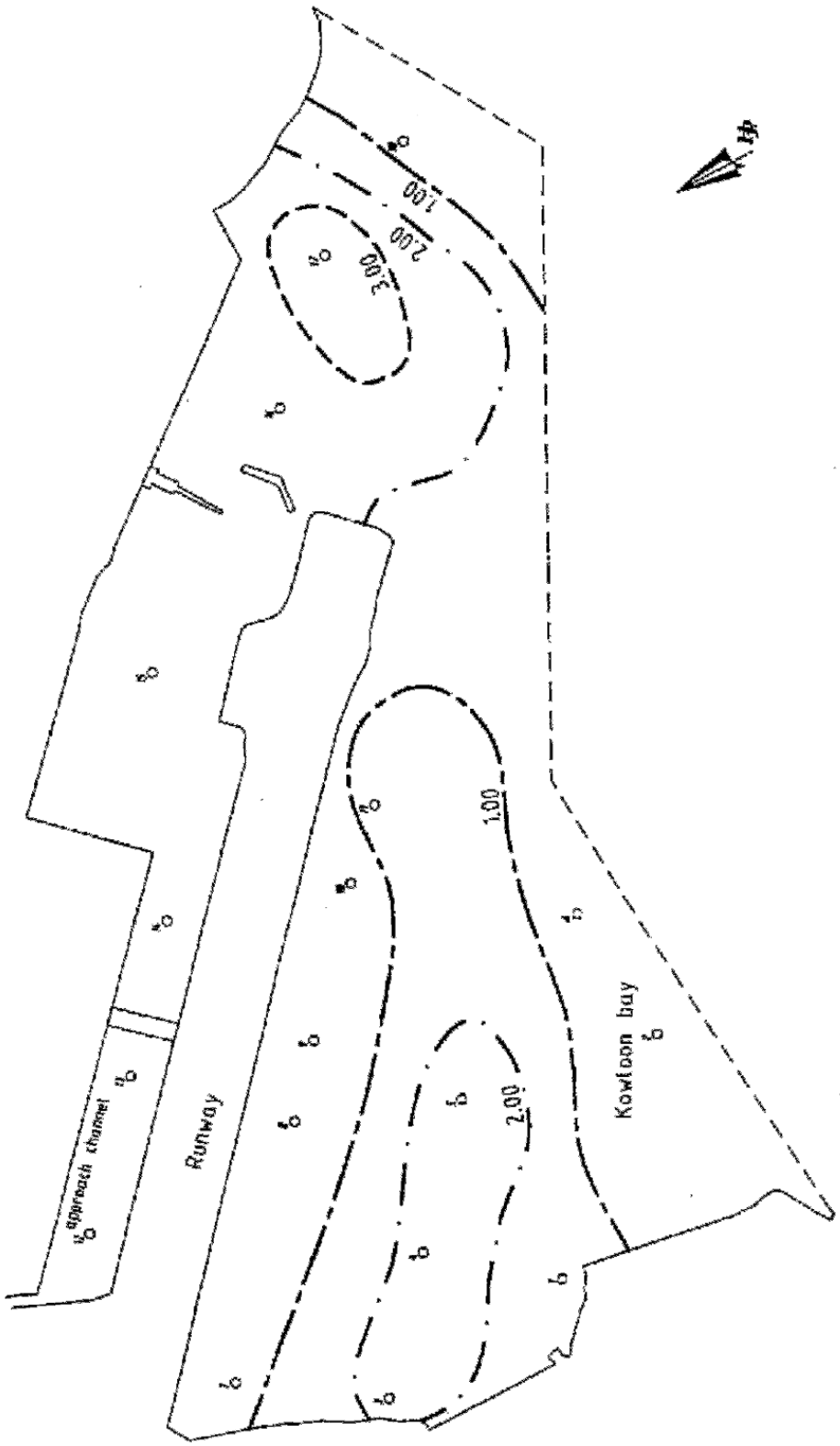
INDICATIVE LAYOUT PLAN OF DREDGING / BACKFILLING AREAS (H2)

Original Size: A3

Scale 1:1000 A3 | Date 12/JAN/2010
File name E0074-EB000560-HCL-HKK-00.dgn
Drawing No. FIGURE 1.1A | Rev. 00

PRINTED BY: jwhkw002 23/2/2010 15:20:56

CAD FILE : K:\EB000560 Trunk Road T2 and Infrastructure at South Apron\E-OurDrawings\SKETCH\E0074-EB000560-HCL-HKK-00.dgn



Drawing title: Thickness (m) of Sediment-Layer Classified as "C-material" (Phase 1 SI) reported in SEKD EIA	Scale NTS	Date 27 Oct 2009
	File name	
	Drawing No. Fig 2.1	Rev. 00

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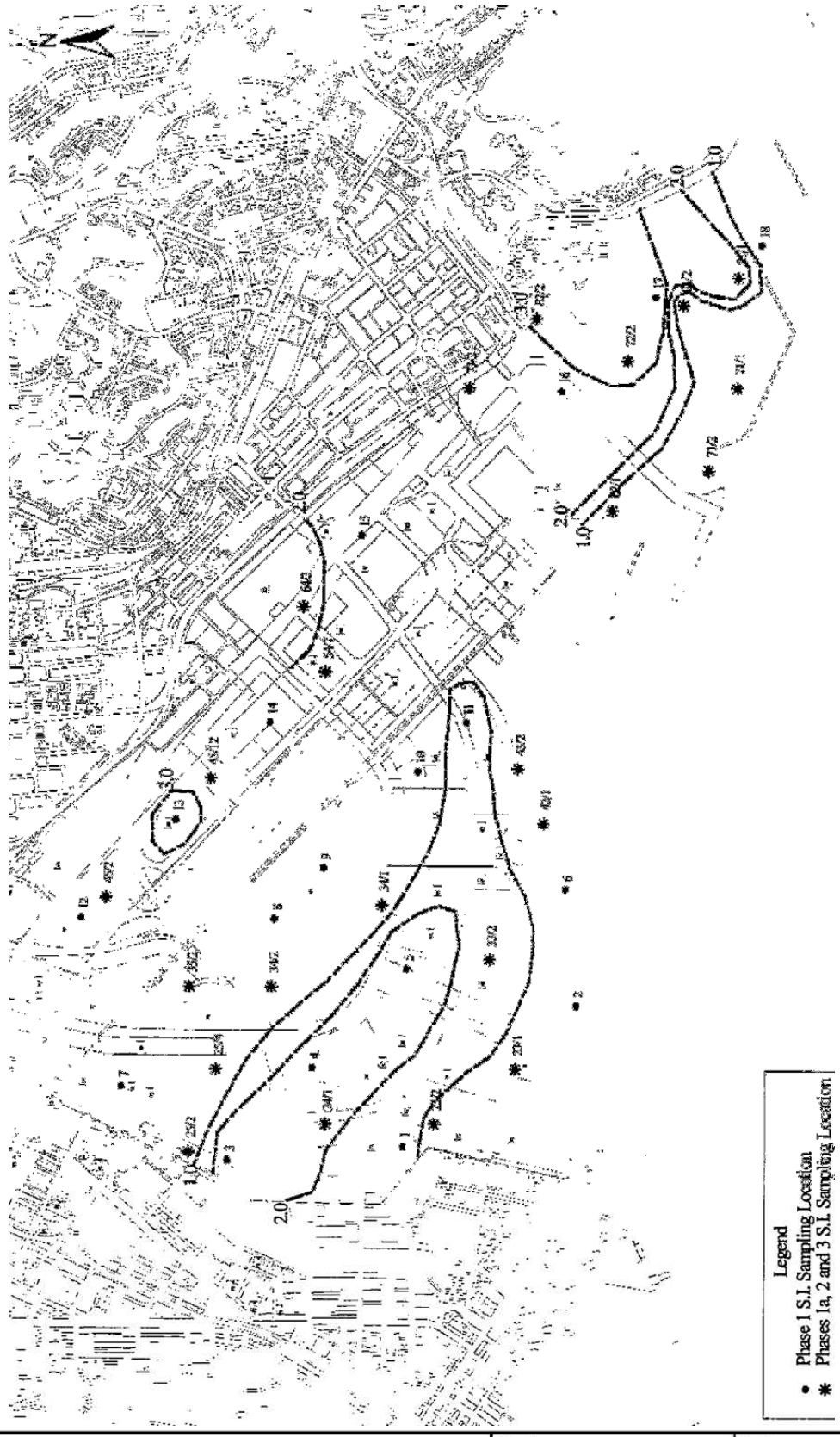

Drawing title
Thickness (m) of Sediment-Layer Classified as "C-material" (Phases 1a, 2 and 3 SI) reported in SEKD EIA

Scale NTS
Date 27 Oct 2009
File name
Drawing No. Fig 2.2
Rev. 00

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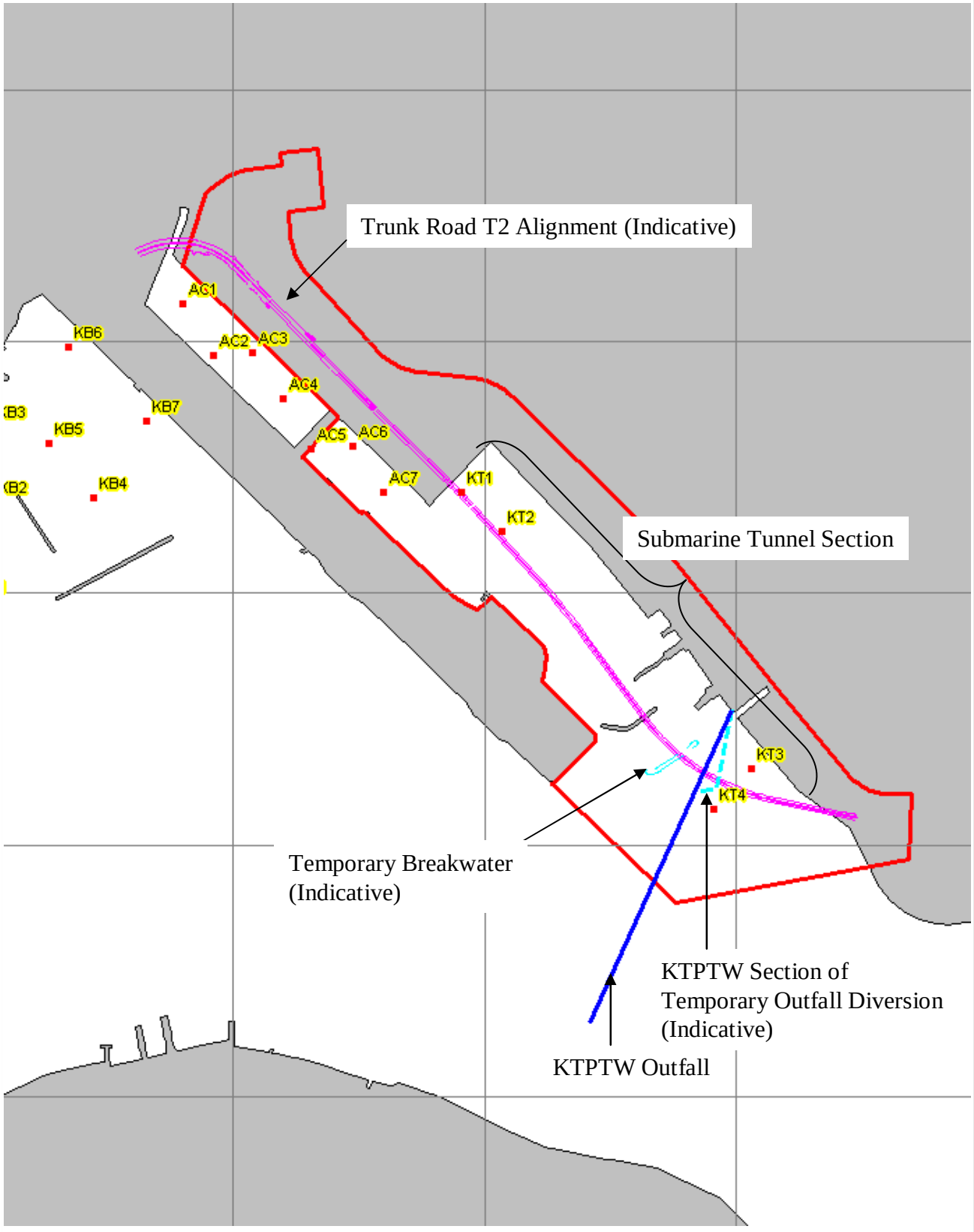
Hyder-Meinhardt JV



Drawing title
Sediment Sampling Point for SI in SEKDCFS EIA

Scale Grid 1,000m apart | Date 14 Oct 2009
File name
Drawing No. Fig 2.3 | Rev. 00

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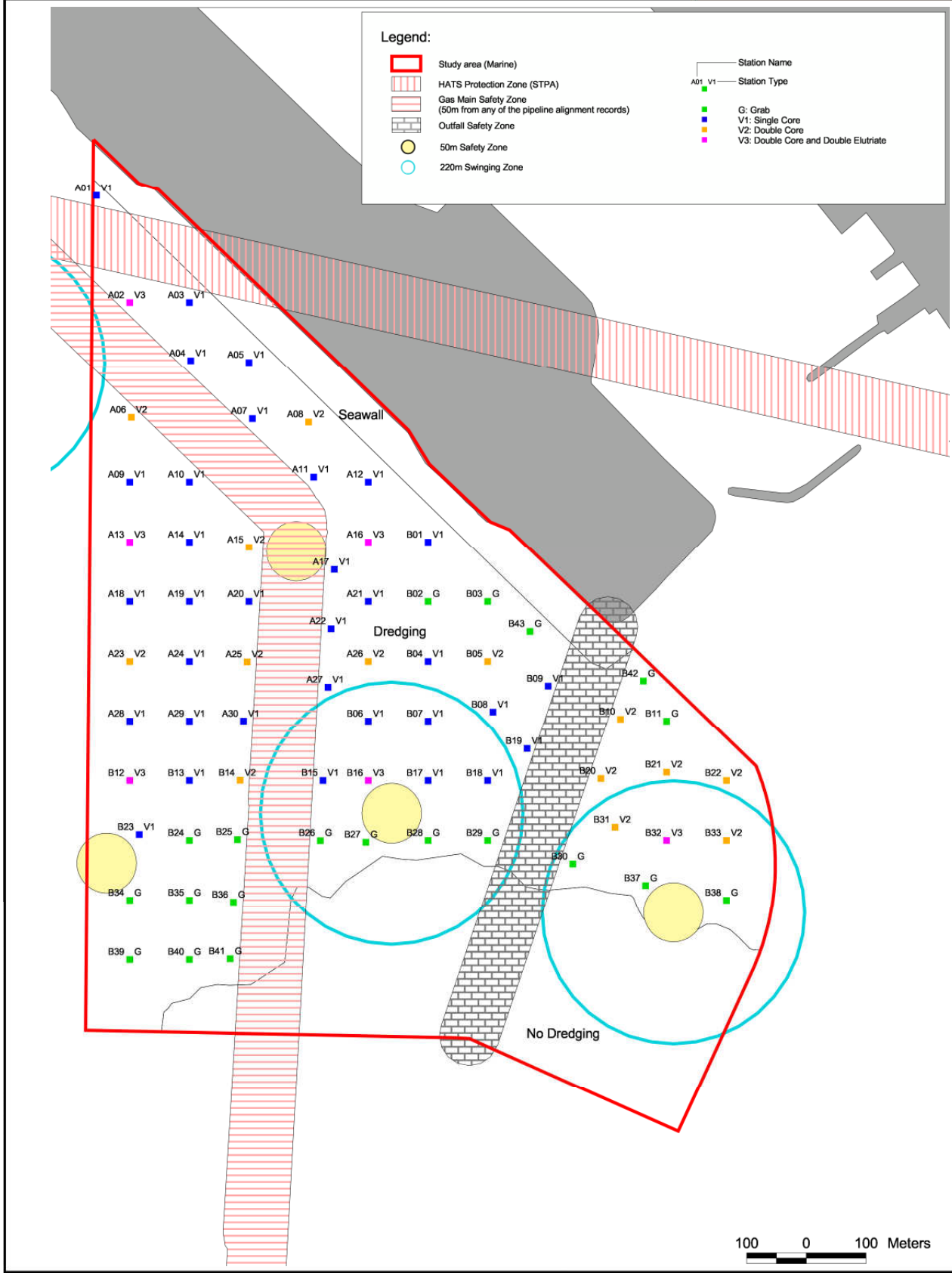
Hyder-Meinhardt JV



Drawing title
Sediment Sampling Plan for CT Dredging EIA

Scale AS SHOWN
Date 27 Oct 2009
File name
Drawing No. Fig 2.4
Rev. 00

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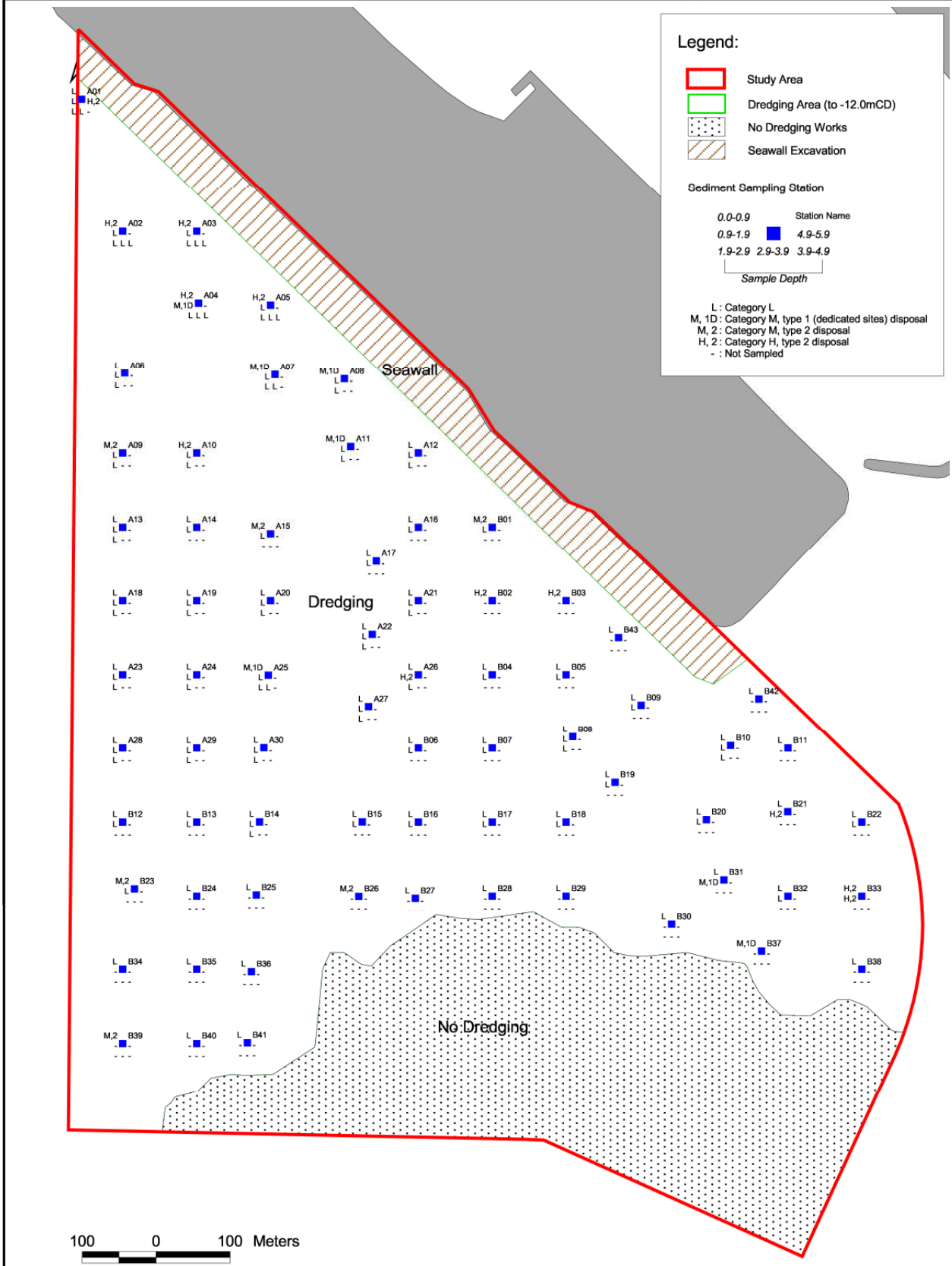
Hyder MEINHARDT
Hyder-Meinhardt JV



Drawing title: Sediment Testing Results for CT Dredging EIA	Scale: AS SHOWN	Date: 27 Oct 2009	
	File name:		
	Drawing No.: Fig 2.5		Rev.: 00

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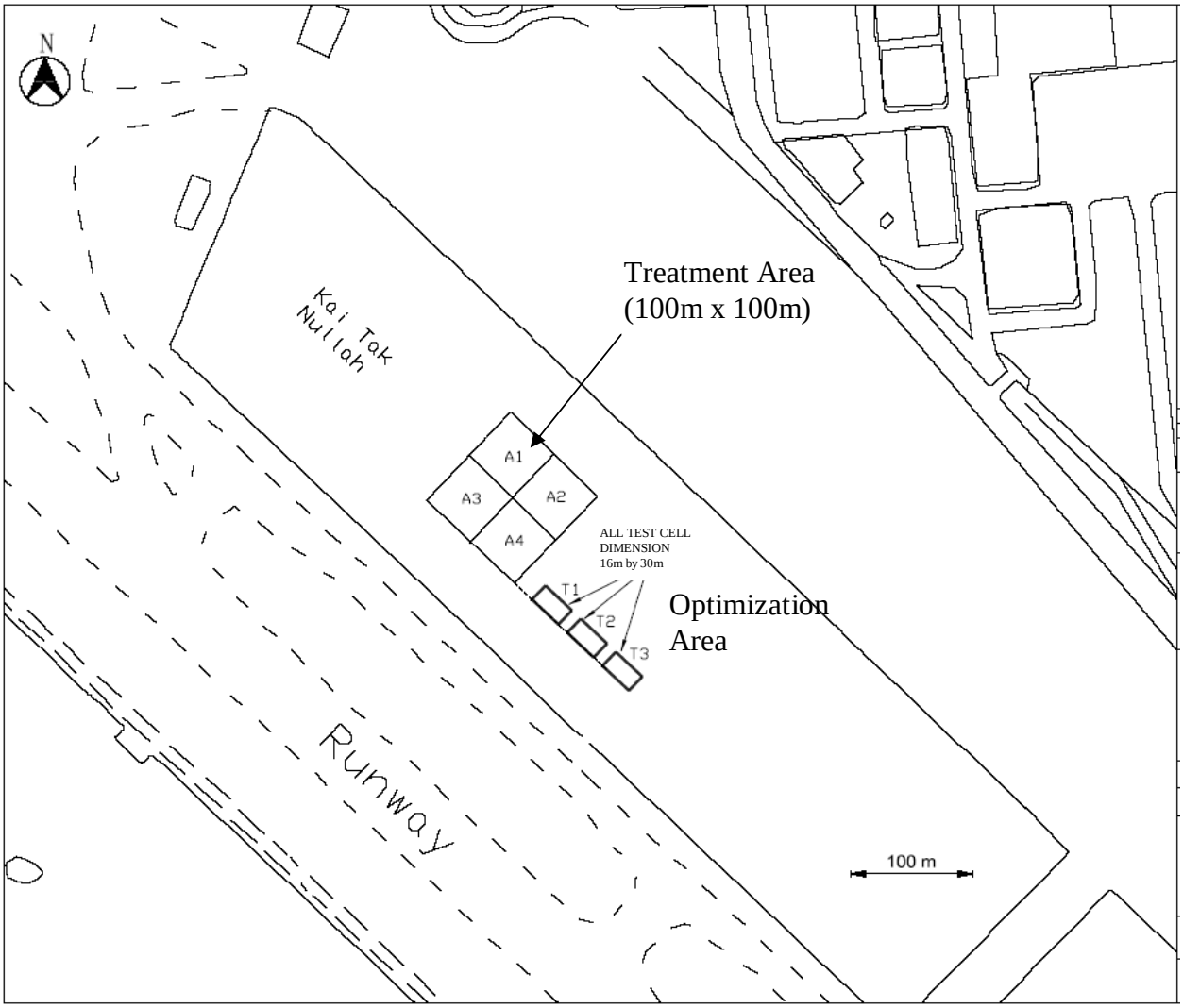
Hyder-Meinhardt JV



Drawing title	Scale	Date
Layout Plan of Bioremediation Trial Site and Treatment Areas	AS SHOWN	14 Oct 2009
	File name	
	Drawing No. Fig 2.6	Rev. 00

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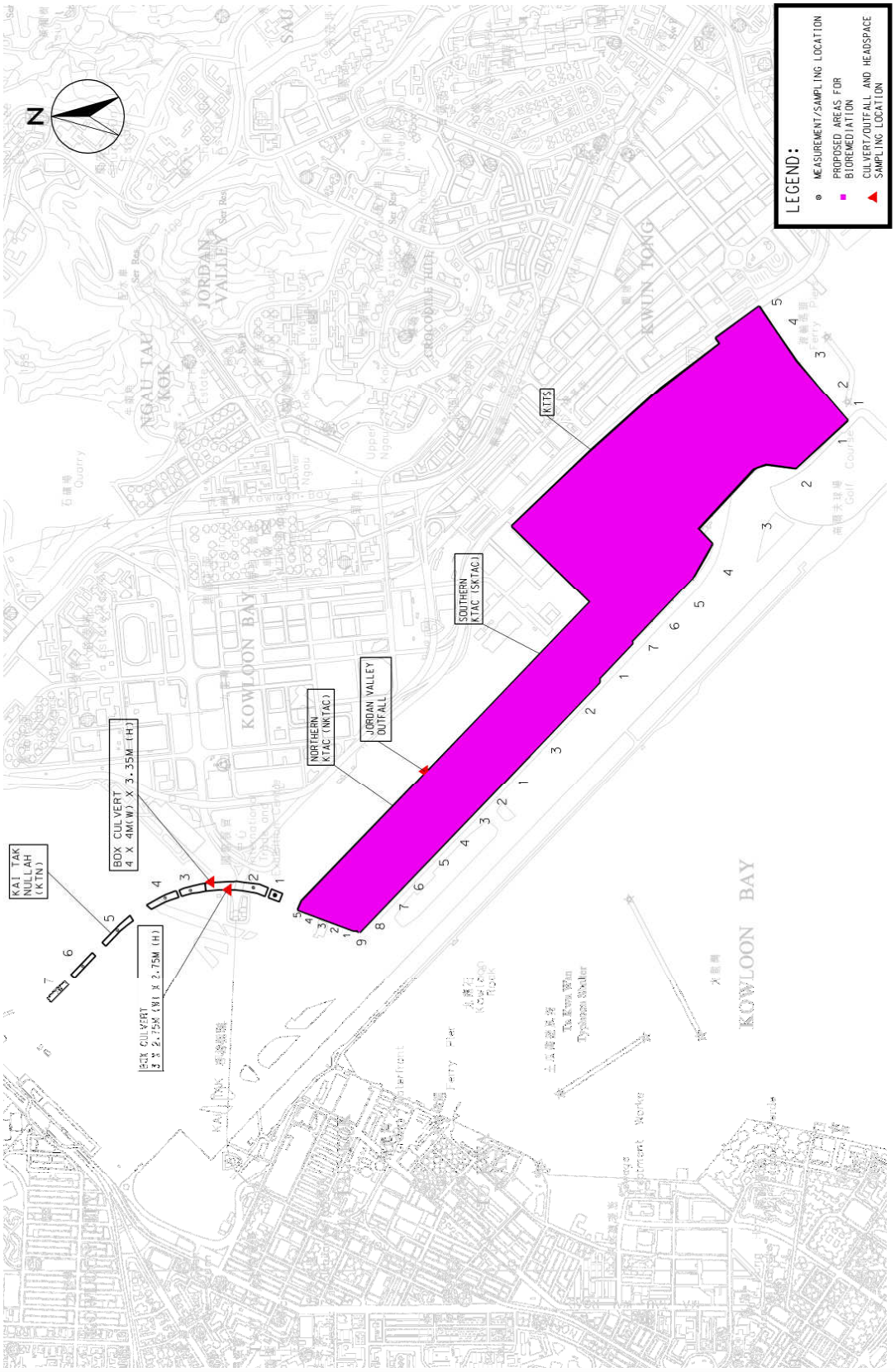
KAI TAK DEVELOPMENT - TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON - INVESTIGATION, DESIGN AND CONSTRUCTION

Hyder-Meinhardt JV



Drawing title

Area Proposed for in-situ Bioremediation in KTD EIA

Scale	NTS	Date	27 Oct 2009
File name			
Drawing No.	Fig 2.7	Rev.	00

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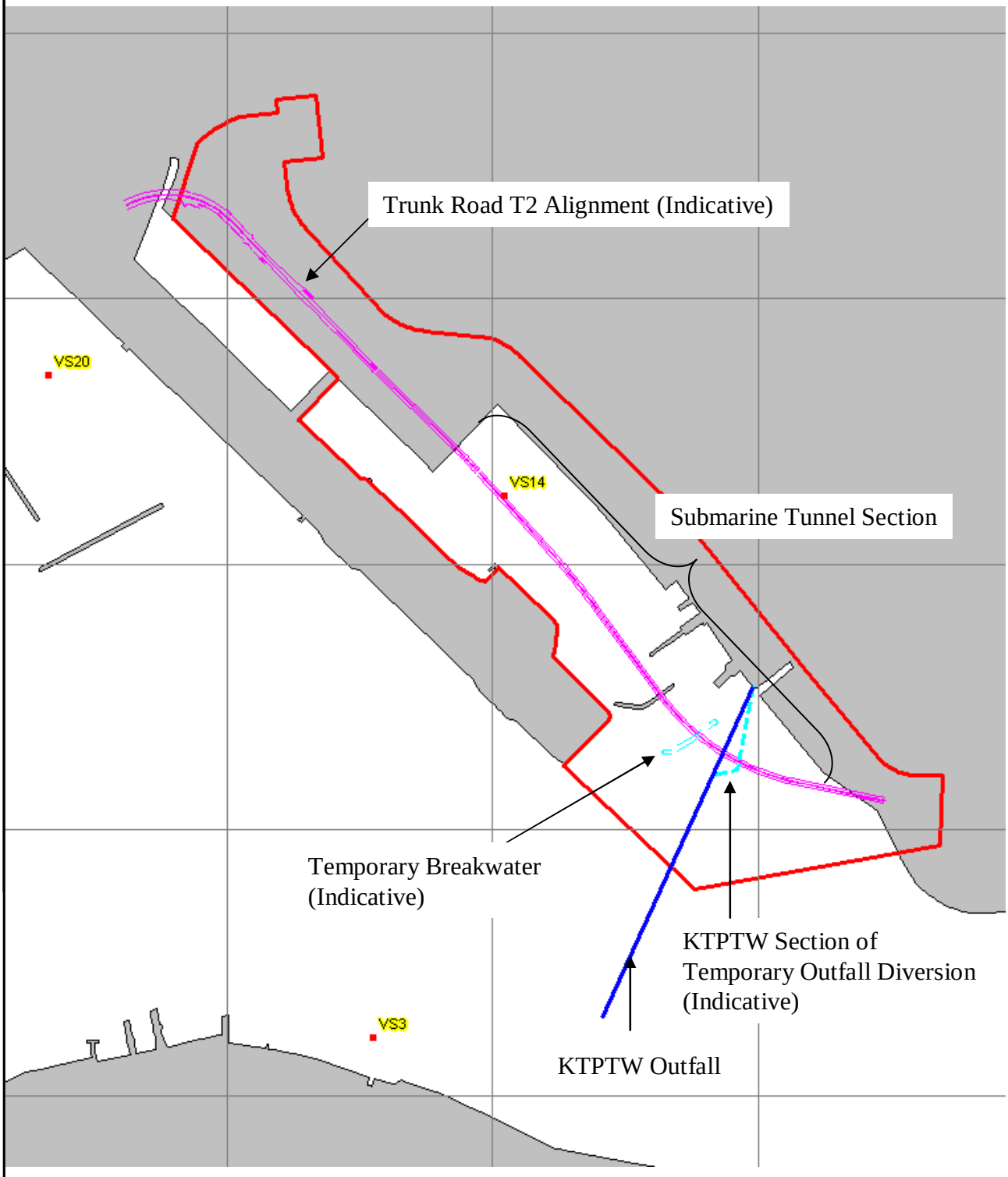
Hyder-Meinhardt JV



Drawing title
EPD Open Water and Typhoon Shelter Sediment Quality Monitoring Stations Near Project Site

Scale Grid 1,000m apart | Date 14 Oct 2009
File name
Drawing No. Fig 2.8 | Rev. 00

114° 12' E

114° 13.5' E

KOWLOON

KWUN TONG

Cha Kwo Ling

HONG KONG ISLAND

Sounding Not Available

Former Kai Tak Airport Runway

820000

819000

818000

817000

22° 18' N

838000

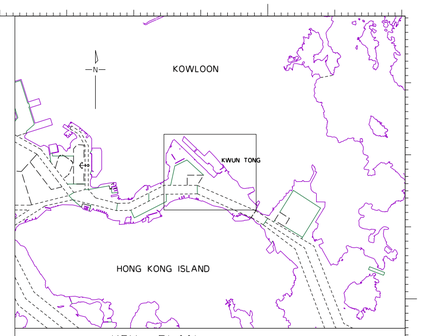
839000

840000

841000

842000

Metres 500 0 500 Metres



KEY PLAN
SCALE :- 1: 200000

NOTES :

1. Coordinates are referred to Hong Kong (1980) Grid.
2. Latitude and Longitude are referred to WGS84 Datum and the graduation mark is in 0.01' interval.
3. Soundings are reduced to Chart Datum which is 0.146m below Hong Kong Principal Datum.
4. The contours are at 0, 2, 5 and 10m

no.	date	description	initial
REVISION			

	name	date
surveyed	SURVEY SECTION	
processed		
checked		

approved

AH/S1

comp. folder no. | encl. no.

job no.

project no.

contract

drawing title

COMPILATION OF SOUNDING RECORDS - AT KOWLOON BAY (Year 2003-08)

drawing no.

FIGURE 2.10

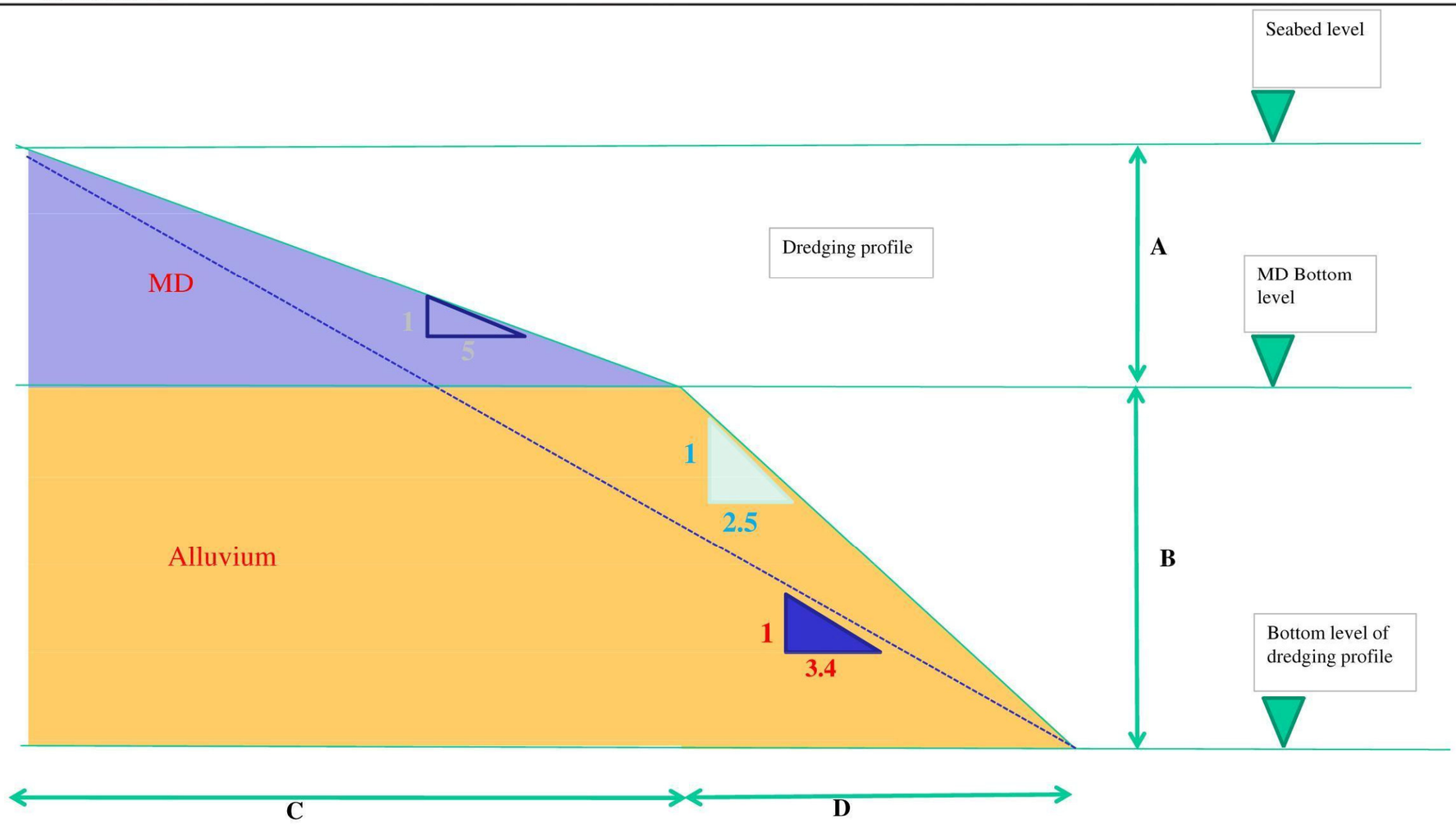
scale

1 : 10000

office

HYDROGRAPHIC OFFICE

MARINE DEPARTMENT
HONG KONG SPECIAL ADMINISTRATIVE REGION



Assume slope ratio for MD 1:5

Assume slope ratio for Alluvium 1:2.5

				A	B	A+B	C	D	C+D	X		
Chainage	Seabed level	MD bottom level	Bottom level of dredging profile	Thickness of MD	Thinkness between MD bottom level and bottom dredging level	Total thickness of dredging profile	Projector of MD Layer	Projector of height between MD bottom level and bottom dredging level	Total side slope width of dredging profile	(A+B)/(C+D)	Slope angle	1/X
6800	-4.937	-11.18	-19.947	6.243	8.767	15.01	31.215	21.9175	53.1325	0.28250129	15.775055	3.5
7200	-5.37	-9.97	-21.493	4.6	11.523	16.123	23	28.8075	51.8075	0.31120977	17.286652	3.2
7600	-5.73	-10.18	-23.271	4.45	13.091	17.541	22.25	32.7275	54.9775	0.3190578	17.695688	3.1
8000	-6.08	-13.36	-27.867	7.28	14.507	21.787	36.4	36.2675	72.6675	0.29981766	16.689659	3.3
8500	-8.36	-18.46	-25.873	10.1	7.413	17.513	50.5	18.5325	69.0325	0.2536921	14.235168	3.9

AVERAGE 3.4

** ONLY FOR REFERENCE

PRINTED BY:

Rev.	Description	Date

Drawing title

ESTIMATION OF AVERAGED SIDE - SLOPE ANGLE

Original Size A3

Scale N.T.S | Date 12/JAN/2010

File name FIGURE 2-9.dgn

Drawing No. FIGURE 2.9

Rev. 00

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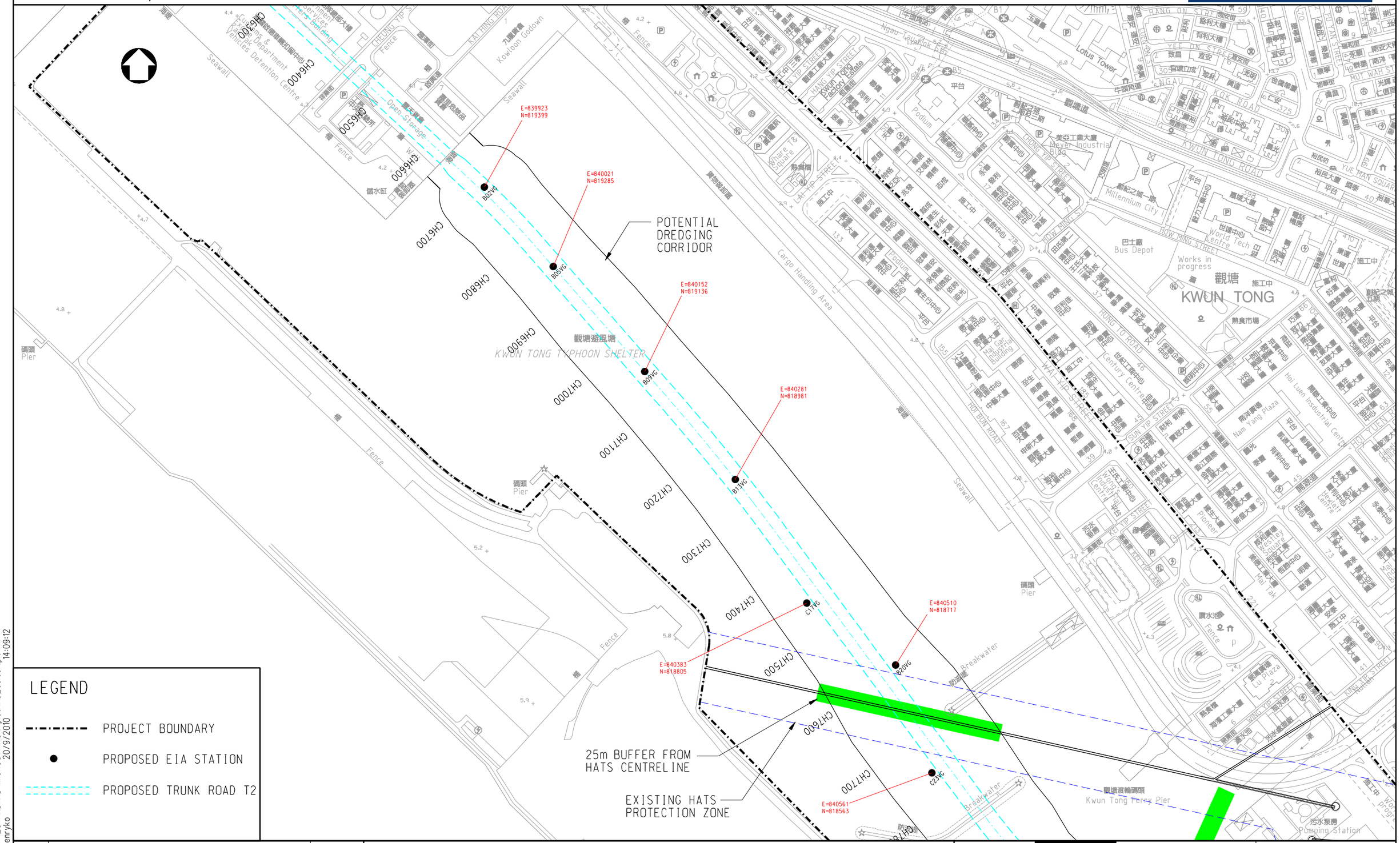
Hyder MEINHARDT
Hyder-Meinhardt JV



LEGEND

- PROJECT BOUNDARY
- PROPOSED EIA STATION
- PROPOSED TRUNK ROAD T2

PLOT DRV: K:_STANDARD\MICROSTATION\plot\A3_colour.plt
PRINTED BY: henryko 20/9/2010 14:09:12

Rev.	Description	Date

Drawing title

PROPOSED SEDIMENT SAMPLING STATIONS FOR IMT OPTION H2 (SHEET 1 OF 2)

Original Size	A3	Scale 1:5000	Date 13 APR 2010
		File name	
© Copyright reserved		Drawing No. FIGURE 3.1	Rev.

CAD FILE : K:\91164 Trunk Road T2\Report\GI\Figure 3.1-Sheet 1 of 2-Proposed Sediment Sampling Stations for IMT Option H2.dgn

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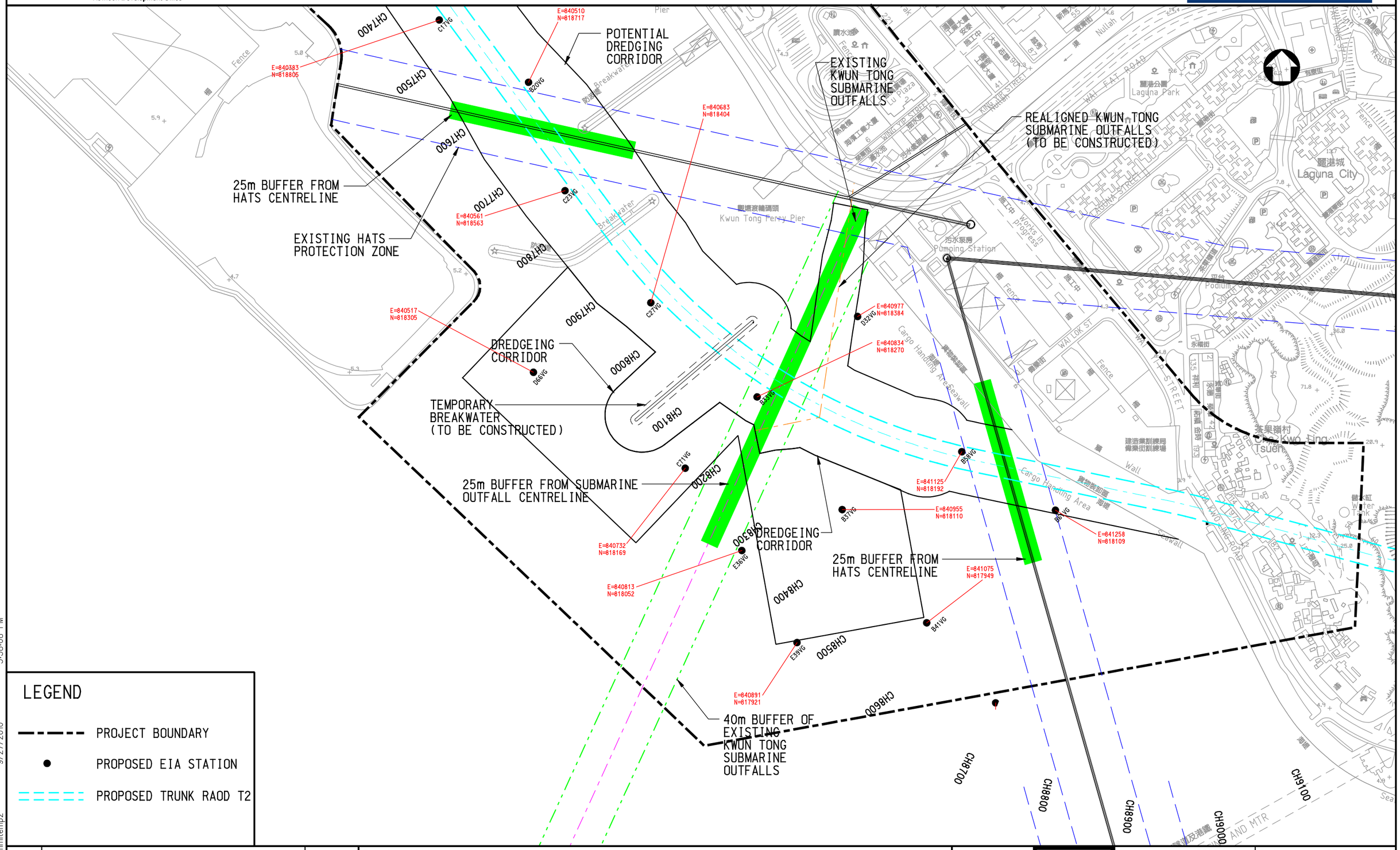
AGREEMENT NO. CE 38/2008(HY)
KAI TAK DEVELOPMENT - TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON - INVESTIGATION, DESIGN AND CONSTRUCTION

Hyder MEINHARDT
Hyder-Meinhardt JV



LEGEND

- PROJECT BOUNDARY
- PROPOSED EIA STATION
- PROPOSED TRUNK RAOD T2

Rev.	Description	Date

Drawing title

PROPOSED SEDIMENT SAMPLING STATIONS FOR IMT OPTION H2 (SHEET 2 OF 2)

Original Size	A3	Scale 1:5000	Date 27 SEP 2010
		File name	
© Copyright reserved		Drawing No. FIGURE 3.1	Rev.

PLOT DRV: K:\91164 Trunk Road T2\Cad Admin\A1 color PDF_Meinhardt.plt 9/27/2010 5:58:08 PM
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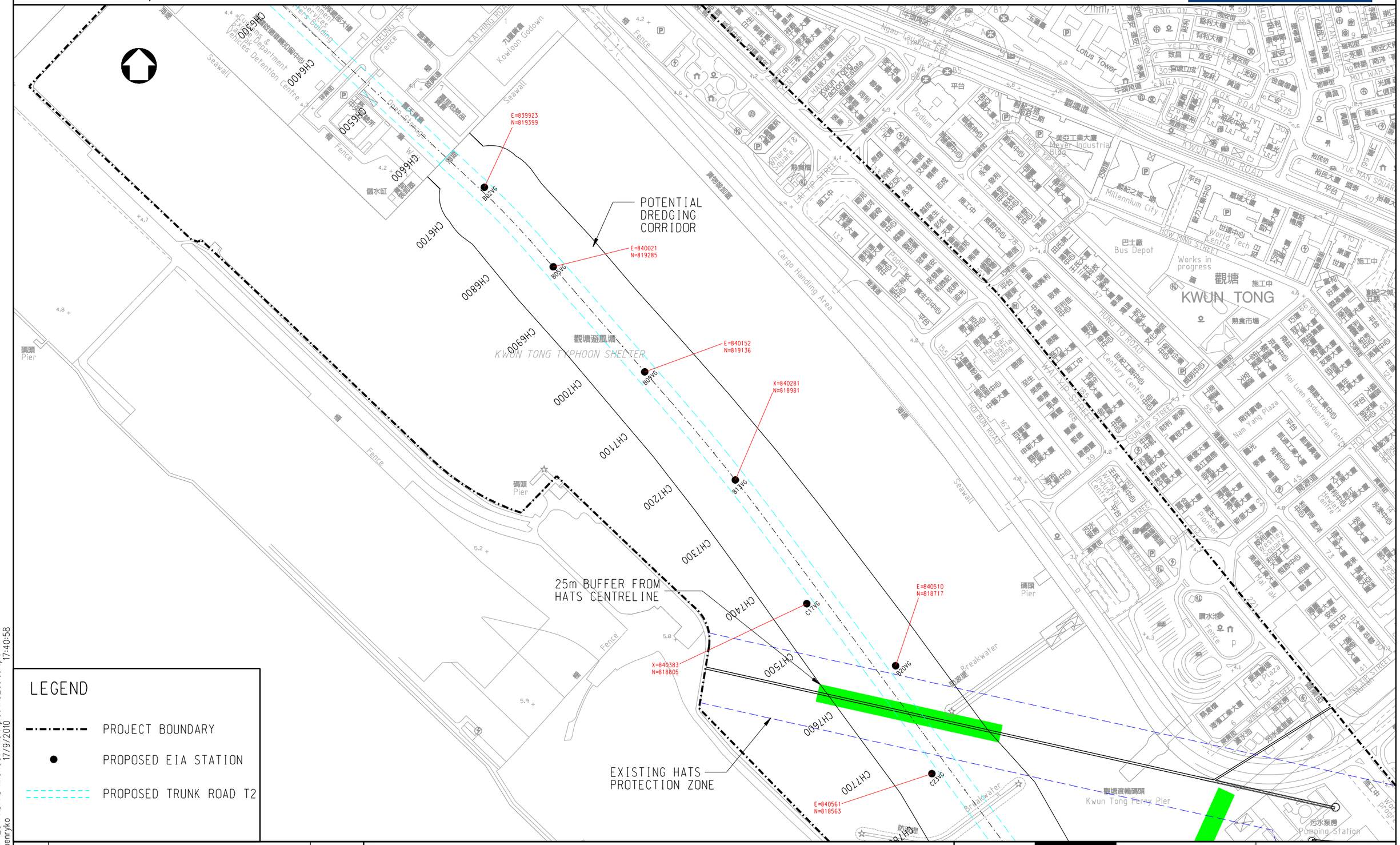
CAD FILE : K:\91164 Trunk Road T2\Report\GI\Figure 3.1-Sheet 2 of 2-Proposed Sediment Sampling Stations for IMT Option H2.dgn

土木工程拓展署
Civil Engineering and Development Department
九龍拓展處
Kowloon Development Office

CEDD

AGREEMENT NO. CE 38/2008(HY)
KAI TAK DEVELOPMENT - TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON - INVESTIGATION, DESIGN AND CONSTRUCTION

Hyder MEINHARDT
Hyder-Meinhardt JV



LEGEND

- PROJECT BOUNDARY
- PROPOSED EIA STATION
- PROPOSED TRUNK ROAD T2

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Rev.	Description	Date

Drawing title

PROPOSED SEDIMENT SAMPLING STATIONS FOR IMT OPTION H4 (SHEET 1 OF 2)

Original Size	A3	Scale 1:5000	Date 13 APR 2010
		File name	
© Copyright reserved		Drawing No. FIGURE 3.2	Rev.

CAD FILE : K:\91164 Trunk Road T2\Report\GI\Figure 3.2-Sheet 1 of 2-Proposed Sediment Sampling Stations for IMT Option H4.dgn

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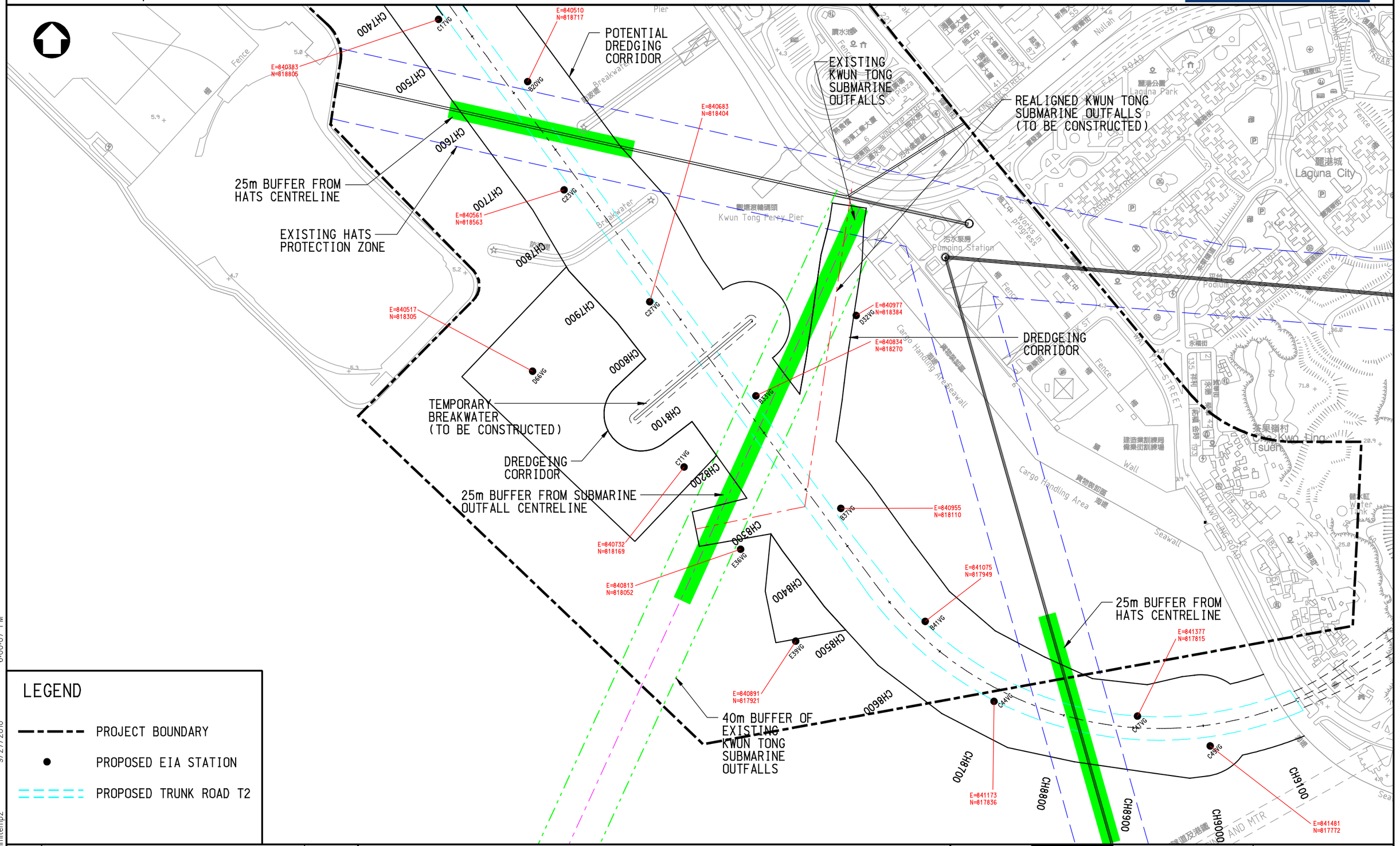
AGREEMENT NO. CE 38/2008(HY)
KAI TAK DEVELOPMENT - TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON - INVESTIGATION, DESIGN AND CONSTRUCTION

Hyder MEINHARDT
Hyder-Meinhardt JV



LEGEND

- PROJECT BOUNDARY
- PROPOSED EIA STATION
- PROPOSED TRUNK ROAD T2

Rev.	Description	Date

Drawing title
PROPOSED SEDIMENT SAMPLING STATIONS FOR IMT OPTION H4
(SHEET 2 OF 2)

Original Size: A3

Scale 1:5000 | Date 27 SEP 2010
File name
Drawing No. FIGURE 3.2
Rev.

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PRINTED BY: mmltemp2

CAD FILE : K:\91164 Trunk Road T2\Report\GI\Figure 3.2-Sheet 2 of 2-Proposed Sediment Sampling Stations for IMT Option H4.dgn

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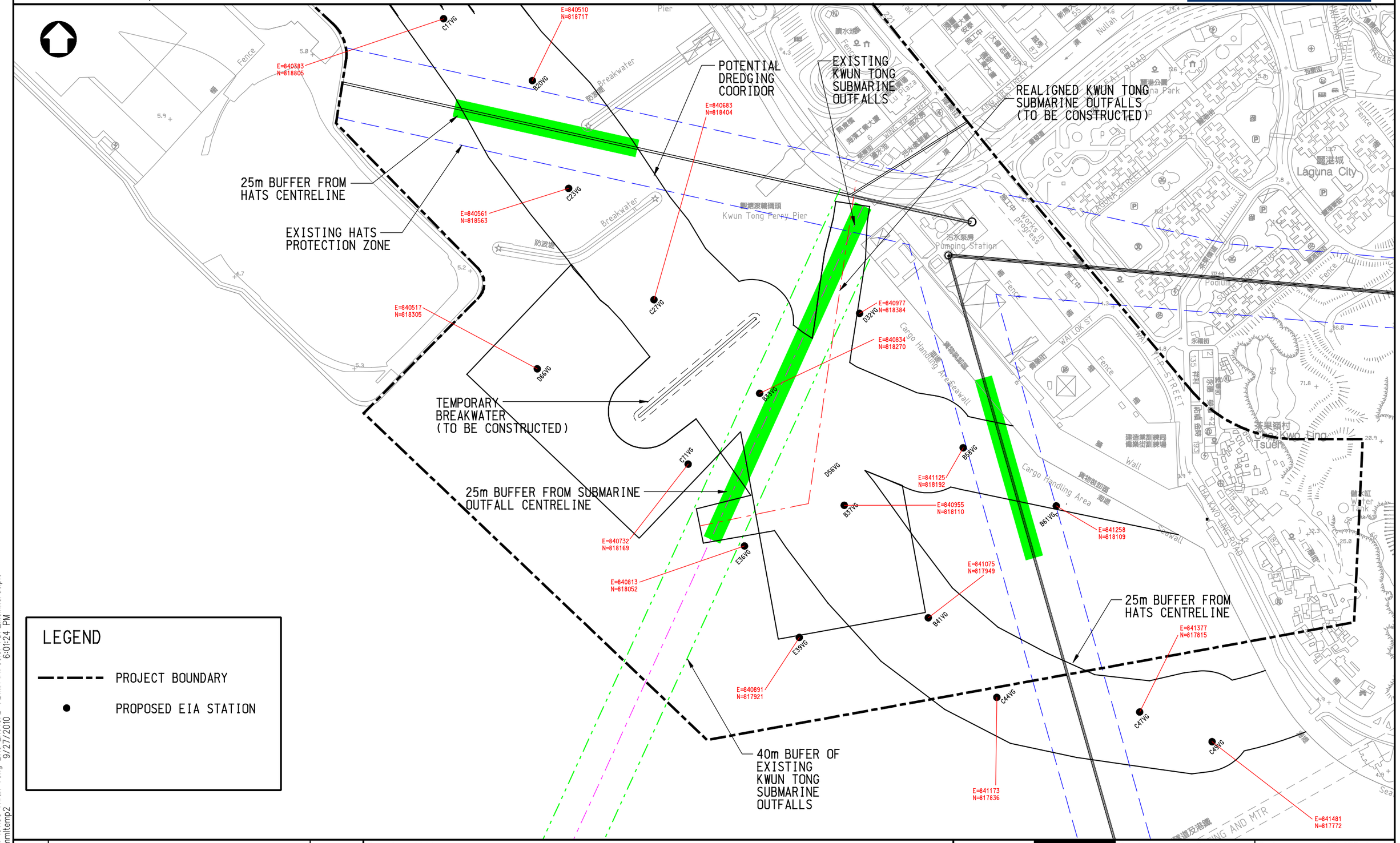
Civil Engineering and Development Department
九龍拓展處
Kowloon Development Office

CEDD

AGREEMENT NO. CE 38/2008(HY)
KAI TAK DEVELOPMENT - TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON - INVESTIGATION, DESIGN AND CONSTRUCTION

Hyder MEINHARDT
Hyder-Meinhardt JV



LEGEND

- PROJECT BOUNDARY
- PROPOSED EIA STATION

Rev.	Description	Date

Drawing title

ADDITIONAL EIA SAMPLING STATIONS IN OPTION ENVELOPE

Original Size: A3

Scale: 1:5000 | Date: 27 SEP 2010

File name

Drawing No. FIGURE 3.3

Rev.

PLOT DRV: K:\91135 Kwun Tong Line Ext\CAD ADMIN\A1 color PDF_Meinhardt.plt 9/27/2010 6:01:24 PM
PRINTED BY: mmltemp2

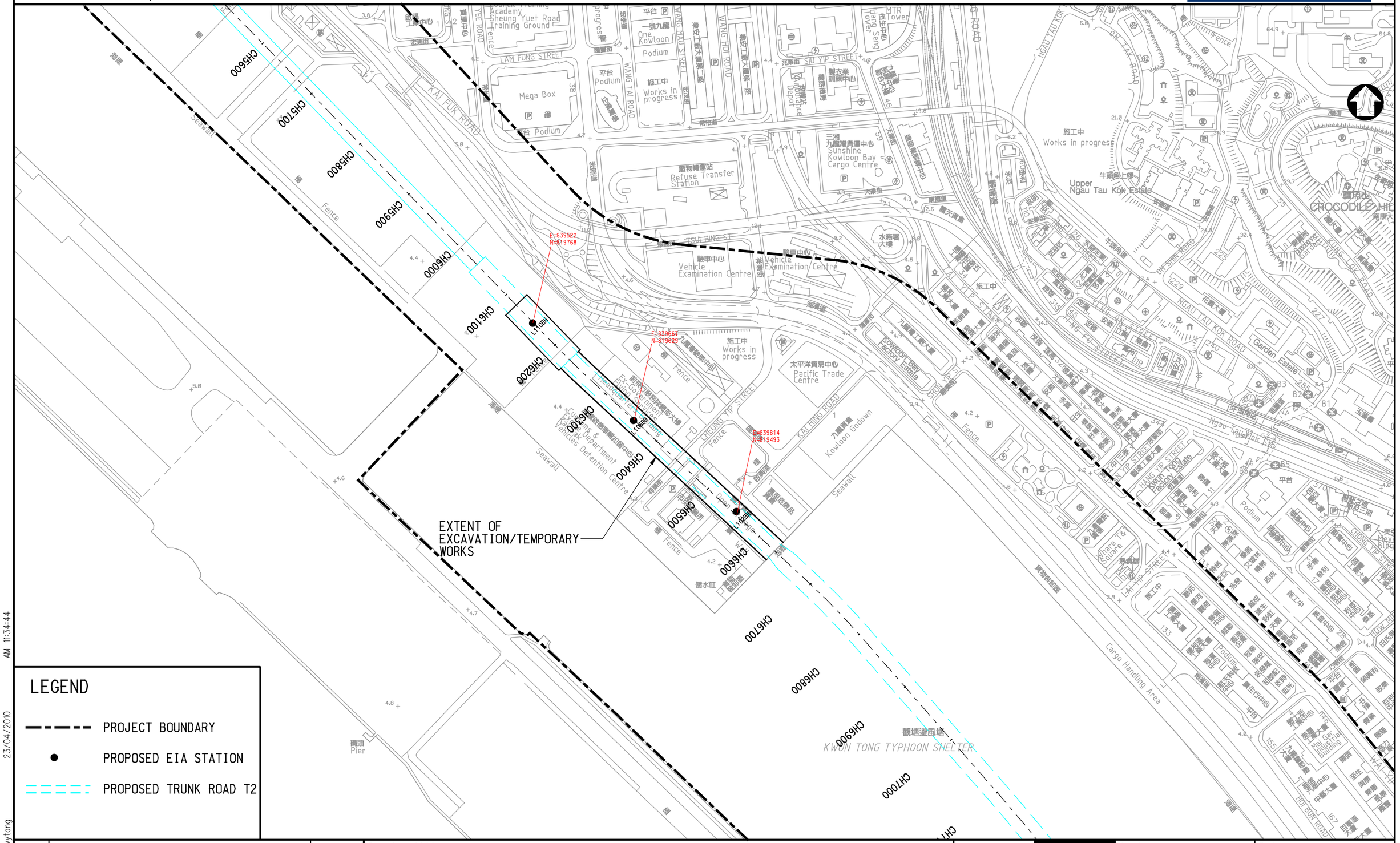
CAD FILE : K:\91164 Trunk Road T2\Report\GI\Figure 3.3-AdditionalEIA Sampling Stations in Option Envelope.dgn

土木工程拓展署
Civil Engineering and Development Department
九龍拓展處
Kowloon Development Office

CEDD

AGREEMENT NO. CE 38/2008(HY)
KAI TAK DEVELOPMENT - TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON - INVESTIGATION, DESIGN AND CONSTRUCTION

Hyder MEINHARDT
Hyder-Meinhardt JV



LEGEND

- PROJECT BOUNDARY
- PROPOSED EIA STATION
- PROPOSED TRUNK ROAD T2

Rev.	Description	Date

Drawing title
PROPOSED SEDIMENT SAMPLING STATIONS FOR IMT OPTION H2 &H4
(SHEET 1 OF 2)

Original Size: A3
Scale: 1:5000
Date:
File name:

Drawing No.: FIGURE 3.4
Rev.:

PRINTED BY: wytang 23/04/2010 AM 11:34:44

CAD FILE : K:\91164 Trunk Road T2\Report\GI\Figure 3.4-Sheet 1 of 2-Proposed Sediment Sampling Stations for IMT Option H2 & H4.dgn

土木工程拓展署
Civil Engineering and Development Department
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Kowloon Development Office

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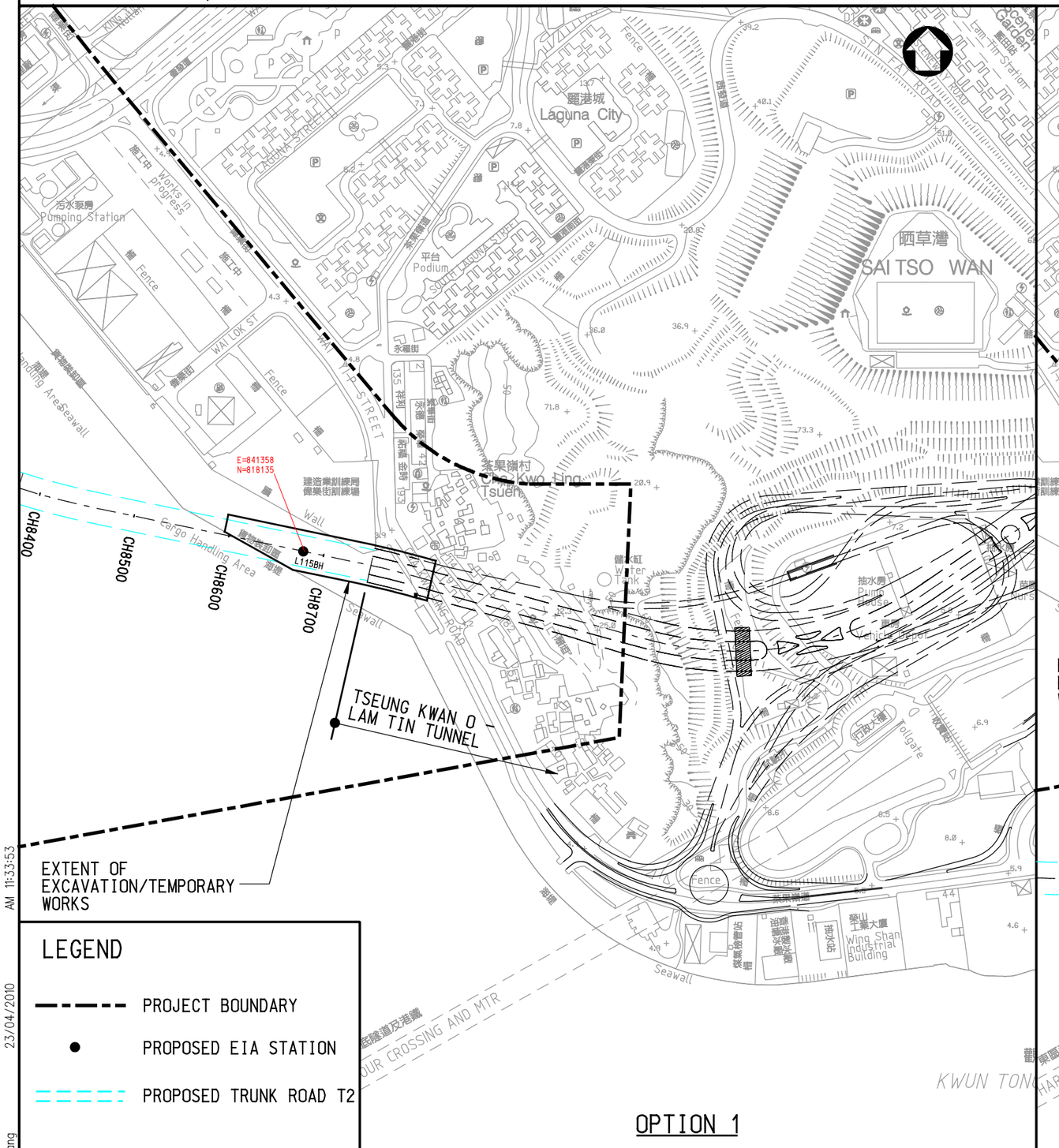
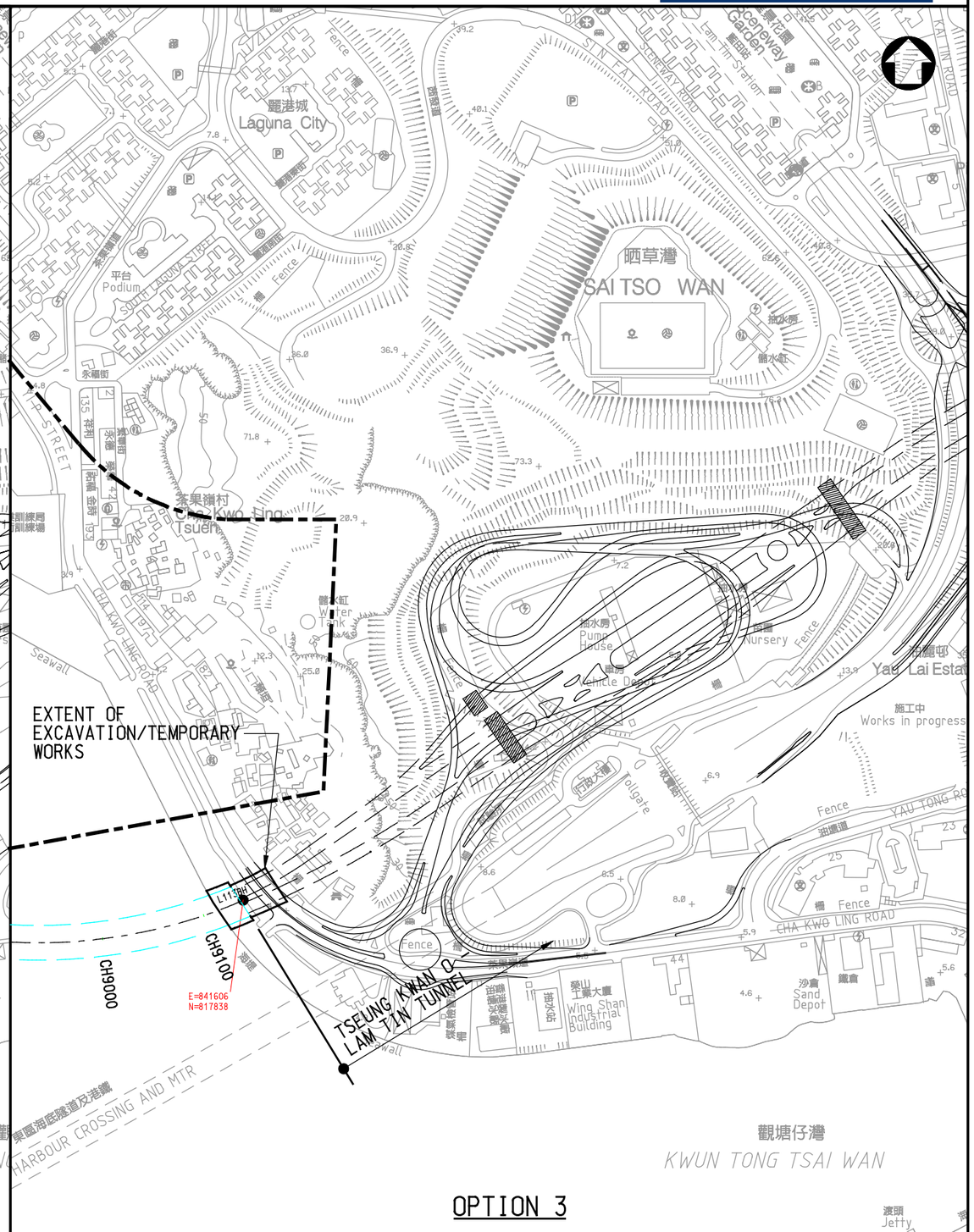
AGREEMENT NO. CE 38/2008(HY)
KAI TAK DEVELOPMENT - TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON - INVESTIGATION, DESIGN AND CONSTRUCTION

Hyder MEINHARDT
Hyder-Meinhardt JV



OPTION 1



OPTION 3

LEGEND

- PROJECT BOUNDARY
- PROPOSED EIA STATION
- PROPOSED TRUNK ROAD T2

AM 11:33:53
23/04/2010
PRINTED BY: wytang

Rev.	Description	Date

Drawing title
PROPOSED SEDIMENT SAMPLING STATIONS FOR IMT OPTION H2 &H4
(SHEET 2 OF 2)

Original Size: A3
Scale: 1:5000
Date:
File name:
Drawing No.: FIGURE 3.5
Rev.:

CAD FILE : K:\91164 Trunk Road T2\Report\GI\Figure 3.5-Sheet 2 of 2-Proposed Sediment Sampling Stations for IMT Option H2 & H4.dgn

FUGRO GEOTECHNICAL SERVICES LTD

INSPECTION PIT RECORD

HOLE No. **L102BH-A&B**

CONTRACT No.: **KL/2009/02**

SHEET: **1** of **1**

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Hand Dug**

MACHINE & No.: **FDR-17**

FLUSHING MEDIUM: **N/A**

CO-ORDINATES:
E **839812.38**
N **819497.69**

ORIENTATION: **Vertical**

WORKS ORDER No. **NIL**

DATE from: **12/10/2010** to **12/10/2010**

GROUND LEVEL **+ 3.93** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Samples Type	Samples Depth	Reduced Level	Depth (m)	Legend	Grade	Description
12/10/2010												3.93	0.00			
												3.73	0.20			CONCRETE.
1									1	INSPECTION PIT	1.00	2.93	1.00			Yellowish brown (10YR//5/6), clayey fine to coarse SAND with some angular fine to medium gravel. (FILL)
											1.70					Firm, reddish brown (5YR/4/3), sandy SILT with occasional fine to medium gravel of weak granite with waste odour. (FILL)
2 12/10/2010												1.93	2.00			End of investigation hole at 2.00m.
3																
4																
5																
6																
7																
8																
9																
10													10.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**

DATE **13/10/2010**

CHECKED **S.M. Pyle**

DATE **12/11/2010**

REMARKS

1. Drillhole abandoned after inspection pit excavation due to relocation.
2. Large disturbed sample was taken from 1.00m to 1.70m and sent to the analytical laboratory.

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD

INSPECTION PIT RECORD

HOLE No. **L102BH-C&D**

CONTRACT No.: **KL/2009/02**

SHEET: **1** of **1**

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Hand Dug**	CO-ORDINATES:	Works Order No.: **NIL**
MACHINE & No.: **FDR-17**	E **839814.23** N **819499.80**	DATE from: **29/10/2010** to **29/10/2010**
FLUSHING MEDIUM: **N/A**	ORIENTATION: **Vertical**	GROUND LEVEL: **+ 3.93** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Samples Type	Samples Depth	Reduced Level	Depth (m)	Legend	Grade	Description
29/10/2010										INSPECTION PIT		3.93	0.00			CONCRETE.
												3.68	0.25			Yellowish brown (10YR//5/6), clayey fine to coarse SAND with some angular fine to medium gravel. (FILL)
29/10/2010												2.93	1.00			End of investigation hole at 1.00m.
2																
3																
4																
5																
6																
7																
8																
9																
10													10.00			

- Small Disturbed Sample
- Piston sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mazier Sample
- 76mm Vibrocore Sample
- 100mm Vibrocore Sample
- Vibrocore Sub-sample
- SPT Liner Sample
- Standard Penetration Test
- In-situ Vane Shear Test
- Permeability Test
- Pressuremeter Test
- Televiewer Survey
- Packer Test
- Impression Packer Test
- Water Sample
- Standpipe
- Piezometer Tip

LOGGED **P. Zhang**

DATE **30/10/2010**

CHECKED **S.M. Pyle**

DATE **12/11/2010**

REMARKS

1. Drillhole abandoned on encountering concrete pipe at 1.00m in inspection pit.

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L102BH-E
	CONTRACT No.: KL/2009/02	SHEET: 1 of 2

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES: E **839811.72** N **819498.49**	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-17**		DATE from: **29/10/2010** to **05/11/2010**
FLUSHING MEDIUM: **Dry Drilling**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 3.89** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
01/11/2010	SW									3.89	0.00			
										3.64	0.25			CONCRETE.
1									1 INSPECTION PIT 3					Yellowish brown (10YR//5/6), clayey fine to coarse SAND with some angular fine to medium gravel. (FILL)
2				65				33 blv	4 5	1.99	1.90			Firm, grey (7.5YR/6/1) to dark grey (5YR/4/1), sandy SILT with some angular fine to coarse gravel of moderately strong granite and an organic waste odour. (FILL)
		1.60m at 18:00		75				23 blv	6 7					
01/11/2010									8 9					
02/11/2010		2.30m at 08:00		100				8 blv						
				100				32 blv	10 11					
4				65				83 blv	12 13	-0.01	3.90			Light yellowish brown (2.5Y/6/4), silty fine to coarse SAND with occasional angular fine to coarse gravel of moderately strong granite. (FILL)
				69				52 blv	14 15					
5				69				21 blv	16 17					
				69				35 blv	18 19					
6				69				31 blv	20 21					
				69				44 blv	22 23					
7				100				106 blv	24 25					
		1.80m at 18:00		100				108 blv	26 27					
02/11/2010									28 29					
03/11/2010		2.20m at 08:00		100				107 blv						
				100				132 blv	30 31	-4.51	8.40			Light grey (10R/7/1) to pinkish grey (7.5YR/7/2), angular coarse GRAVEL and COBBLES of moderately strong to strong granite. (FILL)
9	SW 8.90 PW								32					
				65				60 blv	33					
10		1.10m at 18:00								-6.11	10.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**
DATE **06/11/2010**
CHECKED **S.M. Pyle**
DATE **12/11/2010**

REMARKS

1. An inspection pit was excavated to a depth of 1.90m.
2. U100 samples were sent to the analytical laboratory from 2.90-3.35m, 5.40-5.85m, 5.90-6.35m, 6.40-6.85m, 13.00-13.45m, 13.50-13.95m, 14.00-14.45m, 14.50-14.95m, 15.00-15.45m, 15.50-15.95m, 16.00-16.45m, 16.50-16.95m and 17.00-17.45m.

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L102BH-E
	CONTRACT No.: KL/2009/02	SHEET: 2 of 2

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES: E 839811.72 N 819498.49	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-17**		DATE from: **29/10/2010** to **05/11/2010**
FLUSHING MEDIUM: **Dry Drilling**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 3.89** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
04/11/2010		2.20m at 08:00		89				36 bls	34 35		10.00 10.45	-6.11	10.00			Light yellowish brown (2.5Y/6/4), clayey silty fine to medium SAND. (FILL)
				89				51 bls	36 37		10.50					
11				89				58 bls	38 39		10.95 11.00					
				89				47 bls	40 41		11.45 11.50					
12				89				41 bls	42 43		11.95 12.00					
				89				56 bls	44 45		12.45 12.50					
13				100				39 bls	46 47		12.95 13.00	-9.11	13.00			
				100				37 bls	48 49		13.45 13.50	-9.51	13.40			Yellowish brown (10YR/5/6), clayey silty fine to coarse SAND. (FILL)
14				89				31 bls	50 51		13.95 14.00					Soft to firm, dark grey (5YR/4/1), slightly sandy, silty CLAY with some shell fragments and an organic waste odour. (MARINE DEPOSIT)
				100				44 bls	52 53		14.45 14.50					
15				100				69 bls	54 55		14.95 15.00	-11.26	15.15			
		1.70m at 18:00										-11.51	15.40			Soft to firm, grey (7.5YR/6/1), mottled olive, sandy silty CLAY with pocket of silty sand and shell fragments. (ALLUVIUM)
04/11/2010 05/11/2010		2.20m at 08:00		89				38 bls	56 57		15.45 15.50	-11.61	15.50			
16				100				50 bls	58 59		15.95 16.00					Firm, light greyish yellow (2.5Y/8/3), slightly sandy, silty CLAY. (ALLUVIUM)
				100				54 bls	60 61		16.45 16.50					15.40 - 15.50m : Stiff, light greyish brown (2.5Y/6/2), dappled light grey, silty CLAY. (ALLUVIUM)
17				100				33 bls	62 63		16.95 17.00					
05/11/2010	PW 17.50								64		17.45 17.50	-13.61	17.50			
																End of investigation hole at 17.50m.
18																
19																
20													20.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**
DATE **06/11/2010**
CHECKED **S.M. Pyle**
DATE **12/11/2010**

REMARKS

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L102BH-F
	CONTRACT No.: KL/2009/02	SHEET: 1 of 2

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES: E 839811.48 N 819498.30	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-17**		DATE from: **05/11/2010** to **11/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 3.90** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
05/11/2010	SW											3.70	0.20			Grey (7.5YR/6/1), CONCRETE.
									1	INSPECTION PIT	0.45 0.55					Firm, reddish brown (5YR/4/3), sandy SILT with occasional fine to medium gravel of weak granite. (FILL)
									2		0.85 1.00					
									3		1.45 1.50					
									4		1.85 1.90	2.00	1.90			
				67				18 bls	5		1.85 1.90					Grey (7.5YR/6/1) to dark grey (5YR/4/1), clayey silty coarse SAND with some angular coarse gravel of strong granite, concrete and wood fragments. (FILL)
									6		2.35 2.40					
		1.50m at 18:00		78				22 bls	7							
05/11/2010									8		2.85 2.90	1.00	2.90			
08/11/2010		2.80m at 08:00		78				24 bls	9							Firm, yellowish brown (10YR/5/6), sandy SILT with occasional angular fine to medium gravel. (FILL)
									10		3.35 3.40					
				89				42 bls	11							
									12		3.85 3.90 4.00					
				89				52 bls	13							
									14		4.40	-0.50	4.40			
				52						PX						Pinkish grey (7.5YR/7/2), angular COBBLES of strong granite. (FILL)
				89				39 bls	15		5.00	-1.10	5.00			Light yellowish brown (2.5Y/6/4), silty fine to coarse SAND. (FILL)
		2.40m at 18:00							16		5.45 5.50	-1.60	5.50			
08/11/2010									17							Grey (7.5YR/6/1), slightly silty, fine to coarse SAND with occasional angular coarse gravel of concrete and organic odour. (FILL)
09/11/2010		2.80m at 08:00		89				46 bls	18		5.95 6.00	-2.10	6.00			
										PX						Pinkish grey (7.5YR/7/2), angular COBBLES of strong granite. (FILL)
				28					19		6.50	-2.60	6.50			Light yellowish brown (2.5Y/6/4), silty fine to coarse SAND. (FILL)
				89				41 bls	20		7.00	-3.10	7.00			
										PX						Pinkish grey, angular coarse GRAVEL and COBBLES of strong granite. (FILL)
				27						PX						
										PX		-4.60	8.50			
				78				33 bls	21		8.50					Light yellowish brown (2.5Y/6/4), silty fine to coarse SAND. (FILL)
		2.90m at 18:00							22		8.95 9.00					
09/11/2010	SW 9.00								23							
10/11/2010	PW	2.40m at 08:00		100				41 bls	24		9.50	-5.60	9.50			
				86						PX						Pinkish grey (7.5YR/7/2), angular COBBLES of strong granite. (FILL)
												-6.10	10.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**
DATE **15/11/2010**
CHECKED **S.M. Pyle**
DATE **19/11/2010**

REMARKS

1. An inspection pit was excavated to a depth of 1.90m.
2. U100 samples were sent to the analytical laboratory from 1.90-2.35m, 2.40-2.85m, 2.90-3.35m, 5.50-5.95m, 13.50-13.95m, 14.00-14.45m, 14.50-14.95m, 15.00-15.45m, 15.50-15.95m, 16.00-16.45m and 16.50-16.95m.

FUGRO GEOTECHNICAL SERVICES LTD

DRILLHOLE RECORD

HOLE No. **L102BH-F**

CONTRACT No.: **KL/2009/02**

SHEET: **2** of **2**

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**

MACHINE & No.: **FDR-17**

CO-ORDINATES:
E **839811.48**
N **819498.30**

WORKS ORDER No. **NIL**

DATE from: **05/11/2010** to **11/11/2010**

FLUSHING MEDIUM: **Distilled Water**

ORIENTATION: **Vertical**

GROUND LEVEL **+ 3.90** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
				78				27 bls	25		10.00	-6.10	10.00			Light yellowish brown (2.5Y/6/4), silty fine to coarse SAND with occasional angular medium to coarse gravel of moderately strong granite. (FILL)
				89				72 bls	26 27		10.45 10.50					
11				89				52 bls	28 29		10.95 11.00					
				89				46 bls	30 31		11.45 11.50					
12				89				73 bls	32 33		11.95 12.00					
				89				58 bls	34 35		12.45 12.50					
13				89				64 bls	36 37		12.95 13.00					
				100				58 bls	38 39		13.45 13.50	-9.60	13.50			Soft to firm, light yellowish brown (2.5Y/6/4), dappled light grey (10R/7/1), sandy silty CLAY with occasional subangular coarse gravel of moderately strong granite and rockets of sandy clayey silt. (FILL)
14				91				71 bls	40 41		13.95 14.00	-10.00	13.90			Soft to firm, dark grey (5YR/4/1), silty CLAY with some shell fragments and occasional rockets of sandy silt. (MARINE DEPOSIT)
				100				78 bls	42 43		14.45 14.50					
15				100				61 bls	44 45		14.95 15.00					
				89				107 bls	46 47		15.45 15.50	-11.60 -11.70	15.50 15.60			Stiff, light brown (5YR/6/3), silty CLAY. (ALLUVIUM)
16				100				119 bls	48 49		15.95 16.00					15.50 - 15.6m : With marine silty clay infilled within alluvial cracks.
	PW 16.50			100				95 bls	50 51		16.45 16.50	-12.75	16.65			Firm to stiff, light yellowish brown (2.5Y/6/4), dappled light grey (10R/7/1), silty CLAY. (ALLUVIUM)
17 10/11/2010		2.20m at 18:00							52		16.95 17.00	-13.10	17.00			End of investigation hole at 17.00m.
18																
19																
20													20.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**

DATE **15/11/2010**

CHECKED **S.M. Pyle**

DATE **19/11/2010**

REMARKS

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L106BH-A
	CONTRACT No.: KL/2009/02	SHEET: 1 of 3

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-32**	E **839672.55** N **819621.69**	DATE from: **22/10/2010** to **01/11/2010**
FLUSHING MEDIUM: **Dry Drilling**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 4.65** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
25/10/2010	SW											4.65	0.00			Grey (7.5YR/6/1), CONCRETE.
									1		0.45 0.50	4.15	0.50			Grey (7.5YR/6/1), silty fine to coarse SAND with some angular to subangular fine to coarse gravel of weak to moderately strong granite, tuff and occasional glass and brick fragments. (FILL)
1									2	INSPECTION PIT	0.95 1.00					
									3		1.45 1.50					
2									4		1.95 2.00					
25/10/2010 26/10/2010				100				23 bls	5							
				0				89 bls	6		2.45 2.50					
3				100				103 bls	7 8		2.95 3.00					
		0.40m at 18:00														
26/10/2010 27/10/2010		2.10m at 08:00		100				35 bls	9 10		3.45 3.50					
4				100				44 bls	11 12		3.95 4.00					
				100				16 bls	13 14		4.45 4.50					
5				100				36 bls	15 16		4.95 5.00					
				100				45 bls	17 18		5.45 5.50					
6				100				44 bls	19 20		5.95 6.00					
				100				33 bls	21 22		6.45 6.50					
		0.60m at 18:00														
27/10/2010 28/10/2010		2.20m at 08:00		100				29 bls	23 24		6.95 7.00					
				100				30 bls	25 26		7.45 7.50					
8				100				49 bls	27 28		7.95 8.00					
				100				82 bls	29 30		8.45 8.50					
9				100				33 bls	31 32		8.95 9.00					
				100				93 bls	33 34		9.45 9.50					
10											9.95	-5.35	10.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED P. Zhang
DATE 04/11/2010
CHECKED S.M. Pyle
DATE 12/11/2010

REMARKS

1. An inspection pit was excavated to a depth of 2.00m.
2. U100 samples were sent to the analytical laboratory from 13.00-13.45m, 13.50-13.95m, 14.00-14.45m, 14.50-14.95m, 15.00-15.45m, 15.50-15.95m, 16.00-16.45m, 16.50-16.95m, 17.00-17.45m, 17.50-17.95m, 18.00-18.45m, 18.50-18.95m, 19.00-19.45m, 19.50-19.95m, 20.00-20.45m, 20.50-20.95m, 21.00-21.45m, 21.50-21.95m, 22.00-22.45m and 22.50-22.95m.

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L106BH-A
	CONTRACT No.: KL/2009/02	SHEET: 2 of 3

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES: E 839672.55 N 819621.69	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-32**		DATE from: **22/10/2010** to **01/11/2010**
FLUSHING MEDIUM: **Dry Drilling**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 4.65** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
				100				165 blows	35		10.00					
									36							
				100				120 blows	37		10.45					
									38		10.50					
11				100				110 blows	39		10.95					
		0.90m at 18:00							40		11.00					
29/10/2010				100				89 blows	41		11.45					
29/10/2010		2.00m at 08:00							42		11.50					
12				100				72 blows	43		11.95					
									44		12.00					
				100				98 blows	45		12.45					
									46		12.50					
13				100				59 blows	47		12.95	-8.35	13.00			
									48		13.00					Light brown (7.5YR/6/3), silty coarse SAND with occasional angular coarse gravel and cobbles of concrete. (FILL)
				100				18 blows	49		13.45	-8.85	13.50			
									50		13.50					Soft, dark grey (5YR/4/1), slightly sandy, silty CLAY with occasional angular coarse gravel of concrete and asphalt. (FILL / MARINE INTERFACE?)
14				100				19 blows	51		13.95	-9.39	14.04			
									52		14.00					Soft to firm, dark grey (5YR/4/1), slightly sandy, silty CLAY with some shell and coral fragments. (MARINE DEPOSIT)
				100				27 blows	53		14.45					
									54		14.50					
15	SW 15.00 PW			100				72 blows	55		14.95					
		0.40m at 18:00							56		15.00	-10.55	15.20			
29/10/2010				100				30 blows	57		15.45	-10.85	15.50			Firm to stiff, greyish yellow (2.5Y/7/3), silty CLAY. (ALLUVIUM)
30/10/2010		2.00m at 08:00							58		15.50					15.20 - 15.50m : With marine clay infiltration to alluvial cracks.
16				100				55 blows	59		15.95					
									60		16.00					
				100				85 blows	61		16.45					
									62		16.50					
17				100				83 blows	63		16.95					
									64		17.00					
				100				93 blows	65		17.45					
									66		17.50					
18				100				15 blows	67		17.95					
									68		18.00					
				100				20 blows	69		18.45					
									70		18.50					
19				100				20 blows	71		18.95					
									72		19.00					
				100				26 blows	73		19.45					
		0.80m at 18:00							74		19.50					
30/10/2010											19.95	-15.35	20.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**
DATE **04/11/2010**
CHECKED **S.M. Pyle**
DATE **12/11/2010**

REMARKS

FUGRO GEOTECHNICAL SERVICES LTD

DRILLHOLE RECORD

HOLE No. **L106BH-A**

CONTRACT No.: **KL/2009/02**

SHEET: **3** of **3**

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-32**	E **839672.55** N **819621.69**	DATE from: **22/10/2010** to **01/11/2010**
FLUSHING MEDIUM: **Dry Drilling**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 4.65** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
01/11/2010		1.70m at 08:00		100				29 bls	75 76		20.00	-15.35	20.00			As sheet 2 of 3.
21				100				33 bls	77 78		20.45 20.50					
				100				27 bls	79 80		20.95 21.00					
				100				55 bls	81 82		21.45 21.50	-16.85	21.50			Firm to stiff, light yellowish brown (2.5Y/6/4), slightly sandy, silty CLAY. (ALLUVIUM)
22	PW 22.50			100				120 bls	83 84		21.95 22.00	-17.35	22.00			Light yellowish brown (2.5Y/6/4), silty fine to medium SAND. (ALLUVIUM)
				100				33 bls	85 86		22.45 22.50					
23 01/11/2010		0.60m at 16:00							87		22.95 23.00	-18.35	23.00			End of investigation hole at 23.00m.
24																
25																
26																
27																
28																
29																
30													30.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**

DATE **04/11/2010**

CHECKED **S.M. Pyle**

DATE **12/11/2010**

REMARKS

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD

DRILLHOLE RECORD

HOLE No. **L106BH-B**

CONTRACT No.: **KL/2009/02**

SHEET: **1** of **2**

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-32**	E **839673.02** N **819621.36**	DATE from: **02/11/2010** to **05/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 4.62** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
02/11/2010	SW											4.62	0.00			Light yellowish brown (2.5Y/6/4), silty fine to coarse SAND with some angular fine to medium gravel. (FILL)
									1	B	0.45-0.50					
									2	INSPECTION PIT	0.95-1.00					
									3		1.45-1.50					
				100				70 blows	4 5		1.95-2.00					
				100				79 blows	6 7		2.45-2.50					
				100				35 blows	8 9		2.95-3.00	1.62	3.00			Firm, light yellowish brown (2.5Y/6/4), silty clayey fine to coarse SAND with occasional angular fine to medium gravel of moderately strong granite and some organic waste odour. (FILL)
				100				19 blows	10 11		3.45-3.50					
				100				32 blows	12 13		3.95-4.00					
				100				36 blows	14 15		4.45-4.50					
		1.40m at 18:00		100				34 blows	16 17		4.95-5.00					
02/11/2010 03/11/2010		2.50m at 08:00		100				38 blows	18 19		5.45-5.50					
				100				40 blows	20 21		5.95-6.00					
				100				26 blows	22 23		6.45-6.50					
				100				29 blows	24 25		6.95-7.00					
				100				22 blows	26 27		7.45-7.50					
				100				23 blows	28 29		7.95-8.00	-3.38	8.00			Soft, grey (7.5YR/6/1), sandy clayey SILT with occasional coarse gravel of asphalt, concrete, ceramic wood fragments. (FILL)
				100				28 blows	30 31		8.45-8.50					
				100				54 blows	32 33		8.95-9.00	-4.38	9.00			Light yellowish brown (2.5Y/6/4), clayey silty fine to coarse SAND with some angular fine to medium gravel of moderately strong granite. (FILL)
				100				35 blows	34 35		9.45-9.50					
											9.95	-5.38	10.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**

DATE **05/11/2010**

CHECKED **S.M. Pyle**

DATE **12/11/2010**

REMARKS

1. An inspection pit was excavated to a depth of 2.00m.
2. U100 samples were sent to the analytical laboratory from 13.50-13.95m, 14.00-14.45m, 14.50-14.95m, 15.00-15.45m, 15.50-15.95m, 16.00-16.45m and 16.50-16.95m.

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L106BH-B
	CONTRACT No.: KL/2009/02	SHEET: 2 of 2

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES: E 839673.02 N 819621.36	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-32**		DATE from: **02/11/2010** to **05/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 4.62** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
		1.20m at 18:00		100				40 blows	37		10.00					As sheet 1 of 2.
03/11/2010																
04/11/2010		2.50m at 08:00		100				44 blows	38		10.45					
11									39		10.50					
				100				67 blows	40		10.95					
									41		11.00					
				100				69 blows	42		11.45					
									43		11.50					
12				100				41 blows	44		11.95					
									45		12.00					
				100				53 blows	46		12.45					
									47		12.50					
13									48		13.00	-8.38	13.00			
			0	80						HX						Light grey (10R/7/1), angular COBBLES of moderately strong granite and concrete. (FILL)
				100				30 blows	49		13.50	-8.88	13.50			Soft, grey (7.5YR/6/1), sandy, very clayey SILT with occasional coarse gravel of concrete. (FILL)
14									50		13.95	-9.38	14.00			
				100				19 blows	51		14.00					Soft, dark grey (5YR/4/1), sandy silty CLAY with many fine to coarse gravel and cobbles of shell and coral fragments. (MARINE DEPOSIT)
									52		14.45					
				100				22 blows	53		14.50					
		1.60m at 18:00										-10.23	14.85			
15									54		14.95					Firm, light greyish yellow (2.5Y/8/3), slightly sandy, silty CLAY. (ALLUVIUM)
04/11/2010																
05/11/2010		2.50m at 08:00		100				18 blows	55		15.00					
									56		15.45					
				100				33 blows	57		15.50					
16									58		15.95					
				100				35 blows	59		16.00					
									60		16.45					
				100				34 blows	61		16.50					
17	SW 17.00	2.00m at 18:00							62		16.95 17.00	-12.38	17.00			
05/11/2010																End of investigation hole at 17.00m.
18																
19																
20													20.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED P. Zhang
DATE 06/11/2010
CHECKED S.M. Pyle
DATE 12/11/2010

REMARKS

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L110BH-A
	CONTRACT No.: KL/2009/02	SHEET: 1 of 2

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES: E 839529.15 N 819774.61	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-32**		DATE from: **05/11/2010** to **10/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 4.31** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
08/11/2010	SW											4.31	0.00			
									1		0.45 0.50	3.81	0.50			Grey (7.5YR/6/1), CONCRETE.
1									2	INSPECTION PIT	0.95 1.00					Grey (7.5YR/6/1), fine to coarse SAND with many angular fine to coarse gravel, cobbles and boulders of moderately strong to strong granite. (FILL)
08/11/2010									3		1.45 1.50					
09/11/2010									4		1.68 1.70	2.61	1.70			
2				66												Grey (7.5YR/6/1), angular COBBLES of moderately strong to strong tuff and granite. (FILL)
3				80						PX	3.00					
				100				64 blo	5	PX	3.50	0.81	3.50			Grey (7.5YR/6/1), silty fine to coarse SAND with some angular fine to coarse gravel of moderately strong granite and brick. (FILL)
4				100				42 blo	6 7		3.95 4.00	0.31	4.00			
				100				32 blo	8 9		4.45 4.50	-0.19	4.50			Very soft to soft, dark grey (5YR/4/1), sandy clayey SILT with many angular fine to coarse gravel of strong granite, concrete and iron wires and with organic odour. (FILL)
5				100				27 blo	10 11		4.95 5.00					Dark grey (5YR/4/1), clayey silty fine to coarse SAND with many angular fine to coarse gravel of strong granite, brick and concrete fragments and with organic odour. (FILL)
				100				27 blo	12 13		5.45 5.50	-1.19	5.50			
6				100				28 blo	14 15		5.95 6.00					Soft, light olive grey (5Y/6/2), sandy clayey SILT with some angular fine to coarse gravel of strong granite, concrete and iron fragments. (FILL)
				100				32 blo	16 17		6.45 6.50					
7				100				35 blo	18 19		6.95 7.00					
				100				17 blo	20 21		7.45 7.50					
8		1.50m at 18:00		100				24 blo	22 23		7.95 8.00					
09/11/2010									24 25		8.45 8.50					
10/11/2010		2.10m at 08:00		100				31 blo								
9				100				38 blo	26 27		8.95 9.00	-4.69	9.00			Firm, light yellowish brown (2.5Y/6/4), sandy SILT with occasional angular fine to medium gravel. (FILL)
				100				36 blo	28 29		9.45 9.50					
10											9.95	-5.69	10.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED P. Zhang
DATE 12/11/2010
CHECKED S.M. Pyle
DATE 18/11/2010

REMARKS

1. An inspection pit was excavated to a depth of 1.70m.
2. U100 samples were sent to the analytical laboratory from 4.00-4.45m, 4.50-4.95m, 5.00-5.45m, 5.50-5.95m, 12.00-12.45m, 12.50-12.95m, 13.00-13.45m, 13.50-13.95m, 14.00-14.45m and 14.50-14.95m.

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L110BH-A
	CONTRACT No.: KL/2009/02	SHEET: 2 of 2

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-32**	E **839529.15** N **819774.61**	DATE from: **05/11/2010** to **10/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 4.31** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
				100				38 bls	30		10.00	-5.69	10.00			As sheet 1 of 2.
				100				32 bls	31							
11				100				30 bls	32		10.45					
				100				38 bls	33		10.50					
				100				24 bls	34		10.95					
12				100				28 bls	35		11.00					
				100				22 bls	36		11.45					
				100				15 bls	37		11.50					
13				100				20 bls	38		11.95	-7.69	12.00			Soft to firm, dark grey (5YR/4/1), silty CLAY with some shell fragments and pockets of sandy silt. (MARINE DEPOSIT)
				100				18 bls	39		12.00					
									40		12.45					
14									41		12.50					
									42		12.95					
									43		13.00					
									44		13.45	-9.19	13.50			Soft to firm, olive grey (5Y/5/2), mottled yellowish brown, silty CLAY with marine sandy clayey silt infilled within alluvial cracks. (ALLUVIUM)
									45		13.50					
									46		13.95					
									47		14.00	-9.99	14.30			14.30 - 14.50m : Sandy clayey SILT.
									48		14.45	-10.19	14.50			Light yellowish brown (2.5Y/6/4), locally light grey (10R/7/1), silty fine to coarse SAND with some rounded fine to coarse gravel of moderately strong granite. (ALLUVIUM)
15	SW 15.00	1.70m at 18:00							49		14.95	-10.69	15.00			End of investigation hole at 15.00m.
									50		15.00					
16																
17																
18																
19																
20													20.00			

- Small Disturbed Sample
- Piston sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mazier Sample
- 76mm Vibrocore Sample
- 100mm Vibrocore Sample
- Vibrocore Sub-sample
- SPT Liner Sample
- Standard Penetration Test
- In-situ Vane Shear Test
- Permeability Test
- Pressuremeter Test
- Televiewer Survey
- Packer Test
- Impression Packer Test
- Water Sample
- Standpipe
- Piezometer Tip

LOGGED **P. Zhang**

DATE **12/11/2010**

CHECKED **S.M. Pyle**

DATE **18/11/2010**

REMARKS

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L110BH-B
	CONTRACT No.: KL/2009/02	SHEET: 1 of 2

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES: E 839528.77 N 819774.94	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-32**		DATE from: **11/11/2010** to **13/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 4.32** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
11/11/2010	SW											4.32	0.00			
									1		0.45	3.82	0.50			Grey (7.5YR/6/1), CONCRETE.
1									2	INSPECTION PIT	1.00					Grey (7.5YR/6/1), silty fine to medium SAND with some angular fine to medium gravel, cobbles and occasional boulders. (FILL)
									3		1.50					
									4		1.70	2.62	1.70			
2			0	43					SX		2.50					Grey (7.5YR/6/1), light yellowish brown (2.5Y/6/4), angular coarse GRAVEL and COBBLES of moderately strong to strong tuff, granite and brick. (FILL)
3			0	72					SX		3.00					
			0	64					SX		3.50					
4			0	80					SX							
				100				22 bls	5		4.00	0.32	4.00			
11/11/2010		2.50m at 18:00														Grey (7.5YR/6/1), silty fine to coarse SAND with occasional angular fine to medium gravel of moderately strong tuff and granite. (FILL)
12/11/2010		2.40m at 08:00							6		4.45					
								29 bls	7		4.50					
5				100				10 bls	8		4.95					
									9		5.00					
				100				20 bls	10		5.45					
									11		5.50					
6				100				21 bls	12		5.95					
									13		6.00					
				100				31 bls	14		6.45					
									15		6.50					
7				100				44 bls	16		6.95					
									17		7.00					
				100				35 bls	18		7.45	-3.18	7.50			
									19		7.50					Grey (7.5YR/6/1), silty fine to coarse SAND with some angular fine to coarse gravel of moderately strong tuff and granite. (FILL)
8				100				36 bls	20		7.95					
									21		8.00					
				100				47 bls	22		8.45					
									23		8.50					
9				100				44 bls	24		8.95					
									25		9.00					
				100				15 bls	26		9.45					
									27		9.50					
10											9.95	-5.68	10.00			

- Small Disturbed Sample
- Piston sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mazier Sample
- 76mm Vibrocore Sample
- 100mm Vibrocore Sample
- Vibrocore Sub-sample
- SPT Liner Sample
- Standard Penetration Test
- In-situ Vane Shear Test
- Permeability Test
- Pressuremeter Test
- Televiewer Survey
- Packer Test
- Impression Packer Test
- Water Sample
- Standpipe
- Piezometer Tip

LOGGED **P. Zhang**

DATE **16/11/2010**

CHECKED **S.M. Pyle**

DATE **19/11/2010**

REMARKS

1. An inspection pit was excavated to a depth of 1.70m.
2. U100 samples were sent to the analytical laboratory from 12.00-12.45m, 12.50-12.95m, 13.00-13.45m, 13.50-13.95m, 14.00-14.45m, 14.50-14.95m, 15.00-15.45m and 15.50-15.95m.

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD

DRILLHOLE RECORD

HOLE No. **L110BH-B**

CONTRACT No.: **KL/2009/02**

SHEET: **2** of **2**

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-32**	E **839528.77** N **819774.94**	DATE from: **11/11/2010** to **13/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 4.32** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
												-5.68	10.00			As sheet 1 of 2.
12/11/2010 13/11/2010 11		2.00m at 18:00 3.00m at 08:00		100				41 bls	29		10.00					
				100				43 bls	30 31		10.45 10.50					
				100				38 bls	32 33		10.95 11.00					
				100				37 bls	34 35		11.45 11.50					
12				100				15 bls	36 37		11.95 12.00	-7.68	12.00			Soft to firm, dark grey (5YR/4/1), silty CLAY with some shell fragments. (MARINE DEPOSIT)
				100				20 bls	38 39		12.45 12.50					
13				100				19 bls	40 41		12.95 13.00					
				100				26 bls	42 43		13.45 13.50	-9.18	13.50			13.50 - 13.90m : With pockets of fine to medium SAND.
												-9.58	13.90			Soft to firm, olive grey (5Y/5/2), sandy, very clayey SILT with pockets of marine silty clayey infilled within alluvial cracks. (ALLUVIUM)
14				100				20 bls	44 45		13.95 14.00					
				100				22 bls	46 47		14.45 14.50					
15				100				47 bls	48 49		14.95 15.00	-10.68	15.00			Yellowish brown (10YR/5/6), slightly clayey, silty medium to coarse SAND. (ALLUVIUM)
	SW 15.50			100				34 bls	50 51		15.45 15.50					
13/11/2010 16									52		15.95 16.00	-11.68	16.00			End of investigation hole at 16.00m.
17																
18																
19																
20													20.00			

- Small Disturbed Sample
- Piston sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mazier Sample
- 76mm Vibrocore Sample
- 100mm Vibrocore Sample
- Vibrocore Sub-sample
- SPT Liner Sample
- Standard Penetration Test
- In-situ Vane Shear Test
- Permeability Test
- Pressuremeter Test
- Televiewer Survey
- Packer Test
- Impression Packer Test
- Water Sample
- Standpipe
- Piezometer Tip

LOGGED **P. Zhang**

DATE **15/11/2010**

CHECKED **S.M. Pyle**

DATE **19/11/2010**

REMARKS

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L113BH-A
	CONTRACT No.: KL/2009/02	SHEET: 1 of 2

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES: E 841615.89 N 817821.17	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-32**		DATE from: **15/11/2010** to **18/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 4.30** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
16/11/2010	SW											4.30	0.00			
												4.00	0.30			Grey (7.5YR/6/1), CONCRETE PAVIORS.
									1		0.85					Light yellowish brown (2.5Y/6/4), silty fine to coarse SAND with some angular fine to coarse gravel and cobbles of granite. (FILL)
									2	INSPECTION PIT	1.00					
									3		1.65					
16/11/2010		Dry at 06:00							4		2.00	2.30	2.00			
17/11/2010				29												Pinkish grey (7.5YR/7/2), angular coarse GRAVEL and COBBLES with some medium gravel of moderately strong to strong granite. (FILL)
										FX	3.15					
				20						FX	4.50					
				38						FX	5.65					
				27						FX	6.28	-1.98	6.28			
				78												Pinkish grey (7.5YR/7/2), angular COBBLES and BOULDERS of strong granite. (FILL)
										FX	7.15					
				36						FX	7.90					
				69						FX	9.03					
				80								-5.70	10.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**
DATE **19/11/2010**
CHECKED **S.M. Pyle**
DATE **09/12/2010**

REMARKS
1. An inspection pit was excavated to a depth of 2.00m.
2. U100 samples were sent to the analytical laboratory from 12.00-12.45m, 12.50-12.95m, 13.00-13.45m, 13.50-13.95m, 14.00-14.45m, 14.50-14.95m, 15.00-15.45m, 15.50-15.95m, 16.00-16.45m and 16.50-16.95m.

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD

DRILLHOLE RECORD

HOLE No. **L113BH-A**

CONTRACT No.: **KL/2009/02**

SHEET: **2** of **2**

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-32**	E **841615.89** N **817821.17**	DATE from: **15/11/2010** to **18/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 4.30** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
									10.10	-5.70	10.00			As sheet 1 of 2.
11				24					5 11.50	-7.20	11.50			Dark grey (5YR/4/1), silty fine to coarse SAND with some shell fragments. (FILL)
12	SW 12.00	1.50m at 16:00		67				51 bls	6 11.95 7 12.00	-7.70	12.00			Soft to firm, grey (7.5YR/6/1), sandy clayey SILT with occasional angular coarse gravel of fresh granite and some shell fragments. (FILL)
17/11/2010 18/11/2010	PW	2.10m at 08:00		44				26 bls	8 12.45 9 12.50					
13				89				39 bls	10 12.95 11 13.00	-8.70	13.00			Dark grey (5YR/4/1), slightly clayey, silty fine to coarse SAND with some coral and shell fragments. (MARINE DEPOSIT)
				100				36 bls	12 13.45 13 13.50					
14				87				38 bls	14 13.95 15 14.00					
				67				47 bls	16 14.45 17 14.50	-10.20	14.50			Grey (7.5YR/6/1), slightly silty fine to coarse SAND with some shell fragments. (MARINE DEPOSIT)
15				89				48 bls	18 14.95 19 15.00					
				89				45 bls	20 15.45 21 15.50	-11.10	15.40			Soft to firm, light yellowish brown (2.5Y/6/4), dappled light grey and reddish brown, slightly silty, sandy CLAY with marine sand infilled alluvial cracks. (ALLUVIUM)
16				84				25 bls	22 15.95 23 16.00					
	PW 16.50			89				32 bls	24 16.45 25 16.50					
17 18/11/2010		1.20m at 18:00							26 16.95 17.00	-12.70	17.00			End of investigation hole at 17.00m.
18														
19														
20											20.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**

DATE **19/11/2010**

CHECKED **S.M. Pyle**

DATE **09/12/2010**

REMARKS

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD

DRILLHOLE RECORD

HOLE No. **L113BH-B**

CONTRACT No.: **KL/2009/02**

SHEET: **1** of **2**

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES: E **841616.27** N **817820.59**	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-32**		DATE from: **18/11/2010** to **20/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 4.32** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
18/11/2010	SW											4.32	0.00			
												4.22	0.10			Grey (7.5YR/6/1), CONCRETE PAVIORS.
1									1	INSPECTION PIT	0.60					Light yellowish brown (2.5Y/6/4), silty fine to coarse SAND with some angular fine to medium gravel of moderately strong granite. (FILL)
									2		1.50					
									3		1.95					
2									4		2.00	2.32	2.00			
		1.60m at 18:00		55						T6-116						Pinkish grey (7.5YR/7/2), light yellowish brown (2.5Y/6/4), angular BOULDERS with some cobbles of strong, occasionally moderately strong granite. (FILL)
18/11/2010		2.20m at 06:00									2.98					
19/11/2010				89						T6-116	3.50					
4				33						T6-116	4.28					
										T6-116						
5				68						T6-116	5.50	-1.18	5.50			
																Pinkish grey (7.5YR/7/2), angular coarse GRAVEL and COBBLES of moderately strong to strong granite. (FILL)
6				40						T6-116	6.50					
	SW 6.55 PW															
7				85						T6-116	7.28					
				54						T6-116	8.10					
8																
				28						T6-116	8.85					
9				33						T6-116	9.60					
10										T6-116		-5.68	10.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**

DATE **22/11/2010**

CHECKED **S.M. Pyle**

DATE **06/12/2010**

REMARKS

1. An inspection pit was excavated to a depth of 2.00m.
2. U100 samples were sent to the analytical laboratory from 11.50-11.95m, 12.00-12.45m, 12.50-12.95m, 13.00-13.45m, 13.50-13.95m, 14.00-14.45m, 14.50-14.95m, 15.00-15.45m, 15.50-15.95m, 16.00-16.45m

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L113BH-B
	CONTRACT No.: KL/2009/02	SHEET: 2 of 2

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-32**	E **841616.27** N **817820.59**	DATE from: **18/11/2010** to **20/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 4.32** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
										-5.68	10.00			As sheet 1 of 2.
11		1.70m at 18:00		85					T6-18 10.65 T6-18					
18/11/2010		2.40m at 08:00		52										
20/11/2010				44				33 bls	5 11.50					
12				89				35 bls	6 11.95 7 12.00	-7.68	12.00			Grey (7.5YR/6/1), spotted yellowish brown, clayey silty fine to coarse SAND with occasional shell fragments. (FILL)
				84				13 bls	8 12.45 9 12.50	-8.38	12.70			Dark grey (5YR/4/1), clayey silty fine to coarse SAND with some shell fragments. (MARINE DEPOSIT).
13				89				16 bls	10 12.95 11 13.00					
				37				29 bls	12 13.45 13 13.50	-9.18	13.50			Grey, slightly silty fine to coarse SAND with some shell fragments. (MARINE DEPOSIT)
14				89				37 bls	14 13.95 15 14.00					
				78				30 bls	16 14.45 17 14.50					
15				82				51 bls	18 14.95 19 15.00					
				89				25 bls	20 15.45 21 15.50	-11.28	15.60			Soft to firm, light yellowish brown (2.5Y/6/4), sandy silty CLAY with pockets of silty fine to coarse sand. (ALLUVIUM)
16				36				23 bls	22 15.95 23 16.00					
				89				27 bls	24 16.45 25 16.50					
17 20/11/2010	PW 17.00								26 16.95 17.00	-12.68	17.00			End of investigation hole at 17.00m.
18														
19														
20											20.00			

- Small Disturbed Sample
- Piston sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mazier Sample
- 76mm Vibrocore Sample
- 100mm Vibrocore Sample
- Vibrocore Sub-sample
- SPT Liner Sample
- Standard Penetration Test
- In-situ Vane Shear Test
- Permeability Test
- Pressuremeter Test
- Televiewer Survey
- Packer Test
- Impression Packer Test
- Water Sample
- Standpipe
- Piezometer Tip

LOGGED **P. Zhang**

DATE **22/11/2010**

CHECKED **S.M. Pyle**

DATE **06/12/2010**

REMARKS

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L115BH-A
	CONTRACT No.: KL/2009/02	SHEET: 1 of 3

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES: E 841351.14 N 818126.53	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-03**		DATE from: **08/11/2010** to **13/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 3.74** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
09/11/2010	SW											3.74	0.00			
												3.64	0.10			Grey (7.5YR/6/1), CONCRETE PAVIORS.
									1	±	0.65					Light yellowish brown (2.5Y/6/4), fine to coarse SAND with many angular to subangular medium gravel of moderately strong rock. (FILL)
									2	±	1.00					
									3	±	1.65					
09/11/2010									4	±	1.80	1.94	1.80			
10/11/2010				50						T6-116						Light yellowish brown (2.5Y/6/4), grey (7.5YR/6/1), angular coarse GRAVEL and COBBLES of moderately strong to strong granite, concrete, brick and occasional wood and metal fragments. (FILL)
				0				55 blS	5		2.50 2.80					
				17						T6-116	3.88					
				39						T6-116	4.70					
				39						T6-116	5.16					
				39						T6-116	6.08					
				30						T6-116	7.00	-3.26	7.00			
				0				85 blS	6		7.45					Light grey (10R/7/1), angular fine to medium GRAVEL of moderately strong granite and concrete with some matrix of silty sand. (FILL)
				84				91 blS	7		7.50					
				0				93 blS	8		7.95 8.00					
		2.20m at 16:00		0				104 blS	9		8.45 8.50					
10/11/2010									10		8.83	-5.09	8.83			
11/11/2010		3.00m at 08:00		43						T2101						Grey (7.5YR/6/1), angular to subangular medium GRAVEL with occasional angular cobbles of moderately strong granite, concrete and occasional wood. (FILL)
										T6-116	9.55					
												-6.26	10.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**
DATE **17/11/2010**
CHECKED **S.M. Pyle**
DATE **20/11/2010**

REMARKS

1. An inspection pit was excavated to a depth of 1.80m.
2. U100 samples were sent to the analytical laboratory from 22.90-23.25m, 23.30-23.75m, 23.80-24.25m, 24.30-24.75m, 24.80-25.25m and 25.30-25.75m.

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L115BH-A
	CONTRACT No.: KL/2009/02	SHEET: 2 of 3

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-03**	E **841351.14** N **818126.53**	DATE from: **08/11/2010** to **13/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 3.74** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
				42					T6-I6 10.50	-6.26	10.00			As sheet 1 of 3.
	SW 10.50 PW			86					T6-I6 11.00					
11				0				85 blows	11 11.28	-7.54	11.28			
				29					T6-I6 11.80					Grey (7.5YR/6/1), angular coarse GRAVEL and COBBLES of strong granite with occasional brick, concrete and metal. (FILL)
12														
				35					T6-I6 12.85					
13														
				46					T6-I6 13.75					
14										-10.26	14.00			
				67					T6-I6 14.30					Pinkish grey (7.5YR/7/2), angular COBBLES and coarse GRAVEL of strong granite. (FILL)
		2.70m at 16:00												
15	11/11/2010	2.90m at 08:00		58					T6-I6 15.25					
	12/11/2010													
				89					T6-I6 16.08					
16														
				40					T6-I6 17.00					
17														
				21					T6-I6 18.22					
18														
				40					T6-I6 19.03					
19														
				78					T6-I6 19.35					
									T6-I6					
20				47						-16.26	20.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**
DATE **17/11/2010**
CHECKED **S.M. Pyle**
DATE **20/11/2010**

REMARKS

FUGRO GEOTECHNICAL SERVICES LTD

DRILLHOLE RECORD

HOLE No.	L115BH-A
CONTRACT No.:	KL/2009/02
SHEET:	3 of 3

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES: E 841351.14 N 818126.53	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-03**		DATE from: **08/11/2010** to **13/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 3.74** mPD

Column headings: Drilling Progress | Casing depth/size | Water Level (m) Shift start/end | Water Return % | T C R % | S C R % | R Q D % | F I | Tests | Samples (No., Type, Depth) | Reduced Level | Depth (m) | Legend | Grade | Description

Top of sheet: Reduced Level -16.26, Depth 20.00

Drilling progress / water level: 12/11/2010 – 2.60m at 18:00; 13/11/2010 – 3.00m at 08:00; 13/11/2010 – 2.60m at 18:00. Casing: PW 25.30.

TCR %: 0, 50, 63, 21, 33, 78, 89, 89, 89, 89, 89

Tests: 77 bls; 42 bls; 25 bls; 42 bls; 34 bls; 39 bls; 30 bls

Samples: 12 (20.20–20.35); T6-116 (20.70); T6-116 (21.18); T6-116 (22.00); T6-116; 13 (22.80); 14, 22, 15 (23.25, 23.30); 16, 17 (23.75, 23.80); 18, 19 (24.25, 24.30); 20, 21 (24.75, 24.80); 22, 23 (25.25, 25.30); 24 (25.75, 25.80)

Reduced Level	Depth (m)	Description
	20.00	As sheet 2 of 3.
-19.06	22.80	Soft, grey (7.5YR/6/1), mottled yellowish brown, slightly sandy, silty CLAY with occasional angular and rounded coarse gravel of moderately strong granite. (FILL) 23.3 - 23.8m : With 150mm rock core of granite.
-19.56	23.30	
-20.06	23.80	Soft, grey (7.5YR/6/1), mottled light grey, sandy silty CLAY. (ALLUVIUM)
-20.31	24.05	Soft to firm, light yellowish brown, sandy silty CLAY. (ALLUVIUM)
-20.61	24.35	Soft to firm, light yellowish brown (2.5Y/6/4), mottled light grey, sandy clayey SILT. (ALLUVIUM) 24.35m : 30mm thick, brown (7.5YR/3/4), dessication crust.
-21.16	24.90	Light grey (10R/7/1), mottled yellowish brown, clayey silty coarse SAND. (ALLUVIUM)
-22.06	25.80	End of investigation hole at 25.80m.
	30.00	

Key: Small Disturbed Sample; Piston sample; U76 Undisturbed Sample; U100 Undisturbed Sample; Mazier Sample; 76mm Vibrocore Sample; 100mm Vibrocore Sample; Vibrocore Sub-sample; SPT Liner Sample; Standard Penetration Test; In-situ Vane Shear Test; Permeability Test; Pressuremeter Test; Televiewer Survey; Packer Test; Impression Packer Test; Water Sample; Standpipe; Piezometer Tip

LOGGED	P. Zhang
DATE	17/11/2010
CHECKED	S.M. Pyle
DATE	20/11/2010

REMARKS

FUGRO GEOTECHNICAL SERVICES LTD

DRILLHOLE RECORD

HOLE No. **L115BH-B**

CONTRACT No.: **KL/2009/02**

SHEET: **1** of **3**

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-03**	E **841351.74** N **818126.90**	DATE from: **13/11/2010** to **16/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 3.73** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
13/11/2010	SW											3.63	0.10			Grey (7.5YR/6/1), CONCRETE PAVIORS.
									1	INSPECTION PIT	0.85					Light yellowish brown (2.5Y/6/4), fine to coarse SAND with many angular to subangular fine to medium gravel of moderately strong granite. (FILL)
									2		0.85					
									3		1.65					
									4		1.80	1.93	1.80			
2			0	67						T6-116	2.10	1.63	2.10			Grey (7.5YR/6/1), red (10R/5/8), light yellowish brown (2.5Y/6/4), angular medium to coarse GRAVEL and COBBLES of strong granite, concrete, brick and occasional wood and metal fragments. (FILL)
3																2.10 - 3.65m : No recovery.
											3.65	0.08	3.65			
4			0	15						T6-116						
											4.75					
5			0	26						T6-116						
											5.82					
6			0	21						T6-116						
											7.08					
7	SW	2.60m at 16:00								T6-116						
13/11/2010	7.08															
15/11/2010	PW	2.60m at 08:00	0	43							7.50	-3.77	7.50			7.50 - 8.23m : No recovery.
8											8.23	-4.50	8.23			
			0	36						T6-116						
9											9.35					
				23						T6-116						
10												-6.27	10.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**

DATE **17/11/2010**

CHECKED **S.M. Pyle**

DATE **20/11/2010**

REMARKS

1. An inspection pit was excavated to a depth of 1.80m.
2. U100 samples were sent to the analytical laboratory from 22.85-23.30m, 23.35-23.80m, 23.85-24.30m, 24.35-24.80m, 24.85-25.30m and 25.35-25.80m.

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L115BH-B
	CONTRACT No.: KL/2009/02	SHEET: 2 of 3

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-03**	E **841351.74** N **818126.90**	DATE from: **13/11/2010** to **16/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 3.73** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
									10.00	-6.27	10.00			Pinkish grey (7.5YR/7/2), angular COBBLES and BOULDERS with some angular coarse gravel of strong granite. (FILL)
11			D	24					T6-I6					
									11.35	-7.62	11.35			11.35 - 12.38m : No recovery.
12									12.38	-8.65	12.38			
13			D	61					T6-I6					
									13.45					
14			D	30					T6-I6					
									15.10					
15			D	31					T6-I6					
16		2.50m at 16:00 15/11/2010 2.50m at 08:00 16/11/2010							16.00					
			D	38					T6-I6					
									16.85					
17			D	39					T6-I6					
									18.18					
18			D	55					T6-I6					
									19.05					
19									T6-I6					
			D	24						-16.27	20.00			
20														

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**
DATE **17/11/2010**
CHECKED **S.M. Pyle**
DATE **20/11/2010**

REMARKS

FUGRO GEOTECHNICAL SERVICES LTD

DRILLHOLE RECORD

HOLE No. **L115BH-B**

CONTRACT No.: **KL/2009/02**

SHEET: **3** of **3**

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-03**	E **841351.74** N **818126.90**	DATE from: **13/11/2010** to **16/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 3.73** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
										-16.27	20.00			As sheet 2 of 3.
21			0	34					T6-I6 20.65					
			0	42					T6-I6 21.38					
22			0	22					T6-I6 21.90					
									T6-I6					
23				89				35 bls	5 22.85	-19.17	22.90			Soft to firm, light grey (10R/7/1), mottled yellowish brown, slightly sandy, silty CLAY. (ALLUVIUM)
				89				47 bls	6 23.30 7 23.35	-19.82	23.55			
										-20.02	23.75			Firm, light yellowish brown (2.5Y/6/4), slightly sandy, silty CLAY. (ALLUVIUM)
24				89				25 bls	8 23.80 9 23.85	-20.17	23.90			Soft to firm, light yellowish brown (2.5Y/6/4), sandy clayey SILT. (ALLUVIUM).
				89				31 bls	10 24.30 11 24.35	-20.92	24.65			23.75 - 23.90m : With some subrounded to rounded medium to coarse gravel of quartz.
25	PW 25.35			89				21 bls	12 24.80 13 24.85	-21.57	25.30			Light grey (10R/7/1), streaked yellowish brown, clayey silty coarse SAND with occasional subrounded fine to coarse gravel of quartz. (ALLUVIUM)
				89				25 bls	14 25.30 15 25.35					
16/11/2010		2.60m at 16:00							16 25.80 25.85	-22.12	25.85			Soft to firm, light grey (10R/7/1), mottled yellowish brown, sandy clayey SILT. (ALLUVIUM)
26														End of investigation hole at 25.85m.
27														
28														
29														
30											30.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**

DATE **17/11/2010**

CHECKED **S.M. Pyle**

DATE **20/11/2010**

REMARKS

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD

DRILLHOLE RECORD

HOLE No. **L119BH-A**

CONTRACT No.: **KL/2009/02**

SHEET: **1** of **2**

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**

MACHINE & No.: **FDR-17**

FLUSHING MEDIUM: **Distilled Water**

CO-ORDINATES:
E **839375.77**
N **819991.35**

ORIENTATION: **Vertical**

WORKS ORDER No. **NIL**

DATE from: **12/11/2010** to **18/11/2010**

GROUND LEVEL **+ 5.04** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
12/11/2010	SW											5.04	0.00			
									1		0.50	4.44	0.60			Grey (7.5YR/6/1), CONCRETE.
1									2	INSPECTION PIT	1.00					Grey (7.5YR/6/1), fine to coarse SAND with many angular fine to medium gravel of moderately strong to strong granite. (FILL)
12/11/2010 13/11/2010									3		1.60	3.44	1.60			
				60 100					SX							Light yellowish brown (2.5Y/6/4), red (10R/5/8), angular medium to coarse GRAVEL of moderately strong granite and brick. (FILL)
2								69 blr	4		2.00					
				100				53 blr	5 6		2.45 2.50	2.54	2.50			
																Firm, yellowish brown (10YR/5/6), sandy SILT with some angular fine to medium gravel. (FILL)
3		0.90m at 18:00		100				75 blr	7 8		2.95 3.00					
13/11/2010 15/11/2010		2.20m at 08:00		100				40 blr	9 10		3.45 3.50					
4				100				83 blr	11 12		3.85 4.00	1.04	4.00			
									13		4.45 4.50					Pinkish grey (7.5YR/7/2), light yellowish brown (2.5Y/6/4), angular COBBLES with some coarse gravel of moderately strong to strong granite. (FILL)
5									PX							
				57												
		0.70m at 18:00														
15/11/2010 16/11/2010		2.40m at 08:00									6.00					
6									PX							
				86												
				100				105 blr	14		7.00	-1.96	7.00			Yellowish brown (10YR/5/6), silty fine to coarse SAND with some fine to coarse gravel of weak to moderately strong granite. (FILL)
7									15		7.45 7.50	-2.46	7.50			
																Pinkish grey (7.5YR/7/2), angular BOULDERS with some cobbles of strong granite. (FILL)
				55					T2101							
8											8.30					
				88					T2101							
9											9.50					
									T2101							
10												-4.96	10.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**

DATE **19/11/2010**

CHECKED **S.M. Pyle**

DATE **25/11/2010**

REMARKS

1. An inspection pit was excavated to a depth of 1.60m.
2. U100 samples were sent to the analytical laboratory from 14.00-14.45m, 14.50-14.95m, 15.00-15.45m, 15.50-15.95m, 16.00-16.45m and 16.50-16.95m.

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L119BH-A
	CONTRACT No.: KL/2009/02	SHEET: 2 of 2

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-17**	E **839375.77** N **819991.35**	DATE from: **12/11/2010** to **18/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 5.04** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
										-4.96	10.00			As sheet 1 of 2.
11		0.60m at 18:00		69					T2|01 11.00					
16/11/2010 17/11/2010		2.30m at 08:00												
12	SW 12.00 PW			55					T2|01 12.00					
				42										
13									T2|01 13.10					
14		0.60m at 18:00		99										
17/11/2010 18/11/2010		2.30m at 08:00		100				40 blS	16 14.00	-8.96	14.00			Soft to firm, dark grey (5YR/4/1), silty CLAY with some shell fragments. (MARINE DEPOSIT)
				100				51 blS	17 14.45 18 14.50					
15				85				61 blS	19 14.95 20 15.00	-9.96	15.00			Firm, olive (5Y/5/4), dappled grey, slightly sandy, silty CLAY with marine sand infilled within alluvial cracks. (ALLUVIUM)
				89				69 blS	21 15.45 22 15.50	-10.56	15.60			Light yellowish brown (2.5Y6/4), silty fine SAND with marine sand infilled within alluvial cracks. (ALLUVIUM)
16				89				81 blS	23 15.95 24 16.00					
	PW 16.50			100				62 blS	25 16.45 26 16.50	-11.46 -11.66	16.50 16.70			Olive grey (5Y/5/2), slightly silty, medium to coarse SAND with some rounded gravel of moderately strong granite. (ALLUVIUM)
17 18/11/2010		0.90m at 18:00							27 16.95 17.00	-11.96	17.00			Olive grey (5Y/5/2), silty fine SAND. (ALLUVIUM) End of investigation hole at 17.00m.
18														
19														
20											20.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**
DATE **19/11/2010**
CHECKED **S.M. Pyle**
DATE **25/11/2010**

REMARKS

FGS Job No.: 10 0195 05

FUGRO GEOTECHNICAL SERVICES LTD

DRILLHOLE RECORD

HOLE No. **L119BH-B**

CONTRACT No.: **KL/2009/02**

SHEET: **1** of **2**

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-17**	E **839376.20** N **819991.00**	DATE from: **18/11/2010** to **23/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 5.02** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
18/11/2010	SW											5.02	0.00			Grey (7.5YR/6/1), CONCRETE.
									1	INSPECTION PIT	0.50	4.42	0.60			Light yellowish brown (2.5Y/6/4), silty fine to coarse SAND with many angular fine to coarse gravel of moderately strong to strong granite. (FILL)
1									2		1.00					
18/11/2010 19/11/2010									3		1.60	3.42	1.60			
2			70	60					4		2.00	3.02	2.00			Light yellowish brown (2.5Y/6/4), red (10R/5/8), angular medium to coarse GRAVEL and COBBLES of moderately strong granite and brick. (FILL)
				100				91 blS	5		2.45					
				100				101 blS	6		2.50					Firm, yellowish brown (10R/5/6), sandy SILT with some angular fine to coarse gravel of moderately strong granite (FILL).
3									7		3.00	2.02	3.00			
			70	63						T6-146						Pinkish grey (7.5YR/7/2), angular BOULDERS of strong granite. (FILL)
4			70	60						T6-146	3.80					
			70	73						T6-146	4.20					
5										T6-146	5.00					
			70	27												
6				87				87 blS	8		6.00	-0.98	6.00			
				89				80 blS	9 10		6.45 6.50					Yellowish brown (10YR/5/6), silty fine to coarse SAND with some angular fine to coarse gravel of moderately strong granite. (FILL)
7		1.00m at 18:00							11		7.00	-1.98	7.00			
19/11/2010 20/11/2010		2.00m at 08:00														Pinkish grey (7.5YR/7/2), angular BOULDERS with some COBBLES of moderately strong to strong granite. (FILL)
			70	45						T6-146						
8										T6-146	8.00					
			70	85												
9										T6-146	9.00					
			70	31						T6-146						
10												-4.98	10.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**

DATE **22/11/2010**

CHECKED **S.M. Pyle**

DATE **07/12/2010**

REMARKS

1. An inspection pit was excavated to a depth of 1.60m.
2. U100 samples were sent to the analytical laboratory from 13.50-13.95m, 14.00-14.45m, 14.50-14.95m, 15.00-15.45m, 15.50-15.95m, 16.00-16.45m and 16.50-16.95m.

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. L119BH-B
	CONTRACT No.: KL/2009/02	SHEET: 2 of 2

PROJECT: **Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1)**

METHOD: **Rotary Drilling**	CO-ORDINATES:	WORKS ORDER No. **NIL**
MACHINE & No.: **FDR-17**	E **839376.20** N **819991.00**	DATE from: **18/11/2010** to **23/11/2010**
FLUSHING MEDIUM: **Distilled Water**	ORIENTATION: **Vertical**	GROUND LEVEL **+ 5.02** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
										-4.98	10.00			As sheet 1 of 2.
20/11/2010 22/11/2010		1.00m at 18:00 2.20m at 08:00							T6-146 10.50					
11			70	23					T6-146 11.80					
12			70	15					T6-146 12.90					
13			70	67					T6-146					
				100				38 bls	12 13.50	-8.48	13.50			Soft to firm, dark grey (5YR/4/1), slightly sandy, silty CLAY with some shell fragments. (MARINE DEPOSIT)
14	SW 14.00 PW			100				60 bls	13 13.95 14 14.00					
				89				52 bls	15 14.45 16 14.50	-9.38	14.40			Soft to firm, light greenish grey (5G/7/1), dappled grey, sandy silty CLAY with pockets of marine silty clay infilled within alluvial cracks. (ALLUVIUM).
15				100				68 bls	17 14.95 18 15.00	-9.88	14.90			
				100				54 bls	19 15.45 20 15.50	-10.48	15.50			Olive (5Y/5/4), dappled grey, slightly clayey, silty fine SAND with occasional rounded medium gravel of moderately strong quartz and marine clayey silt infilled within alluvial cracks. (ALLUVIUM)
16				89				63 bls	21 15.95 22 16.00	-11.18	16.20			Light yellowish brown (2.5Y/6/4), slightly clayey silty fine to coarse SAND with some rounded coarse gravel of moderately strong granite and tuff. (ALLUVIUM)
				89				64 bls	23 16.45 24 16.50	-11.78	16.80			Olive (5Y/5/4), striped yellowish brown, silty fine SAND. (ALLUVIUM)
17 22/11/2010	PW 17.00	1.00m at 18:00							25 16.95 17.00	-11.98	17.00			Light yellowish brown (2.5Y/6/4), medium to coarse SAND. (ALLUVIUM)
18														End of investigation hole at 17.00m.
19														
20											20.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample
SPT Liner Sample

Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Water Sample
Standpipe
Piezometer Tip

LOGGED **P. Zhang**
DATE **22/11/2010**
CHECKED **S.M. Pyle**
DATE **07/12/2010**

REMARKS

FGS Job No.: 10 0195 05

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

HOKLAS 066

CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 9
Contact	: MR JAMES PENNY	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1026133
Address	: 47/F., HOPEWELL CENTRE, 183 QUEEN`S ROAD EAST, WAN CHAI, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: james.penny@hyderconsulting.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: +852 2911 2048	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: SITE INVESTIGATION FOR TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON (STAGE 1)	Quote number	: ----	Date Samples Received	: 29-OCT-2010
Order number	: KL/2009/02			Issue Date	: 18-NOV-2010
C-O-C number	: ----			No. of samples received	: 2
Site	: L106BH			No. of samples analysed	: 2

Hong Kong Accreditation Service (HKAS) has accedited this laboratory (ALS Technichem (HK) Pty Ltd) under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS Directory of Accredited Laboratories. The results shown in this certificate were determined by this laboratory in accordance with its terms of accreditation.

This document has been electronically signed by those names that appear on this report and are the authorised signatories. Electronic signing has been carried out in compliance with procedures specified in the Electronic Transactions Ordinance of Hong Kong, Chapter 553, Section 6.

Signatories	*Position*	*Authorised results for*
Anh Ngoc Huynh	**Senior Chemist - Organics**	**Organics**
Chan Siu Ming, Vico	**Senior Chemist**	**Inorganics**
Wong Wing, Kenneth	**Assistant Supervisor**	**Inorganics**

General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 14-NOV-2010

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

Specific comments for Work Order: **HK1026133**

Project Name: Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1).

Sample(s) were received in a chilled condition.

Sediment sample(s) analysed on an as received basis. Result(s) reported on a dry weight basis.

Sediment sample(s) as received, digested by In-house method EG-3051A based on USEPA method 3051a, prior to the determination of metals.

Analysis of Tributyltin in interstitial water was cancelled due to insufficient volume of interstitial water.

"Total PCBs" results (Method: EP065) are not HOKLAS accredited. The values are calculated from summation of the 18 PCB congeners, based on Limit of Detection (LOD) of 1 ug/kg.

Sediment Grain Size and Moisture content were subcontracted and tested by MaterialLab Limited.

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: L106BH 14.0-14.9M (A&B)	L106BH 14.9-15.2M (A)			
				Client sampling date / time: 29-OCT-2010 15:00	29-OCT-2010 15:50			
				HK1026133-001	HK1026133-002			
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	**21.2**	**28.6**			
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	**6**	**6**			
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	<0.2			
EG020: Chromium	7440-47-3	1	mg/kg	**24**	**26**			
EG020: Copper	7440-50-8	1	mg/kg	**6**	**10**			
EG020: Lead	7439-92-1	1	mg/kg	**18**	**18**			
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	<0.05			
EG020: Nickel	7440-02-0	1	mg/kg	**13**	**15**			
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1			
EG020: Zinc	7440-66-6	1	mg/kg	**49**	**155**			
EP: Aggregate Organics								
EP005: Total Organic Carbon	----	0.05	%	**0.90**	**0.37**			
EP-065: PCB Single Congeners								
PCB 8	34883-43-7	3	µg/kg	<3	<3			
PCB 18	37680-65-2	3	µg/kg	<3	<3			
PCB 28	7012-37-5	3	µg/kg	<3	<3			
PCB 44	41464-39-5	3	µg/kg	<3	<3			
PCB 52	35693-99-3	3	µg/kg	<3	<3			
PCB 66	32598-10-0	3	µg/kg	<3	<3			
PCB 77	32598-13-3	3	µg/kg	<3	<3			
PCB 101	37680-73-2	3	µg/kg	<3	<3			
PCB 105	32598-14-4	3	µg/kg	<3	<3			
PCB 118	31508-00-6	3	µg/kg	<3	<3			
PCB 126	57465-28-8	3	µg/kg	<3	<3			
PCB 128	38380-07-3	3	µg/kg	<3	<3			
PCB 138	35065-28-2	3	µg/kg	<3	<3			
PCB 153	35065-27-1	3	µg/kg	<3	<3			
PCB 169	32774-16-6	3	µg/kg	<3	<3			
PCB 170	35065-30-6	3	µg/kg	<3	<3			
PCB 180	35065-29-3	3	µg/kg	<3	<3			
PCB 187	52663-68-0	3	µg/kg	<3	<3			
Total Polychlorinated biphenyls	----	18	µg/kg	<18	<18			
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs)								
EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	<50			
EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	<50			

Sub-Matrix: SEDIMENT				Client sample ID	L106BH 14.0-14.9M (A&B)	L106BH 14.9-15.2M (A)			
				Client sampling date / time	29-OCT-2010 15:00	29-OCT-2010 15:50			
Compound	CAS Number	LOR	Unit		HK1026133-001	HK1026133-002			
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued									
EP076HK: Acenaphthene	83-32-9	50	µg/kg		<50	<50			
EP076HK: Fluorene	86-73-7	50	µg/kg		<50	<50			
EP076HK: Phenanthrene	85-01-8	50	µg/kg		<50	<50			
EP076HK: Anthracene	120-12-7	50	µg/kg		<50	<50			
EP076HK: Fluoranthene	206-44-0	150	µg/kg		<150	<150			
EP076HK: Pyrene	129-00-0	150	µg/kg		<150	<150			
EP076HK: Benz(a)anthracene	56-55-3	150	µg/kg		<150	<150			
EP076HK: Chrysene	218-01-9	150	µg/kg		<150	<150			
EP076HK: Benzo(b)fluoranthene	205-99-2	150	µg/kg		<150	<150			
EP076HK: Benzo(k)fluoranthene	207-08-9	150	µg/kg		<150	<150			
EP076HK: Benzo(a)pyrene	50-32-8	150	µg/kg		<150	<150			
EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	150	µg/kg		<150	<150			
EP076HK: Dibenz(a.h)anthracene	53-70-3	150	µg/kg		<150	<150			
EP076HK: Benzo(g.h.i)perylene	191-24-2	150	µg/kg		<150	<150			
EP076HK: Low M.W. PAHs	----	550	µg/kg		<550	<550			
EP076HK: High M.W. PAHs	----	1700	µg/kg		<1700	<1700			
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates									Surrogate control limits listed at end of this report.
2-Fluorobiphenyl	321-60-8	0.1	%		**75.6**	**73.7**			
4-Terphenyl-d14	1718-51-0	0.1	%		**74.6**	**75.0**			
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate									Surrogate control limits listed at end of this report.
Decachlorobiphenyl	2051-24-3	0.1	%		**122**	**129**			

Laboratory Duplicate (DUP) Report

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1553313)								
HK1026133-001	L106BH 14.0-14.9M (A&B)	**EA055: Moisture Content (dried @ 103°C)**	----	0.1	%	21.2	25.1	17.1
EG: Metals and Major Cations (QC Lot: 1553179)								
HK1026133-002	L106BH 14.9-15.2M (A)	**EG020: Mercury**	7439-97-6	0.05	mg/kg	<0.05	<0.05	0.0
		EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.0
		EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	<0.2	0.0
		EG020: Arsenic	7440-38-2	1	mg/kg	6	6	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	26	26	0.0
		EG020: Copper	7440-50-8	1	mg/kg	10	11	0.0
		EG020: Lead	7439-92-1	1	mg/kg	18	19	0.0
		EG020: Nickel	7440-02-0	1	mg/kg	15	16	0.0
		EG020: Zinc	7440-66-6	1	mg/kg	155	134	14.5
EP: Aggregate Organics (QC Lot: 1557509)								
HK1026133-001	L106BH 14.0-14.9M (A&B)	**EP005: Total Organic Carbon**	----	0.05	%	0.90	1.00	10.4
EP-065: PCB Single Congeners (QC Lot: 1555026)								
HK1026133-001	L106BH 14.0-14.9M (A&B)	**Total Polychlorinated biphenyls**	----	18	µg/kg	<18	<18	0.0
		PCB 8	34883-43-7	3	µg/kg	<3	<3	0.0
		PCB 18	37680-65-2	3	µg/kg	<3	<3	0.0
		PCB 28	7012-37-5	3	µg/kg	<3	<3	0.0
		PCB 44	41464-39-5	3	µg/kg	<3	<3	0.0
		PCB 52	35693-99-3	3	µg/kg	<3	<3	0.0
		PCB 66	32598-10-0	3	µg/kg	<3	<3	0.0
		PCB 77	32598-13-3	3	µg/kg	<3	<3	0.0
		PCB 101	37680-73-2	3	µg/kg	<3	<3	0.0
		PCB 105	32598-14-4	3	µg/kg	<3	<3	0.0
		PCB 118	31508-00-6	3	µg/kg	<3	<3	0.0
		PCB 126	57465-28-8	3	µg/kg	<3	<3	0.0
		PCB 128	38380-07-3	3	µg/kg	<3	<3	0.0
		PCB 138	35065-28-2	3	µg/kg	<3	<3	0.0
		PCB 153	35065-27-1	3	µg/kg	<3	<3	0.0
		PCB 169	32774-16-6	3	µg/kg	<3	<3	0.0
		PCB 170	35065-30-6	3	µg/kg	<3	<3	0.0
		PCB 180	35065-29-3	3	µg/kg	<3	<3	0.0
		PCB 187	52663-68-0	3	µg/kg	<3	<3	0.0
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1555027)								
HK1026133-001	L106BH 14.0-14.9M (A&B)	**EP076HK: Fluoranthene**	206-44-0	150	µg/kg	<150	<150	0.0
		EP076HK: Pyrene	129-00-0	150	µg/kg	<150	<150	0.0
		EP076HK: Benz(a)anthracene	56-55-3	150	µg/kg	<150	<150	0.0
		EP076HK: Chrysene	218-01-9	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(b)fluoranthene	205-99-2	150	µg/kg	<150	<150	0.0

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1555027) - Continued								
HK1026133-001	L106BH 14.0-14.9M (A&B)	**EP076HK: Benzo(k)fluoranthene**	207-08-9	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(a)pyrene	50-32-8	150	µg/kg	<150	<150	0.0
		EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	150	µg/kg	<150	<150	0.0
		EP076HK: Dibenz(a.h)anthracene	53-70-3	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(g.h.i)perylene	191-24-2	150	µg/kg	<150	<150	0.0
		EP076HK: High M.W. PAHs	----	1700	µg/kg	<1700	<1700	0.0
		EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	<50	0.0
		EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	<50	0.0
		EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50	<50	0.0
		EP076HK: Fluorene	86-73-7	50	µg/kg	<50	<50	0.0
		EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50	<50	0.0
		EP076HK: Anthracene	120-12-7	50	µg/kg	<50	<50	0.0
		EP076HK: Low M.W. PAHs	----	550	µg/kg	<550	<550	0.0

Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: **SOIL**

Method: Compound	CAS Number	Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
					Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
		LOR	Unit	Result		LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1553179)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	91.6	----	85	115	----	----
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	91.8	----	85	115	----	----
EG020: Chromium	7440-47-3	1	mg/kg	<1	5 mg/kg	101	----	85	115	----	----
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	101	----	85	115	----	----
EG020: Lead	7439-92-1	1	mg/kg	<1	5 mg/kg	96.9	----	85	115	----	----
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	95.1	----	85	115	----	----
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	96.8	----	85	115	----	----
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	96.8	----	85	115	----	----
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	104	----	85	115	----	----
EP: Aggregate Organics (QC Lot: 1557509)											
EP005: Total Organic Carbon	----	0.05	%	<0.05	40 %	114	----	85	115	----	----
EP-065: PCB Single Congeners (QC Lot: 1555026)											
PCB 8	34883-43-7	3	µg/kg	<3	5 µg/kg	83.3	----	47	131	----	----
PCB 18	37680-65-2	3	µg/kg	<3	5 µg/kg	87.8	----	38	147	----	----
PCB 28	7012-37-5	3	µg/kg	<3	5 µg/kg	81.6	----	36	134	----	----
PCB 44	41464-39-5	3	µg/kg	<3	5 µg/kg	81.1	----	24	149	----	----
PCB 52	35693-99-3	3	µg/kg	<3	5 µg/kg	81.0	----	28	149	----	----
PCB 66	32598-10-0	3	µg/kg	<3	5 µg/kg	82.6	----	31	135	----	----
PCB 77	32598-13-3	3	µg/kg	<3	5 µg/kg	79.8	----	38	123	----	----
PCB 101	37680-73-2	3	µg/kg	<3	5 µg/kg	83.7	----	44	121	----	----
PCB 105	32598-14-4	3	µg/kg	<3	5 µg/kg	81.2	----	41	123	----	----

Matrix: SOIL

Method: Compound	CAS Number	Method Blank (MB) Report LOR	Unit	Result	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report: Spike Concentration	Spike Recovery (%) LCS	DCS	Recovery Limits (%) Low	High	RPD (%) Value	Control Limit
EP-065: PCB Single Congeners (QC Lot: 1555026) - Continued											
PCB 118	31508-00-6	3	µg/kg	<3	5 µg/kg	98.7	----	45	119	----	----
PCB 126	57465-28-8	3	µg/kg	<3	5 µg/kg	110	----	40	119	----	----
PCB 128	38380-07-3	3	µg/kg	<3	5 µg/kg	106	----	46	120	----	----
PCB 138	35065-28-2	3	µg/kg	<3	5 µg/kg	113	----	45	117	----	----
PCB 153	35065-27-1	3	µg/kg	<3	5 µg/kg	109	----	43	121	----	----
PCB 169	32774-16-6	3	µg/kg	<3	5 µg/kg	124	----	43	127	----	----
PCB 170	35065-30-6	3	µg/kg	<3	5 µg/kg	89.0	----	43	124	----	----
PCB 180	35065-29-3	3	µg/kg	<3	5 µg/kg	92.3	----	42	124	----	----
PCB 187	52663-68-0	3	µg/kg	<3	5 µg/kg	113	----	43	124	----	----
Total Polychlorinated biphenyls	----	18	µg/kg	<18	----	----	----	----	----	----	----
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1555027)											
EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	250 µg/kg	87.7	----	57	119	----	----
EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	250 µg/kg	77.4	----	60	113	----	----
EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50	250 µg/kg	81.0	----	64	113	----	----
EP076HK: Fluorene	86-73-7	50	µg/kg	<50	250 µg/kg	79.1	----	61	118	----	----
EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50	250 µg/kg	81.7	----	57	123	----	----
EP076HK: Anthracene	120-12-7	50	µg/kg	<50	250 µg/kg	82.5	----	65	109	----	----
EP076HK: Fluoranthene	206-44-0	50	µg/kg	<50	250 µg/kg	82.8	----	58	124	----	----
EP076HK: Pyrene	129-00-0	50	µg/kg	<50	250 µg/kg	84.0	----	59	127	----	----
EP076HK: Benz(a)anthracene	56-55-3	50	µg/kg	<50	250 µg/kg	86.9	----	56	116	----	----
EP076HK: Chrysene	218-01-9	50	µg/kg	<50	250 µg/kg	88.5	----	72	118	----	----
EP076HK: Benzo(b)fluoranthene	205-99-2	50	µg/kg	<50	250 µg/kg	90.9	----	50	116	----	----
EP076HK: Benzo(k)fluoranthene	207-08-9	50	µg/kg	<50	250 µg/kg	88.4	----	67	121	----	----
EP076HK: Benzo(a)pyrene	50-32-8	50	µg/kg	<50	250 µg/kg	98.4	----	55	133	----	----
EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	50	µg/kg	<50	250 µg/kg	91.2	----	56	108	----	----
EP076HK: Dibenz(a.h)anthracene	53-70-3	50	µg/kg	<50	250 µg/kg	88.4	----	45	117	----	----
EP076HK: Benzo(g.h.i)perylene	191-24-2	50	µg/kg	<50	250 µg/kg	93.4	----	53	118	----	----
EP076HK: Low M.W. PAHs	----	550	µg/kg	<550	----	----	----	----	----	----	----
EP076HK: High M.W. PAHs	----	1700	µg/kg	<1700	----	----	----	----	----	----	----

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%) MS	MSD	Recovery Limits (%) Low	High	RPD (%) Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1553179)										
HK1026133-001	L106BH 14.0-14.9M (A&B)	EG020: Arsenic	7440-38-2	5 mg/kg	96.2	95.4	75	125	0.8	25
		EG020: Cadmium	7440-43-9	5 mg/kg	93.8	96.8	75	125	3.1	25
		EG020: Chromium	7440-47-3	5 mg/kg	85.6	85.8	75	125	0.4	25

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
					MS	MSD	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1553179) - Continued										
HK1026133-001	L106BH 14.0-14.9M (A&B)	**EG020: Copper**	7440-50-8	5 mg/kg	86.7	92.6	75	125	6.6	25
		EG020: Lead	7439-92-1	5 mg/kg	85.6	85.6	75	125	0.0	25
		EG020: Mercury	7439-97-6	0.1 mg/kg	100	105	75	125	4.4	25
		EG020: Nickel	7440-02-0	5 mg/kg	86.9	86.9	75	125	0.0	25
		EG020: Silver	7440-22-4	5 mg/kg	93.8	94.8	75	125	1.1	25
		EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
EP: Aggregate Organics (QC Lot: 1557509)										
HK1026133-002	L106BH 14.9-15.2M (A)	**EP005: Total Organic Carbon**	----	40 %	106	----	75	125	----	----
EP-065: PCB Single Congeners (QC Lot: 1555026)										
HK1026133-002	L106BH 14.9-15.2M (A)	**PCB 8**	34883-43-7	5 µg/kg	103	----	50	130	----	----
		PCB 18	37680-65-2	5 µg/kg	81.4	----	50	130	----	----
		PCB 28	7012-37-5	5 µg/kg	73.8	----	50	130	----	----
		PCB 44	41464-39-5	5 µg/kg	71.8	----	50	130	----	----
		PCB 52	35693-99-3	5 µg/kg	75.4	----	50	130	----	----
		PCB 66	32598-10-0	5 µg/kg	75.6	----	50	130	----	----
		PCB 77	32598-13-3	5 µg/kg	82.0	----	50	130	----	----
		PCB 101	37680-73-2	5 µg/kg	81.8	----	50	130	----	----
		PCB 105	32598-14-4	5 µg/kg	75.7	----	50	130	----	----
		PCB 118	31508-00-6	5 µg/kg	114	----	50	130	----	----
		PCB 126	57465-28-8	5 µg/kg	101	----	50	130	----	----
		PCB 128	38380-07-3	5 µg/kg	97.8	----	50	130	----	----
		PCB 138	35065-28-2	5 µg/kg	99.6	----	50	130	----	----
		PCB 153	35065-27-1	5 µg/kg	119	----	50	130	----	----
		PCB 169	32774-16-6	5 µg/kg	114	----	50	130	----	----
		PCB 170	35065-30-6	5 µg/kg	80.8	----	50	130	----	----
		PCB 180	35065-29-3	5 µg/kg	110	----	50	130	----	----
		PCB 187	52663-68-0	5 µg/kg	101	----	50	130	----	----
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1555027)										
HK1026133-002	L106BH 14.9-15.2M (A)	**EP076HK: Naphthalene**	91-20-3	250 µg/kg	80.0	----	50	130	----	----
		EP076HK: Acenaphthylene	208-96-8	250 µg/kg	70.3	----	50	130	----	----
		EP076HK: Acenaphthene	83-32-9	250 µg/kg	73.0	----	50	130	----	----
		EP076HK: Fluorene	86-73-7	250 µg/kg	69.2	----	50	130	----	----
		EP076HK: Phenanthrene	85-01-8	250 µg/kg	72.0	----	50	130	----	----
		EP076HK: Anthracene	120-12-7	250 µg/kg	69.1	----	50	130	----	----
		EP076HK: Fluoranthene	206-44-0	250 µg/kg	72.9	----	50	130	----	----
		EP076HK: Pyrene	129-00-0	250 µg/kg	73.4	----	50	130	----	----
		EP076HK: Benz(a)anthracene	56-55-3	250 µg/kg	72.3	----	50	130	----	----
		EP076HK: Chrysene	218-01-9	250 µg/kg	75.2	----	50	130	----	----

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%): MS	Spike Recovery (%): MSD	Recovery Limits (%): Low	Recovery Limits (%): High	RPD (%): Value	RPD (%): Control Limit
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1555027) - Continued										
HK1026133-002	L106BH 14.9-15.2M (A)	**EP076HK: Benzo(b)fluoranthene**	205-99-2	250 µg/kg	74.1	----	50	130	----	----
		EP076HK: Benzo(k)fluoranthene	207-08-9	250 µg/kg	74.8	----	50	130	----	----
		EP076HK: Benzo(a)pyrene	50-32-8	250 µg/kg	81.8	----	50	130	----	----
		EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	250 µg/kg	69.2	----	50	130	----	----
		EP076HK: Dibenz(a.h)anthracene	53-70-3	250 µg/kg	69.4	----	50	130	----	----
		EP076HK: Benzo(g.h.i)perylene	191-24-2	250 µg/kg	75.0	----	50	130	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	Recovery Limits (%): Low	Recovery Limits (%): High
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates			
2-Fluorobiphenyl	321-60-8	50	130
4-Terphenyl-d14	1718-51-0	50	130
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate			
Decachlorobiphenyl	2051-24-3	50	130

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

HOKLAS 066

CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 9
Contact	: MR JAMES PENNY	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1026849
Address	: 47/F., HOPEWELL CENTRE, 183 QUEEN`S ROAD EAST, WAN CHAI, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: james.penny@hyderconsulting.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: +852 2911 2048	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: SITE INVESTIGATION FOR TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON (STAGE 1)	Quote number	: ----	Date Samples Received	: 04-NOV-2010
Order number	: KL/2009/02			Issue Date	: 19-NOV-2010
C-O-C number	: ----			No. of samples received	: 3
Site	: L102BH			No. of samples analysed	: 3

Hong Kong Accreditation Service (HKAS) has accedited this laboratory (ALS Technichem (HK) Pty Ltd) under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS Directory of Accredited Laboratories. The results shown in this certificate were determined by this laboratory in accordance with its terms of accreditation.

This document has been electronically signed by those names that appear on this report and are the authorised signatories. Electronic signing has been carried out in compliance with procedures specified in the Electronic Transactions Ordinance of Hong Kong, Chapter 553, Section 6.

Signatories	*Position*	*Authorised results for*
Anh Ngoc Huynh	**Senior Chemist - Organics**	**Organics**
Chan Siu Ming, Vico	**Senior Chemist**	**Inorganics**
Wong Wing, Kenneth	**Assistant Supervisor**	**Inorganics**

General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 18-NOV-2010

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

Specific comments for Work Order: **HK1026849**

Project Name: Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1).

Sample(s) were received in a chilled condition.

Sediment sample(s) analysed on an as received basis. Result(s) reported on a dry weight basis.

Sediment sample(s) as received, digested by In-house method EG-3051A based on USEPA method 3051a, prior to the determination of metals.

Analysis of Tributyltin in interstitial water was cancelled due to insufficient volume of interstitial water.

"Total PCBs" results (Method: EP065) are not HOKLAS accredited. The values are calculated from summation of the 18 PCB congeners, based on Limit of Detection (LOD) of 1 ug/kg.

Sediment Grain Size and Moisture content were subcontracted and tested by MaterialLab Limited.

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: L102BH 13.4-14.3M (E&F)	L102BH 14.3-15.3M (E&F)	L102BH 15.3-15.5M (F)		
				Client sampling date / time: 04-NOV-2010 14:35	04-NOV-2010 16:00	11-NOV-2010 09:50		
				HK1026849-001	HK1026849-002	HK1026849-003		
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	**5**	**6**	**5**		
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	<0.2	<0.2		
EG020: Chromium	7440-47-3	1	mg/kg	**21**	**24**	**20**		
EG020: Copper	7440-50-8	1	mg/kg	**6**	**6**	**6**		
EG020: Lead	7439-92-1	1	mg/kg	**19**	**16**	**15**		
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	<0.05	<0.05		
EG020: Nickel	7440-02-0	1	mg/kg	**14**	**15**	**13**		
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	<0.1		
EG020: Zinc	7440-66-6	1	mg/kg	**100**	**69**	**102**		
EP: Aggregate Organics								
EP005: Total Organic Carbon	----	0.05	%	**1.46**	**1.38**	**0.32**		
EP-065: PCB Single Congeners								
PCB 8	34883-43-7	3	µg/kg	<3	<3	<3		
PCB 18	37680-65-2	3	µg/kg	<3	<3	<3		
PCB 28	7012-37-5	3	µg/kg	<3	<3	<3		
PCB 44	41464-39-5	3	µg/kg	<3	<3	<3		
PCB 52	35693-99-3	3	µg/kg	<3	<3	<3		
PCB 66	32598-10-0	3	µg/kg	<3	<3	<3		
PCB 77	32598-13-3	3	µg/kg	<3	<3	<3		
PCB 101	37680-73-2	3	µg/kg	<3	<3	<3		
PCB 105	32598-14-4	3	µg/kg	<3	<3	<3		
PCB 118	31508-00-6	3	µg/kg	<3	<3	<3		
PCB 126	57465-28-8	3	µg/kg	<3	<3	<3		
PCB 128	38380-07-3	3	µg/kg	<3	<3	<3		
PCB 138	35065-28-2	3	µg/kg	<3	<3	<3		
PCB 153	35065-27-1	3	µg/kg	<3	<3	<3		
PCB 169	32774-16-6	3	µg/kg	<3	<3	<3		
PCB 170	35065-30-6	3	µg/kg	<3	<3	<3		
PCB 180	35065-29-3	3	µg/kg	<3	<3	<3		
PCB 187	52663-68-0	3	µg/kg	<3	<3	<3		
Total Polychlorinated biphenyls	----	18	µg/kg	<18	<18	<18		
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs)								
EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	<50	<50		
EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	<50	<50		
EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50	<50	<50		
EP076HK: Fluorene	86-73-7	50	µg/kg	<50	<50	<50		
EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50	<50	<50		

Sub-Matrix: SEDIMENT				Client sample ID	L102BH 13.4-14.3M (E&F)	L102BH 14.3-15.3M (E&F)	L102BH 15.3-15.5M (F)		
				Client sampling date / time	04-NOV-2010 14:35	04-NOV-2010 16:00	11-NOV-2010 09:50		
Compound	CAS Number	LOR	Unit		HK1026849-001	HK1026849-002	HK1026849-003		
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued									
EP076HK: Anthracene	120-12-7	50	µg/kg		<50	<50	<50		
EP076HK: Fluoranthene	206-44-0	150	µg/kg		<150	<150	<150		
EP076HK: Pyrene	129-00-0	150	µg/kg		<150	<150	<150		
EP076HK: Benz(a)anthracene	56-55-3	150	µg/kg		<150	<150	<150		
EP076HK: Chrysene	218-01-9	150	µg/kg		<150	<150	<150		
EP076HK: Benzo(b)fluoranthene	205-99-2	150	µg/kg		<150	<150	<150		
EP076HK: Benzo(k)fluoranthene	207-08-9	150	µg/kg		<150	<150	<150		
EP076HK: Benzo(a)pyrene	50-32-8	150	µg/kg		<150	<150	<150		
EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	150	µg/kg		<150	<150	<150		
EP076HK: Dibenz(a.h)anthracene	53-70-3	150	µg/kg		<150	<150	<150		
EP076HK: Benzo(g.h.i)perylene	191-24-2	150	µg/kg		<150	<150	<150		
EP076HK: Low M.W. PAHs	----	550	µg/kg		<550	<550	<550		
EP076HK: High M.W. PAHs	----	1700	µg/kg		<1700	<1700	<1700		
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates								Surrogate control limits listed at end of this report.	
2-Fluorobiphenyl	321-60-8	0.1	%		**75.1**	**65.8**	**76.2**		
4-Terphenyl-d14	1718-51-0	0.1	%		**80.6**	**69.6**	**86.0**		
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate								Surrogate control limits listed at end of this report.	
Decachlorobiphenyl	2051-24-3	0.1	%		**75.2**	**61.3**	**77.4**		

Laboratory Duplicate (DUP) Report

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
EG: Metals and Major Cations (QC Lot: 1561548)								
HK1026728-003	Anonymous	**EG020: Mercury**	7439-97-6	0.05	mg/kg	<0.05	<0.05	0.0
		EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.0
		EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	<0.2	0.0
		EG020: Arsenic	7440-38-2	1	mg/kg	6	6	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	24	24	0.0
		EG020: Copper	7440-50-8	1	mg/kg	7	7	0.0
		EG020: Lead	7439-92-1	1	mg/kg	17	17	0.0
		EG020: Nickel	7440-02-0	1	mg/kg	15	15	0.0
		EG020: Zinc	7440-66-6	1	mg/kg	50	49	0.0
HK1026899-003	Anonymous	**EG020: Mercury**	7439-97-6	0.05	mg/kg	<0.05	<0.05	0.0
		EG020: Silver	7440-22-4	0.1	mg/kg	0.1	0.2	0.0
		EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	<0.2	0.0
		EG020: Arsenic	7440-38-2	1	mg/kg	6	7	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	24	26	6.5
		EG020: Copper	7440-50-8	1	mg/kg	21	21	0.0
		EG020: Lead	7439-92-1	1	mg/kg	22	24	9.2
		EG020: Nickel	7440-02-0	1	mg/kg	15	15	0.0
		EG020: Zinc	7440-66-6	1	mg/kg	51	52	3.2
EP: Aggregate Organics (QC Lot: 1562495)								
HK1026728-001	Anonymous	**EP005: Total Organic Carbon**	----	0.05	%	1.09	1.11	1.9
HK1026899-005	Anonymous	**EP005: Total Organic Carbon**	----	0.05	%	0.68	0.66	2.5
EP-065: PCB Single Congeners (QC Lot: 1559835)								
HK1026849-001	L102BH 13.4-14.3M (E&F)	**Total Polychlorinated biphenyls**	----	18	µg/kg	<18	<18	0.0
		PCB 8	34883-43-7	3	µg/kg	<3	<3	0.0
		PCB 18	37680-65-2	3	µg/kg	<3	<3	0.0
		PCB 28	7012-37-5	3	µg/kg	<3	<3	0.0
		PCB 44	41464-39-5	3	µg/kg	<3	<3	0.0
		PCB 52	35693-99-3	3	µg/kg	<3	<3	0.0
		PCB 66	32598-10-0	3	µg/kg	<3	<3	0.0
		PCB 77	32598-13-3	3	µg/kg	<3	<3	0.0
		PCB 101	37680-73-2	3	µg/kg	<3	<3	0.0
		PCB 105	32598-14-4	3	µg/kg	<3	<3	0.0
		PCB 118	31508-00-6	3	µg/kg	<3	<3	0.0
		PCB 126	57465-28-8	3	µg/kg	<3	<3	0.0
		PCB 128	38380-07-3	3	µg/kg	<3	<3	0.0
		PCB 138	35065-28-2	3	µg/kg	<3	<3	0.0
		PCB 153	35065-27-1	3	µg/kg	<3	<3	0.0
		PCB 169	32774-16-6	3	µg/kg	<3	<3	0.0
		PCB 170	35065-30-6	3	µg/kg	<3	<3	0.0

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
EP-065: PCB Single Congeners (QC Lot: 1559835) - Continued								
HK1026849-001	L102BH 13.4-14.3M (E&F)	**PCB 180**	35065-29-3	3	µg/kg	<3	<3	0.0
		PCB 187	52663-68-0	3	µg/kg	<3	<3	0.0
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1559836)								
HK1026849-001	L102BH 13.4-14.3M (E&F)	**EP076HK: Fluoranthene**	206-44-0	150	µg/kg	<150	<150	0.0
		EP076HK: Pyrene	129-00-0	150	µg/kg	<150	<150	0.0
		EP076HK: Benz(a)anthracene	56-55-3	150	µg/kg	<150	<150	0.0
		EP076HK: Chrysene	218-01-9	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(b)fluoranthene	205-99-2	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(k)fluoranthene	207-08-9	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(a)pyrene	50-32-8	150	µg/kg	<150	<150	0.0
		EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	150	µg/kg	<150	<150	0.0
		EP076HK: Dibenz(a.h)anthracene	53-70-3	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(g.h.i)perylene	191-24-2	150	µg/kg	<150	<150	0.0
		EP076HK: High M.W. PAHs	----	1700	µg/kg	<1700	<1700	0.0
		EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	<50	0.0
		EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	<50	0.0
		EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50	<50	0.0
		EP076HK: Fluorene	86-73-7	50	µg/kg	<50	<50	0.0
		EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50	<50	0.0
		EP076HK: Anthracene	120-12-7	50	µg/kg	<50	<50	0.0
		EP076HK: Low M.W. PAHs	----	550	µg/kg	<550	<550	0.0

Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: **SOIL**

Method: Compound	CAS Number	Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
					Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
		LOR	Unit	Result		LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1561548)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	100	----	85	115	----	----
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	92.9	----	85	115	----	----
EG020: Chromium	7440-47-3	1	mg/kg	<1	5 mg/kg	93.9	----	85	115	----	----
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	97.3	----	85	115	----	----
EG020: Lead	7439-92-1	1	mg/kg	<1	5 mg/kg	87.4	----	85	115	----	----
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	92.5	----	85	115	----	----
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	93.4	----	85	115	----	----
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	97.1	----	85	115	----	----
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	101	----	85	115	----	----
EP: Aggregate Organics (QC Lot: 1562495)											
EP005: Total Organic Carbon	----	0.05	%	<0.05	40 %	108	----	85	115	----	----
EP-065: PCB Single Congeners (QC Lot: 1559835)											
PCB 8	34883-43-7	3	µg/kg	<3	5 µg/kg	78.5	----	47	131	----	----

Matrix: SOIL

Method: Compound	CAS Number	Method Blank (MB) Report LOR	Unit	Result	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report: Spike Concentration	Spike Recovery (%) LCS	Spike Recovery (%) DCS	Recovery Limits (%) Low	Recovery Limits (%) High	RPD (%) Value	RPD (%) Control Limit
EP-065: PCB Single Congeners (QC Lot: 1559835) - Continued											
PCB 18	37680-65-2	3	µg/kg	<3	5 µg/kg	51.4	----	38	147	----	----
PCB 28	7012-37-5	3	µg/kg	<3	5 µg/kg	40.3	----	36	134	----	----
PCB 44	41464-39-5	3	µg/kg	<3	5 µg/kg	43.5	----	24	149	----	----
PCB 52	35693-99-3	3	µg/kg	<3	5 µg/kg	43.0	----	28	149	----	----
PCB 66	32598-10-0	3	µg/kg	<3	5 µg/kg	45.8	----	31	135	----	----
PCB 77	32598-13-3	3	µg/kg	<3	5 µg/kg	55.8	----	38	123	----	----
PCB 101	37680-73-2	3	µg/kg	<3	5 µg/kg	48.1	----	44	121	----	----
PCB 105	32598-14-4	3	µg/kg	<3	5 µg/kg	54.9	----	41	123	----	----
PCB 118	31508-00-6	3	µg/kg	<3	5 µg/kg	74.0	----	45	119	----	----
PCB 126	57465-28-8	3	µg/kg	<3	5 µg/kg	57.8	----	40	119	----	----
PCB 128	38380-07-3	3	µg/kg	<3	5 µg/kg	51.4	----	46	120	----	----
PCB 138	35065-28-2	3	µg/kg	<3	5 µg/kg	55.5	----	45	117	----	----
PCB 153	35065-27-1	3	µg/kg	<3	5 µg/kg	80.9	----	43	121	----	----
PCB 169	32774-16-6	3	µg/kg	<3	5 µg/kg	57.5	----	43	127	----	----
PCB 170	35065-30-6	3	µg/kg	<3	5 µg/kg	54.4	----	43	124	----	----
PCB 180	35065-29-3	3	µg/kg	<3	5 µg/kg	53.5	----	42	124	----	----
PCB 187	52663-68-0	3	µg/kg	<3	5 µg/kg	53.4	----	43	124	----	----
Total Polychlorinated biphenyls	----	18	µg/kg	<18	----	----	----	----	----	----	----
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1559836)											
EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	250 µg/kg	65.1	----	57	119	----	----
EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	250 µg/kg	72.1	----	60	113	----	----
EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50	250 µg/kg	82.7	----	64	113	----	----
EP076HK: Fluorene	86-73-7	50	µg/kg	<50	250 µg/kg	63.9	----	61	118	----	----
EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50	250 µg/kg	64.8	----	57	123	----	----
EP076HK: Anthracene	120-12-7	50	µg/kg	<50	250 µg/kg	66.5	----	65	109	----	----
EP076HK: Fluoranthene	206-44-0	50	µg/kg	<50	250 µg/kg	66.2	----	58	124	----	----
EP076HK: Pyrene	129-00-0	50	µg/kg	<50	250 µg/kg	66.0	----	59	127	----	----
EP076HK: Benz(a)anthracene	56-55-3	50	µg/kg	<50	250 µg/kg	66.3	----	56	116	----	----
EP076HK: Chrysene	218-01-9	50	µg/kg	<50	250 µg/kg	73.5	----	72	118	----	----
EP076HK: Benzo(b)fluoranthene	205-99-2	50	µg/kg	<50	250 µg/kg	68.8	----	50	116	----	----
EP076HK: Benzo(k)fluoranthene	207-08-9	50	µg/kg	<50	250 µg/kg	79.7	----	67	121	----	----
EP076HK: Benzo(a)pyrene	50-32-8	50	µg/kg	<50	250 µg/kg	61.9	----	55	133	----	----
EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	50	µg/kg	<50	250 µg/kg	67.6	----	56	108	----	----
EP076HK: Dibenz(a.h)anthracene	53-70-3	50	µg/kg	<50	250 µg/kg	69.1	----	45	117	----	----
EP076HK: Benzo(g.h.i)perylene	191-24-2	50	µg/kg	<50	250 µg/kg	72.5	----	53	118	----	----
EP076HK: Low M.W. PAHs	----	550	µg/kg	<550	----	----	----	----	----	----	----
EP076HK: High M.W. PAHs	----	1700	µg/kg	<1700	----	----	----	----	----	----	----

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Matrix: SOIL

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
					MS	MSD	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1561548)										
HK1026728-001	Anonymous	**EG020: Arsenic**	7440-38-2	5 mg/kg	88.4	88.8	75	125	0.4	25
		EG020: Cadmium	7440-43-9	5 mg/kg	92.4	92.4	75	125	0.04	25
		EG020: Chromium	7440-47-3	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
		EG020: Copper	7440-50-8	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
		EG020: Lead	7439-92-1	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
		EG020: Mercury	7439-97-6	0.1 mg/kg	79.9	84.4	75	125	5.5	25
		EG020: Nickel	7440-02-0	5 mg/kg	85.5	85.5	75	125	0.0	25
		EG020: Silver	7440-22-4	5 mg/kg	86.1	89.9	75	125	4.3	25
		EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
EP: Aggregate Organics (QC Lot: 1562495)										
HK1026849-003	L102BH 15.3-15.5M (F)	**EP005: Total Organic Carbon**	----	40 %	91.8	----	75	125	----	----
EP-065: PCB Single Congeners (QC Lot: 1559835)										
HK1026849-002	L102BH 14.3-15.3M (E&F)	**PCB 8**	34883-43-7	5 µg/kg	122	----	50	130	----	----
		PCB 18	37680-65-2	5 µg/kg	60.0	----	50	130	----	----
		PCB 28	7012-37-5	5 µg/kg	56.1	----	50	130	----	----
		PCB 44	41464-39-5	5 µg/kg	55.6	----	50	130	----	----
		PCB 52	35693-99-3	5 µg/kg	59.2	----	50	130	----	----
		PCB 66	32598-10-0	5 µg/kg	55.9	----	50	130	----	----
		PCB 77	32598-13-3	5 µg/kg	60.4	----	50	130	----	----
		PCB 101	37680-73-2	5 µg/kg	55.9	----	50	130	----	----
		PCB 105	32598-14-4	5 µg/kg	61.2	----	50	130	----	----
		PCB 118	31508-00-6	5 µg/kg	93.2	----	50	130	----	----
		PCB 126	57465-28-8	5 µg/kg	62.8	----	50	130	----	----
		PCB 128	38380-07-3	5 µg/kg	58.2	----	50	130	----	----
		PCB 138	35065-28-2	5 µg/kg	77.9	----	50	130	----	----
		PCB 153	35065-27-1	5 µg/kg	91.5	----	50	130	----	----
		PCB 169	32774-16-6	5 µg/kg	68.4	----	50	130	----	----
		PCB 170	35065-30-6	5 µg/kg	62.8	----	50	130	----	----
		PCB 180	35065-29-3	5 µg/kg	61.2	----	50	130	----	----
		PCB 187	52663-68-0	5 µg/kg	74.6	----	50	130	----	----
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1559836)										
HK1026849-002	L102BH 14.3-15.3M (E&F)	**EP076HK: Naphthalene**	91-20-3	250 µg/kg	76.3	----	50	130	----	----
		EP076HK: Acenaphthylene	208-96-8	250 µg/kg	68.7	----	50	130	----	----
		EP076HK: Acenaphthene	83-32-9	250 µg/kg	74.1	----	50	130	----	----
		EP076HK: Fluorene	86-73-7	250 µg/kg	71.5	----	50	130	----	----

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%): MS	Spike Recovery (%): MSD	Recovery Limits (%): Low	Recovery Limits (%): High	RPD (%): Value	RPD (%): Control Limit
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1559836) - Continued										
HK1026849-002	L102BH 14.3-15.3M (E&F)	**EP076HK: Phenanthrene**	85-01-8	250 µg/kg	71.4	----	50	130	----	----
		EP076HK: Anthracene	120-12-7	250 µg/kg	69.0	----	50	130	----	----
		EP076HK: Fluoranthene	206-44-0	250 µg/kg	72.0	----	50	130	----	----
		EP076HK: Pyrene	129-00-0	250 µg/kg	70.8	----	50	130	----	----
		EP076HK: Benz(a)anthracene	56-55-3	250 µg/kg	71.3	----	50	130	----	----
		EP076HK: Chrysene	218-01-9	250 µg/kg	75.7	----	50	130	----	----
		EP076HK: Benzo(b)fluoranthene	205-99-2	250 µg/kg	72.6	----	50	130	----	----
		EP076HK: Benzo(k)fluoranthene	207-08-9	250 µg/kg	74.6	----	50	130	----	----
		EP076HK: Benzo(a)pyrene	50-32-8	250 µg/kg	69.8	----	50	130	----	----
		EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	250 µg/kg	70.9	----	50	130	----	----
		EP076HK: Dibenz(a.h)anthracene	53-70-3	250 µg/kg	72.1	----	50	130	----	----
		EP076HK: Benzo(g.h.i)perylene	191-24-2	250 µg/kg	74.2	----	50	130	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	Recovery Limits (%): Low	Recovery Limits (%): High
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates			
2-Fluorobiphenyl	321-60-8	50	130
4-Terphenyl-d14	1718-51-0	50	130
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate			
Decachlorobiphenyl	2051-24-3	50	130

CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 9
Contact	: MR JAMES PENNY	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1026567
Address	: 47/F., HOPEWELL CENTRE, 183 QUEEN`S ROAD EAST, WAN CHAI, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: james.penny@hyderconsulting.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: +852 2911 2048	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: SITE INVESTIGATION FOR TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON (STAGE 1)	Quote number	: ----	Date Samples Received	: 09-NOV-2010
Order number	: KL/2009/02			Issue Date	: 19-NOV-2010
C-O-C number	: ----			No. of samples received	: 1
Site	: ----			No. of samples analysed	: 1

Hong Kong Accreditation Service (HKAS) has accedited this laboratory (ALS Technichem (HK) Pty Ltd) under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS Directory of Accredited Laboratories. The results shown in this certificate were determined by this laboratory in accordance with its terms of accreditation.

This document has been electronically signed by those names that appear on this report and are the authorised signatories. Electronic signing has been carried out in compliance with procedures specified in the Electronic Transactions Ordinance of Hong Kong, Chapter 553, Section 6.

Signatories	*Position*	*Authorised results for*
Anh Ngoc Huynh	**Senior Chemist - Organics**	**Organics**
Chan Siu Ming, Vico	**Senior Chemist**	**Inorganics**
Wong Wing, Kenneth	**Assistant Supervisor**	**Inorganics**

General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 17-NOV-2010

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

Specific comments for Work Order: **HK1026567**

Project Name: Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1).

Sample(s) were received in a chilled condition.

Sediment sample(s) analysed on an as received basis. Result(s) reported on a dry weight basis.

Sediment sample(s) as received, digested by In-house method EG-3051A based on USEPA method 3051a, prior to the determination of metals.

"Total PCBs" results (Method: EP065) are not HOKLAS accredited. The values are calculated from summation of the 18 PCB congeners, based on Limit of Detection (LOD) of 1 ug/kg.

Sediment Grain Size and Moisture content were subcontracted and tested by MaterialLab Limited.

Tributyl tin in interstitial water was subcontracted and tested by Hong Kong Productivity Council.

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: R1-A				
				Client sampling date / time: 09-NOV-2010 11:29				
				HK1026567-001				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	**8**				
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2				
EG020: Chromium	7440-47-3	1	mg/kg	**37**				
EG020: Copper	7440-50-8	1	mg/kg	**16**				
EG020: Lead	7439-92-1	1	mg/kg	**35**				
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05				
EG020: Nickel	7440-02-0	1	mg/kg	**25**				
EG020: Silver	7440-22-4	0.1	mg/kg	**0.1**				
EG020: Zinc	7440-66-6	1	mg/kg	**92**				
EP: Aggregate Organics								
EP005: Total Organic Carbon	----	0.05	%	**1.03**				
EP-065: PCB Single Congeners								
PCB 8	34883-43-7	3	µg/kg	<3				
PCB 18	37680-65-2	3	µg/kg	<3				
PCB 28	7012-37-5	3	µg/kg	<3				
PCB 44	41464-39-5	3	µg/kg	<3				
PCB 52	35693-99-3	3	µg/kg	<3				
PCB 66	32598-10-0	3	µg/kg	<3				
PCB 77	32598-13-3	3	µg/kg	<3				
PCB 101	37680-73-2	3	µg/kg	<3				
PCB 105	32598-14-4	3	µg/kg	<3				
PCB 118	31508-00-6	3	µg/kg	<3				
PCB 126	57465-28-8	3	µg/kg	<3				
PCB 128	38380-07-3	3	µg/kg	<3				
PCB 138	35065-28-2	3	µg/kg	<3				
PCB 153	35065-27-1	3	µg/kg	<3				
PCB 169	32774-16-6	3	µg/kg	<3				
PCB 170	35065-30-6	3	µg/kg	<3				
PCB 180	35065-29-3	3	µg/kg	<3				
PCB 187	52663-68-0	3	µg/kg	<3				
Total Polychlorinated biphenyls	----	18	µg/kg	<18				
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs)								
EP076HK: Naphthalene	91-20-3	50	µg/kg	<50				
EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50				
EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50				
EP076HK: Fluorene	86-73-7	50	µg/kg	<50				
EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50				
EP076HK: Anthracene	120-12-7	50	µg/kg	<50				

Sub-Matrix: SEDIMENT				Client sample ID	R1-A				
				Client sampling date / time	09-NOV-2010 11:29				
Compound	CAS Number	LOR	Unit	HK1026567-001					
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued									
EP076HK: Fluoranthene	206-44-0	150	µg/kg	<150					
EP076HK: Pyrene	129-00-0	150	µg/kg	<150					
EP076HK: Benz(a)anthracene	56-55-3	150	µg/kg	<150					
EP076HK: Chrysene	218-01-9	150	µg/kg	<150					
EP076HK: Benzo(b)fluoranthene	205-99-2	150	µg/kg	<150					
EP076HK: Benzo(k)fluoranthene	207-08-9	150	µg/kg	<150					
EP076HK: Benzo(a)pyrene	50-32-8	150	µg/kg	<150					
EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	150	µg/kg	<150					
EP076HK: Dibenz(a.h)anthracene	53-70-3	150	µg/kg	<150					
EP076HK: Benzo(g.h.i)perylene	191-24-2	150	µg/kg	<150					
EP076HK: Low M.W. PAHs	----	550	µg/kg	<550					
EP076HK: High M.W. PAHs	----	1700	µg/kg	<1700					
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates								Surrogate control limits listed at end of this report.	
2-Fluorobiphenyl	321-60-8	0.1	%	**98.3**					
4-Terphenyl-d14	1718-51-0	0.1	%	**89.9**					
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate								Surrogate control limits listed at end of this report.	
Decachlorobiphenyl	2051-24-3	0.1	%	**90.4**					

Laboratory Duplicate (DUP) Report

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
EG: Metals and Major Cations (QC Lot: 1558533)								
HK1026631-001	Anonymous	**EG020: Mercury**	7439-97-6	0.05	mg/kg	0.28	0.32	15.2
		EG020: Silver	7440-22-4	0.1	mg/kg	2.4	2.5	5.2
		EG020: Cadmium	7440-43-9	0.2	mg/kg	0.4	0.4	0.0
		EG020: Arsenic	7440-38-2	1	mg/kg	8	10	18.2
		EG020: Chromium	7440-47-3	1	mg/kg	55	60	9.0
		EG020: Copper	7440-50-8	1	mg/kg	140	156	10.8
		EG020: Lead	7439-92-1	1	mg/kg	46	50	8.0
		EG020: Nickel	7440-02-0	1	mg/kg	22	23	0.0
		EG020: Zinc	7440-66-6	1	mg/kg	156	169	8.2
EP: Aggregate Organics (QC Lot: 1557509)								
HK1026133-001	Anonymous	**EP005: Total Organic Carbon**	----	0.05	%	0.90	1.00	10.4
EP-065: PCB Single Congeners (QC Lot: 1559846)								
HK1026631-001	Anonymous	**Total Polychlorinated biphenyls**	----	18	µg/kg	<18	<18	0.0
		PCB 8	34883-43-7	3	µg/kg	<3	<3	0.0
		PCB 18	37680-65-2	3	µg/kg	<3	<3	0.0
		PCB 28	7012-37-5	3	µg/kg	<3	<3	0.0
		PCB 44	41464-39-5	3	µg/kg	<3	<3	0.0
		PCB 52	35693-99-3	3	µg/kg	<3	<3	0.0
		PCB 66	32598-10-0	3	µg/kg	<3	<3	0.0
		PCB 77	32598-13-3	3	µg/kg	<3	<3	0.0
		PCB 101	37680-73-2	3	µg/kg	<3	<3	0.0
		PCB 105	32598-14-4	3	µg/kg	<3	<3	0.0
		PCB 118	31508-00-6	3	µg/kg	<3	<3	0.0
		PCB 126	57465-28-8	3	µg/kg	<3	<3	0.0
		PCB 128	38380-07-3	3	µg/kg	<3	<3	0.0
		PCB 138	35065-28-2	3	µg/kg	<3	<3	0.0
		PCB 153	35065-27-1	3	µg/kg	<3	<3	0.0
		PCB 169	32774-16-6	3	µg/kg	<3	<3	0.0
		PCB 170	35065-30-6	3	µg/kg	<3	<3	0.0
		PCB 180	35065-29-3	3	µg/kg	<3	<3	0.0
		PCB 187	52663-68-0	3	µg/kg	<3	<3	0.0
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1559848)								
HK1026631-001	Anonymous	**EP076HK: Fluoranthene**	206-44-0	150	µg/kg	<150	<150	0.0
		EP076HK: Pyrene	129-00-0	150	µg/kg	<150	<150	0.0
		EP076HK: Benz(a)anthracene	56-55-3	150	µg/kg	<150	<150	0.0
		EP076HK: Chrysene	218-01-9	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(b)fluoranthene	205-99-2	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(k)fluoranthene	207-08-9	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(a)pyrene	50-32-8	150	µg/kg	<150	<150	0.0

Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1559848) - Continued								
HK1026631-001	Anonymous	**EP076HK: Indeno(1.2.3.cd)pyrene**	193-39-5	150	µg/kg	<150	<150	0.0
		EP076HK: Dibenz(a.h)anthracene	53-70-3	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(g.h.i)perylene	191-24-2	150	µg/kg	<150	<150	0.0
		EP076HK: High M.W. PAHs	----	1700	µg/kg	<1700	<1700	0.0
		EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	<50	0.0
		EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	<50	0.0
		EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50	<50	0.0
		EP076HK: Fluorene	86-73-7	50	µg/kg	<50	<50	0.0
		EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50	<50	0.0
		EP076HK: Anthracene	120-12-7	50	µg/kg	<50	<50	0.0
		EP076HK: Low M.W. PAHs	----	550	µg/kg	<550	<550	0.0

Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL

Method: Compound	CAS Number	Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
					Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
		LOR	Unit	Result		LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1558533)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.1	----	85	115	----	----
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	89.9	----	85	115	----	----
EG020: Chromium	7440-47-3	1	mg/kg	<1	5 mg/kg	98.8	----	85	115	----	----
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	96.3	----	85	115	----	----
EG020: Lead	7439-92-1	1	mg/kg	<1	5 mg/kg	87.7	----	85	115	----	----
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	96.0	----	85	115	----	----
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	95.0	----	85	115	----	----
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	91.5	----	85	115	----	----
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	95.8	----	85	115	----	----
EP: Aggregate Organics (QC Lot: 1557509)											
EP005: Total Organic Carbon	----	0.05	%	<0.05	40 %	114	----	85	115	----	----
EP-065: PCB Single Congeners (QC Lot: 1559846)											
PCB 8	34883-43-7	3	µg/kg	<3	5 µg/kg	59.1	----	47	131	----	----
PCB 18	37680-65-2	3	µg/kg	<3	5 µg/kg	60.3	----	38	147	----	----
PCB 28	7012-37-5	3	µg/kg	<3	5 µg/kg	69.3	----	36	134	----	----
PCB 44	41464-39-5	3	µg/kg	<3	5 µg/kg	62.0	----	24	149	----	----
PCB 52	35693-99-3	3	µg/kg	<3	5 µg/kg	63.3	----	28	149	----	----
PCB 66	32598-10-0	3	µg/kg	<3	5 µg/kg	61.3	----	31	135	----	----
PCB 77	32598-13-3	3	µg/kg	<3	5 µg/kg	64.1	----	38	123	----	----
PCB 101	37680-73-2	3	µg/kg	<3	5 µg/kg	60.7	----	44	121	----	----
PCB 105	32598-14-4	3	µg/kg	<3	5 µg/kg	63.7	----	41	123	----	----
PCB 118	31508-00-6	3	µg/kg	<3	5 µg/kg	63.1	----	45	119	----	----
PCB 126	57465-28-8	3	µg/kg	<3	5 µg/kg	75.9	----	40	119	----	----
PCB 128	38380-07-3	3	µg/kg	<3	5 µg/kg	65.6	----	46	120	----	----

Matrix: SOIL

Method: Compound	CAS Number	Method Blank (MB) Report LOR	Unit	Result	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report: Spike Concentration	Spike Recovery (%) LCS	DCS	Recovery Limits (%) Low	High	RPD (%) Value	Control Limit
EP-065: PCB Single Congeners (QC Lot: 1559846) - Continued											
PCB 138	35065-28-2	3	µg/kg	<3	5 µg/kg	65.0	----	45	117	----	----
PCB 153	35065-27-1	3	µg/kg	<3	5 µg/kg	63.8	----	43	121	----	----
PCB 169	32774-16-6	3	µg/kg	<3	5 µg/kg	73.2	----	43	127	----	----
PCB 170	35065-30-6	3	µg/kg	<3	5 µg/kg	69.1	----	43	124	----	----
PCB 180	35065-29-3	3	µg/kg	<3	5 µg/kg	67.6	----	42	124	----	----
PCB 187	52663-68-0	3	µg/kg	<3	5 µg/kg	63.8	----	43	124	----	----
Total Polychlorinated biphenyls	----	18	µg/kg	<18	----	----	----	----	----	----	----
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1559848)											
EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	250 µg/kg	57.4	----	57	119	----	----
EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	250 µg/kg	79.8	----	60	113	----	----
EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50	250 µg/kg	66.7	----	64	113	----	----
EP076HK: Fluorene	86-73-7	50	µg/kg	<50	250 µg/kg	63.7	----	61	118	----	----
EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50	250 µg/kg	70.3	----	57	123	----	----
EP076HK: Anthracene	120-12-7	50	µg/kg	<50	250 µg/kg	70.3	----	65	109	----	----
EP076HK: Fluoranthene	206-44-0	50	µg/kg	<50	250 µg/kg	70.2	----	58	124	----	----
EP076HK: Pyrene	129-00-0	50	µg/kg	<50	250 µg/kg	69.8	----	59	127	----	----
EP076HK: Benz(a)anthracene	56-55-3	50	µg/kg	<50	250 µg/kg	62.4	----	56	116	----	----
EP076HK: Chrysene	218-01-9	50	µg/kg	<50	250 µg/kg	79.6	----	72	118	----	----
EP076HK: Benzo(b)fluoranthene	205-99-2	50	µg/kg	<50	250 µg/kg	64.1	----	50	116	----	----
EP076HK: Benzo(k)fluoranthene	207-08-9	50	µg/kg	<50	250 µg/kg	69.9	----	67	121	----	----
EP076HK: Benzo(a)pyrene	50-32-8	50	µg/kg	<50	250 µg/kg	58.0	----	55	133	----	----
EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	50	µg/kg	<50	250 µg/kg	66.2	----	56	108	----	----
EP076HK: Dibenz(a.h)anthracene	53-70-3	50	µg/kg	<50	250 µg/kg	72.6	----	45	117	----	----
EP076HK: Benzo(g.h.i)perylene	191-24-2	50	µg/kg	<50	250 µg/kg	69.6	----	53	118	----	----
EP076HK: Low M.W. PAHs	----	550	µg/kg	<550	----	----	----	----	----	----	----
EP076HK: High M.W. PAHs	----	1700	µg/kg	<1700	----	----	----	----	----	----	----

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%) MS	MSD	Recovery Limits (%) Low	High	RPD (%) Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1558533)										
HK1026567-001	R1-A	EG020: Arsenic	7440-38-2	5 mg/kg	92.9	97.2	75	125	4.5	25
		EG020: Cadmium	7440-43-9	5 mg/kg	90.4	92.8	75	125	2.6	25
		EG020: Chromium	7440-47-3	5 mg/kg	96.3	97.8	75	125	1.6	25
		EG020: Copper	7440-50-8	5 mg/kg	97.6	94.0	75	125	3.8	25
		EG020: Lead	7439-92-1	5 mg/kg	98.6	100	75	125	1.4	25
		EG020: Mercury	7439-97-6	0.1 mg/kg	100	95.0	75	125	5.6	25

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%): MS	Spike Recovery (%): MSD	Recovery Limits (%): Low	Recovery Limits (%): High	RPD (%): Value	RPD (%): Control Limit
EG: Metals and Major Cations (QC Lot: 1558533) - Continued										
HK1026567-001	R1-A	**EG020: Nickel**	7440-02-0	5 mg/kg	112	110	75	125	1.6	25
		EG020: Silver	7440-22-4	5 mg/kg	93.4	96.8	75	125	3.6	25
		EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
EP: Aggregate Organics (QC Lot: 1557509)										
HK1026133-002	Anonymous	**EP005: Total Organic Carbon**	----	40 %	106	----	75	125	----	----
EP-065: PCB Single Congeners (QC Lot: 1559846)										
HK1026631-003	Anonymous	**PCB 8**	34883-43-7	5 µg/kg	81.4	----	50	130	----	----
		PCB 18	37680-65-2	5 µg/kg	95.3	----	50	130	----	----
		PCB 28	7012-37-5	5 µg/kg	97.8	----	50	130	----	----
		PCB 44	41464-39-5	5 µg/kg	93.4	----	50	130	----	----
		PCB 52	35693-99-3	5 µg/kg	122	----	50	130	----	----
		PCB 66	32598-10-0	5 µg/kg	108	----	50	130	----	----
		PCB 77	32598-13-3	5 µg/kg	112	----	50	130	----	----
		PCB 101	37680-73-2	5 µg/kg	89.8	----	50	130	----	----
		PCB 105	32598-14-4	5 µg/kg	104	----	50	130	----	----
		PCB 118	31508-00-6	5 µg/kg	111	----	50	130	----	----
		PCB 126	57465-28-8	5 µg/kg	113	----	50	130	----	----
		PCB 128	38380-07-3	5 µg/kg	126	----	50	130	----	----
		PCB 138	35065-28-2	5 µg/kg	109	----	50	130	----	----
		PCB 153	35065-27-1	5 µg/kg	98.6	----	50	130	----	----
		PCB 169	32774-16-6	5 µg/kg	102	----	50	130	----	----
		PCB 170	35065-30-6	5 µg/kg	130	----	50	130	----	----
		PCB 180	35065-29-3	5 µg/kg	117	----	50	130	----	----
		PCB 187	52663-68-0	5 µg/kg	128	----	50	130	----	----
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1559848)										
HK1026631-003	Anonymous	**EP076HK: Naphthalene**	91-20-3	250 µg/kg	67.2	----	50	130	----	----
		EP076HK: Acenaphthylene	208-96-8	250 µg/kg	67.6	----	50	130	----	----
		EP076HK: Acenaphthene	83-32-9	250 µg/kg	60.7	----	50	130	----	----
		EP076HK: Fluorene	86-73-7	250 µg/kg	68.6	----	50	130	----	----
		EP076HK: Phenanthrene	85-01-8	250 µg/kg	69.2	----	50	130	----	----
		EP076HK: Anthracene	120-12-7	250 µg/kg	69.0	----	50	130	----	----
		EP076HK: Fluoranthene	206-44-0	250 µg/kg	85.5	----	50	130	----	----
		EP076HK: Pyrene	129-00-0	250 µg/kg	84.4	----	50	130	----	----
		EP076HK: Benz(a)anthracene	56-55-3	250 µg/kg	72.9	----	50	130	----	----
		EP076HK: Chrysene	218-01-9	250 µg/kg	74.1	----	50	130	----	----
		EP076HK: Benzo(b)fluoranthene	205-99-2	250 µg/kg	63.9	----	50	130	----	----
		EP076HK: Benzo(k)fluoranthene	207-08-9	250 µg/kg	70.5	----	50	130	----	----
		EP076HK: Benzo(a)pyrene	50-32-8	250 µg/kg	68.3	----	50	130	----	----

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%): MS	Spike Recovery (%): MSD	Recovery Limits (%): Low	Recovery Limits (%): High	RPD (%): Value	RPD (%): Control Limit
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1559848) - Continued										
HK1026631-003	Anonymous	**EP076HK: Indeno(1.2.3.cd)pyrene**	193-39-5	250 µg/kg	67.6	----	50	130	----	----
		EP076HK: Dibenz(a.h)anthracene	53-70-3	250 µg/kg	69.7	----	50	130	----	----
		EP076HK: Benzo(g.h.i)perylene	191-24-2	250 µg/kg	70.9	----	50	130	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	Recovery Limits (%): Low	Recovery Limits (%): High
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates			
2-Fluorobiphenyl	321-60-8	50	130
4-Terphenyl-d14	1718-51-0	50	130
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate			
Decachlorobiphenyl	2051-24-3	50	130

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

HOKLAS 066

CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 9
Contact	: MR JAMES PENNY	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1027307
Address	: 47/F., HOPEWELL CENTRE, 183 QUEEN`S ROAD EAST, WAN CHAI, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: james.penny@hyderconsulting.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: +852 2911 2048	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: SITE INVESTIGATION FOR TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON (STAGE 1)	Quote number	: ----	Date Samples Received	: 10-NOV-2010
Order number	: KL/2009/02			Issue Date	: 26-NOV-2010
C-O-C number	: ----			No. of samples received	: 2
Site	: L110BH			No. of samples analysed	: 2

Hong Kong Accreditation Service (HKAS) has accedited this laboratory (ALS Technichem (HK) Pty Ltd) under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS Directory of Accredited Laboratories. The results shown in this certificate were determined by this laboratory in accordance with its terms of accreditation.

This document has been electronically signed by those names that appear on this report and are the authorised signatories. Electronic signing has been carried out in compliance with procedures specified in the Electronic Transactions Ordinance of Hong Kong, Chapter 553, Section 6.

Signatories	*Position*	*Authorised results for*
Anh Ngoc Huynh	**Senior Chemist - Organics**	**Organics**
Chan Siu Ming, Vico	**Senior Chemist**	**Inorganics**
Wong Wing, Kenneth	**Assistant Supervisor**	**Inorganics**

General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 26-NOV-2010

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

Specific comments for Work Order: **HK1027307**

Project Name: Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1).

Sample(s) were received in a chilled condition.

Sediment sample(s) analysed on an as received basis. Result(s) reported on a dry weight basis.

Sediment sample(s) as received, digested by In-house method EG-3051A based on USEPA method 3051a, prior to the determination of metals.

Analysis of Tributyltin in interstitial water was cancelled due to insufficient volume of interstitial water.

"Total PCBs" results (Method: EP065) are not HOKLAS accredited. The values are calculated from summation of the 18 PCB congeners, based on Limit of Detection (LOD) of 1 ug/kg.

Sediment Grain Size and Moisture content were subcontracted and tested by MaterialLab Limited.

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: L110BH 12.0-12.9M (A&B)	L110BH 12.9-13.9M (A&B)			
				Client sampling date / time: 10-NOV-2010 13:45	10-NOV-2010 14:30			
				HK1027307-001	HK1027307-002			
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	**5**	**5**			
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	<0.2			
EG020: Chromium	7440-47-3	1	mg/kg	**21**	**20**			
EG020: Copper	7440-50-8	1	mg/kg	**7**	**12**			
EG020: Lead	7439-92-1	1	mg/kg	**15**	**19**			
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	<0.05			
EG020: Nickel	7440-02-0	1	mg/kg	**14**	**14**			
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1			
EG020: Zinc	7440-66-6	1	mg/kg	**70**	**83**			
EP: Aggregate Organics								
EP005: Total Organic Carbon	----	0.05	%	**0.32**	**0.34**			
EP-065: PCB Single Congeners								
PCB 8	34883-43-7	3	µg/kg	<3	<3			
PCB 18	37680-65-2	3	µg/kg	<3	<3			
PCB 28	7012-37-5	3	µg/kg	<3	<3			
PCB 44	41464-39-5	3	µg/kg	<3	<3			
PCB 52	35693-99-3	3	µg/kg	<3	<3			
PCB 66	32598-10-0	3	µg/kg	<3	<3			
PCB 77	32598-13-3	3	µg/kg	<3	<3			
PCB 101	37680-73-2	3	µg/kg	<3	<3			
PCB 105	32598-14-4	3	µg/kg	<3	<3			
PCB 118	31508-00-6	3	µg/kg	<3	<3			
PCB 126	57465-28-8	3	µg/kg	<3	<3			
PCB 128	38380-07-3	3	µg/kg	<3	<3			
PCB 138	35065-28-2	3	µg/kg	<3	<3			
PCB 153	35065-27-1	3	µg/kg	<3	<3			
PCB 169	32774-16-6	3	µg/kg	<3	<3			
PCB 170	35065-30-6	3	µg/kg	<3	<3			
PCB 180	35065-29-3	3	µg/kg	<3	<3			
PCB 187	52663-68-0	3	µg/kg	<3	<3			
Total Polychlorinated biphenyls	----	18	µg/kg	<18	<18			
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs)								
EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	<50			
EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	<50			
EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50	<50			
EP076HK: Fluorene	86-73-7	50	µg/kg	<50	<50			
EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50	<50			

Sub-Matrix: SEDIMENT				Client sample ID	L110BH 12.0-12.9M (A&B)	L110BH 12.9-13.9M (A&B)			
				Client sampling date / time	10-NOV-2010 13:45	10-NOV-2010 14:30			
Compound	CAS Number	LOR	Unit		HK1027307-001	HK1027307-002			
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued									
EP076HK: Anthracene	120-12-7	50	µg/kg		<50	<50			
EP076HK: Fluoranthene	206-44-0	150	µg/kg		<150	<150			
EP076HK: Pyrene	129-00-0	150	µg/kg		<150	<150			
EP076HK: Benz(a)anthracene	56-55-3	150	µg/kg		<150	<150			
EP076HK: Chrysene	218-01-9	150	µg/kg		<150	<150			
EP076HK: Benzo(b)fluoranthene	205-99-2	150	µg/kg		<150	<150			
EP076HK: Benzo(k)fluoranthene	207-08-9	150	µg/kg		<150	<150			
EP076HK: Benzo(a)pyrene	50-32-8	150	µg/kg		<150	<150			
EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	150	µg/kg		<150	<150			
EP076HK: Dibenz(a.h)anthracene	53-70-3	150	µg/kg		<150	<150			
EP076HK: Benzo(g.h.i)perylene	191-24-2	150	µg/kg		<150	<150			
EP076HK: Low M.W. PAHs	----	550	µg/kg		<550	<550			
EP076HK: High M.W. PAHs	----	1700	µg/kg		<1700	<1700			
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates									Surrogate control limits listed at end of this report.
2-Fluorobiphenyl	321-60-8	0.1	%		**65.4**	**77.2**			
4-Terphenyl-d14	1718-51-0	0.1	%		**66.3**	**79.1**			
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate									Surrogate control limits listed at end of this report.
Decachlorobiphenyl	2051-24-3	0.1	%		**71.8**	**78.9**			

Laboratory Duplicate (DUP) Report

Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
EG: Metals and Major Cations (QC Lot: 1569807)								
HK1027287-003	Anonymous	**EG020: Mercury**	7439-97-6	0.05	mg/kg	1.19	1.28	7.3
		EG020: Silver	7440-22-4	0.1	mg/kg	3.9	4.0	4.0
		EG020: Cadmium	7440-43-9	0.2	mg/kg	1.1	1.2	0.0
		EG020: Arsenic	7440-38-2	1	mg/kg	8	8	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	175	182	4.0
		EG020: Copper	7440-50-8	1	mg/kg	270	281	3.8
		EG020: Lead	7439-92-1	1	mg/kg	79	77	3.4
		EG020: Nickel	7440-02-0	1	mg/kg	40	41	2.7
		EG020: Zinc	7440-66-6	1	mg/kg	320	329	2.8
EP: Aggregate Organics (QC Lot: 1570066)								
HK1027307-001	L110BH 12.0-12.9M (A&B)	**EP005: Total Organic Carbon**	----	0.05	%	0.32	0.34	4.6
HK1027307-002	L110BH 12.9-13.9M (A&B)	**EP005: Total Organic Carbon**	----	0.05	%	0.34	0.36	4.7
EP-065: PCB Single Congeners (QC Lot: 1567806)								
HK1026899-001	Anonymous	**Total Polychlorinated biphenyls**	----	18	µg/kg	<18	<18	0.0
		PCB 8	34883-43-7	3	µg/kg	<3	<3	0.0
		PCB 18	37680-65-2	3	µg/kg	<3	<3	0.0
		PCB 28	7012-37-5	3	µg/kg	<3	<3	0.0
		PCB 44	41464-39-5	3	µg/kg	<3	<3	0.0
		PCB 52	35693-99-3	3	µg/kg	<3	<3	0.0
		PCB 66	32598-10-0	3	µg/kg	<3	<3	0.0
		PCB 77	32598-13-3	3	µg/kg	<3	<3	0.0
		PCB 101	37680-73-2	3	µg/kg	<3	<3	0.0
		PCB 105	32598-14-4	3	µg/kg	<3	<3	0.0
		PCB 118	31508-00-6	3	µg/kg	<3	<3	0.0
		PCB 126	57465-28-8	3	µg/kg	<3	<3	0.0
		PCB 128	38380-07-3	3	µg/kg	<3	<3	0.0
		PCB 138	35065-28-2	3	µg/kg	4	4	0.0
		PCB 153	35065-27-1	3	µg/kg	<3	<3	0.0
		PCB 169	32774-16-6	3	µg/kg	<3	<3	0.0
		PCB 170	35065-30-6	3	µg/kg	<3	<3	0.0
		PCB 180	35065-29-3	3	µg/kg	<3	<3	0.0
		PCB 187	52663-68-0	3	µg/kg	<3	<3	0.0
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1567807)								
HK1026899-001	Anonymous	**EP076HK: Fluoranthene**	206-44-0	150	µg/kg	<150	<150	0.0
		EP076HK: Pyrene	129-00-0	150	µg/kg	<150	<150	0.0
		EP076HK: Benz(a)anthracene	56-55-3	150	µg/kg	<150	<150	0.0
		EP076HK: Chrysene	218-01-9	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(b)fluoranthene	205-99-2	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(k)fluoranthene	207-08-9	150	µg/kg	<150	<150	0.0

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1567807) - Continued								
HK1026899-001	Anonymous	**EP076HK: Benzo(a)pyrene**	50-32-8	150	µg/kg	<150	<150	0.0
		EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	150	µg/kg	<150	<150	0.0
		EP076HK: Dibenz(a.h)anthracene	53-70-3	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(g.h.i)perylene	191-24-2	150	µg/kg	<150	<150	0.0
		EP076HK: High M.W. PAHs	----	1700	µg/kg	<1700	<1700	0.0
		EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	<50	0.0
		EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	<50	0.0
		EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50	<50	0.0
		EP076HK: Fluorene	86-73-7	50	µg/kg	<50	<50	0.0
		EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50	<50	0.0
		EP076HK: Anthracene	120-12-7	50	µg/kg	<50	<50	0.0
		EP076HK: Low M.W. PAHs	----	550	µg/kg	<550	<550	0.0

Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: **SOIL**

Method: Compound	CAS Number	Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
					Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
		LOR	Unit	Result		LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1569807)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	87.8	----	85	115	----	----
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	93.0	----	85	115	----	----
EG020: Chromium	7440-47-3	1	mg/kg	<1	5 mg/kg	99.8	----	85	115	----	----
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	95.1	----	85	115	----	----
EG020: Lead	7439-92-1	1	mg/kg	<1	5 mg/kg	85.6	----	85	115	----	----
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	86.6	----	85	115	----	----
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	96.6	----	85	115	----	----
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	97.4	----	85	115	----	----
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	106	----	85	115	----	----
EP: Aggregate Organics (QC Lot: 1570066)											
EP005: Total Organic Carbon	----	0.05	%	<0.05	40 %	114	----	85	115	----	----
EP-065: PCB Single Congeners (QC Lot: 1567806)											
PCB 8	34883-43-7	3	µg/kg	<3	5 µg/kg	100	----	47	131	----	----
PCB 18	37680-65-2	3	µg/kg	<3	5 µg/kg	109	----	38	147	----	----
PCB 28	7012-37-5	3	µg/kg	<3	5 µg/kg	103	----	36	134	----	----
PCB 44	41464-39-5	3	µg/kg	<3	5 µg/kg	106	----	24	149	----	----
PCB 52	35693-99-3	3	µg/kg	<3	5 µg/kg	107	----	28	149	----	----
PCB 66	32598-10-0	3	µg/kg	<3	5 µg/kg	104	----	31	135	----	----
PCB 77	32598-13-3	3	µg/kg	<3	5 µg/kg	106	----	38	123	----	----
PCB 101	37680-73-2	3	µg/kg	<3	5 µg/kg	107	----	44	121	----	----
PCB 105	32598-14-4	3	µg/kg	<3	5 µg/kg	107	----	41	123	----	----
PCB 118	31508-00-6	3	µg/kg	<3	5 µg/kg	113	----	45	119	----	----

Matrix: SOIL

Method: Compound	CAS Number	Method Blank (MB) Report LOR	Unit	Result	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report: Spike Concentration	Spike Recovery (%) LCS	DCS	Recovery Limits (%) Low	High	RPD (%) Value	Control Limit
EP-065: PCB Single Congeners (QC Lot: 1567806) - Continued											
PCB 126	57465-28-8	3	µg/kg	<3	5 µg/kg	113	----	40	119	----	----
PCB 128	38380-07-3	3	µg/kg	<3	5 µg/kg	99.9	----	46	120	----	----
PCB 138	35065-28-2	3	µg/kg	<3	5 µg/kg	88.1	----	45	117	----	----
PCB 153	35065-27-1	3	µg/kg	<3	5 µg/kg	95.1	----	43	121	----	----
PCB 169	32774-16-6	3	µg/kg	<3	5 µg/kg	112	----	43	127	----	----
PCB 170	35065-30-6	3	µg/kg	<3	5 µg/kg	106	----	43	124	----	----
PCB 180	35065-29-3	3	µg/kg	<3	5 µg/kg	102	----	42	124	----	----
PCB 187	52663-68-0	3	µg/kg	<3	5 µg/kg	112	----	43	124	----	----
Total Polychlorinated biphenyls	----	18	µg/kg	<18	----	----	----	----	----	----	----
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1567807)											
EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	250 µg/kg	74.6	----	57	119	----	----
EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	250 µg/kg	65.2	----	60	113	----	----
EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50	250 µg/kg	70.6	----	64	113	----	----
EP076HK: Fluorene	86-73-7	50	µg/kg	<50	250 µg/kg	74.7	----	61	118	----	----
EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50	250 µg/kg	71.8	----	57	123	----	----
EP076HK: Anthracene	120-12-7	50	µg/kg	<50	250 µg/kg	76.4	----	65	109	----	----
EP076HK: Fluoranthene	206-44-0	50	µg/kg	<50	250 µg/kg	82.3	----	58	124	----	----
EP076HK: Pyrene	129-00-0	50	µg/kg	<50	250 µg/kg	81.5	----	59	127	----	----
EP076HK: Benz(a)anthracene	56-55-3	50	µg/kg	<50	250 µg/kg	80.5	----	56	116	----	----
EP076HK: Chrysene	218-01-9	50	µg/kg	<50	250 µg/kg	92.8	----	72	118	----	----
EP076HK: Benzo(b)fluoranthene	205-99-2	50	µg/kg	<50	250 µg/kg	92.9	----	50	116	----	----
EP076HK: Benzo(k)fluoranthene	207-08-9	50	µg/kg	<50	250 µg/kg	105	----	67	121	----	----
EP076HK: Benzo(a)pyrene	50-32-8	50	µg/kg	<50	250 µg/kg	87.8	----	55	133	----	----
EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	50	µg/kg	<50	250 µg/kg	91.2	----	56	108	----	----
EP076HK: Dibenz(a.h)anthracene	53-70-3	50	µg/kg	<50	250 µg/kg	105	----	45	117	----	----
EP076HK: Benzo(g.h.i)perylene	191-24-2	50	µg/kg	<50	250 µg/kg	99.1	----	53	118	----	----
EP076HK: Low M.W. PAHs	----	550	µg/kg	<550	----	----	----	----	----	----	----
EP076HK: High M.W. PAHs	----	1700	µg/kg	<1700	----	----	----	----	----	----	----

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%) MS	MSD	Recovery Limits (%) Low	High	RPD (%) Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1569807)										
HK1027287-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	89.6	97.4	75	125	8.3	25
		EG020: Cadmium	7440-43-9	5 mg/kg	89.9	95.9	75	125	6.5	25
		EG020: Chromium	7440-47-3	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%): MS	Spike Recovery (%): MSD	Recovery Limits (%): Low	Recovery Limits (%): High	RPD (%): Value	RPD (%): Control Limit
EG: Metals and Major Cations (QC Lot: 1569807) - Continued										
HK1027287-001	Anonymous	**EG020: Copper**	7440-50-8	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
		EG020: Lead	7439-92-1	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
		EG020: Mercury	7439-97-6	0.1 mg/kg	91.0	91.0	75	125	0.0	25
		EG020: Nickel	7440-02-0	5 mg/kg	89.0	88.8	75	125	0.2	25
		EG020: Silver	7440-22-4	5 mg/kg	85.2	104	75	125	20.4	25
		EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
EP: Aggregate Organics (QC Lot: 1570066)										
HK1027307-001	L110BH 12.0-12.9M (A&B)	**EP005: Total Organic Carbon**	----	40 %	87.5	----	75	125	----	----
EP-065: PCB Single Congeners (QC Lot: 1567806)										
HK1026899-003	Anonymous	**PCB 8**	34883-43-7	5 µg/kg	79.1	----	50	130	----	----
		PCB 18	37680-65-2	5 µg/kg	97.4	----	50	130	----	----
		PCB 28	7012-37-5	5 µg/kg	85.8	----	50	130	----	----
		PCB 44	41464-39-5	5 µg/kg	89.3	----	50	130	----	----
		PCB 52	35693-99-3	5 µg/kg	85.0	----	50	130	----	----
		PCB 66	32598-10-0	5 µg/kg	88.7	----	50	130	----	----
		PCB 77	32598-13-3	5 µg/kg	84.4	----	50	130	----	----
		PCB 101	37680-73-2	5 µg/kg	91.7	----	50	130	----	----
		PCB 105	32598-14-4	5 µg/kg	85.8	----	50	130	----	----
		PCB 118	31508-00-6	5 µg/kg	109	----	50	130	----	----
		PCB 126	57465-28-8	5 µg/kg	89.1	----	50	130	----	----
		PCB 128	38380-07-3	5 µg/kg	109	----	50	130	----	----
		PCB 138	35065-28-2	5 µg/kg	117	----	50	130	----	----
		PCB 153	35065-27-1	5 µg/kg	92.9	----	50	130	----	----
		PCB 169	32774-16-6	5 µg/kg	87.9	----	50	130	----	----
		PCB 170	35065-30-6	5 µg/kg	82.5	----	50	130	----	----
		PCB 180	35065-29-3	5 µg/kg	79.1	----	50	130	----	----
		PCB 187	52663-68-0	5 µg/kg	91.2	----	50	130	----	----
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1567807)										
HK1026899-003	Anonymous	**EP076HK: Naphthalene**	91-20-3	250 µg/kg	76.1	----	50	130	----	----
		EP076HK: Acenaphthylene	208-96-8	250 µg/kg	81.1	----	50	130	----	----
		EP076HK: Acenaphthene	83-32-9	250 µg/kg	73.4	----	50	130	----	----
		EP076HK: Fluorene	86-73-7	250 µg/kg	77.3	----	50	130	----	----
		EP076HK: Phenanthrene	85-01-8	250 µg/kg	73.8	----	50	130	----	----
		EP076HK: Anthracene	120-12-7	250 µg/kg	76.7	----	50	130	----	----
		EP076HK: Fluoranthene	206-44-0	250 µg/kg	83.2	----	50	130	----	----
		EP076HK: Pyrene	129-00-0	250 µg/kg	82.8	----	50	130	----	----

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%): MS	Spike Recovery (%): MSD	Recovery Limits (%): Low	Recovery Limits (%): High	RPD (%): Value	RPD (%): Control Limit
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1567807) - Continued										
HK1026899-003	Anonymous	**EP076HK: Benz(a)anthracene**	56-55-3	250 µg/kg	74.2	----	50	130	----	----
		EP076HK: Chrysene	218-01-9	250 µg/kg	78.9	----	50	130	----	----
		EP076HK: Benzo(b)fluoranthene	205-99-2	250 µg/kg	78.4	----	50	130	----	----
		EP076HK: Benzo(k)fluoranthene	207-08-9	250 µg/kg	86.3	----	50	130	----	----
		EP076HK: Benzo(a)pyrene	50-32-8	250 µg/kg	82.7	----	50	130	----	----
		EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	250 µg/kg	76.0	----	50	130	----	----
		EP076HK: Dibenz(a.h)anthracene	53-70-3	250 µg/kg	85.5	----	50	130	----	----
		EP076HK: Benzo(g.h.i)perylene	191-24-2	250 µg/kg	79.4	----	50	130	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	Recovery Limits (%): Low	Recovery Limits (%): High
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates			
2-Fluorobiphenyl	321-60-8	50	130
4-Terphenyl-d14	1718-51-0	50	130
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate			
Decachlorobiphenyl	2051-24-3	50	130

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

HOKLAS 066

CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 9
Contact	: MR JAMES PENNY	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1027989
Address	: 47/F., HOPEWELL CENTRE, 183 QUEEN`S ROAD EAST, WAN CHAI, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: james.penny@hyderconsulting.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: +852 2911 2048	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: SITE INVESTIGATION FOR TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON (STAGE 1)	Quote number	: ----	Date Samples Received	: 18-NOV-2010
Order number	: KL/2009/02			Issue Date	: 02-DEC-2010
C-O-C number	: ----			No. of samples received	: 2
Site	: L119BH			No. of samples analysed	: 2

Hong Kong Accreditation Service (HKAS) has accedited this laboratory (ALS Technichem (HK) Pty Ltd) under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS Directory of Accredited Laboratories. The results shown in this certificate were determined by this laboratory in accordance with its terms of accreditation.

This document has been electronically signed by those names that appear on this report and are the authorised signatories. Electronic signing has been carried out in compliance with procedures specified in the Electronic Transactions Ordinance of Hong Kong, Chapter 553, Section 6.

Signatories	*Position*	*Authorised results for*
Anh Ngoc Huynh	**Senior Chemist - Organics**	**Organics**
Chan Siu Ming, Vico	**Senior Chemist**	**Inorganics**
Wong Wing, Kenneth	**Assistant Supervisor**	**Inorganics**

General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 26-NOV-2010

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

Specific comments for Work Order: **HK1027989**

Project Name: Site Investigation for Trunk Road T2 and Infrastructure at South Apron (Stage 1).

Sample(s) were received in a chilled condition.

Sediment sample(s) analysed on an as received basis. Result(s) reported on a dry weight basis.

Sediment sample(s) as received, digested by In-house method EG-3051A based on USEPA method 3051a, prior to the determination of metals.

Analysis of Tributyltin in interstitial water was cancelled due to insufficient volume of interstitial water.

"Total PCBs" results (Method: EP065) are not HOKLAS accredited. The values are calculated from summation of the 18 PCB congeners, based on Limit of Detection (LOD) of 1 ug/kg.

Sediment Grain Size and Moisture content were subcontracted and tested by MaterialLab Limited.

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: L119BH 14.5-15.0M (A)	L119BH 13.5-14.4M (B)			
				Client sampling date / time: 18-NOV-2010 10:00	22-NOV-2010 14:00			
				HK1027989-001	HK1027989-002			
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	**5**	**4**			
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	<0.2			
EG020: Chromium	7440-47-3	1	mg/kg	**21**	**19**			
EG020: Copper	7440-50-8	1	mg/kg	**6**	**5**			
EG020: Lead	7439-92-1	1	mg/kg	**15**	**14**			
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	<0.05			
EG020: Nickel	7440-02-0	1	mg/kg	**12**	**12**			
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1			
EG020: Zinc	7440-66-6	1	mg/kg	**60**	**49**			
EP: Aggregate Organics								
EP005: Total Organic Carbon	----	0.05	%	**0.61**	**0.36**			
EP-065: PCB Single Congeners								
PCB 8	34883-43-7	3	µg/kg	<3	<3			
PCB 18	37680-65-2	3	µg/kg	<3	<3			
PCB 28	7012-37-5	3	µg/kg	<3	<3			
PCB 44	41464-39-5	3	µg/kg	<3	<3			
PCB 52	35693-99-3	3	µg/kg	<3	<3			
PCB 66	32598-10-0	3	µg/kg	<3	<3			
PCB 77	32598-13-3	3	µg/kg	<3	<3			
PCB 101	37680-73-2	3	µg/kg	<3	<3			
PCB 105	32598-14-4	3	µg/kg	<3	<3			
PCB 118	31508-00-6	3	µg/kg	<3	<3			
PCB 126	57465-28-8	3	µg/kg	<3	<3			
PCB 128	38380-07-3	3	µg/kg	<3	<3			
PCB 138	35065-28-2	3	µg/kg	<3	<3			
PCB 153	35065-27-1	3	µg/kg	<3	<3			
PCB 169	32774-16-6	3	µg/kg	<3	<3			
PCB 170	35065-30-6	3	µg/kg	<3	<3			
PCB 180	35065-29-3	3	µg/kg	<3	<3			
PCB 187	52663-68-0	3	µg/kg	<3	<3			
Total Polychlorinated biphenyls	----	18	µg/kg	<18	<18			
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs)								
EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	<50			
EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	<50			
EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50	<50			
EP076HK: Fluorene	86-73-7	50	µg/kg	<50	<50			
EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50	<50			

Sub-Matrix: SEDIMENT				Client sample ID	L119BH 14.5-15.0M (A)	L119BH 13.5-14.4M (B)			
				Client sampling date / time	18-NOV-2010 10:00	22-NOV-2010 14:00			
Compound	CAS Number	LOR	Unit		HK1027989-001	HK1027989-002			
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued									
EP076HK: Anthracene	120-12-7	50	µg/kg		<50	<50			
EP076HK: Fluoranthene	206-44-0	150	µg/kg		<150	<150			
EP076HK: Pyrene	129-00-0	150	µg/kg		<150	<150			
EP076HK: Benz(a)anthracene	56-55-3	150	µg/kg		<150	<150			
EP076HK: Chrysene	218-01-9	150	µg/kg		<150	<150			
EP076HK: Benzo(b)fluoranthene	205-99-2	150	µg/kg		<150	<150			
EP076HK: Benzo(k)fluoranthene	207-08-9	150	µg/kg		<150	<150			
EP076HK: Benzo(a)pyrene	50-32-8	150	µg/kg		<150	<150			
EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	150	µg/kg		<150	<150			
EP076HK: Dibenz(a.h)anthracene	53-70-3	150	µg/kg		<150	<150			
EP076HK: Benzo(g.h.i)perylene	191-24-2	150	µg/kg		<150	<150			
EP076HK: Low M.W. PAHs	----	550	µg/kg		<550	<550			
EP076HK: High M.W. PAHs	----	1700	µg/kg		<1700	<1700			
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates									Surrogate control limits listed at end of this report.
2-Fluorobiphenyl	321-60-8	0.1	%		**90.4**	**91.5**			
4-Terphenyl-d14	1718-51-0	0.1	%		**85.5**	**90.2**			
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate									Surrogate control limits listed at end of this report.
Decachlorobiphenyl	2051-24-3	0.1	%		**88.5**	**89.6**			

Laboratory Duplicate (DUP) Report

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
EG: Metals and Major Cations (QC Lot: 1578336)								
HK1027792-003	Anonymous	**EG020: Mercury**	7439-97-6	0.05	mg/kg	1.44	1.29	10.6
		EG020: Silver	7440-22-4	0.1	mg/kg	2.0	2.1	0.0
		EG020: Cadmium	7440-43-9	0.2	mg/kg	0.8	0.8	0.0
		EG020: Arsenic	7440-38-2	1	mg/kg	6	5	19.8
		EG020: Chromium	7440-47-3	1	mg/kg	102	95	6.8
		EG020: Copper	7440-50-8	1	mg/kg	104	113	7.7
		EG020: Lead	7439-92-1	1	mg/kg	93	104	11.5
		EG020: Nickel	7440-02-0	1	mg/kg	26	24	6.7
		EG020: Zinc	7440-66-6	1	mg/kg	292	281	4.0
HK1027989-001	L119BH 14.5-15.0M (A)	**EG020: Mercury**	7439-97-6	0.05	mg/kg	<0.05	<0.05	0.0
		EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.0
		EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	<0.2	0.0
		EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	21	20	7.7
		EG020: Copper	7440-50-8	1	mg/kg	6	5	0.0
		EG020: Lead	7439-92-1	1	mg/kg	15	13	12.9
		EG020: Nickel	7440-02-0	1	mg/kg	12	11	10.5
		EG020: Zinc	7440-66-6	1	mg/kg	60	74	19.8
EP: Aggregate Organics (QC Lot: 1581170)								
HK1027638-005	Anonymous	**EP005: Total Organic Carbon**	----	0.05	%	1.24	1.24	0.0
HK1027710-005	Anonymous	**EP005: Total Organic Carbon**	----	0.05	%	1.36	1.46	6.5
EP-065: PCB Single Congeners (QC Lot: 1581367)								
HK1027989-001	L119BH 14.5-15.0M (A)	**Total Polychlorinated biphenyls**	----	18	µg/kg	<18	<18	0.0
		PCB 8	34883-43-7	3	µg/kg	<3	<3	0.0
		PCB 18	37680-65-2	3	µg/kg	<3	<3	0.0
		PCB 28	7012-37-5	3	µg/kg	<3	<3	0.0
		PCB 44	41464-39-5	3	µg/kg	<3	<3	0.0
		PCB 52	35693-99-3	3	µg/kg	<3	<3	0.0
		PCB 66	32598-10-0	3	µg/kg	<3	<3	0.0
		PCB 77	32598-13-3	3	µg/kg	<3	<3	0.0
		PCB 101	37680-73-2	3	µg/kg	<3	<3	0.0
		PCB 105	32598-14-4	3	µg/kg	<3	<3	0.0
		PCB 118	31508-00-6	3	µg/kg	<3	<3	0.0
		PCB 126	57465-28-8	3	µg/kg	<3	<3	0.0
		PCB 128	38380-07-3	3	µg/kg	<3	<3	0.0
		PCB 138	35065-28-2	3	µg/kg	<3	<3	0.0
		PCB 153	35065-27-1	3	µg/kg	<3	<3	0.0
		PCB 169	32774-16-6	3	µg/kg	<3	<3	0.0
		PCB 170	35065-30-6	3	µg/kg	<3	<3	0.0

Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
EP-065: PCB Single Congeners (QC Lot: 1581367) - Continued								
HK1027989-001	L119BH 14.5-15.0M (A)	PCB 180	35065-29-3	3	µg/kg	<3	<3	0.0
		PCB 187	52663-68-0	3	µg/kg	<3	<3	0.0
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1581368)								
HK1027989-001	L119BH 14.5-15.0M (A)	EP076HK: Fluoranthene	206-44-0	150	µg/kg	<150	<150	0.0
		EP076HK: Pyrene	129-00-0	150	µg/kg	<150	<150	0.0
		EP076HK: Benz(a)anthracene	56-55-3	150	µg/kg	<150	<150	0.0
		EP076HK: Chrysene	218-01-9	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(b)fluoranthene	205-99-2	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(k)fluoranthene	207-08-9	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(a)pyrene	50-32-8	150	µg/kg	<150	<150	0.0
		EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	150	µg/kg	<150	<150	0.0
		EP076HK: Dibenz(a.h)anthracene	53-70-3	150	µg/kg	<150	<150	0.0
		EP076HK: Benzo(g.h.i)perylene	191-24-2	150	µg/kg	<150	<150	0.0
		EP076HK: High M.W. PAHs	----	1700	µg/kg	<1700	<1700	0.0
		EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	<50	0.0
		EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	<50	0.0
		EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50	<50	0.0
		EP076HK: Fluorene	86-73-7	50	µg/kg	<50	<50	0.0
		EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50	<50	0.0
		EP076HK: Anthracene	120-12-7	50	µg/kg	<50	<50	0.0
		EP076HK: Low M.W. PAHs	----	550	µg/kg	<550	<550	0.0

Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL

Method: Compound	CAS Number	Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report					
					Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
		LOR	Unit	Result		LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1578336)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	95.0	----	85	115	----	----
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	94.6	----	85	115	----	----
EG020: Chromium	7440-47-3	1	mg/kg	<1	5 mg/kg	102	----	85	115	----	----
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	96.3	----	85	115	----	----
EG020: Lead	7439-92-1	1	mg/kg	<1	5 mg/kg	90.5	----	85	115	----	----
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	104	----	85	115	----	----
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	88.4	----	85	115	----	----
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	91.2	----	85	115	----	----
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	103	----	85	115	----	----
EP: Aggregate Organics (QC Lot: 1581170)											
EP005: Total Organic Carbon	----	0.05	%	<0.05	40 %	107	----	85	115	----	----
EP-065: PCB Single Congeners (QC Lot: 1581367)											
PCB 8	34883-43-7	3	µg/kg	<3	5 µg/kg	102	----	47	131	----	----

Matrix: SOIL

Method: Compound	CAS Number	Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
					Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
		LOR	Unit	Result		LCS	DCS	Low	High	Value	Control Limit
EP-065: PCB Single Congeners (QC Lot: 1581367) - Continued											
PCB 18	37680-65-2	3	µg/kg	<3	5 µg/kg	75.9	----	38	147	----	----
PCB 28	7012-37-5	3	µg/kg	<3	5 µg/kg	54.5	----	36	134	----	----
PCB 44	41464-39-5	3	µg/kg	<3	5 µg/kg	37.9	----	24	149	----	----
PCB 52	35693-99-3	3	µg/kg	<3	5 µg/kg	43.7	----	28	149	----	----
PCB 66	32598-10-0	3	µg/kg	<3	5 µg/kg	33.4	----	31	135	----	----
PCB 77	32598-13-3	3	µg/kg	<3	5 µg/kg	79.3	----	38	123	----	----
PCB 101	37680-73-2	3	µg/kg	<3	5 µg/kg	84.3	----	44	121	----	----
PCB 105	32598-14-4	3	µg/kg	<3	5 µg/kg	81.1	----	41	123	----	----
PCB 118	31508-00-6	3	µg/kg	<3	5 µg/kg	81.0	----	45	119	----	----
PCB 126	57465-28-8	3	µg/kg	<3	5 µg/kg	56.6	----	40	119	----	----
PCB 128	38380-07-3	3	µg/kg	<3	5 µg/kg	77.0	----	46	120	----	----
PCB 138	35065-28-2	3	µg/kg	<3	5 µg/kg	81.7	----	45	117	----	----
PCB 153	35065-27-1	3	µg/kg	<3	5 µg/kg	82.9	----	43	121	----	----
PCB 169	32774-16-6	3	µg/kg	<3	5 µg/kg	84.0	----	43	127	----	----
PCB 170	35065-30-6	3	µg/kg	<3	5 µg/kg	83.4	----	43	124	----	----
PCB 180	35065-29-3	3	µg/kg	<3	5 µg/kg	84.2	----	42	124	----	----
PCB 187	52663-68-0	3	µg/kg	<3	5 µg/kg	89.2	----	43	124	----	----
Total Polychlorinated biphenyls	----	18	µg/kg	<18	----	----	----	----	----	----	----
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1581368)											
EP076HK: Naphthalene	91-20-3	50	µg/kg	<50	250 µg/kg	82.4	----	38	125	----	----
EP076HK: Acenaphthylene	208-96-8	50	µg/kg	<50	250 µg/kg	75.4	----	42	125	----	----
EP076HK: Acenaphthene	83-32-9	50	µg/kg	<50	250 µg/kg	82.4	----	45	120	----	----
EP076HK: Fluorene	86-73-7	50	µg/kg	<50	250 µg/kg	84.5	----	38	133	----	----
EP076HK: Phenanthrene	85-01-8	50	µg/kg	<50	250 µg/kg	84.8	----	41	126	----	----
EP076HK: Anthracene	120-12-7	50	µg/kg	<50	250 µg/kg	79.7	----	45	115	----	----
EP076HK: Fluoranthene	206-44-0	50	µg/kg	<50	250 µg/kg	86.2	----	41	133	----	----
EP076HK: Pyrene	129-00-0	50	µg/kg	<50	250 µg/kg	86.7	----	40	137	----	----
EP076HK: Benz(a)anthracene	56-55-3	50	µg/kg	<50	250 µg/kg	88.5	----	42	123	----	----
EP076HK: Chrysene	218-01-9	50	µg/kg	<50	250 µg/kg	91.8	----	47	130	----	----
EP076HK: Benzo(b)fluoranthene	205-99-2	50	µg/kg	<50	250 µg/kg	81.8	----	40	134	----	----
EP076HK: Benzo(k)fluoranthene	207-08-9	50	µg/kg	<50	250 µg/kg	96.8	----	51	124	----	----
EP076HK: Benzo(a)pyrene	50-32-8	50	µg/kg	<50	250 µg/kg	82.0	----	38	146	----	----
EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	50	µg/kg	<50	250 µg/kg	85.2	----	44	129	----	----
EP076HK: Dibenz(a.h)anthracene	53-70-3	50	µg/kg	<50	250 µg/kg	87.3	----	46	130	----	----
EP076HK: Benzo(g.h.i)perylene	191-24-2	50	µg/kg	<50	250 µg/kg	92.4	----	45	136	----	----
EP076HK: Low M.W. PAHs	----	550	µg/kg	<550	----	----	----	----	----	----	----
EP076HK: High M.W. PAHs	----	1700	µg/kg	<1700	----	----	----	----	----	----	----

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Matrix: SOIL

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
					MS	MSD	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1578336)										
HK1027792-001	Anonymous	**EG020: Arsenic**	7440-38-2	5 mg/kg	86.9	88.2	75	125	1.5	25
		EG020: Cadmium	7440-43-9	5 mg/kg	84.7	77.8	75	125	8.4	25
		EG020: Chromium	7440-47-3	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
		EG020: Copper	7440-50-8	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
		EG020: Lead	7439-92-1	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
		EG020: Mercury	7439-97-6	0.1 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
		EG020: Nickel	7440-02-0	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
		EG020: Silver	7440-22-4	5 mg/kg	81.0	84.7	75	125	4.5	25
		EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined	# Not Determined	75	125	# Not Determined	25
EP: Aggregate Organics (QC Lot: 1581170)										
HK1027638-004	Anonymous	**EP005: Total Organic Carbon**	----	40 %	105	----	75	125	----	----
EP-065: PCB Single Congeners (QC Lot: 1581367)										
HK1027989-001	L119BH 14.5-15.0M (A)	**PCB 8**	34883-43-7	5 µg/kg	67.7	----	50	130	----	----
		PCB 18	37680-65-2	5 µg/kg	77.6	----	50	130	----	----
		PCB 28	7012-37-5	5 µg/kg	66.4	----	50	130	----	----
		PCB 44	41464-39-5	5 µg/kg	65.5	----	50	130	----	----
		PCB 52	35693-99-3	5 µg/kg	67.9	----	50	130	----	----
		PCB 66	32598-10-0	5 µg/kg	62.3	----	50	130	----	----
		PCB 77	32598-13-3	5 µg/kg	62.5	----	50	130	----	----
		PCB 101	37680-73-2	5 µg/kg	64.1	----	50	130	----	----
		PCB 105	32598-14-4	5 µg/kg	62.8	----	50	130	----	----
		PCB 118	31508-00-6	5 µg/kg	92.5	----	50	130	----	----
		PCB 126	57465-28-8	5 µg/kg	70.5	----	50	130	----	----
		PCB 128	38380-07-3	5 µg/kg	66.6	----	50	130	----	----
		PCB 138	35065-28-2	5 µg/kg	80.5	----	50	130	----	----
		PCB 153	35065-27-1	5 µg/kg	92.4	----	50	130	----	----
		PCB 169	32774-16-6	5 µg/kg	81.3	----	50	130	----	----
		PCB 170	35065-30-6	5 µg/kg	74.5	----	50	130	----	----
		PCB 180	35065-29-3	5 µg/kg	71.6	----	50	130	----	----
		PCB 187	52663-68-0	5 µg/kg	69.7	----	50	130	----	----
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1581368)										
HK1027989-001	L119BH 14.5-15.0M (A)	**EP076HK: Naphthalene**	91-20-3	250 µg/kg	80.2	----	50	130	----	----
		EP076HK: Acenaphthylene	208-96-8	250 µg/kg	80.1	----	50	130	----	----

Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%): MS	Spike Recovery (%): MSD	Recovery Limits (%): Low	Recovery Limits (%): High	RPD (%): Value	RPD (%): Control Limit
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 1581368) - Continued										
HK1027989-001	L119BH 14.5-15.0M (A)	**EP076HK: Acenaphthene**	83-32-9	250 µg/kg	81.9	----	50	130	----	----
		EP076HK: Fluorene	86-73-7	250 µg/kg	84.5	----	50	130	----	----
		EP076HK: Phenanthrene	85-01-8	250 µg/kg	83.2	----	50	130	----	----
		EP076HK: Anthracene	120-12-7	250 µg/kg	84.9	----	50	130	----	----
		EP076HK: Fluoranthene	206-44-0	250 µg/kg	84.7	----	50	130	----	----
		EP076HK: Pyrene	129-00-0	250 µg/kg	85.2	----	50	130	----	----
		EP076HK: Benz(a)anthracene	56-55-3	250 µg/kg	83.4	----	50	130	----	----
		EP076HK: Chrysene	218-01-9	250 µg/kg	85.2	----	50	130	----	----
		EP076HK: Benzo(b)fluoranthene	205-99-2	250 µg/kg	79.5	----	50	130	----	----
		EP076HK: Benzo(k)fluoranthene	207-08-9	250 µg/kg	86.2	----	50	130	----	----
		EP076HK: Benzo(a)pyrene	50-32-8	250 µg/kg	79.5	----	50	130	----	----
		EP076HK: Indeno(1.2.3.cd)pyrene	193-39-5	250 µg/kg	69.4	----	50	130	----	----
		EP076HK: Dibenz(a.h)anthracene	53-70-3	250 µg/kg	79.5	----	50	130	----	----
		EP076HK: Benzo(g.h.i)perylene	191-24-2	250 µg/kg	84.6	----	50	130	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	Recovery Limits (%): Low	Recovery Limits (%): High
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates			
2-Fluorobiphenyl	321-60-8	50	130
4-Terphenyl-d14	1718-51-0	50	130
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate			
Decachlorobiphenyl	2051-24-3	50	130

CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT
CONTRACT NO. KL/2009/02
PROJECT: SITE INVESTIGATION FOR TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON (STAGE 1)
Sediment Quality Report
Table 6.1 Summary of Sediment Quality Reports

Analyte Description							Silver	Arsenic	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Mercury	Total Polychlorinated biphenyls	Low M.W. PAHs	High M.W. PAHs	Tributyl Tin	Classification
Unit (In dry Wt basis)							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	µg/kg	µg/kg	ug TBT/L	
Reporting Limits							0.1	1	0.2	1	1	1	1	1	0.05	18	550	1700	0.015	
Lower Chemical Exceedance Level (LCEL)							1	12	1.5	80	65	40	75	200	0.5	23	550	1700	0.15	
Upper Chemical Exceedance Level (UCEL)							***2***	***42***	***4***	***160***	***110***	***40***	***110***	***270***	***1***	***180***	***3160***	***9600***	***0.15***	
10 x (LCEL)							**10**	**120**	**15**	**800**	**650**	**400**	**750**	**2000**	**5**	**230**	**5500**	**17000**	**1.5**	
Sample Description																				
ALS Lab ID	Sample ID	Sample	Sample From (depth,m)	Sample To (depth,m)	Sampling Method	Sampling Date														
HK1026133001	L106BH 14.0-14.9M (A&B)	L106BH (A&B)	14.0	14.9	V	29/10/2010	<0.1	6	<0.2	24	6	13	18	49	<0.05	<18	<550	<1700	IS	L
HK1026133002	L106BH 14.9-15.2M (A)	L106BH (A)	14.9	15.2	V	29/10/2010	<0.1	6	<0.2	26	10	15	18	155	<0.05	<18	<550	<1700	IS	L
HK1026849001	L102BH 13.4-14.3M (E&F)	L102BH (E&F)	13.4	14.3	V	4 & 10/11/2010	<0.1	5	<0.2	21	6	14	19	100	<0.05	<18	<550	<1700	IS	L
HK1026849002	L102BH 14.3-15.3M (E&F)	L102BH (E&F)	14.3	15.3	V	4,10,11/11/2010	<0.1	6	<0.2	24	6	15	16	69	<0.05	<18	<550	<1700	IS	L
HK1026849003	L102BH 15.3-15.5M (F)	L102BH (F)	15.3	15.5	V	11/11/2010	<0.1	5	<0.2	20	6	13	15	102	<0.05	<18	<550	<1700	IS	L
HK1027307001	L110BH 12.0-12.9M (A&B)	L110BH	12.0	12.9	V	10 & 13/11/2010	<0.1	5	<0.2	21	7	14	15	70	<0.05	<18	<550	<1700	IS	L
HK1027307002	L110BH 12.9-13.9M (A&B)	L110BH	12.9	13.9	V	10 & 13/11/2010	<0.1	5	<0.2	20	12	14	19	83	<0.05	<18	<550	<1700	IS	L

Note:

Bold: Analytical results greater than Lower Chemical Exceedance Level (LCEL), but less than or equal to Upper Chemical Exceedance Level (UCEL)

***Bold Italic and Underlined*:** Analytical results greater than Upper Chemical Exceedance Level (UCEL) but less than or equal to 10x Lower Chemical Exceedance Level (10xLCEL)

Bold and Underlined: Analytical results greater than 10x Lower Chemical Exceedance Level (10xLCEL)

Total PCB: Total PCBs calculated through summation of the 18 PCB congeners, based on raw data above the limit of detection of 1ug/kg.
For detailed information on the individual congeners please refer to the certificate of analysis for the work order.

IS Denoted: Insufficient interstitial water generated for TBT analysis.

CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT
CONTRACT NO. KL/2009/02
PROJECT: SITE INVESTIGATION FOR TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON (STAGE 1)
Sediment Quality Report
Table 6.1 Summary of Sediment Quality Reports

Analyte Description						Silver	Arsenic	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Mercury	Total Polychlorinated biphenyls	Low M.W. PAHs	High M.W. PAHs	Tributyl Tin	Classification
Unit (In dry Wt basis)						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	µg/kg	µg/kg	ug TBT/L	
Reporting Limits						0.1	1	0.2	1	1	1	1	1	0.05	18	550	1700	0.015	
Lower Chemical Exceedance Level (LCEL)						1	12	1.5	80	65	40	75	200	0.5	23	550	1700	0.15	
Upper Chemical Exceedance Level (UCEL)						***2***	***42***	***4***	***160***	***110***	***40***	***110***	***270***	***1***	***180***	***3160***	***9600***	***0.15***	
10 x (LCEL)						**10**	**120**	**15**	**800**	**650**	**400**	**750**	**2000**	**5**	**230**	**5500**	**17000**	**1.5**	
Sample Description																			
ALS Lab ID	Sample ID	Sample	Sample From (depth,m)	Sample To (depth,m)	Sampling Method	Sampling Date													
HK1027989001	L119BH 14.5-15.0M (A)	L119BH (A)	14.5	15.0	V	18/11/2010	<0.1	5	<0.2	21	6	12	15	60	<0.05	<18	<550	<1700	IS	L
HK1027989002	L119BH 13.5-14.4M (B)	L119BH (B)	13.5	14.4	V	22/11/2010	<0.1	4	<0.2	19	5	12	14	49	<0.05	<18	<550	<1700	IS	L

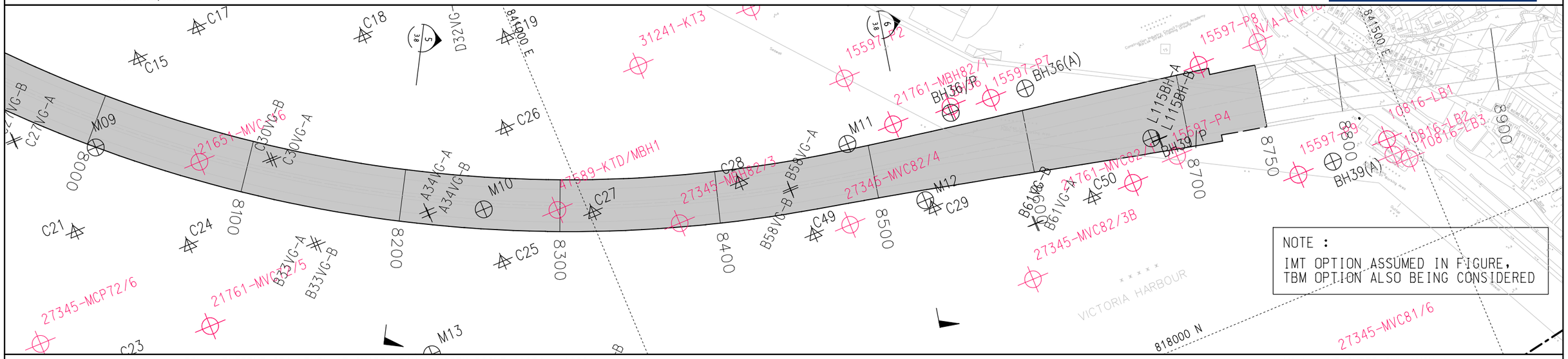
Note:
Bold: Analytical results greater than Lower Chemical Exceedance Level (LCEL), but less than or equal to Upper Chemical Exceedance Level (UCEL)
***Bold Italic and Underlined*:** Analytical results greater than Upper Chemical Exceedance Level (UCEL) but less than or equal to 10x Lower Chemical Exceedance Level (10xLCEL)
Bold and Underlined: Analytical results greater than 10x Lower Chemical Exceedance Level (10xLCEL)
Total PCB: Total PCBs calculated through summation of the 18 PCB congeners, based on raw data above the limit of detection of 1ug/kg.
For detailed information on the individual congeners please refer to the certificate of analysis for the work order.
IS Denoted: Insufficient interstitial water generated for TBT analysis.

土木工程拓展署
Civil Engineering and Development Department
九龍拓展處
Kowloon Development Office

CEDD

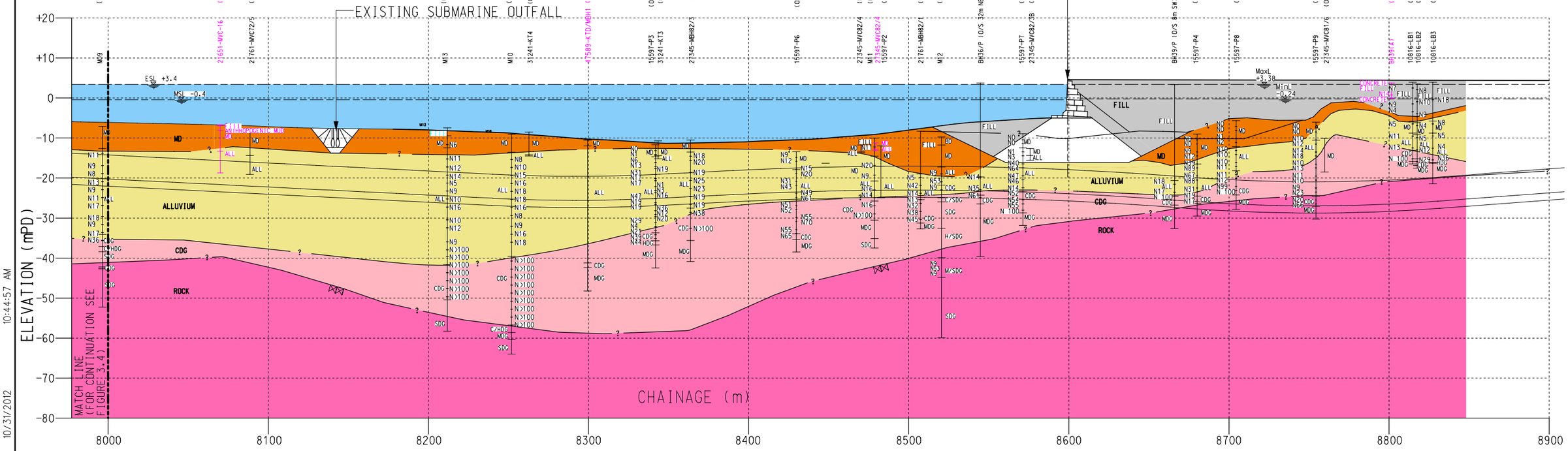
AGREEMENT NO. CE 38/2008(HY)
KAI TAK DEVELOPMENT - TRUNK ROAD T2 AND INFRASTRUCTURE AT SOUTH APRON - INVESTIGATION, DESIGN AND CONSTRUCTION

Hyder MEINHARDT
Hyder-Meinhardt JV



NOTE :
IMT OPTION ASSUMED IN FIGURE,
TBM OPTION ALSO BEING CONSIDERED

ESL : EXTREME SEA LEVEL AT QUARRY BAY / NORTH POINT (1954 - 1999)
MSL : MINIMUM SEA LEVEL AT QUARRY BAY / NORTH POINT (1954 - 1999)
MinL : MEASURED GWL (MIN.)
MaxL : MEASURED GWL (MAX.)



STRUCTURE	IMMERSED TUBE TUNNEL			CUT & COVER TUNNEL SECTION	TSEUNG KWAN O - LAM TIN TUNNEL
ZONE	V	VI			
GEOLOGICAL UNIT	ALLUVIUM	CDG	ROCK		

Rev.	Description	Date

Drawing title
VERTICAL ALIGNMENT AND GEOLOGICAL PROFILE
(SHEET 4 OF 4)

Original Size: A3
Scale: VERTICAL 1:1000, HORIZONTAL 1:2500
Date: 16AUG2012
File name: F0092_FIGURE 3_5.DGN

Drawing No.: F0092/FIGURE 3.5
Rev.: -

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CAD FILE : K:\EB000560 Trunk Road T2 and Infrastructure at South Apron\F-Reports\F0092 Site Investigation Report\Information for preparing figures\2012-07-23\F0092_FIGURE 3_5.dgn