



惠保建築有限公司
VIBRO CONSTRUCTION CO LTD
成員公司 成員 Member of NWS Holdings

CONTRACTOR SUBMISSION FORM

CSF ref.: CSF/1402

Ref. No. S5013/VC201501-K23/JL/KH

To Mr. Angus Law (ER)
WSP (Asia) Ltd.

Contract Road Improvement Works in West Kowloon
Reclamation Development

Contract No. HY/2013/17

Date 05-Sep-2017

Anticipated Date of Reply 12-Sep-2017

Subject Sediment Test Report - Phase 1 & 2

Review Status

* We certify that the submission has been checked and is in full compliance with the Specification & Contract Documents, unless otherwise stated in the remarks.

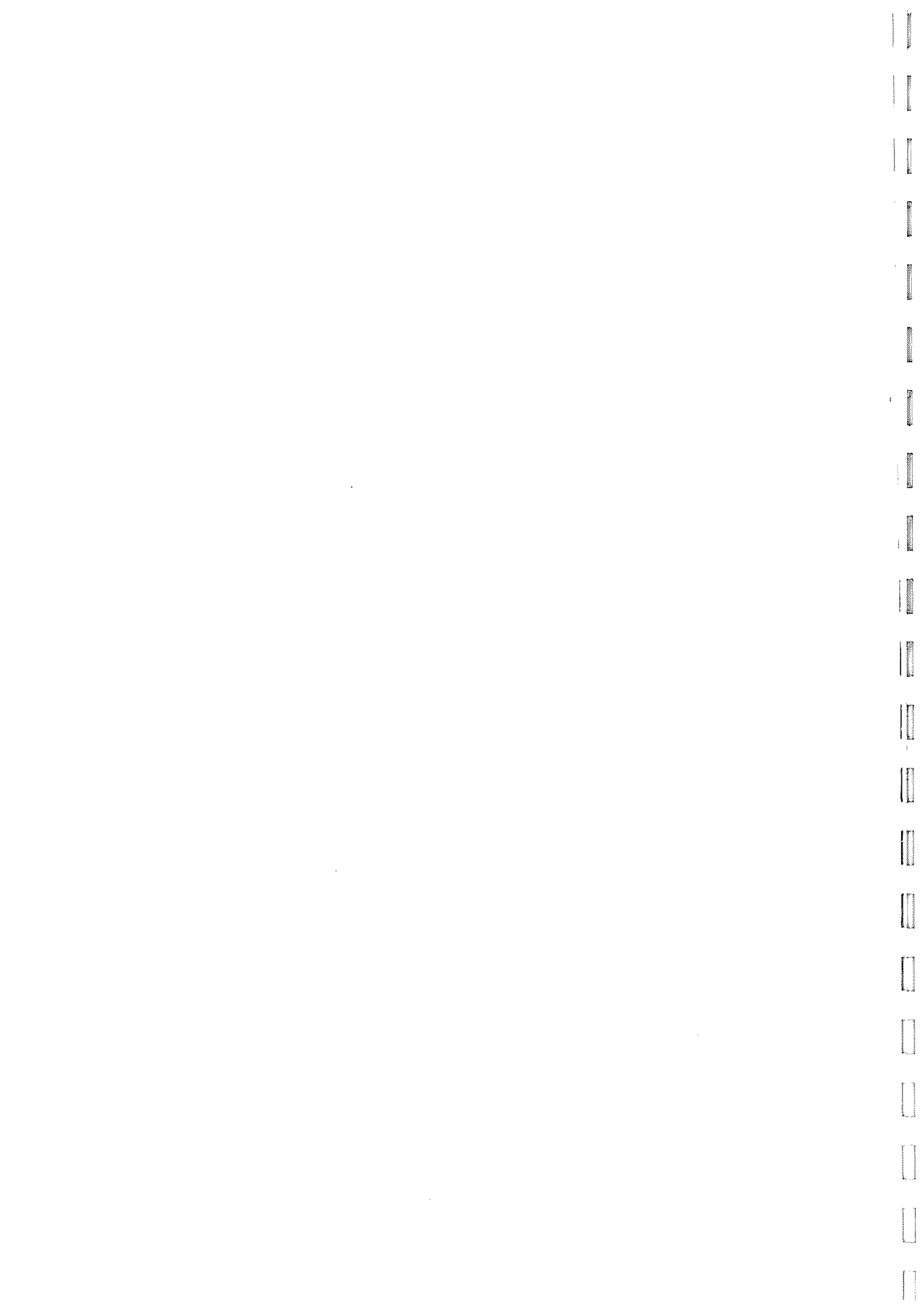
* We submit the following information / documents for your comment / approval by the date indicated above

John Leung
 Site Agent (Contractor's Representative)
 Vibro Construction Co., Ltd.

Material / Work Description

Related Dwg.	<input type="checkbox"/>	
Specification Reference	<input type="checkbox"/>	
Submission Type		
Method Statement	<input type="checkbox"/>	
Temporary Works Design	<input type="checkbox"/>	
Material	<input type="checkbox"/>	
Mill Certificate / Test Report	<input type="checkbox"/>	
Geotechnical Monitoring	<input type="checkbox"/>	
Others	<input checked="" type="checkbox"/>	Sediment Test Report & IEC Verification Letter x 6

Encl.





Highways Department
Works Division
7/F, Trade and Industry Tower
3 Concorde Road
Kowloon
Hong Kong

Your reference:

Our reference: HKHYD201/50/104510

Date: 17 August 2017

Attention: Mr Ivan S C Li

BY POST

Agreement No. HMW 1/2015 (EP)
Road Improvement Works for West Kowloon Reclamation Development
– Independent Environmental Checker
Verification of Sediment Test Report

We refer to the email on 16 August 2017 attaching Sediment Test Report for the captioned project prepared by the ET.

We have no further comment and hereby verify the Sediment Test Report in accordance with Clause 2.7 of the Environmental Permit no. EP-455/2013.

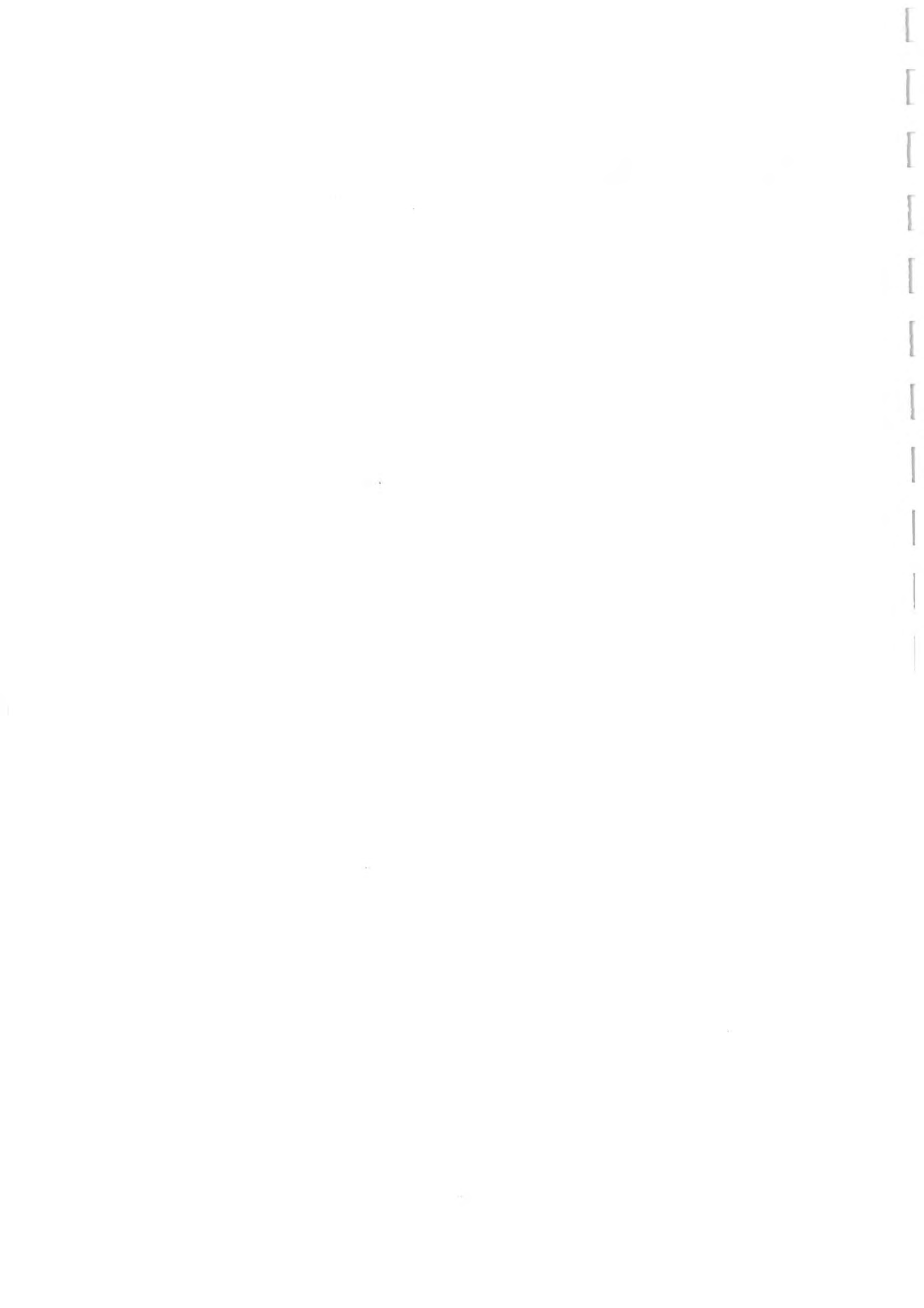
Please do not hesitate to contact the undersigned or our Mr Nic Lam on 2618 2836 should you have any queries.

Yours faithfully
ANEWR CONSULTING LIMITED

Adi Lee
Independent Environmental Checker

LYMA/LHHN/CLYA/lhnh

cc Parsons Brinckerhoff – Mr Angus Law (email: SRE@hy201317.com)
EP SL – Mr Goldie Fung (email: GoldieFung@fsenv.com.hk)



Contract No. HY/2013/17

**Road Improvement Works in
West Kowloon Reclamation Development
– Phase 1**

Sediment Test Report

APPROVAL SHEET

Prepared and Certified by: ET Leader (Environmental Pioneers & Solutions Limited)

Signature: 
Miss Goldie Fung

Date: 31/05/2017

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1. Introduction

1.1 Background

This is a road improvement project in West Kowloon Reclamation Development (WKR D) for completing the developments and the commissioning of the new transport facilities.

Apart from the additional traffic impacts arising from the major development and transport facilities in WKR D, several major junctions in the area are currently operating with insufficient capacity causing serious congestion to some existing major road corridors such as Jordan Road (JRD), Ferry Street (FST) and Canton Road (CRD).

To enhance the road network of the area, Transport Department commissioned the “West Kowloon Reclamation Development Traffic Study” which identified and recommended Core and Additional Schemes together with the improvement works at the junction of CRD/FST/JRD. Implementation of these schemes would enable most of the key road junctions in the study area to operate with spare capacity, and the traffic queue length would also be reduced avoiding blockage to the upstream junctions.

The Schemes which are under this contract (HY/2013/17) comprises:

- a) Scheme H (A) – New road connection from Hoi Po Road to West Kowloon Highway (WKH) Northbound
- b) Scheme I – New Link Road from Elevated Nga Cheung Road (NCR) to West Harbour Crossing
- c) Scheme J – New Link road from WKH Southbound to NCR
- d) Scheme Q – Interim road widening works along Canton Road
- e) Improvement Works at the Junction of Canton Road/Ferry Street/Jordan Road

The project layout plan is shown in Appendix A.

1.2 Purpose of This Report

Sediment sampling and testing in accordance with the Sediment Sampling and Testing Plan in Appendix 6.4A of the EIA Report (Register no. AEIAR-179/2013) was carried out. This report is to review the sediment quantity and category as estimated and the disposal option as recommended in S. 6.5.26 of the EIA Report (Register No. AEIAR-179/2013) with the sediment quantity and category as submitted in Sediment Quality Report (SQR).

1.3 Report Structure

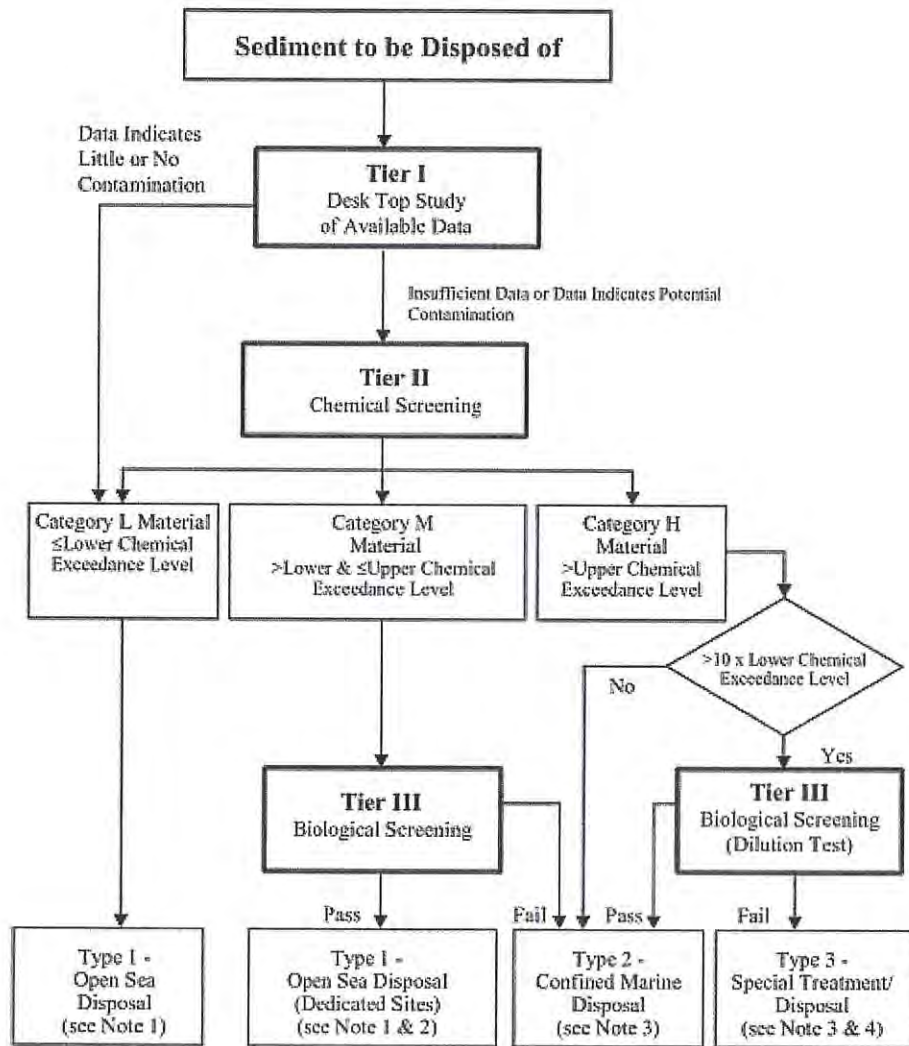
The remainder of the report is organized as follows:

- Section 2 present the estimated volume and disposal options of the sediment as recommended in EIA report
- Section 3 present the testing results of sediment in both Phase 1 and 2
- Section 4 present the volume of sediment and the allocation of marine disposal space of this project
- Section 5 present the conclusion of this review report

2. Marine Sediment at EIA Stage

Sediment sampling and testing are required to be carried out at the design stage of this project to determine the disposal procedures of the excavated marine sediment. Both the Proposal for Sediment Sampling and Testing and the Preliminary Sediment Quality Report of this project are prepared in accordance with the ETWB TC(W) No. 34/2002.

According to ETWB TC(W) No. 34/2002, the sediment is classified into 3 categories based on its contaminated levels through the Desk Top Study of available data and the Chemical Screening of sediment sample. The disposal options are determined according to the sediment category and the result of Biological Screening. The below flow chart shows the details of classification of sediment and different types of disposal option.



2.1 Excavated Marine Sediment from Piling Works

The marine sediment generated under this project is a result of the piling works for the viaducts. The scope of Scheme H (A) and Scheme I include the construction of vehicular viaducts along WKH. Foundation in form of pre-bored H-piles has to be constructed to support the viaduct structures. According to the location of viaducts, excavation of marine sediment will be carried out during the course of the piling works.

2.2 Estimated Quantity and Disposal Options

According to S.6.5.26 of the EIA Report (Register No. AEIAR-179/2013), the

estimated volume and disposal options of the sediment based on the chemical and biological screening test results are summarized as below.

Category	Biological Screening	Disposal Option	Estimated Volume (in-situ) m ³
Category L	N/A	Type 1 – Open Sea	700
Category M	Pass	Type 1 – Open Sea (Dedicated Sites)	-
	Fail	Type 2 – Confined Marine Disposal	-
Category H (not > 10 x LCEL)	N/A	Type 2 – Confined Marine Disposal	-
Category H (> 10 x LCEL)	Fail	Type 3 – Special Treatment / Disposal	300

3. Sediment Quality Report

A Sediment Sampling and Testing Plan (SSTP) was approved by the Environmental Protection Department (EPD) on 29 October 2013. 2 individual phases (Phase 1 and 2) for the sampling and testing were proposed. Chemical tests and if necessary, biological tests for the sediment samples under Phase 1 and Phase 2 were completed by July 2013 and Oct 2016 respectively. Preliminary Sediment Quality Report (PSQR) of Phase 1 and 2 were submitted to the Director of Environmental Protection (DEP) and approved on 13 November 2013 and 3 February 2017 respectively. PSQR of Phase 1 and 2 can refer to Appendix B.

3.1 Testing Result of Phase 1

Four numbers of drillholes (CB1, CB2, CB4 and CB5) were carried out at locations as shown on the as-built GI plans in Appendix C. Total 8 samples of marine sediment from CB1, CB2 and CB5 were taken for chemical tests. As no marine deposits were retrieved in CB4, no sample from CB4 was taken for the chemical tests. According to the test results, the classification of the sediment

and the corresponding disposal option are as below.

Category	Biological Screening	Disposal Option	No of Sample
Category L	N/A	Type 1 – Open Sea	7
Category M	Pass	Type 1 – Open Sea (Dedicated Sites)	-
	Fail	Type 2 – Confined Marine Disposal	-
Category H (not > 10 x LCEL)	N/A	Type 2 – Confined Marine Disposal	1
Category H (> 10 x LCEL)	Fail	Type 3 – Special Treatment / Disposal	-

One of the sample taken at CB2 was classified as Category H and all other samples were classified as Category L. No biological test is required as the results of chemical test shown all samples are classified in either Category L or Category H (not > 10 x LCEL).

3.2 Testing Result of Phase 2

Three numbers of drillholes (CB6, CB7 and CB8) were carried out at locations as shown on the as-built GI plans in Appendix D. Total 18 samples of marine sediment from CB7 and CB8 were taken for chemical tests. As no marine deposits were retrieved in CB6, no sample from CB6 was taken for the chemical tests. According to the test results, the classification of the sediment and the corresponding disposal option are as below.

Category	Biological Screening	Disposal Option	No of Sample
Category L	N/A	Type 1 – Open Sea	18

Category M	Pass	Type 1 – Open Sea (Dedicated Sites)	-
	Fail	Type 2 – Confined Marine Disposal	-
Category H (not > 10 x LCEL)	N/A	Type 2 – Confined Marine Disposal	-
Category H (> 10 x LCEL)	Fail	Type 3 – Special Treatment / Disposal	-

All samples were classified as Category L. No biological test is required as the results of chemical test shown all samples are classified in Category L.

4. Allocation of Marine Disposal Space

Both PSQR of Phase 1 and 2 were approved by DEP and the approved classification of sediment categories and quantity of sediment have submitted to Marine Fill Committee Secretariat (MFC) of Civil Engineering and Development Department (CEDD) And MFC has provided the allocation of marine disposal space for both Phase 1 and 2 as attached in Appendix E. Details are summarized as below.

Phase	Category of Sediment	In situ Volume of Sediment	Sediment Disposal Space
1	Category H	30 m ³	Subareas to be directed on site within Mud Pit CMP1 of the Confined Marine Sediment Disposal Facility to the South of The Brothers (or at East of Sha Chau)
	Category L	140 m ³	Suitable for capping the exhausted Confined Marine Disposal Facility at East Sha Chau (or South of the Brothers)

2	Category L	830 m ³	Subareas “WKRD” within South Cheung Chau Open Sea Sediment Disposal Area as shown on Drawing No. MFC/002-WKRD
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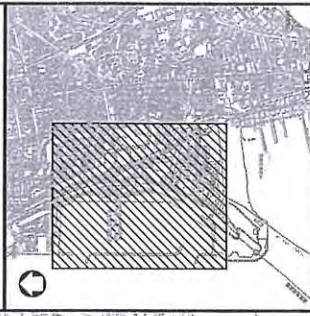
The total estimated volume of sediment of this project is 1000m³, with 970m³ was classified as Category L and 30m³ was classified as Category H.

5. Conclusion

The methodology for sampling and testing of the sediment of this project is based on the approved SSTP. The results submitted in the PSQR of Phase 1 and 2 indicated that no biological screening was required. And subjected to approval of DEP, the PSQR was deemed to the formal SQR. The total in-situ volume of sediment for this project is 1000m³ which is same as estimated in EIA report. According to the testing results, 970m³ and 30m³ of sediment of this project were classified as Category L and Category H respectively. Since the 30 m³ of sediment was classified as Category H (with not >10 x LCEL), the Type 2 – Confined Marine Disposal option will be implemented. No Type 3 – Special Treatment/Disposal as stated in EIA report will not be used for this project. There is no major variation of the construction works in this project, so that the results of sediment sampling and testing are still valid for the project.

Appendix A: Project Layout Plan

YAU TSIM MONG DISTRICT



LOCATION PLAN
SCALE 1:10000

LEGEND

ROAD IMPROVEMENT WORKS
TO BE IMPLEMENTED UNDER
THIS PROJECT

REV.	DESCRIPTION	DATE

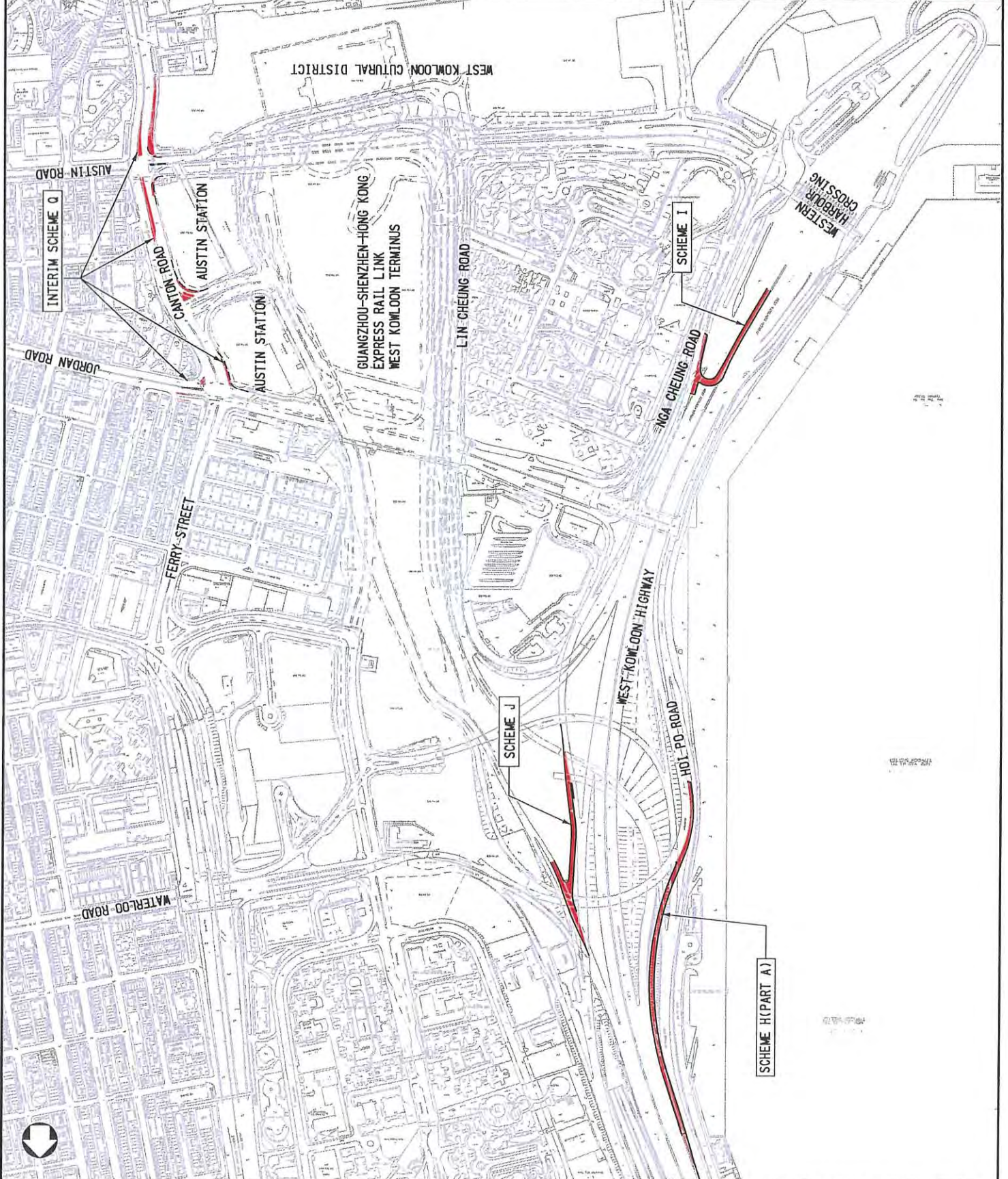
**PARSONS
BRINCKERHOFF**

PROJECT TITLE
PWP ITEM NO. 08357H
PROPOSED ROAD IMPROVEMENT WORKS IN
WEST KOWLOON RECLAMATION DEVELOPMENT

THIS IS THE
KEY PLAN

DRAWING NO.	CE44/K/CV/0010	REV.	B
DATE		PREPARED	
SCALE	1:10000	DATE	

路政署
 HIGHWAYS DEPARTMENT
 主要工程處辦事處
 MAJOR WORKS PROJECT MANAGEMENT OFFICE



Appendix B: Preliminary Sediment Quality Report of Phase 1 and 2

PARSONS BRINCKERHOFF

Parsons Brinckerhoff (Asia) Ltd.

7 November 2013

Environmental Protection Department
Environmental Compliance Division
Territorial Control Office
Marine Dumping Section
25/F, Southorn Centre,
130 Hennessy Road,
Wan Chai, Hong Kong.

Attn: Mr. W C LING, Jackson (EPO/E(TC)33)

Dear Sir,

Agreement No. CE 44/2011 (HY)
Proposed Road Improvement Works in West Kowloon Reclamation Development – Phase 1
Investigation, Design and Construction
Preliminary Sediment Quality Report – Phase 1 (Issue 1)

Further to our Sediment Sampling and Testing Plan (Issue 2) approved by EPD on 29 October 2013, we enclosed the Preliminary Sediment Quality Report – Phase 1 for your comment and approval.

If you have any enquiries, please contact our Kinix Wong on 2579 7007.

Yours faithfully
PARSONS BRINCKERHOFF (ASIA) LTD.



Emeric Wan
Deputy Project Manager

EW/KCW/yc

Encl.

cc. HyD/MWPMO – Mr. K F LAM -w/e
CEDD/FMD – Mr. F W LAU -w/e

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Certified to ISO 9001, ISO 14001

Our ref. 2512043A-GN-07966/13

By Hand



HIGHWAYS DEPARTMENT

MAJOR WORKS PROJECT MANAGEMENT OFFICE

路政署

主要工程管理處

Agreement No. CE44/2011(HY)

Proposed Road Improvement Works in West Kowloon Reclamation Development (Phase 1)

– Investigation, Design and Construction



Preliminary Sediment Quality Report – Phase 1 (Issue 1)

**PARSONS
BRINCKERHOFF**

PRELIMINARY SEDIMENT QUALITY REPORT – PHASE 1 (ISSUE 1)

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Appendix B (Phase 1) As-built Ground Investigation Plans with Sediment Samples for Chemical Testing

Appendix C (Phase 1) Drillhole Records including Sampling for Chemical Test

Appendix D (Phase 1) Chemical Test Reports

Appendix E (Phase 1) Record of Sediment Sampling & Collection under ETWB TCW No. 34/2002

1. INTRODUCTION

1.1 Background

There will be substantial developments in West Kowloon Reclamation Development (WKRd) including the West Kowloon Cultural District (WKCD), Austin Station of the Kowloon Southern Link (KSL) and West Kowloon Terminus (WKT) of the Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) and building developments above the two railway stations. With the completion of these developments and the commissioning of the new transport facilities, their traffic impacts to the road network of WKRd and its vicinity will be significant.

Apart from the additional traffic impacts arising from the major developments and transport facilities in WKRd, several major junctions in the area are currently operating with insufficient capacity causing serious congestion to some existing major road corridors including Jordan Road (JRD), Ferry Street (FST), Canton Road (CRD), Lin Cheung Road (LCR), Wui Cheung Road (WCR) and Austin Road (AUR). For example, the observed traffic queue on LCR southbound at its junction with JRD can be up to 340 metres (m) in the PM peak of Saturdays.

Against this background, Transport Department commissioned the "West Kowloon Reclamation Development Traffic Study" (the Traffic Study) in May 2008 to formulate comprehensive traffic and transport measures to address the traffic congestion problems and the additional traffic impacts arising from the various developments and transport infrastructures on the WKRd.

The Final Report of the Traffic Study was issued in September 2009. Findings of the study concluded that in design year 2031 the original road network in the WKRd previously planned in the late 1980s would be inadequate to support the demand of the local traffic as well as through traffic heading for other surrounding areas such as WKCD and Tsim Sha Tsui (TST). For instance, out of 41 key road junctions in the study area, 18 of them would be overloaded or approaching their capacity. The critical reserve capacity (RC) of these 18 junctions would range from -37% (junction of Austin Road West/Road D1) to +7% (junction of CRD/Kowloon Park Drive). Furthermore, there would be long traffic queues at five major junctions on JRD, FST, LCR, Austin Road West (AURW) and the future Road D1 causing blockage to the upstream junctions. Please refer to the Final Report of Agreement No. TD 54/2008 – West Kowloon Reclamation Traffic Study for the detailed junction analysis results within the study area.

To enhance the road network of the area, the Traffic Study identified and recommended, amongst others, the following Core and Additional Schemes together with the improvement works at the junction of CRD/FST/JRD. While the Core Schemes are being implemented by other agents, the Additional Schemes together with the improvement works at the said junction are going to be implemented under this Project.

Core Schemes (by other agents)

- (i) Scheme D – Extension of the previously planned LCR/AUR underpass to the west of the junction of CRD/AUR. This scheme will be implemented under the ‘Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link’ project by Railway Development Office of Highways Department;
- (ii) Scheme E – Provision of a new link road from the Kowloon exit of the Western Harbour Crossing (WHC) to the elevated JRD. This scheme will be implemented by a private developer led by the Mass Transit Railways Corporation Limited

Additional Schemes (under this Project)

- (iii) Scheme H - New road connection from Hoi Po Road to West Kowloon Highway (WKH) northbound plus widening of the elevated Nga Cheung Road (NCR);
- (iv) Scheme I - New link road from elevated NCR to WHC;
- (v) Scheme J - New link road from WKH southbound to NCR;
- (vi) Scheme Q - Provision of a local underpass along CRD at the junction of CRD/AUR;
- (vii) Improvement Works at the Junction of CRD/FST/JRD

Coupled with the Core Schemes, the Additional Schemes and the junction improvement works would enable most of the key road junctions in the study area to operate with spare capacity, and the traffic queue length would also be reduced avoiding blockage to the upstream junctions. To accommodate the increased traffic volume arising from XRL commissioning and WKCD (Phase 1) opening in 2015, it is desirable to complete the improvement works as early as possible.

A Feasibility Study (FS) consultancy (CE 65/2009 (HY)) was commissioned by the Highways Department (HyD) in May 2010 to study the technical feasibility of the proposed works. The Study concluded in June 2011 that the proposed Schemes H, I, J and Junction Improvement Works at CRD/FST/JRD were, prima facie, technically feasible. However, for Scheme Q (underpass) which would involve the construction of an underpass along Canton Road at the junction of CRD/AUR/AURW and the reconstruction of the associated pedestrian subway at the junction, its technical feasibility was still yet to be ascertained subject to the clarification of a number of site constraints and uncertainties. As such, it was decided that the proposed works would be divided into two phases for implementation. Phase 1 of works would include Schemes H, I, J, Q (interim road improvement only) and the Junction Improvement Works at CRD/FST/JRD. Meanwhile, if the Scheme Q (underpass) is subsequently found to be technical feasible, it will be put under Phase 2 of works for later implementation.

1.2 This Assignment

On 7 March 2012, the Government of Hong Kong Administration Region awarded Agreement No. CE44/2011 (HY) Proposed Road Improvement Works in West Kowloon Reclamation Development – Phase 1 – Investigation, Design and Construction to Parsons Brinckerhoff (Asia) Ltd. The major scope of the Project under this Assignment comprises:

- a) Scheme H (A) – New road connection from Hoi Po Road to WKH Northbound
- b) Scheme H (B) - Widening of elevated NCR
- c) Scheme I - New Link Road from Elevated NCR to WHC
- d) Scheme J - New Link Road from WKH Southbound to NCR
- e) Interim Scheme Q - Interim road widening works along Canton Road
- f) Improvement Works at the Junction of Canton Road/ Ferry Street/ Jordan Road

The corresponding layouts are shown in **Appendix A**.

1.3 Objectives of this Assignment

The objectives of the Assignment are:

- a) to affirm the engineering practicability of the project;
- b) to refine the Project Scope, layout and design requirements through review of previous studies, preliminary works, and the latest available information and carry out necessary further investigation and studies;
- c) to enhance aesthetic friendliness of the Project;
- d) to produce sound and cost-effective preliminary design and formulate an implementation strategy for the Project;
- e) to conduct and assist the Employer in conducting public consultation and engagement;
- f) to carry out the detailed design for the Project; and
- g) to provide supervision of construction including site investigation works for the Project.

2. PURPOSE OF THIS REPORT

2.1 Management of Excavated Sediment in accordance with ETWB TC(W) No. 34/2002

This report is prepared in accordance with the Environment, Transport and Works Bureau Technical Circular (Works) No. 34/2002 for management of excavated sediment. It is anticipated that marine sediment will be encountered and excavated in the course of construction works under the Project.

2.2 Excavated Marine Sediment from Piling Works

The marine sediment generated under this project is a result of the piling works for the viaducts. Among the improvement schemes as described above in Section 1, Scheme H and Scheme I are vehicular viaducts along the West Kowloon Highway. General layout of the viaducts is shown in **Appendix A**. Deep foundation in form of pre-bored H-piles has to be constructed to support the viaduct structures. As the viaducts are located in reclamation area, it is anticipated that marine sediment will be excavated during the course of the piling works.

Piling works (and hence sediment excavation) are planned to carry out in two phases, and this report deal with the first phase (Phase 1) of the piling works. Piles under Phase 1 are shown on plans in **Appendix B** inside the 100m x 100m grids.

2.3 Preliminary Sediment Quality Report (PSQR)

A Sediment Sampling and Testing Plan (SSTP) was approved by the Environmental Protection Department (EPD) on 29 October 2013, in which sampling and testing in 2 individual phases were proposed. Sediment samples under Phase 1 were collected in July 2013 in ground investigation drillholes for chemical tests and if necessary, biological screening.

This PSQR (Phase 1) was prepared as set out in ETWB TC (W) No. 34/2002 to include the sampling details, the chemical testing results, quality control procedures, proposed classification and delineation of sediment according to Appendix A of ETWB TC (W) No. 34/2002.

PSQR (Phase 2) will be submitted separately and is outside the scope of this Report.

3. SEDIMENT SAMPLING PLAN

3.1 Sampling Locations

Samplings of sediments for chemical/biological testing (Phase 1) are proposed at 4 numbers of drillholes, namely CB1 to CB5 (CB3 is not used), at locations as shown on the as-built record plans in **Appendix B**. These CB drillholes were carried out so that the sampling arrangement adopted will be in accordance with ETWB TC(W) No. 34/2002, i.e. all future excavation sites during piling works will be within the 100 x 100 m grids of the CB drillholes.

The drillholes for sediment sampling were intended to locate along the alignments of the proposed viaducts as far as possible, with samples taken at the excavation sites of

sediment. However, some of the sampling locations had been adjusted away from the alignment due to site specific conditions (e.g. locations and presence of existing foundations, existing dense vegetation, underground utilities, etc.).

3.2 Sampling in 2 Individual Phases

Samplings of sediments for chemical/biological testing are proposed in two phases.

For Phase 1, four numbers of drillholes (CB1, CB2, CB4 and CB5) were carried out at locations as shown on the as-built GI plans in **Appendix B**. This report deals with sampling and testing in Phase 1 only.

For Phase 2, three numbers of drillholes (CB6, CB7 and CB8) were proposed at locations as shown on the proposed GI plans in the SSTP approved by EPD in on 29 October 2013. Sampling and testing are expected to commence after commencement of works in June 2014, and the corresponding PSQR will be under separate submission and is outside the scope of this report.

In light of the sampling and testing in 2 individual phases, application of dumping permits and hence excavation of sediments (i.e. piling works) for Phase 1 will be independent of Phase 2. Piles under Phase 1 are shown in **Appendix B**, as indicated within the 100m x 100m grids of the corresponding CB drillholes.

3.3 Sampling Method and Depth of Sampling

As the layers of marine sediment are approximately 15m to 30m below the existing ground level according to the existing GI data, the drillholes for sampling were advanced by means of rotary drilling method.

Before drilling of each CB drillhole, depth and thickness of sediment were ascertained by an adjacent conventional GI drillhole sunk from existing ground level to 5m into bedrock. After that, the CB drillhole were sunk for sampling of sediment for chemical/biological testing.

For drillhole no. CB4, marine sediment was not encountered and the drillhole was terminated 5m into bedrock as a conventional GI drillhole. Records of all sampling drillholes (CB1 to CB5; CB3 not used) and conventional GI drillholes (DH1 to DH10; DH6 and DH7 not used) are enclosed in **Appendix C** with a proforma "Record of Sediment Sampling & Collection under ETWB TCW No. 34/2002" in **Appendix E**.

Vertical profiles of samples were taken according to Appendix B Section 2(a)(vi) of ETWB TC (W) No. 34/2002. Samples of sediment for chemical/biological testing were taken once the layer of marine deposit had been encountered. U100 undisturbed soil samples were taken. Samples were continuous, and the top level of the sub-samples were the top of the marine deposit, 0.9m down, 1.9m down, 2.9m down, and then every 3m to the bottom of the marine deposit.

The marine deposit consists of a stratum of marine mud and a subsequent stratum of marine sand according to the existing GI data. Undisturbed U100 samples should be taken. One stratum of marine sediment of approximate thickness between 0m (no sediment) to 6m is expected to encounter in the proposed CB drillholes.

3.4 Strata Logging

Strata logging for drillholes were taken during the course of drilling and sampling by a qualified geologist. The logs included the general stratigraphic descriptions, depth of sampling, sample notation and level of groundwater (if encountered). Details of the logs are enclosed in **Appendix C**.

3.5 Decontamination Procedures

All equipment in contact with the ground was thoroughly decontaminated between each drilling and sampling event to minimize the potential for cross contamination. The equipment (including drilling bits and samplers) were decontaminated by steam cleaning/high-pressure hot water jet, and then washed by phosphate-free detergent and finally rinsed by distilled/deionized water.

All sampling bottles were labelled with the station number, sample length, diameter and depth, sampling date and time, together with full description of the sample. If the contents were hazardous, this was clearly marked on the container and precautions taken during transport. The samples were contained in laboratory cleaned high-density polyethylene bottles in accordance with ETWB TC (W) No. 34/2002.

The samples were kept at 4°C in the dark and were not frozen. All samples were promptly analysed.

3.6 QA/QC Requirements

All tests were conducted by ALS Technichem (HK) Pty Ltd., a laboratory accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) with HOKLAS accreditation registration number 066.

4. CHEMICAL SCREENING (PHASE 1)

4.1 Tier II Chemical Screening

All samples were tested for all the contaminants (except Tributyltin (TBT) due to insufficient volume of interstitial water in soil samples) stated in Table 1 – Analytical Methodology in Appendix B of ETWB TC (W) No. 34/2002 as shown below:

Parameters	Preparation Method <i>US EPA Method</i>	Determination Method <i>US EPA Method</i>	Reporting Limit
Metals <i>(mg/kg dry wt.)</i>			
Cadmium (Cd)	3050B	6020A or 7000A or 7131A	0.2
Chromium (Cr)	3050B	6010C or 7000A or 7190	8
Copper (Cu)	3050B	6010C or 7000A or 7210	7
Mercury (Hg)	7471A	7471A	0.05
Nickel (Ni)	3050B	6010C or 7000A or 7520	4
Lead (Pb)	3050B	6010C or 7000A or 7420	8
Silver (Ag)	3050B	6020A or 7000A or 7761	0.1
Zinc (Zn)	3050B	6010C or 7000A or 7950	20
Metalloid <i>(mg/kg dry wt.)</i>			
Arsenic (As)	3050B	6020A or 7000A or 7061A	1
Organic-PAHs <i>(µg/kg dry wt.)</i>			
Low Molecular Weight PAHs+	3550B or 3540C and 3630C	8260B or 8270C	55
High Molecular Weight PAHs++	3550B or 3540C and 3630C	8260B or 8270C	170
Organic-non-PAHs <i>(µg/kg dry wt.)</i>			
Total PCBs+++	3550B or 3540C and 3665A	8082	3

4.2 Classification Criteria

Upon completion of the chemical testing, the sediment quality was assessed according to sediment quality criteria in Appendix A of ETWB TC (W) No. 34/2002 as enclosed below:

Sediment Quality Criteria for the 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

* *The contaminant level is considered to have exceeded the UCEL if it is greater than the value shown.*

The sediment is classified into 3 categories based on its contamination levels, namely Category L, Category M and Category H. Details of the classification are listed below.

- Category L: Sediment with all contaminant levels not exceeding the Lower Chemical Exceedance Level (LCEL). The material must be dredged, transported and disposed of in a manner which minimizes the loss of contaminants either into solution or by resuspension.
- Category M: Sediment with any one or more contaminant levels exceeding the Lower Chemical Exceedance Level (LCEL) and none exceeding the Upper Chemical Exceedance Level (UCEL). The material must be dredged and transported with care, and must be effectively isolated from the environment upon final disposal unless appropriate biological tests demonstrate that the material will not adversely affect the marine environment.
- Category H: Sediment with any one or more contaminant levels exceeding the Upper Chemical Exceedance Level (UCEL). The material must be dredged and transported with great care, and must be effectively isolated from the environment upon final disposal.

4.3 Test Results and Classification of Sediments

A total of 8 samples of marine sediments were taken for chemical testing under Phase 1. Summary of the chemical test results are tabulated in **Table 1** on the following page. Details of the chemical test reports are enclosed in **Appendix D**.

7 out of the 8 samples were classified as **Category L**. Type 1 – Open Sea Disposal will be applicable in accordance with the management framework as set out in Appendix C of ETWB TC (W) No. 34/2002.

The remaining 1 out of the 8 samples was classified as **Category H** (with no >10 x LCEL). Biological screening (dilution test) is not required and Type 2 – Confined Marine Disposal is applicable in accordance with the management framework as set out in Appendix C of ETWB TC (W) No. 34/2002.

No marine deposits were retrieved in drillhole no. CB4. See **Appendix C** for details of the drillhole records. The drillhole was terminated 5m into the bedrock level.

Table 1 – Summary of Chemical Test Results (Phase 1)

Sampling ID	Parameter ^{4,5,6}											Overall Category	
	PAH (µg/kg dry wt.)		Total PCB (µg/kg)	Metals (mg/kg dry wt.)									
	LW ²	HW ³		Cd	Cr	Cu	Ni	Pb	Zn	Hg	As		Ag
Reporting Limit	55	170	3	0.2	8	7	4	8	20	0.05	1	0.1	-
LCEL	<u>550</u>	<u>1700</u>	<u>23</u>	<u>1.5</u>	<u>80</u>	<u>65</u>	<u>40</u>	<u>75</u>	<u>200</u>	<u>0.5</u>	<u>12</u>	<u>1</u>	-
UCEL	3160	9600	180	4	160	110	40	110	270	1	42	2	-
10 x LCEL	<u>5500</u>	<u>17000</u>	<u>230</u>	<u>15</u>	<u>800</u>	<u>650</u>	<u>400</u>	<u>750</u>	<u>2000</u>	<u>5</u>	<u>120</u>	<u>10</u>	-
CE44-CB1 16M-17M	<550	<1700	<18	<0.2	37	10	26	21	91	<0.05	6	<0.1	L
CE44-CB1 17M-18M	<550	<1700	<18	<0.2	36	10	24	22	129	<0.05	8	<0.1	L
CE44-CB1 18M-19M	<550	<1700	<18	<0.2	10	3	6	9	102	<0.05	3	<0.1	L
CE44-CB1 19M-20.5M	<550	<1700	<18	<0.2	15	5	8	17	192	<0.05	6	<0.1	L
CE44-CB2 17.5M-18.5M	<550	<u>3400</u>	<18	1.1	<u>133</u>	177	44	145	722	2.03	9	2.9	H
CE44-CB2 18.5M-19.5M	<550	<1700	<18	<0.2	44	12	30	26	146	<0.05	6	<0.1	L
CE44-CB2 19.5M-20.5M	<550	<1700	<18	<0.2	42	12	27	28	105	<0.05	5	<0.1	L
CE44-CB5 27M-28M	<550	<1700	<18	<0.2	8	4	5	10	54	<0.05	3	<0.1	L

Notes:

1. U100 - U100 undisturbed soil sample retrieved from drillhole.
2. LW - Low molecular weight PAHs (i.e. acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene and phenanthrene).
3. HW - High molecular weight PAHs (i.e. benzo[a]anthracene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, pyrene, benzo[a]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-c,d]pyrene and benzo[g,h,i]perylene).
4. Values underlined indicate levels exceeding the LCEL but at or below the UCEL under ETWB TC(W) No. 34/2002.
5. Values in bold indicate levels exceeding the UCEL under ETWB TC(W) No. 34/2002.
6. Values in bold and underlined indicate levels exceeding the UCEL and 10 times the LCEL under ETWB TC(W) No. 34/2002.

5. BIOLOGICAL SCREENING (PHASE 1)

5.1 Tier III Biological Screening

The chemical test results revealed that all samples are either **Category L** or **Category H (with no >10 x LCEL)**. In accordance with the management framework as set out in Appendix C of ETWB TC (W) No. 34/2002, Tier III biological screening is not required.

6. CLASSIFICATION OF SEDIMENTS (PHASE 1) TO BE EXCAVATED

6.1 Based on information including the existing ground investigation data and detailed design of the pre-bored H-piles (of sizes 610mm outer diameter) for the viaducts, the estimated maximum quantity of marine sediment to be excavated by the piling works is approximately 1,000m³ (Phase 1 and Phase 2 together).

6.2 For Phase 1, the estimated maximum quantity of marine sediment to be excavated by the piling works is approximately 700m³. Based on the chemical test results, it is estimated that 600m³ of the sediment is Category L and 100m³ is Category H (with no >10 x LCEL).

7. CONCLUSION (PHASE 1)

All sediment samples were tested for chemical contaminants in the HOKLAS accredited laboratory (ALS Technichem (HK) Pty Ltd).

Analysis of the chemical test results (Phase 1) indicated that the sediments (total 8 samples) should be classified as Category L (7 samples) and Category H (with no >10 x LCEL) (1 sample).

No biological screening is required in accordance with ETWB TC (W) No. 34/2002.

Appendix A

**Layout Plan of Proposed Works
under the Project**

YAU TSIM MONG DISTRICT



LOCATION PLAN
SCALE 1:110000

LEGEND



ROAD IMPROVEMENT WORKS
TO BE IMPLEMENTED UNDER
THIS PROJECT

REV.	DESCRIPTION	BY	DATE

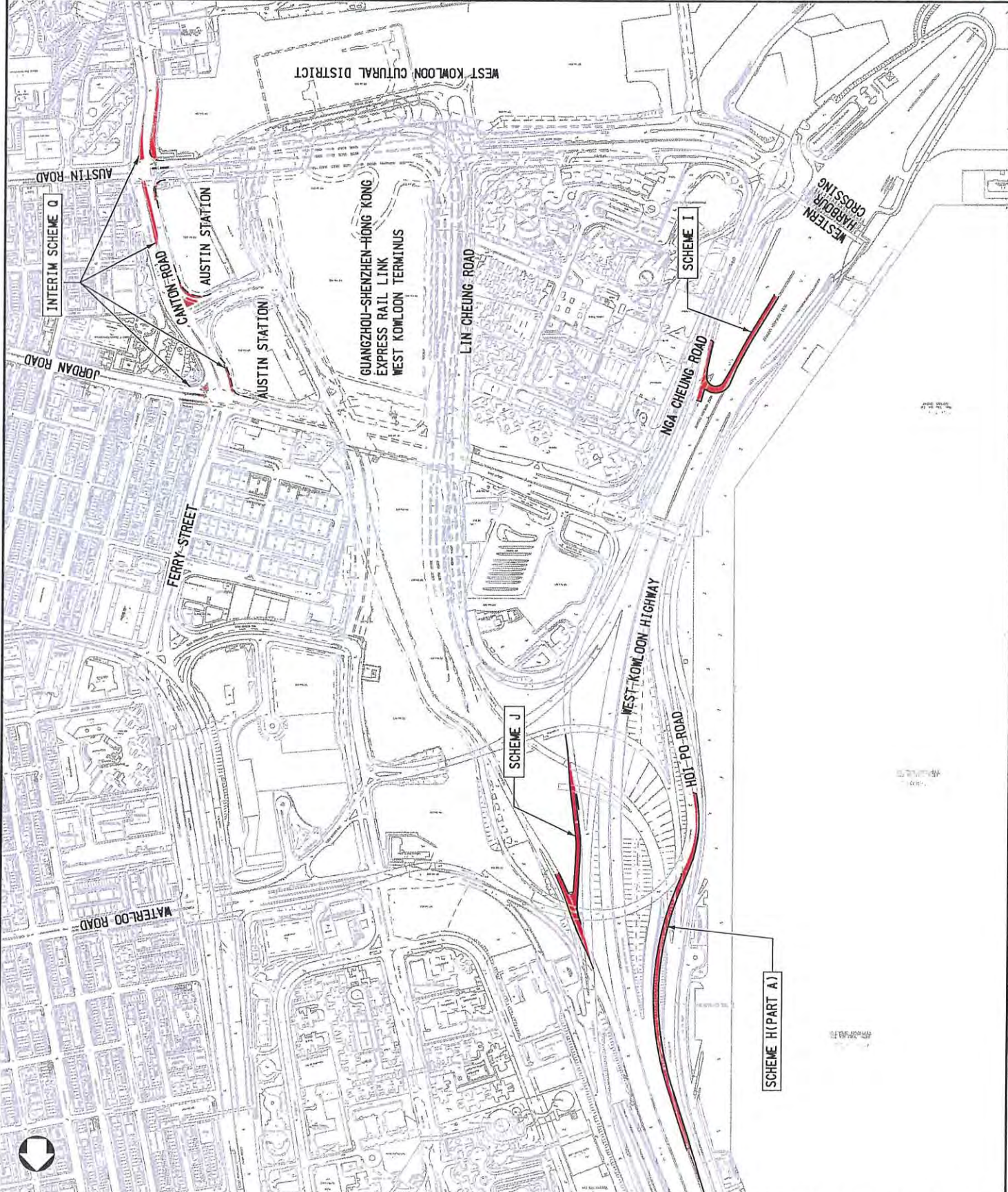
**PARSONS
BRINCKERHOFF**

PROJECT TITLE
PWP ITEM NO. 68257H
PROPOSED ROAD IMPROVEMENT WORKS IN
WEST KOWLOON RECLAMATION DEVELOPMENT

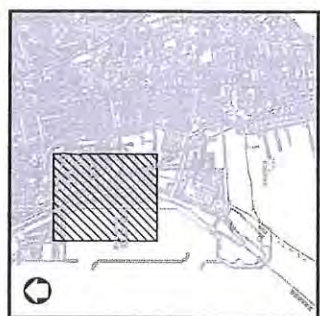
MAP TITLE
KEY PLAN

STANDARD NO.	CE44/K/CV/0010	REV.	B
ISSUE DATE		DESIGNED	
SCALE	1:12500	APPROVED	

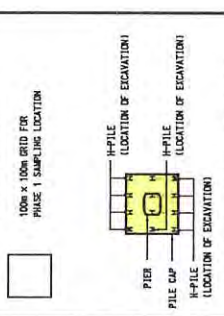
PRELIMINARY DESIGN
© 版權所有 版權保留
路政署
HIGHWAYS DEPARTMENT
主要工程發展處
MAJOR WORKS PROJECT MANAGEMENT OFFICE



Appendix B
(Phase 1) As-built Ground
Investigation Plans with Sediment
Samples for Chemical Testing



LOCATION PLAN



Drawn	Checked	Approved
DATE	DATE	DATE
1:1500 (A1)	WORKING	

© COPYRIGHT RESERVED

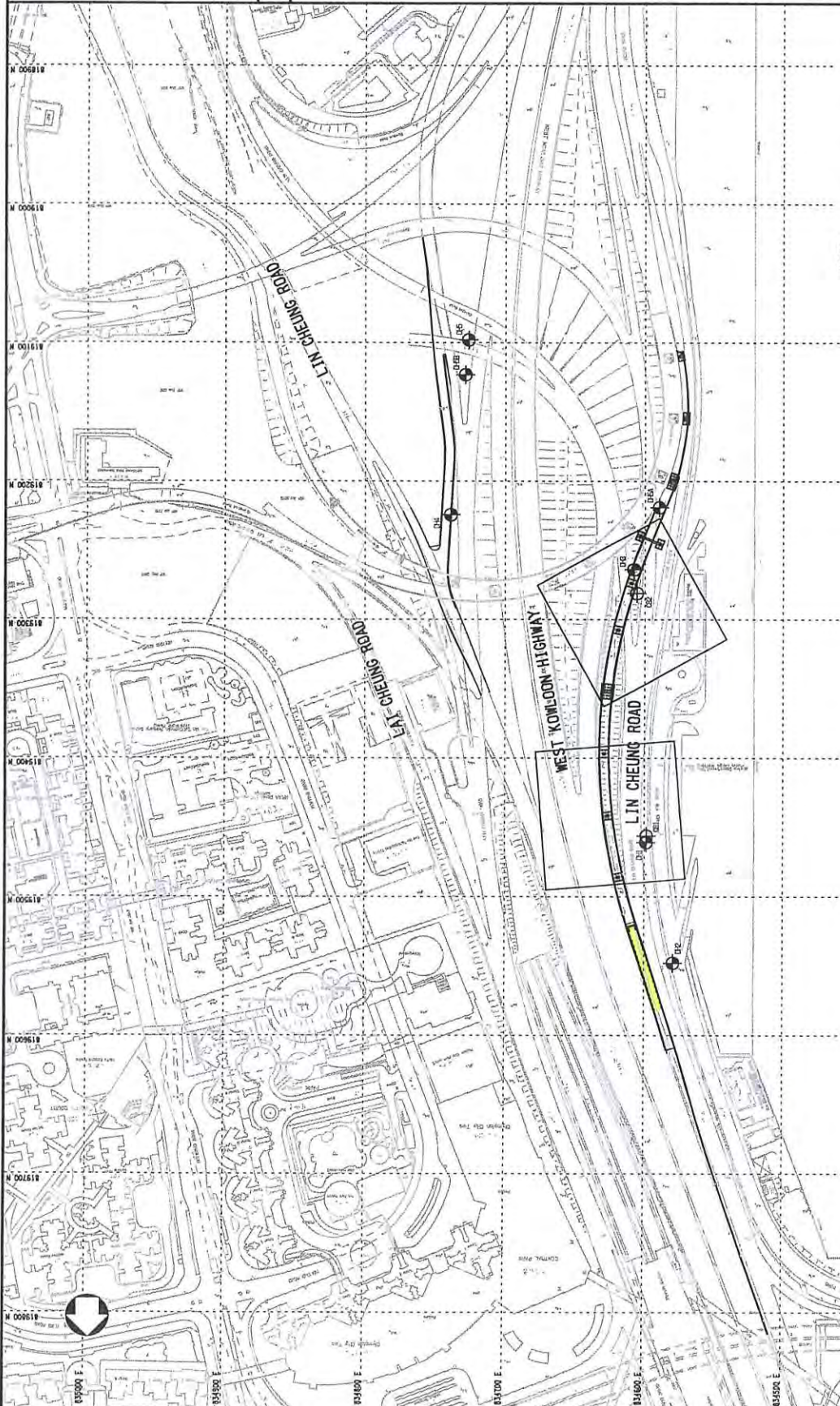
羅致濤
HIGHWAYS DEPARTMENT
主要工程事務處
MAJOR WORKS PROJECT MANAGEMENT OFFICE

PARSONS BRINCKERHOFF

Project No. HY2012/1
CONTRACT NO. HY2012/1
PROVISION OF BARRIER-FREE ACCESS FACILITIES FOR HIGHWAY STRUCTURES- PHASE 3 CONTRACT 1

Drawn by
(PHASE 1) AS-BUILT GROUND INVESTIGATION PLAN WITH SAMPLES FOR CHEMICAL TESTING (SHEET 1)

Drawn No. CE44/K/TB/0001 Rev. A
Date NOV 2012
Scale 1:1500 (A1)
Status WORKING



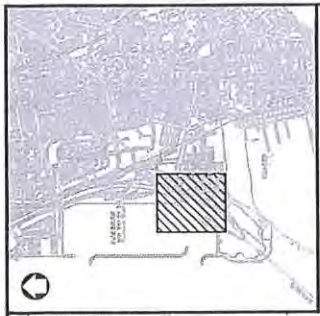
NOTES :

- IN THE EVENT THAT MARINE SEDIMENT WAS FOUND IN THE DRILLHOLE LOG, CHEMICAL AND BIOLOGICAL TESTS ON MARINE SEDIMENT WERE CARRIED OUT IN ACCORDANCE WITH EMB TECO NO. 34 / 2002 . SAMPLES WERE CONTAMINATED AND THE TOP LEVEL OF THE CORE-SAMPLES WAS THE TOP OF THE MARINE SEDIMENT. THE CORES WERE 1.2M LONG, 2.5M DIAM, AND THEIR CROSS SECTION WAS THE SECTION OF THE MARINE SEDIMENT. 0.100 SAMPLES WERE TAKEN.
- PILE LOCATIONS NOT COVERED BY PHASE 1'S 100m x 100m GRID WILL BE COVERED BY PHASE 2'S 100m x 100m GRID.

PHASE 1) AS-BUILT SAMPLING LOCATION (BORING / PHOTOLOGICAL TEST)		HK METRIC GRID COORDINATES	
CB1	CB2	EASTING	NORTHING
		B34595.35 E	B19456.27 N
		B34605.35 E	B19285.98 N

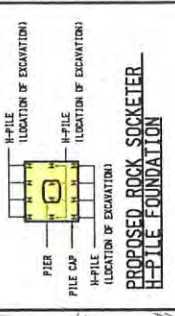
PHASE 1) AS-BUILT O1 DRILLHOLE		HK METRIC GRID COORDINATES	
DH1	DH2	EASTING	NORTHING
		B34598.35 E	B19465.07 N
		B34618.35 E	B19442.50 N
		B34607.55 E	B19325.48 N
		B34715.55 E	B19325.54 N
		B34725.55 E	B19325.58 N
		B34595.15 E	B19273.02 N
		B34725.45 E	B19125.10 N





LOCATION PLAN

- LEGEND :**
- ☉ PHASE 1) AS-BUILT DRILLHOLE OF SAMPLES FOR CHEMICAL TESTING
 - ☉ PHASE 1) AS-BUILT DRILLHOLE FOR GROUND INVESTIGATION
 - 100M X 100M GRID FOR PHASE 1) SAMPLING LOCATION



Rev	Description	By	Date

PARSONS BRINCKERHOFF

Project Site: CONTRACT NO. HY201211
 PROVISION OF BARRIER-FREE ACCESS FACILITIES FOR HIGHWAY STRUCTURES- PHASE 3 CONTRACT 1

Drawing No: CE44/K/TB/0002
 Scale: 1:1000 (A1)
 Date: NOV 2012
 Status: WORKING
 Rev: A



NOTES :
 REFER TO DRAWING NO. CE44/K/TB/0001 FOR NOTES

PHASE 1) AS-BUILT SAMPLE LOCATION (CHEMICAL / BIOLOGICAL TEST)	IR. METRIC GRID COORDINATES	
	EASTING	NORTHING
CM*	834628.46 E	818611.88 N
CS	834628.23 E	818571.21 N

PHASE 1) AS-BUILT 01 DRILLHOLE	IR. METRIC GRID COORDINATES	
	EASTING	NORTHING
CM*	834628.46 E	818611.88 N
DM	834629.17 E	818494.70 N
DM	834653.84 E	818386.63 N
DM	834628.33 E	818511.97 N

CM* WAS BILLED FROM EXISTING GROUND LEVEL TO 5m BELOW ROCK HEAD LEVEL (NO SETTLEMENT FOUND)

Appendix C
(Phase 1) Drillhole Records
including Sampling for Chemical
Test



Drillhole Record

Drillhole No. CE44-CB1
 Sheet 1 of 3

Contract No. HY/2012/11

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. DR-13

E 834598.36

Date 25/06/13 to 29/06/13

N 819456.27

FLUSHING MEDIUM

ORIENTATION VERTICAL

GROUND LEVEL +5.52 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type					
25/06/2013																Wash boring
1																
2																
3																
4																
5																
6																
7																
8																
9																
25/06/2013																

- Small Disturbed Sample
- ⊗ Large Disturbed Sample
- ☒ SPT Liner Sample
- ☒ U76 Undisturbed Sample
- ☒ U100 Undisturbed Sample
- ☒ Mozier Sample
- ☒ Piston Sample
- ☒ Water Sample
- ✕ Water Level
- Standard Penetration Test
- Permeability Test
- Piezometer Tip
- Standpipe Tip
- ⊕ Pressuremeter Test
- Impression Packer Test
- ∨ Vane Shear Test

LOGGED M. Chia
DATE 04/07/2013
CHECKED S.K. Wong
DATE 05/07/2013

REMARKS



Drillhole Record

Drillhole No. CE44-CBI

Contract No. HY/2012/11

Sheet 2 of 3

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract J

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. DR-13

E 834598.36

Date 25/06/13 to 29/06/13

N 819456.27

FLUSHING MEDIUM

ORIENTATION VERTICAL

GROUND LEVEL +5.52 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	T.C.D. %	Fracture Index	F.L. / Test Depth (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
27/06/2013															See previous page
27/06/2013				96						T2-101	-5.48	11.00			Grey occasionally brown, angular to subangular COBBLE and BOULDER with some coarse gravel sized moderately strong to strong tuff, granite and rhyolite fragments and refuse. (FILL)
28/06/2013				71						T2-101		11.50			11.22-11.50m: Boulder sized strong rhyolite fragments. 11.80-12.00m: Boulder sized strong granite fragments.
				17						T2-101		12.50			
										T2-101		13.50			13.55-13.75m: Boulder sized moderately strong granite fragments.
				64						T2-101		14.50			14.44-15.32m: Boulder sized strong tuff fragments.
				34						T2-101		15.00			
	16.00 / 168mm									1	-10.48	16.00			15.80-16.00m: With marine clay pocket.
				100					B-41	2		16.45			Firm to stiff, dark greenish grey, slightly sandy silty CLAY with occasional shell fragments. (MARINE DEPOSITS)
				100					B-229	3		16.50			
28/06/2013				100					D-20	4		16.95			
29/06/2013				100					D-20	5		17.00			
				100					B-49	6	-11.98	17.50			Dark greenish grey, clayey silty fine to coarse SAND with some angular to subangular fine gravel sized rock and shell fragments. (MARINE DEPOSITS)
				56					B-49	7		17.50			
				87					B-13	8	-12.48	18.00			Greyish brown, slightly clayey silty fine to coarse SAND with some angular to subangular fine to coarse gravel sized rock and shell fragments. (MARINE DEPOSITS)
				87					B-13	9		18.00			
				87					B-28	10		18.45			
				87					B-28	11		18.50			
				87					B-59	12		18.95			
				87					B-59	13		19.00			
				38					B-49	14		19.45			
									B-49	15		19.50			
										16	-14.48	20.00			

<ul style="list-style-type: none"> • Small Disturbed Sample • Large Disturbed Sample • SPT Liner Sample • U76 Undisturbed Sample • U100 Undisturbed Sample • Minzier Sample • Piston Sample • Water Sample 	<ul style="list-style-type: none"> • Water Level • Standard Penetration Test • Permeability Test • Piezometer Tip • Standpipe Tip • Pressuremeter Test • Impression Factor Test • Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>04/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>05/07/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-CB1
 Contract No. HY/2012/11
 Sheet 3 of 3

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. DR-13

E 834598.36
 N 819456.27

Date 25/06/13 to 29/06/13

FLUSHING MEDIUM

ORIENTATION VERTICAL

GROUND LEVEL +5.52 mPD

Drilling Progress (Add/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depths (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description				
										No.	Type									
24/6/2013				100					B-64	17	20.00					Grey, clayey silty fine to coarse SAND with some subangular to subrounded fine gravel. (ALLUVIUM)				
										18	20.45									
												-16.48	22.00							
					67					B-57	19	22.50								Yellowish brown, slightly clayey silty fine to coarse SAND with some subangular to subrounded fine to coarse gravel. (ALLUVIUM)
					100					B-101	20	22.95								
					100						21	23.00								
					100					B-12	22	23.45	-17.98				23.50			Firm to stiff, yellowish brown occasionally white, slightly sandy silty CLAY. (ALLUVIUM)
					100						23	23.50								
											24	23.95	-18.48				24.00			Drillhole completed at 24.00m

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample □ SPT Liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ⊕ Mazier Sample ⊖ Piston Sample △ Water Sample ✕ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊖ Piezometer Tip ⊖ Standpipe Tip ⊖ Pressuremeter Test ⊖ Impression Packer Test ⊖ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>04/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>05/07/2013</u></p>	<p>REMARKS</p>
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Drillhole Record

Drillhole No. CE44-CB2

Contract No. HY/2012/11

Sheet 1 of 3

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. DR-35

E 834605.62

Date 08/07/13 to 11/07/13

N 819280.98

FLUSHING MEDIUM Water

ORIENTATION VERTICAL

GROUND LEVEL +6.94 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	FL/ Test Depths (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type Depth					
08/07/2013										1	• 0.40					Brown, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
										2	• 0.90					
										3	• 1.40					
										4	• 1.90					
										5	• 2.40	+4.44	2.50			
																Wash boring

08/07/2013

5.15m at 18:00

- Small Disturbed Sample
- Large Disturbed Sample
- SPT Liner Sample
- ▨ U76 Undisturbed Sample
- ▩ U100 Undisturbed Sample
- ▧ Mnzier Sample
- ▤ Piston Sample
- △ Water Sample

- ⊕ Water Level
- ⊖ Standard Penetration Test
- ⊗ Permenibility Test
- ⊠ Piezometer Tip
- ⊡ Standpipe Tip
- ⊢ Pressuremeter Test
- ⊣ Impression Packer Test
- ⊤ Vane Shear Test

LOGGED M.Chiu
 DATE 17/07/2013
 CHECKED S.K.Wong
 DATE 18/07/2013

REMARKS
 1. An inspection pit was excavated by hand to a depth of 2.50m.



Drillhole Record

Drillhole No. CE44-CB2

Contract No. HY/2012/11

Sheet 2 of 3

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-35**

E 834605.62

Date 08/07/13 to 11/07/13

N 819280.98

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+6.94 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (h:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type/Depth					
09/07/2013		2.16m at 08:00														See previous page
	12.00 / 168mm							12.00	2,5,7,10,14,16 N=47	6 7	12.00 12.40	-5.05	12.00			Dense, brown occasionally greyish brown, slightly clayey silty fine to coarse SAND with some angular to subangular fine to coarse gravel. (FILL)
				0				13.00	4,6,8,9,10 N=53	8 9	13.00 13.40 13.50					
				0					B=156	10	13.95 14.00					
				0					B=124	11	14.45 14.50					
				0					B=111	12	14.95 15.00					
				0					B=182	13	15.45 15.50					
09/07/2013		6.17m at 08:00		100					B=35	14	15.50	-8.56	15.50			Firm to stiff, dark greenish grey occasionally yellowish brown, slightly sandy clayey SILT with occasional angular to subangular fine gravel and occasional sandy pocket. (FILL)
10/07/2013				100					B=45	15 16	15.95 16.00					
				44					B=64	17 18	16.45 16.50					
				100					B=135	19 20	16.95 17.00					
				100					B=64	21 22	17.45 17.50					
				100					B=276	23 24	17.95 18.00	-11.06	18.00			Stiff, dark greenish grey, slightly sandy silty CLAY with occasional angular to subangular fine gravel sized rock and shell fragments. (MARINE DEPOSITS)
				100					B=29	25 26	18.45 18.50					
				100					B=94	27 28	18.95 19.00					
				100					B=32	29 30	19.45 19.50					
				100						31	19.95	-13.06	20.00			

<ul style="list-style-type: none"> ■ Small Disturbed Sample ■ Large Disturbed Sample ■ SPT Liner Sample ■ U76 Undisturbed Sample ■ U100 Undisturbed Sample ■ Mnzier Sample ■ Piston Sample ■ Water Sample 	<ul style="list-style-type: none"> ⊗ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>17/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>18/07/2013</u></p>	<p>REMARKS</p>
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Drillhole Record

Drillhole No. CE44-CB2

Contract No. HY/2012/11

Sheet 3 of 3

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling	CO-ORDINATES E 834605.62 N 819280.98	Works Order No.
Machine & No. DR-35		Date <u>08/07/13</u> to <u>11/07/13</u>
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	GROUND LEVEL +6.94 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m)	Casing Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I./Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
											No.	Type/Depth					
					100					B=101	32	20.00					Stiff, dark grey occasionally brown, sandy silty CLAY with some subangular to subrounded fine gravel. (ALLUVIUM)
					100					B=27	33 34	20.45 20.50					
10/07/2013			2.27m at 18:00		100					B=67	35 36	20.95 21.00	-14.06	21.00			Grey occasionally yellowish brown, clayey silty fine to coarse SAND with some subangular to subrounded fine gravel. (ALLUVIUM)
11/07/2013			6.07m at 08:00		50					B=41	37 38	21.45 21.50					
					100					B=71	39 40	21.95 22.00	-15.06	22.00			Light grey, clayey silty fine to coarse SAND with some subangular to subrounded fine gravel. (ALLUVIUM)
11/07/2013											41	22.45	-15.56	22.50			
																	Drillhole completed at 22.50m

<ul style="list-style-type: none"> ■ Small Disturbed Sample ■ Large Disturbed Sample ▨ SPT Liner Sample ▨ U76 Undisturbed Sample ▨ U100 Undisturbed Sample ▨ Mazier Sample ▨ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ⊖ Water Level ⊖ Standard Penetration Test ⊖ Permeability Test ⊖ Piezometer Tip ⊖ Standpipe Tip ⊖ Pressuremeter Test ⊖ Impression Packer Test ⊖ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>17/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>18/07/2013</u></p>	REMARKS
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Drillhole Record

Drillhole No. CE44-CB4

Contract No. HY/2012/11

Sheet 1 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **XY4**

E 834628.86

Date 10/07/13 to 15/07/13

N 818611.88

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+4.78 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type Depth					
10/07/2013										1	• 0.40					Brown occasionally greyish brown, slightly silty fine to coarse SAND with some angular to subangular fine to coarse gravel. (FILL)
										2	• 0.90					
										3	• 1.40					
										4	• 1.90	+2.78	2.00			
										5	• 2.00					
10/07/2013 11/07/2013				100					B-25	6	▨ 2.45					Medium dense, brown, slightly clayey silty fine to coarse SAND with some angular to subangular fine to coarse gravel. (FILL)
										7	▨ 3.00					
								3.00	1,2,3,3,4 N=12	8	▨ 3.40					
				67					B-36	9	▨ 4.00					
										10	▨ 4.45					
								5.00	1,2,3,3,4,4 N=14	11	▨ 5.00					
										12	▨ 5.40					
				100					D-49	13	▨ 6.00	-1.22	6.00			Medium dense, brown occasionally greyish brown, slightly silty fine to coarse SAND with some angular to subangular fine to coarse gravel. (FILL)
										14	▨ 6.45					
								7.00	2,3,3,4,4,6 N=17	15	▨ 7.00					
										16	▨ 7.40					
				100					B-66	17	▨ 8.00					
										18	▨ 8.45					
								9.00	3,5,6,6,8,10 N=30	19	▨ 9.00	-4.22	9.00			Medium dense to dense, yellowish brown occasionally brown and greyish brown, slightly clayey silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
										20	▨ 9.40					

• Small Disturbed Sample	✕ Water Level	LOGGED <u>M.Chiu</u>	
▨ Large Disturbed Sample	— Standard Penetration Test		DATE <u>17/07/2013</u>
▨ SFT Liner Sample	— Permeability Test		CHECKED <u>S.J.Wong</u>
▨ U76 Undisturbed Sample	▨ Piezometer Tip		DATE <u>18/07/2013</u>
▨ U100 Undisturbed Sample	▨ Standpipe Tip		
▨ Mnzier Sample	▨ Pressuremeter Test		
▨ Piston Sample	▨ Impression Packer Test		
▨ Water Sample	▨ Vane Shear Test		

REMARKS
1. An inspection pit was excavated by hand to a depth of 2.00m.



Drillhole Record

Drillhole No. CE44-CB4

Contract No. HY/2012/11

Sheet 2 of 5

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. XY4

E 834628.86

N 818611.88

Date 10/07/13 to 15/07/13

FLUSHING MEDIUM Water

ORIENTATION VERTICAL

GROUND LEVEL +4.78 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depths (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type/Depth					
11				100					D-78	21	10.00				See previous page	
										22	10.45					
12	12.00 / 168mm			100				11.00	3,4,4,5,7,9 N=25	23	11.00					
										24	11.40					
13				100				13.00	2,5,5,4,6,7 N=22	27	13.00					
										28	13.40					
14				100					B-73	29	14.00					
										30	14.45					
15				100				15.00	3,5,6,7,7,9 N=23	31	15.00					
										32	15.40					
16				100					B-101	33	16.00					
										34	16.45					
17				100				17.00	7,6,8,9,11,13 N=41	35	17.00					
										36	17.40					
18				100					B-105	37	18.00					
										38	18.45					
19				100				19.00	2,6,8,10,10,12 N=40	39	19.00					
										40	19.40					

● Small Disturbed Sample	✕ Water Level	LOGGED <u>M.Chiu</u>
○ Large Disturbed Sample	— Standard Penetration Test	
▨ SPT Liner Sample	— Permeability Test	DATE <u>17/07/2013</u>
▨ U76 Undisturbed Sample	⊕ Piezometer Tip	CHECKED <u>S.K.Wong</u>
▨ U100 Undisturbed Sample	⊕ Standpipe Tip	DATE <u>18/07/2013</u>
▨ Mixer Sample	⊕ Pressuremeter Test	
▨ Piston Sample	⊕ Impression Packer Test	
△ Water Sample	∨ Vane Shear Test	

REMARKS



Drillhole Record

Drillhole No. CE44-CB4

Contract No. HY/2012/11

Sheet 3 of 5

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. XY4

E 834628.86

Date 10/07/13 to 15/07/13

N 818611.88

FLUSHING MEDIUM Water

ORIENTATION VERTICAL

GROUND LEVEL +4.78 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
11/07/2013		5.10m at 18:00		100						B=107	41 20.00				See previous page
12/07/2013		5.20m at 08:00									42 20.45				
								21.00	2,5,7,9,10,13 N=39		43 21.00				
											44 21.40				
				100						B=131	45 22.00	-17.22	22.00		Medium dense to dense, brown occasionally grey, silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
											46 22.45				
								23.00	3,6,7,9,14,16 N=46		47 23.00				
											48 23.40				
	24.00 (40mm)			100						B=133	49 24.00				
											50 24.45				
								25.00	3,5,6,7,7,8 N=27		51 25.00				
											52 25.40				
				100						B=106	53 26.00				
											54 26.45				
								27.00	1,1,1,3,4,6 N=14		55 27.00				
											56 27.40				
				90							57 28.00	-23.22	28.00		Medium dense, light grey, slightly clayey silty fine to coarse SAND with some subangular to subrounded fine gravel. (ALLUVIUM)
											58 29.00				
								29.10	2,3,5,5,6,7 N=23		59 29.10				
											60 29.50				
												-25.22	30.00		

<ul style="list-style-type: none"> ● Small Disturbed Sample ■ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▧ U100 Undisturbed Sample ▦ Mazier Sample ▤ Piston Sample △ Water Sample ⊗ Water Level ⊖ Standard Penetration Test ⊕ Permeability Test ⊙ Piezometer Tip ⊚ Standpipe Tip ⊛ Pressuremeter Test ⊜ Impression Packer Test ⊝ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>17/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>18/07/2013</u></p>	REMARKS
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Drillhole Record

Drillhole No. CE44-CB4

Contract No. HY/2012/11

Sheet 4 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **XY4**

E 834628.86

Date 10/07/13 to 15/07/13

N 818611.88

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+4.78 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	FL / Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
				100						61 30.00 62 31.00 63 31.10 64 31.50				V	Extremely weak to very weak, yellowish brown spotted grey and brown, completely decomposed medium grained GRANITE. (Very stiff, sandy clayey SILT with some fine gravel.)
				100						65 32.10 66 33.00 67 33.10 68 33.50					
				100						69 34.00 70 35.00 71 35.10 72 35.50					
				100						73 36.00 74 37.00 75 37.10 76 37.50					
20/07/2013 13/07/2013		4.60m at 18:00 5.50m at 06:00								77 38.63					
	39.00 / 115mm			100	100	100	1.1			T2-101				II	Strong to very strong, grey occasionally brownish grey spotted pink, black and grey, slightly decomposed medium grained GRANITE with widely occasionally medium spaced, rough stepped and undulating, limonite and manganese oxide stained joints, dipping at 50°-60° occasional 60°-70°.

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▨ U76 Undisturbed Sample ▨ U100 Undisturbed Sample ▨ Mazier Sample ▨ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ▽ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M. Chiu</u></p> <p>DATE <u>17/07/2013</u></p> <p>CHECKED <u>S.K. Wong</u></p> <p>DATE <u>18/07/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-CB4

Contract No. HY/2012/11

Sheet 5 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

E 834628.86

Machine & No. **XY4**

N 818611.88

Date 10/07/13 to 15/07/13

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+4.78 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depth (m)	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type	Depth					
13/07/2013 15/07/2013	4.80m at 18:00		100	100	100	100	1.1	40.47		T2-101		40.13		+	II	See previous page	
							0.5			T2-101		41.45					
14/07/2013			100	100	100	100	2.6	42.42		T2-101		42.86		+	II	Drillhole completed at 44.00m	
							0.9			T2-101		44.00	-39.22				44.00
45																	
46																	
47																	
48																	
49																	
50																	

- Small Disturbed Sample
- Large Disturbed Sample
- SPT Liner Sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Muzier Sample
- Piston Sample
- Water Sample
- Water Level
- Standard Penetration Test
- Permeability Test
- Piezometer Tip
- Standpipe Tip
- Pressuremeter Test
- Impression Packer Test
- Vane Shear Test

LOGGED McChiu
 DATE 17/07/2013
 CHECKED S.K.Wong
 DATE 18/07/2013

REMARKS



Drillhole Record

Drillhole No. CE44-CB5

Contract No. HY/2012/11

Sheet 1 of 4

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-35**

E 834528.25

Date 16/07/13 to 22/07/13

N 818517.21

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+4.83 mPD**

Drilling Progress (d/d/m/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (h:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	FL / Test Depths (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description	
										No.	Type/Depth						
16/07/2013										1	• 0.40			[Cross-hatched pattern]		Brown, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)	
										2	• 0.90						
										3	• 1.40						
										4	• 1.90	+2.83	2.00				
																	Wash boring
16/07/2013		4.15m at 18:00															
17/07/2013		3.16m at 08:00															

• Small Disturbed Sample	∇ Water Level	LOGGED <u>M.Chiu</u>
○ Large Disturbed Sample	⊥ Standard Penetration Test	DATE <u>26/07/2013</u>
□ SPT Liner Sample	⊥ Permenibility Test	CHECKED <u>S.I.C.Wong</u>
U76 Undisturbed Sample	⊥ Piezometer Tip	DATE <u>27/07/2013</u>
U100 Undisturbed Sample	⊥ Standpipe Tip	
Mazier Sample	⊥ Pressuremeter Test	
Piston Sample	⊥ Impression Packer Test	
Water Sample	∇ Vane Shear Test	

REMARKS
1. An inspection pit was excavated by hand to a depth of 2.00m.



Drillhole Record

Drillhole No. CE44-CB5

Contract No. HY/2012/11

Sheet 2 of 4

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-35**

E 834528.25

Date 16/07/13 to 22/07/13

N 818517.21

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+4.83 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
	12.00 / 168mm														See previous page
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▨ Maxier Sample ▨ Piston Sample △ Water Sample ⊥ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>26/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>27/07/2013</u></p>	<p>REMARKS</p>
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Drillhole Record

Drillhole No. CE44-CB5

Contract No. HY/2012/11

Sheet 3 of 4

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-35**

E 834528.25

Date 16/07/13 to 22/07/13

N 818517.21

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+4.83 mPD**

Drilling Progress (d/d/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L./Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
															See previous page
17/07/2013		3.62m at 18:00						23.00	3,3, 5,5,6,8 N=24	5 23.00	-18.17	23.00			Medium dense, dark greenish grey, silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
18/07/2013		3.45m at 08:00								6 23.40					
								24.00	4,4, 4,4,6,7 N=21	7 24.00					Firm, dark greenish grey, sandy clayey SILT. (FILL)
										8 24.40					
										9 24.50					
										10 24.95					
										11 25.00					
										12 25.45					
										13 25.50					
										14 25.95					
										15 26.00					
18/07/2013		3.11m at 18:00								16 26.45	-21.67	26.50			
19/07/2013		3.69m at 08:00								17 26.50					
										18 26.95	-22.17	27.00			Dark greenish grey, silty fine to coarse SAND with some angular to subangular fine gravel sized rock and shell fragments. (MARINE DEPOSITS)
										19 27.00					
										20 27.45					Dark grey, clayey silty fine to coarse SAND. (ALLUVIUM)
										21 27.50					
										22 27.95	-23.17	28.00			Light grey, slightly silty fine to coarse SAND with some angular to subangular fine to medium gravel. (ALLUVIUM)
										23 28.00					
										24 28.45	-23.67	28.50			Light brownish grey, slightly silty fine to coarse SAND with some angular to subrounded fine gravel. (ALLUVIUM)
										25 28.50					
										26 28.95					Light brownish grey, slightly silty fine to coarse SAND with some angular to subrounded fine gravel. (ALLUVIUM)
										27 29.00					
19/07/2013		4.01m at 18:00								28 29.45	-24.67	29.50			Light brownish grey, slightly silty fine to coarse SAND with some angular to subrounded fine gravel. (ALLUVIUM)
20/07/2013		4.06m at 18:00								29 29.50					
28/07/2013	30.00 at 18:00									30 29.95	-25.17	30.00			

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample □ SPT Liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▧ Mznier Sample ▦ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ⊕ Water Level ⊖ Standard Penetration Test ⊗ Permeability Test ⊕ Piezometer Tip ⊖ Standpipe Tip ⊕ Pressuremeter Test ⊖ Impression Packer Test ⊕ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>26/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>27/07/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-DH1

Contract No. HY/2012/11

Sheet 1 of 7

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. DR-34

E 834598.55

N 819461.07

Date 22/06/13 to 10/07/13

FLUSHING MEDIUM

ORIENTATION VERTICAL

GROUND LEVEL +5.56 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	P.T. / Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type/Depth					
22/06/2013										1	0.40					Brown, slightly silty fine to coarse SAND with some angular to subangular fine to coarse gravel. (FILL)
										2	0.90					
										3	1.40					
										4	1.90					
										5	2.40					
										6	2.90					
										7	3.40					
				90						T2-101	3.70	+1.86	3.70			Brown, angular to subangular medium to coarse GRAVEL sized moderately strong to strong granite fragments and some firm sandy silt matrix. (FILL) NO RECOVERY
				0						T2-101	4.00	+1.56	4.00			
22/06/2013		3.30m at 18:00		75						8	5.00	+0.46	5.10			Grey occasionally brown, angular to subangular fine to coarse GRAVEL sized moderately strong to strong granite, concrete and asphalt fragments. (FILL)
24/06/2013		4.02m at 08:00		29						T2-101	5.50					
										T2-101	6.20	-0.64	6.20			Dense, brown occasionally greyish brown, slightly silty fine to coarse SAND with some angular to subangular fine to coarse gravel. (FILL)
				0						9	7.20					
				0						10	7.30					
										11	8.30					
24/06/2013		3.50m at 18:00						8.40	3, 7, 8, 13, 16, 9 N=46	12	8.40					
25/06/2013		4.65m at 08:00									8.80					
				0							9.30					

● Small Disturbed Sample	✕ Water Level	LOGGED <u>M.Chiu</u>
○ Large Disturbed Sample	⊥ Standard Penetration Test	DATE <u>15/07/2013</u>
▨ SPT Liner Sample	⊥ Permeability Test	CHECKED <u>S.J.C. Wong</u>
▨ U76 Undisturbed Sample	⊥ Piezometer Tip	DATE <u>16/07/2013</u>
▨ U100 Undisturbed Sample	⊥ Standpipe Tip	
▨ Maxier Sample	⊥ Pressuremeter Test	
▨ Piston Sample	⊥ Impression Packer Test	
△ Water Sample	⊥ Vane Shear Test	

REMARKS
 1. An inspection pit was excavated by hand to a depth of 3.50m.
 2. An in situ vane shear test was undertaken at depth of 16.70m.



Drillhole Record

Drillhole No. CE44-DH1

Contract No. HY/2012/11

Sheet 2 of 7

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. DR-34

E 834598.55
N 819461.07

Date 22/06/13 to 10/07/13

FLUSHING MEDIUM

ORIENTATION VERTICAL

GROUND LEVEL +5.56 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.Y./T Test Depth (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
			0							13					See previous page
11			0							14 15					
23/06/2013		4.5m at 18:00						11.50	4, 6, 11, 14, 14 N=5	16					
26/06/2013		4.5m at 06:00								17	-6.64	12.20			Dark grey, angular COBBLE sized strong tuff fragments. (FILL)
13			10							18	-7.44	13.00			Brown, slightly silty fine to coarse SAND with some angular to subangular fine to coarse gravel. (FILL)
14			0					13.90	2, 3, 1, 1, 2, 3 N=7	19	-8.24	13.90			Loose, dark grey, slightly clayey silty fine to coarse SAND. (FILL)
15			100							20	-8.84	14.40			Dark grey occasionally brown, angular BOULDER sized moderately strong to strong rhyolite and granite fragments. (FILL)
26/06/2013		4.5m at 18:00	74							21					
27/06/2013		4.5m at 08:00	100							22	-9.74	15.30			Firm to stiff, dark greenish grey, slightly sandy silty CLAY with occasional angular to subangular gravel. (FILL)
16			100							23					
27/06/2013		3.5m at 18:00								24					
28/06/2013		4.75m at 06:00								25					
17			100							26					
18	17.75 168mm		100							27	-11.74	17.30			Greyish brown, slightly clayey silty fine to coarse SAND with some angular to subangular fine gravel sized rock and shell fragments. (MARINE DEPOSITS)
19			100							28					
28/06/2013		4.10m at 18:00						19.10	2, 3, 3, 3, 3, 5 N=14	29					
29/06/2013		4.5m at 08:00								30					
20										31	-13.09	18.65			Medium dense, grey and brown, slightly silty fine to coarse SAND with some angular to subangular fine gravel sized rock and shell fragments. (MARINE DEPOSITS)
										32					
										33					
										34					
										35					

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample □ SPT Liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▧ Mazier Sample ▦ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ⊕ Water Level ⊖ Standard Penetration Test ⊗ Permeability Test ⊘ Piezometer Tip ⊙ Standpipe Tip ⊚ Pressuremeter Test ⊛ Impression Packer Test ⊜ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>15/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>16/07/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-DH1

Contract No. HY/2012/11

Sheet 3 of 7

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD <u>Rotary Drilling</u>	CO-ORDINATES <u>E 834598.55</u> <u>N 819461.07</u>	Works Order No.
Machine & No. <u>DR-34</u>		Date <u>22/06/13</u> to <u>10/07/13</u>
FLUSHING MEDIUM	ORIENTATION <u>VERTICAL</u>	GROUND LEVEL <u>+5.56 mPD</u>

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
				0											See previous page
21				100				21.55	B=183 B=13 B=63 2,2,3,3,3 N=11	36 20.60 37 20.65 38 21.05 39 21.10 40 21.50 41 21.55 42 21.95	-15.09	20.65			Medium dense, grey, clayey silty fine to coarse SAND with some subangular to subrounded fine gravel. (ALLUVIUM)
22				100				23.55	B=97 B=116 1,2,3,4,7 N=17	43 22.65 44 23.05 45 23.10 46 23.50 47 23.55 48 23.95	-17.09 -17.54 -17.99	22.65 23.10 23.55			Brown, slightly silty fine to coarse SAND with some subangular to subrounded fine gravel. (ALLUVIUM) Firm to stiff, grey occasionally yellowish brown, slightly sandy silty CLAY. (ALLUVIUM)
23		5.00m at 18:00		100				25.75	2,3,3,4,8 N=19	49 24.65 50 25.65 51 25.75 52 26.15					Extremely weak, pinkish brown occasionally yellowish brown and grey, completely decomposed medium grained GRANITE. (Firm to stiff, sandy clayey SILT.)
24	24.65 140mm	4.10m at 08:00		100				27.75	3,4,7,13,19 N=46	53 26.65 54 27.65 55 27.75 56 28.15					
25				100				29.65	3,7,12,17,20 N=56	57 28.65 58 29.65 59 29.65	-24.09	29.65		V	Extremely weak, greyish brown occasionally yellowish brown, completely decomposed medium grained

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▩ Mazier Sample ▩ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ⊕ Water Level ⊖ Standard Penetration Test ⊖ Permeability Test ⊖ Piezometer Tip ⊖ Standpipe Tip ⊖ Pressuremeter Test ⊖ Impression Packer Test ⊖ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>15/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>16/07/2013</u></p>	REMARKS
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Drillhole Record

Drillhole No. CE44-DH1

Contract No. HY/2012/11

Sheet 4 of 7

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. DR-34

E 834598.55

Date 22/06/13 to 10/07/13

N 819461.07

FLUSHING MEDIUM

ORIENTATION VERTICAL

GROUND LEVEL +5.56 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	P.L. / Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description	
02/07/2013		0.59m at 28:00								60 30.15				V	GRANITE. (Slightly clayey silty fine to coarse SAND with some fine gravel.)	
03/07/2013		3.35m at 08:00		80						61 30.65						
								31.75	3.5, 7, 7, 13, 20 N=47	62 31.65 63 31.75						
										64 32.15						
				80						65 32.65						
								33.75	4, 7, 8, 10, 13, 21 N=52	66 33.65 67 33.75						
										68 34.15						
				80						69 34.65						
								35.75	7, 12, 17, 21, 29, 39 N=106	70 35.65 71 35.75						
				0						72 36.15						
										73 36.65						
										74 37.65	-32.19	37.75		V		Extremely weak to very weak, light yellowish brown, completely decomposed medium grained GRANITE. (Very stiff, sandy clayey SILT with occasional fine gravel.)
03/07/2013		4.26m at 18:00		90						75 38.75						
04/07/2013		4.66m at 08:00						38.85	6, 10, 16, 22, 26, 34 N=98	76 38.85						
										77 39.25						
				80						78 39.75						

● Small Disturbed Sample	✱ Water Level	LOGGED	<u>M.Chiu</u>
○ Large Disturbed Sample	⊥ Standard Penetration Test	DATE	<u>15/07/2013</u>
▨ SPT Liner Sample	⊥ Permeability Test	CHECKED	<u>S.K.Wong</u>
▨ U76 Undisturbed Sample	⊥ Piezometer Tip	DATE	<u>16/07/2013</u>
▨ U100 Undisturbed Sample	⊥ Standpipe Tip		
▨ Mazer Sample	⊥ Pressuremeter Test		
▨ Piston Sample	⊥ Impression Packer Test		
▨ Water Sample	⊥ Vane Shear Test		

REMARKS



Drillhole Record

Drillhole No. CE44-DH1

Contract No. HY/2012/11

Sheet 5 of 7

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. DR-34

E 834598.55

Date 22/06/13 to 10/07/13

N 819461.07

FLUSHING MEDIUM

ORIENTATION VERTICAL

GROUND LEVEL +5.56 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	R.L. / Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type Depth					
04/07/2013	4.00m at 18:00			80				40.85	7,13, 19, 23, 30, 42 N=113	79 40.75 80 40.85 81 41.25				V	See previous page	
05/07/2013	4.85m at 08:00			80				42.85	7,14, 33, 33, 34/40mm (100/190mm)	82 41.75 83 42.75 84 42.85 85 43.14	-36.12	41.75		V	Very weak, yellowish brown, completely decomposed medium grained GRANITE. (Silty fine to coarse SAND with much fine to medium gravel.)	
05/07/2013	4.70m at 18:00	44.85		0				44.85		86 43.75						
06/07/2013	4.60m at 08:00			45	14	0	NI	45.12	11.1	T2-101	-39.56	45.12	+	IV	Weak to moderately weak, brown spotted grey and brown, highly decomposed medium grained GRANITE.	
				100	15	0	NR	45.30		T2-101	-39.74	45.30	+	III	45.12-45.30m: Moderately strong, moderately decomposed.	
				100	15	0	NI	45.86		T2-101	-45.86	45.86	+	IV	No recovery, assumed to be completely decomposed GRANITE.	
				100	96	86	6.7	46.28		T2-101	-46.25	46.28	+	III	Moderately strong occasionally moderately weak and strong, pinkish brown occasionally pink spotted grey and brown, moderately decomposed medium grained GRANITE with closely to medium occasionally very closely spaced, rough stepped and undulating occasionally planar, limonite and manganese oxide stained joints, dipping at 20°-30°, 40°-50° and 50°-60° occasional 0°-10° and 60°-70°.	
				100	77	65	14.3	47.14	>20	T2-101	-47.16	47.14	+	III	45.86-46.28m: Weak to moderately weak, highly decomposed.	
				100	77	65	2.9	47.42		T2-101	-41.86	47.42	+	III	46.53-47.42m: Strong, slightly decomposed.	
				100	77	65	2.9	47.60		T2-101	-42.04	47.60	+	III	47.60-48.07m: Strong, slightly decomposed.	
06/07/2013	3.50m at 18:00			100	47	18		48.28		T2-101	-42.51	48.07	+	III		
08/07/2013	4.50m at 08:00			100	91	61	11.4	49.60		T2-101	-48.40	48.74	+	III		
09/07/2013	4.50m at 08:00			100	91	61	11.4	49.90		T2-101	-48.74	48.74	+	III		
				100	91	61	3.3	49.60		T2-101	-44.36	49.92	+	III	49.32-49.52m: Subvertical joint.	
				100	91	61	3.3	49.90		T2-101	-44.36	49.92	+	III		

● Small Disturbed Sample	↕ Water Level	LOGGED	M. Chiu
○ Large Disturbed Sample	⊥ Standard Penetration Test	DATE	15/07/2013
□ SPT Liner Sample	⊥ Permeability Test	CHECKED	S. C. Wang
□ U76 Undisturbed Sample	⊥ Piezometer Tip	DATE	16/07/2013
□ U100 Undisturbed Sample	⊥ Standpipe Tip		
□ Mazier Sample	⊥ Pressuremeter Test		
□ Piston Sample	⊥ Impression Packer Test		
△ Water Sample	⊥ Vane Shear Test		

REMARKS



Drillhole Record

Drillhole No. CE44-DH1

Contract No. HY/2012/11

Sheet 6 of 7

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. DR-34

E 834598.55

N 819461.07

Date 22/06/13 to 10/07/13

FLUSHING MEDIUM

ORIENTATION **VERTICAL**

GROUND LEVEL +5.56 mPD

Drilling Progress (d/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	E.I./Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
			100	100	100	100	11.1	50.26		T2-101	50.03		+	II	Strong, pink occasionally brown spotted black and grey, slightly decomposed medium grained GRANITE with closely to medium occasionally very closely spaced, rough stepped and undulating occasionally planar, limonite and chlorite stained, calcite coated (up to 1mm) joints, dipping at 0°-10°, 20°-30° and 50°-60° occasional 60°-70°. 50.03-50.24m:Subvertical joint.
			100	96	96	4.8	11.1			T2-101	50.33		+	II	
51								51.30							
			100	92	62	3.8	11.8	51.64		T2-101	51.53		+	III	51.53-51.66m:Moderately strong, moderately decomposed.
62								51.90							
								52.04							
								52.45							
53			89	38	34	5.2		53.00		T2-101	52.45		+	IV	52.63-53.07m:With subvertical joints.
								53.44							
								53.44							
54			54	43	43		NR	54.00		T2-101	53.34		+	V	53.00-53.44m:Weak to moderately weak, highly decomposed. 53.44-54.00m:No recovery, assumed to be completely decomposed granite.
								54.00							
								54.21							
								54.55							
55			95	20	16	>20	NI	54.82		T2-101	54.21		+	II	54.21-54.76m:With subvertical joints.
								54.82							
								55.34							
								55.60							
56			100	74	74	6.3		56.87		T2-101	55.60		+	II	Strong to very strong occasionally moderately strong, pink occasionally brown spotted black and grey, slightly decomposed medium grained GRANITE with medium to widely occasionally very closely to closely spaced, rough stepped and undulating occasionally planar, limonite, manganese oxide and chlorite stained, calcite coated (up to 1mm) joints, dipping at 0°-10°, 40°-50° and 50°-60° occasional 30°-40° and 60°-70°. 55.78-55.87m:Subvertical joint. 56.16-56.58m:A subvertical quartz vein up to 15mm thickness. 56.16-56.95m:With subvertical joints.
57			100	79	79	4.3		57.23		T2-101	56.87		+	II	
								57.93							
			100	100	100	1.0		58.95		T2-101	57.81		+	III	58.95-59.37m:Moderately strong, moderately decomposed.
59								59.24							
								59.37							
60			98	98	98	2.1				T2-101	59.37		+	II	

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample □ SPT Liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▧ Mazer Sample ▦ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ✕ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Factor Test ⊥ Vane Shear Test 	<p>LOGGED <u>M. Clu</u></p> <p>DATE <u>15/07/2013</u></p> <p>CHECKED <u>S.K. Wong</u></p> <p>DATE <u>16/07/2013</u></p>	<p>REMARKS</p>
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Drillhole Record

Drillhole No. CE44-DH1

Contract No. HY/2012/11

Sheet 7 of 7

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. DR-34

E 834598.55

Date 22/06/13 to 10/07/13

N 819461.07

FLUSHING MEDIUM

ORIENTATION VERTICAL

GROUND LEVEL +5.56 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type					
10/07/2013			98	98	98	98	2.1			72-101		-55.12	60.68	+	II	See previous page
																Drillhole completed at 60.68m

<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Small Disturbed Sample <input checked="" type="checkbox"/> Large Disturbed Sample <input checked="" type="checkbox"/> SPT Liner Sample <input checked="" type="checkbox"/> U76 Undisturbed Sample <input checked="" type="checkbox"/> U100 Undisturbed Sample <input checked="" type="checkbox"/> Mazier Sample <input checked="" type="checkbox"/> Piston Sample <input checked="" type="checkbox"/> Water Sample 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Water Level <input checked="" type="checkbox"/> Standard Penetration Test <input checked="" type="checkbox"/> Permeability Test <input checked="" type="checkbox"/> Piezometer Tip <input checked="" type="checkbox"/> Standpipe Tip <input checked="" type="checkbox"/> Pressuremeter Test <input checked="" type="checkbox"/> Impression Packer Test <input checked="" type="checkbox"/> Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>15/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>16/07/2013</u></p>	<p>REMARKS</p>
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Drillhole Record

Drillhole No. CE44-DH3

Contract No. HY/2012/11

Sheet 1 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No. .

Machine & No. **DR-13**

E 834607.56

Date 03/07/13 to 09/07/13

N 819263.82

FLUSHING MEDIUM

ORIENTATION **VERTICAL**

GROUND LEVEL **+7.32 mPD**

Drilling Progress (d/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type/Depth					
03/07/2013										A	0.40					Greyish brown, silty fine to coarse SAND with some angular to subangular fine to coarse gravel. (FILL)
										B	0.90					
										C	1.40					
										D	1.90					
										E	2.30	+5.02	2.30			
				50						T2-101						Light grey, angular to subangular COBBLE with much coarse gravel sized moderately strong concrete fragments. (FILL)
				50						1	3.00	+4.32	3.00			
				55						2	3.90	+3.32	4.00			Brown, slightly clayey silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
				51						T2-101						
				51						3	4.50	+2.82	4.50			Grey, angular to subangular medium to coarse GRAVEL sized strong granite fragments and refuse. (FILL)
				33				4.50	2, 3, 2, 3, 2 N=10	4	4.90					
				67						5	5.00					Loose, brown, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
				67						6	6.00					
				95						7	6.10					Very dense, brown occasionally greyish brown, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
				95						8	6.55					
				100						9	6.60					Very dense, brown occasionally greyish brown, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
				100						10	7.05	+0.22	7.10			
				100						11	7.10					Very dense, brown occasionally greyish brown, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
				100						12	7.50					
				100						13	8.10					Very dense, brown occasionally greyish brown, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
				100						14	8.55					
				100						15	8.60					Very dense, brown occasionally greyish brown, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
				100						16	9.05					
				100						17	9.10					Very dense, brown occasionally greyish brown, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
				100						18	9.50					

<ul style="list-style-type: none"> Small Disturbed Sample Large Disturbed Sample SPT liner Sample U76 Undisturbed Sample U100 Undisturbed Sample Mnizer Sample Piston Sample Water Sample 	<ul style="list-style-type: none"> Water Level Standard Penetration Test Permeability Test Piezometer Tip Standpipe Tip Pressuremeter Test Impression Pnelter Test Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>15/07/2013</u></p> <p>CHECKED <u>S.JC Wong</u></p> <p>DATE <u>16/07/2013</u></p>
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REMARKS
1. An inspection pit was excavated by hand to a depth of 2.30m.



Drillhole Record

Drillhole No. CE44-DH3

Contract No. HY/2012/11

Sheet 2 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-13**

E 834607.56
N 819263.82

Date 03/07/13 to 09/07/13

FLUSHING MEDIUM

ORIENTATION **VERTICAL**

GROUND LEVEL **+7.32 mPD**

Drilling Progress (d/m/y)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.T. / Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
11			100	100					B=163 D=179 4, 7, 13, 16, 20, 23 N=79	19 10.10 20 10.55 21 10.60 22 11.05 23 11.10 24 11.50				See previous page	
12			100	100					D=175 D=193 5, 7, 12, 16, 22, 25 N=75	25 12.10 26 12.55 27 12.60 28 13.05 29 13.10 30 13.50					
13			100	100					B=130 B=33 2, 3, 5, 2, 2, 3 N=10	31 14.10 32 14.55 33 14.60 34 15.05 35 15.10 36 15.50 37 15.60	-6.78	14.10		Firm, dark grey occasional black, sandy clayey SILT with occasional angular to subangular fine gravel. (FILL)	
14			100	100					B=161 6, 8, 10, 11, 12, 15 N=18	38 16.05 39 16.10 40 16.55 41 16.60 42 17.05	-8.78	16.10		Medium dense to dense, light brown, slightly silty fine to coarse SAND. (FILL)	
15			100	100					B=166 B=182 2, 3, 6, 8, 12, 22 N=38	43 17.60 44 18.05 45 18.10 46 18.55 47 18.60 48 19.00				19.00-19.05m:Gravel.	
16			100	100					B=126	49 19.60					

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▧ U100 Undisturbed Sample ▤ Maxier Sample ▥ Piston Sample △ Water Sample ⊥ Water Level ⊢ Standard Penetration Test ⊣ Permeability Test ⊤ Piezometer Tip ⊥ Standpipe Tip ⊦ Pressuremeter Test ⊧ Impression Packer Test ⊨ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>15/07/2013</u></p> <p>CHECKED <u>S.L. Wong</u></p> <p>DATE <u>16/07/2013</u></p>	<p>REMARKS</p>
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Drillhole Record

Drillhole No. CE44-DH3

Contract No. HY/2012/11

Sheet 3 of 5

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling	CO-ORDINATES	Works Order No.
Machine & No. DR-13	E 834607.56 N 819263.82	Date <u>03/07/13</u> to <u>09/07/13</u>
FLUSHING MEDIUM	ORIENTATION VERTICAL	GROUND LEVEL +7.32 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L./Test Depth (m)	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type	Depth					
				100				20.60	U-321 4, 5, 6, 7, 6, 9 N=29	50 20.05 51 20.10 52 20.55 53 20.60 54 21.00						See previous page	
				100				22.60	D-16 B-28 2, 1, 2, 3, 2 N=9	55 21.60 56 22.05 57 22.10 58 22.55 59 22.60 60 23.00	-14.28	21.60			Firm, dark greenish brown, sandy silty CLAY with occasional subangular to subrounded fine gravel sized rock and shell fragments. (MARINE DEPOSITS)		
				100				24.60	B-30 B-85 3, 4, 5, 6, 7, 6 N=24	61 23.60 62 24.05 63 24.10 64 24.55 65 24.60 66 25.00	-16.28	23.60			Stiff to very stiff, orangish brown occasionally light grey, slightly sandy silty CLAY. (ALLUVIUM)		
				100				26.70	3, 3, 5, 8, 10, 12 N=35	67 25.60 68 26.60 69 26.70 70 27.10	-19.38	26.70			Dense, light yellow, silty fine to coarse SAND. (ALLUVIUM)		
				20						71 27.60	-20.28	27.60			Stiff to very stiff, yellowish brown, slightly sandy silty CLAY. (ALLUVIUM)		
05/07/2013 16:00 06/07/2013 08:00	1.42m at 16:00 6.02m at 08:00			90				29.80	2, 3, 3, 4, 3, 4	72 28.60 73 28.70 74 29.70 75 29.80	-21.38	28.70			Medium dense, yellowish brown, silty fine to coarse SAND with some subangular to subrounded fine gravel. (ALLUVIUM)		

<ul style="list-style-type: none"> ■ Small Disturbed Sample ■ Large Disturbed Sample ■ SPT Liner Sample ■ U76 Undisturbed Sample ■ U100 Undisturbed Sample ■ Mazier Sample ■ Piston Sample △ Water Sample ✕ Water Level — Standard Penetration Test — Permeability Test ■ Piezometer Tip □ Standpipe Tip — Pressuremeter Test — Impression Packer Test — Vane Shear Test 	LOGGED <u>M.Chiu</u> DATE <u>15/07/2013</u> CHECKED <u>S.K.Wong</u> DATE <u>16/07/2013</u>	REMARKS
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Drillhole Record

Drillhole No. CE44-DH3

Contract No. HY/2012/11

Sheet 4 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-13**

E 834607.56

Date 03/07/13 to 09/07/13

N 819263.82

FLUSHING MEDIUM

ORIENTATION **VERTICAL**

GROUND LEVEL **+7.32 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test Depths (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type Depth					
									N=14	76	30.20					See previous page
31				100						77	30.70	-23.38	30.70		V	Extremely weak, pinkish brown, completely decomposed medium grained GRANITE. (Firm to stiff, sandy clayey SILT.)
32								31.80	2, 3, 4, 5 N=16	78	31.70					
										79	31.80					
33				90						80	32.20					
										81	32.70					
34								33.80	3, 3, 4, 6, 7, 12 N=29	82	33.70					
										83	33.80					
										84	34.20					
36				85						85	34.70					
										86	35.70	-28.48	35.80		V	Extremely weak, brown, completely decomposed medium grained GRANITE. (Clayey silty fine to coarse SAND with some fine gravel.)
36								35.80	3, 4, 5, 7, 11, 13 N=36	87	35.80					
										88	36.20					
37				85						89	36.70					
										90	37.70	-30.48	37.80		V	Extremely weak to very weak, yellowish brown, completely decomposed medium grained GRANITE. (Slightly clayey silty fine to coarse SAND with some fine to medium gravel.)
38								37.80	3, 4, 7, 13, 17 N=44	91	37.80					
										92	38.20					
39				55						93	38.70					
06/07/2013		1.62m at 18:00								94	39.70					
08/07/2013		6.13m at 00		0							39.80					

<ul style="list-style-type: none"> ■ Small Disturbed Sample ■ Large Disturbed Sample ▨ SPT Liner Sample ▨ U76 Undisturbed Sample ▨ U100 Undisturbed Sample ▨ Monier Sample ▨ Piston Sample ▨ Water Sample 	<ul style="list-style-type: none"> ⊕ Water Level ⊕ Standard Penetration Test ⊕ Permeability Test ⊕ Piezometer Tip ⊕ Standpipe Tip ⊕ Pressuremeter Test ⊕ Impression Packer Test ⊕ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>15/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>16/07/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-DH3

Contract No. HY/2012/11

Sheet 5 of 5

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling	CO-ORDINATES	Works Order No.
Machine & No. DR-13	E 834607.56 N 819263.82	Date <u>03/07/13</u> to <u>09/07/13</u>
FLUSHING MEDIUM	ORIENTATION VERTICAL	GROUND LEVEL +7.32 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	R.I. / Test Depth (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
				0										V	See previous page
41								40.90	4.12, 15.20, 43.22/25mm (100/250mm)	95 40.80 96 40.90 97 41.25					
42				85						98 41.80					
43								42.90	5.14, 26.34, 10/60mm (100/210mm)	99 42.80 100 42.90 101 43.21					
44	44.00 / 115mm			0				44.00		102 43.80 103 43.90	-36.68	44.00		II	
45				100	99	99	3.8			T2-101					Strong to very strong occasionally moderately strong, grey occasionally brown spotted pink, black and grey, slightly decomposed medium grained GRANITE with closely to medium occasionally very closely and widely spaced, rough stepped and undulating occasionally planar, limonite and manganese oxide stained, calcite coated (up to 1mm) joints, dipping at 0°-10°, 20°-30° and 40°-50° occasional 30°-40° and 60°-70°.
46								45.57 45.69	NI		-38.25 -38.37	45.57 45.69		IV II	45.57-45.69m: Weak to moderately weak, highly decomposed.
47				94	87	83	5.9	46.87		T2-101	-39.26 -39.48	46.58 46.80		III II	46.58-46.80m: Moderately strong, moderately decomposed.
48				98	97	79		47.07 47.49 47.73		T2-101	-40.18 -40.39	47.50 47.71		III II	47.40-47.49m: Subvertical joint. 47.50-47.71m: Moderately strong, moderately decomposed.
49		1.86m at 18:00 6.17m at 08:00		100	100	100	0.8	48.17		T2-101	-48.39				
50											-42.16	49.48			Drillhole completed at 49.48m

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample □ SPT Liner Sample ▣ U76 Undisturbed Sample ▤ U100 Undisturbed Sample ▥ Mazier Sample ▧ Piston Sample ▨ Water Sample ⊥ Water Level ⊢ Standard Penetration Test ⊣ Permeability Test ⊤ Piezometer Tip ⊥ Standpipe Tip ⊦ Pressuremeter Test ⊧ Impression Packer Test ⊨ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>15/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>16/07/2013</u></p>	REMARKS
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Drillhole Record

Drillhole No. CE44-DH4

Contract No. HY/2012/11

Sheet 1 of 6

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **BR-21**

E 834738.52

Date 16/07/13 to 25/07/13

N 819224.34

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

REFERENCE LEVEL **+9.08 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depth (m)	Tests	Samples No.	Type	Depth (m)	Reduced Level	Depth (m)	Legend	Grade	Description
16/07/2013										1	ASPHALT PIT	0.40	+8.58	0.50			Firm, orangish brown, sandy clayey SILT with some angular to subangular fine to medium gravel. (FILL)
										2		0.90					Brown, silty fine to coarse SAND with some angular to subangular fine to coarse gravel. (FILL)
				0						3		1.40					2.50-2.60m:Gravel.
										4		2.50					
				90						5		2.60					
										6		3.60	+5.38	3.70			Firm, orangish brown, sandy clayey SILT with some angular to subangular fine to medium gravel. (FILL)
								3.70	2, 2, 1, 3, 3, 2 N=9	7		3.70					
										8		4.10					
16/07/2013		Dry at 18:00								9		4.60	+4.48	4.60			Firm, orangish brown, sandy clayey SILT with some angular to subangular fine to medium gravel. (FILL)
17/07/2013		2.56m at 08:00		100					B=65	10		5.05					Medium dense to dense, brown, silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
								5.10	3, 2, 3, 3, 3, 2 N=11	11		5.10					
										12		5.50					
				100						13		6.60					
									D=220	14		7.05					
								7.10	2, 3, 4, 3, 3 N=13	15		7.10					
										16		7.50					
				0						17		8.60					
									D=366	18		9.05					
		1.78m at 18:00						9.10	4, 6, 9, 13, 14, 14 N=50	19		9.10					
17/07/2013										18		9.10					
18/07/2013		5.09m at 08:00								19		9.50					

● Small Disturbed Sample	⊥ Water Level	LOGGED <u>M.Chiu</u>
○ Large Disturbed Sample	⊥ Standard Penetration Test	DATE <u>31/07/2013</u>
□ SPT Liner Sample	⊥ Permeability Test	CHECKED <u>S.K.Wong</u>
▨ U76 Undisturbed Sample	⊥ Piezometer Tip	DATE <u>01/08/2013</u>
▨ U100 Undisturbed Sample	⊥ Standpipe Tip	
▨ Minzler Sample	⊥ Pressuremeter Test	
▨ Piston Sample	⊥ Impression Packer Test	
▨ Water Sample	⊥ Vane Shear Test	

REMARKS
1. An inspection pit was excavated by hand to a depth of 1.50m.



Drillhole Record

Drillhole No. CE44-DH4

Gold Ram Engineering and Development Limited

Contract No. HY/2012/11

Sheet 2 of 6

PROJECT **Provision of Barrier-Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

E 834738.52

Date 16/07/13 to 25/07/13

Machine & No. **BR-21**

N 819224.34

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

REFERENCE LEVEL **+9.08 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	FI / Test	Depth (m)	Tests	Sampler No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
																See previous page
				100					11.10	B-273 5, 6, 7, 9, 8, 7 N=31	20 10.60 21 11.05 22 11.10 23 11.50	-1.52	10.60			Dense to very dense, grey, slightly silty fine to coarse SAND with some angular to subangular fine to medium gravel. (FILL)
				100					13.10	B-369 6, 7, 9, 10, 10, 12 N=41	24 12.60 25 13.05 26 13.10 27 13.50					
18/07/2013		2.38m at 18:50														
19/07/2013		5.75m at 08:00														
19/07/2013	14.60 68mm	2.10m at 18:00														
20/07/2013		6.18m at 08:00		81					15.10	B-416 7, 9, 11, 14, 15, 20 N=60	28 14.60 29 15.05 30 15.10 31 15.50					
				81					17.10	B-324 6, 8, 10, 12, 14, 19 N=55	32 16.60 33 17.05 34 17.10 35 17.50					
				0					19.10	B-447 7, 10, 13, 15, 16, 20 N=64	36 18.60 37 19.05 38 19.10 38 19.50					

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample □ SPT Liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▧ Marlier Sample ▤ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ✕ Water Level — Standard Penetration Test — Permeability Test ■ Piezometer Tip □ Standpipe Tip ⊕ Pressuremeter Test — Impression Packer Test ∨ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>31/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>01/08/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-DH4Contract No. HY/2012/11Sheet 3 of 6PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **BR-21**

E 834738.52

Date 16/07/13 to 25/07/13

N 819224.34

FLUSHING MEDIUM **Water**ORIENTATION **VERTICAL**REFERENCE LEVEL **+9.08 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
															See previous page
21				0				21.10	D=180 8,10,13,18,20,24 N=75	39 20.60 40 21.05 41 21.50	-11.52	20.60			Very dense, light grey, slightly clayey silty fine to coarse SAND with some angular to subangular fine to coarse gravel. (FILL)
22		2.53m at 18:00													
23		6.75m at 08:00		0				23.10	D=110 8,11,15,17,19,22 N=73	42 22.60 43 23.05	-13.52	22.60			Very dense, grey, slightly silty fine to coarse SAND with some angular to subangular fine to medium gravel. (FILL)
24															
25				0				25.10	D=143 7,9,12,14,16,20 N=62	44 24.60 45 25.05					
26															
27				0				27.10	D=187 1,4,5,7 N=20	46 26.60 47 27.10 48 27.50	-18.02	27.10			Medium dense, yellowish brown, slightly clayey silty fine to coarse SAND with occasional subangular to subrounded fine gravel. (ALLUVIUM)
28															
29				0											
30															

● Small Disturbed Sample	⊗ Water Level	LOGGED	<u>MLChiu</u>
○ Large Disturbed Sample	— Standard Penetration Test	DATE	<u>31/07/2013</u>
▨ SPT Liner Sample	— Permeability Test	CHECKED	<u>S.K.Wong</u>
▨ U76 Undisturbed Sample	■ Piezometer Tip	DATE	<u>01/08/2013</u>
▨ U100 Undisturbed Sample	□ Standpipe Tip		
▨ Mazier Sample	⊕ Pressuremeter Test		
▨ Piston Sample	⊕ Impression Packer Test		
△ Water Sample	∨ Vane Shear Test		

REMARKS



Drillhole Record

Drillhole No. CE44-DH4

Contract No. HY/2012/11

Sheet 4 of 6

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **BR-21**

E 834738.52
N 819224.34

Date 16/07/13 to 25/07/13

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

REFERENCE LEVEL **+9.08 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type					
				20												See previous page
31 22/07/2013 23/07/2013	230m at 18:00 6.91m at 04:00							30.80	3, 3, 2, 4, 6, 8 N=20	51 30.70		-21.72	30.80			Very dense, yellowish brown, slightly clayey silty fine to coarse SAND with occasional subangular to subrounded fine gravel. (ALLUVIUM)
32				40						53 31.70		-22.62	31.70			Very stiff, yellowish brown, sandy clayey SILT. (ALLUVIUM)
33								32.80	4, 7, 10, 11, 13, 16 N=50	54 32.70 55 32.80 56 33.20						
34	34.80 140mm			100				34.80	7, 11, 14, 13, 16, 18 N=61	57 33.70 58 34.70 59 34.80 60 35.20		-24.62	33.70	V		Extremely weak, reddish brown, completely decomposed medium grained GRANITE. (Very stiff, slightly sandy clayey SILT.)
36				100				36.80	8, 12, 14, 17, 23, 25 N=79	61 35.70 62 36.70 63 36.80 64 37.20 65 37.70 66 38.70 67 38.80		-26.62	35.70	V		Extremely weak, pinkish brown, completely decomposed medium grained GRANITE. (Very stiff, sandy clayey SILT.)
38				50												
39				80												
40								39.90	8, 12	68 39.80 69 39.90		-30.72	39.80	V		Extremely weak, greyish brown occasionally pink,

- Small Disturbed Sample
- Large Disturbed Sample
- SPT Liner Sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mnzler Sample
- Piston Sample
- △ Water Sample
- ✕ Water Level
- Standard Penetration Test
- Permeability Test
- Piezometer Tip
- Standpipe Tip
- Pressuremeter Test
- Impression Packer Test
- Vane Shear Test

LOGGED M.Chiu
DATE 31/07/2013
CHECKED S.K.Wong
DATE 01/08/2013

REMARKS



Drillhole Record

Drillhole No. CE44-DH4

Contract No. HY/2012/11

Sheet 5 of 6

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

E 834738.52

Machine & No. BR-21

N 819224.34

Date 16/07/13 to 25/07/13

FLUSHING MEDIUM Water

ORIENTATION VERTICAL

REFERENCE LEVEL +9.08 mPD

Drilling Progress (d/m/y)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test Depth (m)	Tests	No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
									14, 17, 25, 30 N=86	70 40.30				V	completely decomposed medium grained GRANITE. (Slightly clayey silty fine to coarse SAND.)
41				80						71 40.80					
42								41.90	9, 13, 18, 20, 26, 32 N=96	72 41.80 73 41.90					
23/07/2013		2.50m at 18:00								74 42.30					
24/07/2013		6.66m at 08:00		75						75 42.80					
43										76 43.80 77 43.90					
44				90						78 44.90 79 45.00					
45								45.00	6, 9, 10, 13, 15, 18 N=56	80 45.40					
46				95						81 45.90					
47								47.00	5, 8, 10, 12, 14, 16 N=52	82 46.90 83 47.00					
48				90						84 47.40					
49	49.11	2.46m at 18:00								85 47.90	-38.82	47.90		V	Extremely weak to very weak, yellowish brown, completely decomposed medium grained GRANITE. (Slightly silty fine to coarse SAND with some fine to coarse gravel.)
24/07/2013	115mm	18:00						49.00	32, 16/10mm, 100/20mm (100/20mm)	86 48.90 87 49.07	-40.03 -40.13	49.11 49.21		III	Strong occasionally moderately strong and very strong, pink occasionally brown spotted black and grey, slightly decomposed medium grained GRANITE with closely to medium occasionally very closely spaced, rough stepped and undulating occasionally planar,
25/07/2013		6.76m at 08:00		100	99	98	4.6	49.11		T2-101	-40.74	49.82		II	
50														III	

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample □ SPT Liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▧ Muzier Sample ▦ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ✕ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>31/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>01/08/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-DH4

Contract No. HY/2012/11

Sheet 6 of 6

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

E 834738.52

Date 16/07/13 to 25/07/13

Machine & No. **BR-21**

N 819224.34

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

REFERENCE LEVEL **+9.08 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (h:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
61				100	99	98				T2-101	50.64	50.04	+	II	limonite, manganese oxide and chlorite stained, calcite coated (up to 1mm) joints, dipping at 20°-30°, 40°-50° and 50°-60° occasional 0°-10° and 60°-70°. 49.11-49.21m: Moderately strong, moderately decomposed. 49.82-50.04m: Moderately strong, moderately decomposed. 51.37-51.64m: Subvertical joint. 53.30-53.68m: Subvertical joint. 53.93-54.18m: With subvertical joints. 54.30-54.44m: Subvertical joint. 54.59-54.94m: Subvertical joint.
62				100	77	77	4.6	15.8		T2-101	52.10		+		
63				100	90	90	4.1			T2-101	53.68		+		
64				98	47	42		0.0		T2-101	54.34	54.94	+		
25/07/2013		2.21m at 18:00									45.86	54.94	+		
65															Drillhole completed at 54.94m
66															
67															
68															
69															
60															

<ul style="list-style-type: none"> ■ Small Disturbed Sample ▣ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▧ U100 Undisturbed Sample ▦ Mnzier Sample ▤ Piston Sample ▣ Water Sample 	<ul style="list-style-type: none"> ✕ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>31/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>01/08/2013</u></p>	<p>REMARKS</p>
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Drillhole Record

Drillhole No. CE44-DH 5

Contract No. HY/2012/11

Sheet 2 of 8

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD Rotary Drilling	CO-ORDINATES E 834726.35 N 819097.99	Works Order No.
Machine & No. XY2B-4		Date <u>31/08/13</u> to <u>11/09/13</u>
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	GROUND LEVEL +5.32 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) /Size (mm)	Water level (m) /Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	S.L./Test Depth (m)	Tests	Sample No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
31/08/2013 02/09/2013	12.00 168mm	3.28m at 18:00 4.03m at 06:00						10.00	3.1 2, 1, 3 N=4	20 10.00 21 10.40					See previous page
				87					B=60	22 11.00 23 11.45					
								12.00	1.2 1, 1, 3, 4 N=3	24 12.00 25 12.40					
				89					B=57	26 13.00 27 13.45	-7.68	13.00			Loose to medium dense, dark brown occasionally grey, slightly clayey silty fine to medium SAND with some fine to medium gravel sized rock and shell fragments. (FILL)
								14.00	2.2 1, 1, 1, 2 N=4	28 14.00 29 14.40					
				91					B=52	30 15.00 31 15.45					
								16.00	3.1 2, 1, 1, 4 N=4	32 16.00 33 16.40					
				100					B=41	34 17.00 35 17.45					
								18.00	1.2 2, 3, 4, 3 N=12	36 18.00 37 18.40					
				100					B=31	38 19.00 39 19.45					
											-14.68	20.00			

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▩ Master Sample ▩ Piston Sample ▩ Water Sample ✕ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>18/09/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>19/09/2013</u></p>	<p>REMARKS</p>
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Drillhole Record

Drillhole No. CE44-DH 5

Contract No. HY/2012/11

Sheet 3 of 8

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **XY2B-4**

E 834726.35

Date 31/08/13 to 11/09/13

N 819097.99

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.32 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m)	Water level (m) /Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Failure Index	F.L./Test Depth (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
								20.00	2, 2, 4, 4 N=12	40 20.00 41 20.40					Firm, grey occasionally brownish grey and black, silty CLAY with occasional angular to subangular fine to medium gravel sized rock and shell fragments. (FILL)
				100				22.10	2, 3, 4, 3, 4 N=13	42 21.00 43 22.00 44 22.30 45 22.50					
				100				24.10	6, 9, 10, 10, 9, 6 N=35	46 23.00 47 24.00 48 24.10 49 24.50	-17.68	23.00			Medium dense to dense, light brown occasionally yellowish brown and brown, silty fine to coarse SAND with some angular to subangular fine to medium gravel. (ALLUVIUM)
				44				26.00	B=54 5, 6, 7, 7, 5, 5 N=24	50 25.00 51 25.45 52 26.00 53 26.40					
02/09/2013 03/09/2013		3.30m at 18:00 4.90m at 08:00		67				28.00	B=65 5, 5, 7, 6, 7 N=29	54 27.00 55 27.45 56 28.00 57 28.40					
				81						58 29.00	-23.68	29.00		V	Very weak to weak, reddish brown occasionally yellowish brown and brown spotted white and black, completely decomposed medium grained GRANITE. (Stiff to very stiff, slightly clayey sandy SILT with occasional angular to subangular fine to medium gravel.)

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample □ SPT Liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▧ Mazier Sample ▤ Fluton Sample △ Water Sample 	<ul style="list-style-type: none"> x Water Level — Standard Penetration Test — Permeability Test — Piezometer Tip — Standpipe Tip — Pressuremeter Test — Impression Packer Test — Vane Shear Test 	<p>LOGGED <u>M.Chin</u></p> <p>DATE <u>18/09/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>19/09/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-DH 5

Contract No. HY/2012/11

Sheet 4 of 8

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. XY2B-4

E 834726.35

Date 31/08/13 to 11/09/13

N 819097.99

FLUSHING MEDIUM Water

ORIENTATION VERTICAL

GROUND LEVEL +5.32 mPD

Drilling Progress (Gd/mam/yyyy)	Casing depth (m) /Size (mm)	Water level (m) /Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R-QD %	Fracture Index	F.L./Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description	
										No.	Type/Depth						
								30.10	58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78	30.00 30.10 30.50 31.00 32.00 32.10 32.50 33.00 34.00 34.10 34.50 35.00 36.00 36.10 36.50 37.00 38.00 38.10 38.50 39.00						See previous page	
03/09/2013	33.00	130m at 10:00						32.10	63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78								
04/09/2013	140mm	130m at 10:00						34.10	70, 71, 72, 73, 74, 75, 76, 77, 78								
								36.10	72, 73, 74, 75, 76, 77, 78								
								38.10	76, 77, 78								

- Small Disturbed Sample
- Large Disturbed Sample
- ▨ SPT Liner Sample
- ▩ U76 Undisturbed Sample
- ▧ U100 Undisturbed Sample
- ▦ Maxir Sample
- ▤ Piston Sample
- △ Water Sample
- ✕ Water Level
- ⊖ Standard Penetration Test
- ⊕ Permeability Test
- ⊗ Piezometer Tip
- ⊘ Standpipe Tip
- ⊙ Pressuremeter Test
- ⊚ Impression Packer Test
- ⊛ Vane Shear Test

LOGGED M.Chiu
 DATE 18/09/2013
 CHECKED S.K.Wong
 DATE 19/09/2013

REMARKS

 Gold Ram Engineering and Development Limited	Drillhole Record	Drillhole No. <u>ICE44-DHSI</u>
	Contract No. <u>HY/2012/11</u>	Sheet <u>5</u> of <u>8</u>

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling	CO-ORDINATES E 834726.35 N 819097.99	Works Order No.
Machine & No. XY2B-4		Date <u>31/08/13</u> to <u>11/09/13</u>
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	GROUND LEVEL +5.32 mPD

Drillhole Progress (dd/mm/yyyy)	Casing depth (m)	Casing Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	K _L / Test Depth (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
									40.10	7, 8, 9, 10, 24, 28 N=71	79 40.00 80 40.10 81 40.50				V	See previous page
					88				42.10	5, 10, 12, 14, 24, 35 N=85	82 41.00 83 42.00 84 42.10 85 42.50					
					88				44.10	5, 6, 8, 14, 15, 24 N=61	86 43.00 87 44.00 88 44.10 89 44.50					
			3.78m at 18:00 4.64m at 06:00		100				46.10	15, 20, 100/50mm (100/50mm)	90 45.00 91 46.00 92 46.10 93 46.25	-40.78	46.10		V	Weak occasionally very weak, brown occasionally yellowish brown and grey spotted white and black, completely decomposed medium grained GRANITE. (Very stiff, slightly clayey sandy SILT with some angular to subangular fine to medium gravel.)
					100				48.10	12, 25, 15, 40, 55/20mm (100/170mm)	94 47.00 95 48.00 96 48.10 97 48.27					
					100						98 49.00					

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample □ SPT Liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ■ Mixer Sample □ Piston Sample △ Water Sample * Water Level — Standard Penetration Test — Permeability Test — Piezometer Tip — Standpipe Tip — Pressuremeter Test — Impression Packer Test — Vane Shear Test 	LOGGED <u>M.Chlu</u> DATE <u>18/09/2013</u> CHECKED <u>S.K.Wong</u> DATE <u>19/09/2013</u>	REMARKS
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Drillhole Record

Drillhole No. CE44-DH 5

Contract No. HY/2012/11

Sheet 6 of 8

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **XY2B-4**

E 834726.35

Date 31/08/13 to 11/09/13

N 819097.99

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.32 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	FL / Test Depth (m)	Tests	Samples No. Type Depth	Residual Level	Depth (m)	Legend	Grade	Description
								50.10	15.25 100/40mm (100/40mm)	99 50.00 100 50.10 101 50.24				V	See previous page
				92						102 51.00					
								52.10	50/20mm, 100/40mm (100/40mm)	103 52.00 104 52.11					
				84						105 53.00					
								54.10	50/20mm, 100/40mm (100/20mm)	106 54.00 107 54.12					
08/09/2013 06/09/2013		3.7m at 18:30 4.85m at 08:09		100						108 55.00					
								56.10	50, 100 (100/75mm)	109 56.00 110 56.10 111 56.20					
				100						112 57.00					
								58.10	50, 100/40mm (100/40mm)	113 58.00 114 58.10 115 58.17					
				80						116 59.00					

- Small Disturbed Sample
- Large Disturbed Sample
- SPT Liner Sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mudler Sample
- Piston Sample
- Water Sample
- Water Level
- Standard Penetration Test
- Permeability Test
- Piezometer Tip
- Standpipe Tip
- Pressuremeter Test
- Impression Packer Test
- Vane Shear Test

LOGGED M.Chiu
 DATE 18/09/2013
 CHECKED SK.Wong
 DATE 19/09/2013

REMARKS



Drillhole Record

Drillhole No. CE44-DH 5

Contract No. HY/2012/11

Sheet 7 of 8

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **XY2B-4**

E 834726.35

Date 31/08/13 to 11/09/13

N 819097.99

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.32 mPD**

Drilling Progress (Date/Time)	Casing depth (m) (Size (mm))	Water level (m) (Time (hh:mm))	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	FL / Test Depth (m)	Tests	Samples No. Type Depth	Recover Level	Depth (m)	Legend	Grade	Description
								60.10	50/40mm, 100/10mm (100/10mm)	117 = 60.00 118 = 60.11				V	See previous page
61															
62		3.53m at 18:08						62.10	50/10mm, 100/50mm (100/50mm)	120 = 62.00 121 = 62.12					
63		4.65m at 06:04													
64	64.10 115mm	3.78m at 18:04						64.10	50/10mm, 100/50mm (100/50mm)	122 = 64.00 124 = 64.10					
65		4.13m at 06:04						65.00	50/10mm, 100/50mm (100/50mm)	125 = 65.01					
66															
67								67.00	50/10mm, 100/50mm (100/50mm)	126 = 67.00					
68	68.12 89mm							68.12 68.24						IV III	Moderately strong occasionally strong and moderately weak, pinkish grey occasionally brown and yellowish brown spotted grey, white, black, moderately decomposed fine to medium grained GRANITE with closely to medium occasional very closely spaced, rough stepped and undulating, limonite, manganese oxide and chlorite stained, calcite coated (up to 1mm) joints, dipping at 20°-30°, 30°-40° and 40°-50° occasional 10°-20° and 50°-60°. 68.12-68.24m: Moderately weak, highly decomposed.
69				100	92	76		68.97		TNW					
70				100	98	92		69.57 69.89		TNW					

<ul style="list-style-type: none"> • Small Disturbed Sample ○ Large Disturbed Sample □ SPT Liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ■ Master Sample □ Piston Sample □ A Water Sample 	<ul style="list-style-type: none"> ⊕ Water Level ⊖ Standard Penetration Test ⊗ Permeability Test ⊙ Piezometer Tip ⊙ Standpipe Tip ⊙ Pressuremeter Test ⊙ Impression Packer Test ⊙ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>18/09/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>19/09/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-DH 5

Contract No. HY/2012/11

Sheet 8 of 8

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **XY2B-4**

E 834726.35

Date 31/08/13 to 11/09/13

N 819097.99

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL: **+5.32 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L./Test Depth (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
10/09/2013 17:00		2.80m ± 12:00		100	98	92	3.8	70.55		DNW				III	
17/09/2013 06:00		4.01m ± 06:00		100	94	77	3.2	71.79 71.92 72.10		DNW					72.18-73.16m: Moderately weak
				100	92	68	9.4 3.6 9.1 6.9 >20	72.74 73.02 73.22 73.33 73.62		DNW					
11/09/2013								73.72			-68.40	73.72			Drillhole completed at 73.72m

- Small Disturbed Sample
- Large Disturbed Sample
- SPT L liner Sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mazda Sample
- Piston Sample
- Water Sample
- Water Level
- Standard Penetration Test
- Permeability Test
- Piezometer Tip
- Standpipe Tip
- Pressuremeter Test
- Impression Packer Test
- Vane Shear Test

LOGGED M.Chu
 DATE 18/09/2013
 CHECKED S.K.Wong
 DATE 19/09/2013

REMARKS



Drillhole Record

Drillhole No. CE44-DH5A

Contract No. HY/2012/11

Sheet 1 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **Y4**

E 834589.46

Date 20/07/13 to 22/07/13

N 819219.02

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+6.39 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	E.L. / Test Depths (m)	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type	Depth					
20/07/2013										1	*	0.40					Medium dense to dense, brown occasionally greyish brown, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
										2	INSPECTION PT.	0.60					
										3	*	1.40					
				180					B-45	4	*	1.50					
										5	*	1.95					
								2.50	1,2,3,3,5 N=13	6	*	2.50					
										7	*	2.90					
				180					B-58	8	*	3.50					
										9	*	3.95					
								4.50	2,2,3,4,4,5 N=16	10	*	4.50					
										11	*	4.90					
				180					B-68	12	*	5.50					
										13	*	5.95					
								6.50	2,3,3,5,5,6 N=19	14	*	6.50					
										15	*	6.90					
				180					B-70	16	*	7.50					
										17	*	7.95					
								8.50	1,2,3,3,5,6 N=19	18	*	8.50					
										19	*	8.90					
				89					D-80	20	*	9.50					
										21	*	9.95					

● Small Disturbed Sample	⊕ Water Level	LOGGED <u>M.Chiu</u>
○ Large Disturbed Sample	⊖ Standard Penetration Test	DATE <u>26/07/2013</u>
□ SPT Liner Sample	⊙ Permeability Test	CHECKED <u>S.K.Wong</u>
▨ U76 Undisturbed Sample	⊕ Piezometer Tip	DATE <u>27/07/2013</u>
▩ U100 Undisturbed Sample	⊖ Standpipe Tip	
▧ Mnzier Sample	⊙ Pressuremeter Test	
□ Piston Sample	⊖ Impression Packer Test	
△ Water Sample	⊙ Vane Shear Test	

REMARKS
1. An inspection pit was excavated by hand to a depth of 1.50m.



Drillhole Record

Drillhole No. CE44-DH5A

Contract No. HY/2012/11

Sheet 2 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **Y4**

E 834589.46

Date 20/07/13 to 22/07/13

N 819219.02

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+6.39 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) /Size (mm)	Water level (m) /Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description	
								10.50	1, 2, 3, 3, 4, 6 N=16	22 10.50 23 10.90					See previous page	
				89					B=90	24 11.50 25 11.95						
								12.50	2, 3, 4, 5, 8, 9 N=26	26 12.50 27 12.90						
				89					B=104	28 13.50 29 13.95						
								14.50	3, 3, 5, 5, 6, 7 N=23	30 14.50 31 14.90						
				100					B=96	32 15.50 33 15.95						
								16.50	3, 4, 5, 5, 7, 8 N=25	34 16.50 35 16.90						
				89					B=112	36 17.50 37 17.95						
								18.50	3, 4, 6, 7, 9, 11 N=33	38 18.50 39 18.90						
				100					B=118	40 19.50 41 19.95	-13.11	19.50				
20/07/2013																Medium dense, grey, slightly clayey silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)

<ul style="list-style-type: none"> ■ Small Disturbed Sample ▬ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▧ U100 Undisturbed Sample ▨ Mazier Sample ▭ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> * Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>26/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>27/07/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-DH5A

Contract No. HY/2012/11

Sheet 3 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **Y4**

E 834589.46

Date 20/07/13 to 22/07/13

N 819219.02

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+6.39 mPD**

Drilling Progress (d/d/mm/yyyy)	Casing depth (m) /Size (mm)	Water level (m) /Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	FT / Test Depth (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
21/07/2013															See previous page
				100				20.50	2, 4, 6, 7, 7, 8 N=28	42 20.50 43 20.90					
									B=93	44 21.50 45 21.95					
								22.50	1, 2, 2, 3, 3, 5 N=13	46 22.50 47 22.90					
				99					B=105	48 23.50 49 23.95	-17.11	23.50			Very stiff, greyish brown, sandy clayey SILT with some angular to subangular fine gravel. (FILL)
								24.50	1, 4, 6, 8, 8, 10 N=32	50 24.50 51 24.90					
				98						52 25.50	-19.11	25.50			Medium dense to dense, yellowish brown, slightly clayey silty fine to coarse SAND with some subangular to subrounded fine gravel. (ALLUVIUM)
								26.60	2, 3, 5, 7, 8, 11 N=32	53 26.50 54 26.60 55 27.00					
				98						56 27.50					
								28.60	3, 4, 6, 8, 11, 13 N=38	57 28.50 58 28.60 59 29.00					
				98						60 29.50					

<ul style="list-style-type: none"> ● Small Disturbed Sample ■ Large Disturbed Sample □ SFT Liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▧ Minzier Sample ▦ Plston Sample △ Water Sample 	<ul style="list-style-type: none"> ✕ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>26/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>27/07/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-DH5A

Contract No. HY/2012/11

Sheet 4 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **Y4**

E 834589.46

Date 20/07/13 to 22/07/13

N 819219.02

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+6.39 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) /Size (mm)	Water level (m) /Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.T. / Test Depths (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										Na.	Type/Depth					
				90						61 62 63	30.50 30.60 31.00					See previous page
				90					2,3 6,6,7,8 N=27	64 65 66 67	31.50 32.50 32.60 33.00	-25.11	31.50		VI	Stiff to very stiff, reddish brown, sandy clayey SILT. (RESIDUAL SOIL)
				90					1,2 4,5,6,8 N=23	68 69 70 71 72	33.50 34.50 34.60 35.00 35.20					
				80					1,3 3,5,8,9 N=25	73	36.20	-29.11	35.50		V	Extremely weak to very weak, yellowish brown, completely decomposed medium grained GRANITE. (Slightly silty fine to coarse SAND with some fine to medium gravel.)
21/07/2013	36.30 15mm										36.20	-29.91	36.30		IV	
22/07/2013											36.40	-30.01	36.40		II	Strong to very strong occasionally moderately strong, pink occasionally brown spotted black and grey, slightly decomposed medium grained GRANITE with medium to widely occasionally very closely to closely spaced, rough stepped and undulating occasionally planar, limonite, manganese oxide and chlorite stained joints, dipping at 0°-10°, 40°-50° and 60°-70° occasional 20°-30° and 50°-60°.
				100	89	77			NI 18.2	T2-101						36.30-36.40m: Weak to moderately weak, highly decomposed.
				93	90	90			2.2 20.0	T2-101						38.15-39.24m: Slightly chloritized granite.
				94	67	63			4.6	T2-101						38.48-38.57m: Subvertical joint.
				100	92	92			8.0	T2-101						38.88-39.03m: Subvertical joint.

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▨ U76 Undisturbed Sample ▨ U100 Undisturbed Sample ▨ Muzier Sample ▨ Piston Sample ▨ Water Sample 	<ul style="list-style-type: none"> ⊥ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M.Chin</u></p> <p>DATE <u>26/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>27/07/2013</u></p>	<p>REMARKS</p>
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Drillhole Record

Drillhole No. CE44-DH5A

Contract No. HY/2012/11

Sheet 5 of 5

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract I

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. Y4

E 834589.46

Date 20/07/13 to 22/07/13

N 819219.02

FLUSHING MEDIUM Water

ORIENTATION VERTICAL

GROUND LEVEL +6.39 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / size (mm)	Water level (m) / Time (h:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	FL / Test Depth (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
41			100	100	92	92		40.05		T2-101 40.54			+	II	40.05-41.66m: Slightly chloritized granite.
22/07/2013			100	100	100	100	0.0			T2-101 41.66	-35.27	41.66	+		Drillhole completed at 41.66m
42															
43															
44															
45															
46															
47															
48															
49															
50															

<ul style="list-style-type: none"> ● Small Disturbed Sample ■ Large Disturbed Sample □ SPT Liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▭ Mazier Sample ▮ Piston Sample △ Water Sample ⊠ Water Level ⊞ Standard Penetration Test ⊟ Permeability Test ⊠ Piezometer Tip ⊡ Standpipe Tip ⊢ Pressuremeter Test ⊣ Impression Packer Test ⊤ Vane Shear Test 	<p>LOGGED <u>M. Chiu</u></p> <p>DATE <u>26/07/2013</u></p> <p>CHECKED <u>S.K. Wong</u></p> <p>DATE <u>27/07/2013</u></p>	<p>REMARKS</p>
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Drillhole Record

Drillhole No. CE44-DH 5B

Contract No. HY/2012/11

Sheet 1 of 7

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-33**

E 834728.45

Date 31/08/13 to 13/09/13

N 819123.18

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.39 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) /Size (mm)	Water Level (m) /Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I./Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type/Depth					
31/08/2013										1	• 0.40					Firm to stiff, brown occasionally dark brown, sandy SILT with some angular to subangular fine to medium gravel and occasional rootlets. (FILL)
										2	• 0.90					
										3	• 1.40					
										4	• 1.90					
										5	• 2.40					
										6	• 2.90					
								3.20	2, 3, 4, 7, 11 N=16	7	• 3.40					
										8	• 3.90					
										9	• 4.40					
										10	• 4.90	+0.39	5.00			
										11	• 5.40					Yellowish brown occasionally brown, silty fine to medium SAND. (FILL)
31/08/2013	6.00									12	• 5.90					Medium dense to very dense, dark grey occasionally brownish grey and brown, silty occasionally clayey silty fine to coarse SAND with some angular to subangular fine to medium gravel sized rock and shell fragments. (FILL)
02/09/2013	6.80m	5.00m at 04:00								13	• 6.00	-0.61	6.00			
										14	• 6.45					
										15	• 7.00					
								7.00	13, 14, 18, 16, 17, 18 N=69	16	• 7.40					
										17	• 8.00					
										18	• 8.45					
										19	• 9.00					
								9.00	5, 6, 8, 12, 22 N=154	20	• 9.40					

- Small Disturbed Sample
- Large Disturbed Sample
- SPT L liner Sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mazfer Sample
- Piston Sample
- Water Sample
- Water Level
- Standard Penetration Test
- Permeability Test
- Piezometer Tip
- Standpipe Tip
- Pressuremeter Test
- Impression Packer Test
- Vane Shear Test

REMARKS
1. An inspection pit was excavated by hand to a depth of 2.00m.

LOGGED M. Chiu
DATE 18/09/2013
CHECKED S.K. Wong
DATE 19/09/2013



Drillhole Record

Drillhole No. CE44-DH 5B

Contract No. HY/2012/11

Sheet 2 of 7

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-33**

E 834728.45
N 819123.18

Date 31/08/13 to 13/09/13

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.39 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) /Size (mm)	Water level (m) /Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L./Test Depth (m)	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type	Depth					
11				0					D-73	21	10.45					See previous page	
				0													
12							11.50	5, 7, 9, 10 N=31	D=30	22	10.90						
14		5.00m at 06:00		80					D=60	23	11.50						
16				78			13.50	5, 4, 7, 8, 9 N=19	D=69	24	11.90						
17				81					D=22	25	12.50						
18				89			15.50	7, 5, 10, 11, 14 N=43	D=29	26	12.95						
19							17.50	2, 3, 4, 5, 6 N=21	D=22	27	13.50						
20							19.50	3, 3, 4, 5, 5 N=18	D=29	28	13.90						

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample □ SPT Liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▧ Maxier Sample ▦ Piston Sample ▤ Water Sample 	<ul style="list-style-type: none"> ⊕ Water Level ⊖ Standard Penetration Test ⊗ Permeability Test ⊘ Piezometer Tip ⊙ Standpipe Tip ⊚ Pressuremeter Test ⊛ Impression Packer Test ⊜ Vane Shear Test 	<p>LOGGED <u>M.Chlu</u></p> <p>DATE <u>18/09/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>19/09/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-DH 5B

Contract No. HY/2012/11

Sheet 3 of 7

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-33**

E 834728.45
N 819123.18

Date 31/08/13 to 13/09/13

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.39 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depth (m)	Tests	Sample No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
03/09/2013 06/09/2013		3.00m at 08:00		80						41 B-36 20.50 42 20.95					See previous page
								21.50	4, 7, 7, 11, 15 N=30	43 21.50 44 21.90	-16.11	21.50			Dense to very dense, brown occasionally yellowish brown, silty fine to medium SAND with occasional fine to medium gravel. (FILL)
				100						45 22.50 46 23.50 47 23.60 48 24.00					
								23.60	8, 7, 11, 9, 12, 19 N=51	49 D-84 24.50 50 D-54 25.00 51 25.45	-19.11	24.50			Stiff to very stiff, brown occasionally grey and brownish grey, sandy SILT. (FILL)
06/09/2013 07/09/2013		3.00m at 08:00								52 26.00 53 26.40	-20.61	26.00			Medium dense to very dense, dark brown occasionally brown, clayey silty fine to coarse SAND with occasional angular to subangular fine to medium gravel. (ALLUVIUM)
				100						54 27.00 55 28.00 56 28.10 57 28.50					
								28.10	1, 2, 13, 15, 22, 24 N=78						
				10							-23.61	29.00		V	Very weak, reddish brown occasionally yellowish brown and brown spotted white and black, completely decomposed medium grained GRANITE. (Stiff to very stiff, slightly clayey sandy SILT with occasional fine to medium gravel.)

● Small Disturbed Sample	✕ Water Level	LOGGED <u>M.Chiu</u>
○ Large Disturbed Sample	⊥ Standard Penetration Test	DATE <u>18/09/2013</u>
▨ SPT Liner Sample	⊥ Permeability Test	CHECKED <u>S.J.C. Wong</u>
▨ U76 Undisturbed Sample	⊥ Piezometer Tip	DATE <u>19/09/2013</u>
▨ U100 Undisturbed Sample	⊥ Standpipe Tip	
▨ Mixer Sample	⊥ Pressuremeter Test	
▨ Piston Sample	⊥ Impression Packer Test	
▨ Water Sample	⊥ Vane Shear Test	

REMARKS



Drillhole Record

Drillhole No. CE44-DH 5B

Contract No. HY/2012/11

Sheet 4 of 7

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD Rotary Drilling	CO-ORDINATES E 834728.45 N 819123.18	Works Order No.
Machine & No. DR-33		Date <u>31/08/13</u> to <u>13/09/13</u>
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	GROUND LEVEL +5.39 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) /Size (mm)	Water level (m) /Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I./Test Depth (m)	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type	Depth					
				100						58	30.00				V	See previous page	
									2, 3, 4, 7, 11 N=26	59	30.10						
										60	31.10						
										61	31.20						
										62	31.60						
				0							32.10						
										63	33.10						
											33.20						
07/09/2013										64	34.20						
09/09/2013		3.00m at 04:00							11, 14, 16, 26, 27, 30 N=29	65	34.30						
											34.70						
				0							35.20						
										67	36.20						
				80						68	36.30						
											37.30						
									2, 5, 6, 12, 13, 16 N=47	69	37.30						
										70	37.40						
										71	37.80						
											38.30						
				100						72	38.30						
											39.30						
									3, 4, 5, 6, 7 N=21	73	39.30						
										74	39.40						
										75	39.80						

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▨ Mazler Sample ▩ Piston Sample △ Water Sample ✕ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M. Chiu</u></p> <p>DATE <u>18/09/2013</u></p> <p>CHECKED <u>S.K. Wong</u></p> <p>DATE <u>19/09/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-DH 5B

Contract No. HY/2012/11

Sheet 5 of 7

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. DR-33

E 834728.45
N 819123.18

Date 31/08/13 to 13/09/13

FLUSHING MEDIUM Water

ORIENTATION VERTICAL

GROUND LEVEL +5.39 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	FL / Test Depth (m)	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type	Depth					
09/09/2013	41.40			80						76		40.30				See previous page	
10/09/2013	140mm							2, 2, 3, 4 N=12		77		41.30					
		3.60m @ 06:50								78		41.80					
				0						79		43.30					
										80		43.40					
				87						81		44.40					
								2, 6, 12, 16, 21 N=55		82		44.50					
										83		44.90					
				160						84		45.40					
								2, 7, 11, 17, 21 N=56		85		46.40					
										86		46.50					
										87		46.90					
				80						88		47.40					
								1, 2, 7, 12, 13, 22 N=54		89		48.40					
										90		48.50					
										91		48.90					
				0								49.40					

<ul style="list-style-type: none"> ● Small Disturbed Sample ■ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▧ U100 Undisturbed Sample ▦ Mazer Sample ▤ Piston Sample ▣ Water Sample 	<ul style="list-style-type: none"> ✕ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ∨ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>18/09/2013</u></p> <p>CHECKED <u>S.K. Wong</u></p> <p>DATE <u>19/09/2013</u></p>	REMARKS
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Drillhole Record

Drillhole No. CE44-DH 5B

Contract No. HY/2012/11

Sheet 6 of 7

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-33**

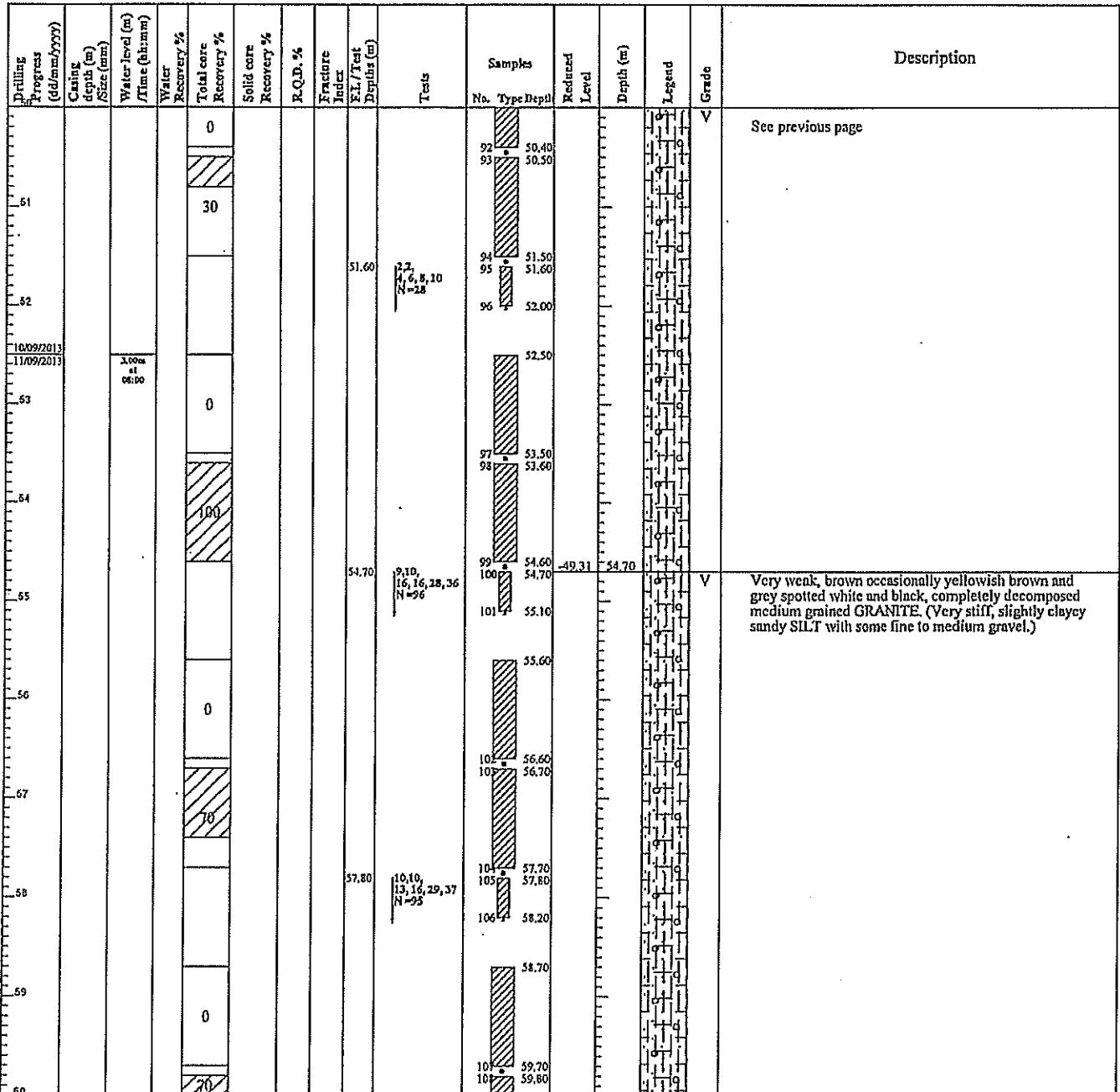
E 834728.45
N 819123.18

Date 31/08/13 to 13/09/13

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.39 mPD**



<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample □ U76 Undisturbed Sample ▨ U100 Undisturbed Sample ▨ Mazier Sample □ Piston Sample □ Water Sample x Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>18/09/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>19/09/2013</u></p>	<p>REMARKS</p>
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Drillhole Record

Drillhole No. CE44-DH 5B

Contract No. HY/2012/11

Sheet 7 of 7

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

E 834728.45

Machine & No. **DR-33**

N 819123.18

Date 31/08/13 to 13/09/13

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.39 mPD**

Drilling Progress (add/am/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	S.L./Test	Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
											No.	Type/Depth					
61	61.90			20													See previous page
11/09/2013	15mm																
16/09/2013		3.00m at 06:00		97	45	34	10.0		61.90			T2-101	-56.81	61.80		IV	Strong occasionally moderately strong and very strong, pinkish grey occasionally brownish grey and brown spotted white and black, slightly decomposed fine to medium grained GRANITE with closely to medium occasionally very closely spaced, rough stepped and undulating occasionally planar, limonite, manganese oxide and chlorite stained, calcite coated (up to 1mm) joints, dipping at 20°-30°, 30°-40° and 40°-50° occasional 10°-20° and 30°-60°.
				100	100	72	4.8 >20 3.0		62.30 62.51 62.62			T2-101		62.20		III II	
63																	61.90-62.00m: Moderately weak, highly decomposed. 62.00-62.20m: Moderately strong, moderately decomposed.
				100	100	87	16.7 10.0 3.6 15.8 6.3		62.95 63.07 63.17 63.45 63.64 63.80			T2-101		63.17			
64																	64.60-64.80m: Moderately strong occasionally moderately weak, moderately decomposed.
				100	97	84	2.0 8.8 11.1		64.29 64.63 64.90			T2-101		64.44 64.60 64.80		III II	
65																	Drillhole completed at 67.45m
				100	97	89	2.1 3.8 4.3 5.9		65.38 65.50 66.13 66.30			T2-101		65.87			
66																	Drillhole completed at 67.45m
				99	97	89	1.7 3.6 8.3 0.0		66.88 67.16 67.28			T2-101		67.45			
67																	Drillhole completed at 67.45m
68																	Drillhole completed at 67.45m
69																	Drillhole completed at 67.45m
70																	Drillhole completed at 67.45m

● Small Disturbed Sample	⊠ Water Level	LOGGED <u>M.Chlu</u>
○ Large Disturbed Sample	⊡ Standard Penetration Test	DATE <u>18/09/2013</u>
⊞ SPT Liner Sample	⊢ Permeability Test	CHECKED <u>S.K.Wong</u>
⊞ U76 Undisturbed Sample	⊣ Piezometer Tip	DATE <u>19/09/2013</u>
⊞ U100 Undisturbed Sample	⊤ Standpipe Tip	
⊞ Mazda Sample	⊥ Pressuremeter Test	
⊞ Piston Sample	⊦ Impression Packer Test	
⊞ Water Sample	⊧ Vane Shear Test	

REMARKS



Drillhole Record

Drillhole No. CE44-DH8

Contract No. HY/2012/11

Sheet 1 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

E 834559.17

Date 23/07/13 to 29/07/13

Machine & No. **DR-300**

N 818494.70

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

REFERENCE LEVEL **+6.20 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depths (m)	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type	Depth					
23/07/2013										1	•	0.40					Brown, fine to coarse SAND with some angular to subangular fine gravel. (FILL)
										2	•	0.90					
										3	•	1.40					
										4	•	1.90	+4.20	2.00			
				100					B=59	5	▨	2.00					Medium dense, grey, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
										6	▨	2.45					
								3.00	2, 4, 4, 6, 7 N=21	7	▨	3.00					
										8	▨	3.40					
				100					B=65	9	▨	4.00					
										10	▨	4.45					
								5.00	2, 3, 5, 5, 5, 8 N=23	11	▨	5.00					
										12	▨	5.40					
				100					B=79	13	▨	6.00	+0.20	6.00			Greyish brown, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
										14	▨	6.45					
								7.00	4, 6, 7, 7, 10, 11 N=35	15	▨	7.00	-0.80	7.00			Medium dense to very dense, grey, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
										16	▨	7.40					
				89					B=82	17	▨	8.00					
23/07/2013										18	▨	8.45					
24/07/2013		2.60m at 08:00								19	▨	9.00					
								9.00	2, 2, 3, 3, 4, 5 N=17	20	▨	9.40					

<ul style="list-style-type: none"> ■ Small Disturbed Sample ▨ Large Disturbed Sample ▨ SPT Liner Sample ▨ U76 Undisturbed Sample ▨ U100 Undisturbed Sample ▨ Mixer Sample ▨ Piston Sample ▨ Water Sample 	<ul style="list-style-type: none"> ▨ Water Level ▨ Standard Penetration Test ▨ Permeability Test ▨ Piezometer Tip ▨ Standpipe Tip ▨ Pressuremeter Test ▨ Impression Packer Test ▨ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>08/08/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>09/08/2013</u></p>
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REMARKS
1. An inspection pit was excavated by hand to a depth of 2.00m.



Drillhole Record

Drillhole No. CE44-DH8

Contract No. HY/2012/11

Sheet 2 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

E 834559.17

Date 23/07/13 to 29/07/13

Machine & No. **DR-300**

N 818494.70

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

REFERENCE LEVEL **+6.20 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test	Depth (m)	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
											No.	Type	Depth					
				100						B-91	21	10.00			See previous page			
											22	10.45						
11								11.00		3,4,6,7,9 N=28	23	11.00						
											24	11.40						
				100						B-96	25	12.00						
											26	12.45						
								13.00		3,5,5,6,6 N=22	27	13.00						
											28	13.40						
				100						B-92	29	14.00						
		1.70m at 18:00									30	14.45						
24/07/2013		2.70m at 08:00									31	15.00						
25/07/2013								15.00		4,6,7,9,9,12 N=37	32	15.40						
											33	16.00						
				100						B-103	34	16.45						
											35	17.00						
17								17.00		3,4,6,7,10,11 N=34	36	17.40						
											37	18.00						
				100						B-118	38	18.45						
											39	19.00						
								19.00		5,7,7,8,10,11 N=36	40	19.40						

- Small Disturbed Sample
- Large Disturbed Sample
- ▨ SPT Liner Sample
- ▨ U76 Undisturbed Sample
- ▨ U100 Undisturbed Sample
- ▨ Mnzier Sample
- ▨ Piton Sample
- ▨ Water Sample
- ✕ Water Level
- Standard Penetration Test
- Permenibility Test
- Piezometer Tip
- Standpipe Tip
- Pressuremeter Test
- Impression Packer Test
- Vane Shear Test

LOGGED M.Chiu
 DATE 08/08/2013
 CHECKED S.K.Wong
 DATE 09/08/2013

REMARKS



Drillhole Record

Drillhole No. CE44-DH8

Contract No. HY/2012/11

Sheet 3 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD Rotary Drilling	CO-ORDINATES E 834559.17 N 818494.70	Works Order No.
Machine & No. DR-300		Date <u>23/07/13</u> to <u>29/07/13</u>
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	REFERENCE LEVEL +6.20 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L./Test Depths (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type/Depth					
25/07/2013	1.40m ± 18:00			100					B-105	41	20.00					See previous page
26/07/2013	3.20m ± 08:00							4,6,7,9,10,13 N=39	42	20.45						
21																
22				100					B-109	45	22.00					
										46	22.45					
23																
										47	23.00					
										48	23.40					
24				100					D-102	49	24.00					
										50	24.45					
25																
										51	25.00					
										52	25.40					
26				100					B-119	53	26.00					
										54	26.45					
27																
										55	27.00	-20.80	27.00			Firm, dark greenish grey, very sandy silty CLAY with occasional angular to subangular fine gravel sized rock and shell fragments. (MARINE DEPOSITS)
										56	27.40					
28				100					D-76	57	28.00	-21.80	28.00			Dense, dark grey, slightly silty fine to coarse SAND with some angular to subangular fine gravel sized rock and shell fragments. (MARINE DEPOSITS)
										58	28.45					
29																
										59	29.00					
										60	29.40					
30	30.00 (40mm)											-23.80	30.00			

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample □ SPT Liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample △ Minzler Sample □ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ✕ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>08/08/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>09/08/2013</u></p>	REMARKS
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Drillhole Record

Drillhole No. CE44-DH8
 Sheet 4 of 5

Contract No. HY/2012/11

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD Rotary Drilling	CO-ORDINATES	Works Order No.
Machine & No. DR-300	E 834559.17 N 818494.70	Date <u>23/07/13</u> to <u>29/07/13</u>
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	REFERENCE LEVEL +6.20 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L./Test Depth (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
26/07/2013	2.10m at 18:00	3.10m at 08:00	100	100	100				I-51	61		30.00			Stiff, reddish brown occasionally light brown, slightly sandy silty CLAY. (ALLUVIUM)
27/07/2013										62		30.45			
31									3.5, 5, 6, 5, 8 N=24	63		31.00			
										64		31.40			
32			100							65		32.00		V	Extremely weak, reddish brown, completely decomposed medium grained GRANITE. (Firm to stiff, slightly sandy clayey SILT.)
33									2, 3, 4, 4, 5 N=16	66		33.00			
										67		33.10			
										68		33.50			
34			100							69		34.00			
35									3.5, 5, 6, 8, 9 N=28	70		35.00		V	Extremely weak, yellowish brown, completely decomposed medium grained GRANITE. (Stiff to very stiff, sandy clayey SILT.)
										71		35.10			
										72		35.50			
36			100							73		36.00			
37									5, 7, 8, 11, 14, 20 N=53	74		37.00			
										75		37.10			
										76		37.50			
38	38.45	2.60m at 18:00	100							77		38.00		V	Very weak, yellowish brown, completely decomposed medium grained GRANITE. (Fine to coarse SAND with much fine to coarse gravel.)
27/07/2013	15mm									78		38.35			
29/07/2013												38.45			
39			100		80	72				T2-101				III	Strong to very strong occasionally moderately strong, pink occasionally brownish grey spotted black and grey, slightly decomposed medium grained GRANITE with medium to widely occasionally very closely to closely spaced, rough stepped and undulating occasionally planar, limonite stained, calcite coated (up to 1mm) joints, dipping at 20°-30°, 40°-50°, 50°-60° and 60°-70° occasional 0°-10° and 20°-30°.
							6.8							II	
							11.1								
							4.3								
40			100		86	86				T2-101					Moderately strong, moderately

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample □ SPT Liner Sample ▤ U76 Undisturbed Sample ▥ U100 Undisturbed Sample ▧ Maxier Sample ▨ Piston Sample △ Water Sample ✱ Water Level ⊥ Standard Penetration Test ⊕ Permeability Test ⊖ Piezometer Tip ⊙ Standpipe Tip ⊗ Pressuremeter Test ⊘ Impression Packer Test ⊙ Vane Shear Test 	LOGGED <u>MC Chiu</u> DATE <u>08/08/2013</u> CHECKED <u>S.K. Wong</u> DATE <u>09/08/2013</u>
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REMARKS



Drillhole Record

Drillhole No. CE44-DH8

Contract No. HY/2012/11

Sheet 5 of 5

PROJECT Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-300**

E 834559.17
N 818494.70

Date 23/07/13 to 29/07/13

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

REFERENCE LEVEL **+6.20 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	FL / Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type					
29/07/2013				100	86	86	7.2	40.04			T2-101				II	decomposed. 38.45-38.80m:Subvertical joint. 43.11-43.25m:Subvertical joint.
				100	100	100	1.8	41.01			T2-101					
				100	100	84		43.25			T2-101					
								15.6				43.57	43.57			Drillhole completed at 43.57m

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample □ SPT L liner Sample ▨ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ⊠ Muzier Sample ⊡ Piston Sample △ Water Sample ▽ Water Level ⊥ Standard Penetration Test ⊢ Permeability Test ⊣ Piezometer Tip ⊤ Standpipe Tip ⊥ Pressuremeter Test ⊦ Impression Packer Test ⊧ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>08/08/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>09/08/2013</u></p>	REMARKS
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Drillhole Record

Drillhole No. CE44-DH9

Contract No. HY/2012/11

Sheet 1 of 7

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-13**

E 834453.94

Date 15/07/13 to 23/07/13

N 818386.63

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.48 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depths (m)	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type	Depth					
15/07/2013										1	•	0.40				Medium dense to very dense, greyish brown occasionally brown, slightly silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)	
										2	•	0.90					
										3	•	1.40					
				0						4	•	1.90					
										5	•	2.00					
									B-130	6	▨	3.00					
										7	▨	3.10					
										8	▨	3.55					
										9	▨	4.10					
								4.10	3.6, 10, 13, 16, 21 N=60	10	▨	4.50					
										11	▨	5.10					
									B-132	12	▨	5.55					
										13	▨	6.10					
								6.10	2.5, 11, 14, 17, 22 N=64	14	▨	6.50					
										15	▨	7.10					
										16	▨	7.55					
										17	▨	8.10					
								8.10	3.6, 13, 17, 20, 25 N=75	18	▨	8.50					
										19	▨	9.10					
									B-151	20	▨	9.55					

• Small Disturbed Sample	✕ Water Level	LOGGED <u>M.Chiu</u>
▨ Large Disturbed Sample	⊥ Standard Penetration Test	DATE <u>26/07/2013</u>
▨ SPT Liner Sample	⊥ Permeability Test	CHECKED <u>S.K.Wong</u>
▨ U76 Undisturbed Sample	⊥ Piezometer Tip	DATE <u>27/07/2013</u>
▨ U100 Undisturbed Sample	⊥ Standpipe Tip	
▨ Mazier Sample	⊥ Pressuremeter Test	
▨ Piston Sample	⊥ Impression Packer Test	
▨ Water Sample	⊥ Vane Shear Test	

REMARKS
1. An inspection pit was excavated by hand to a depth of 2.00m.



Drillhole Record

Drillhole No. CE44-DH9

Contract No. HY/2012/11

Sheet 2 of 7

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-13**

E 834453.94

Date 15/07/13 to 23/07/13

N 818386.63

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.48 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I./Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
								10.10	4,7, 15, 18, 22, 27 N=82	20 10.10 21 10.50					See previous page
				100					B=160	22 11.10 23 11.53					
								12.10	2,8, 11, 11, 10, 7 N=39	24 12.10 25 12.50	-6.62	2.10			Dense to very dense, dark greenish grey occasionally brown, silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
				100					B=117	26 13.70 27 13.55					
								14.10	3,7, 13, 12, 13, 15 N=5	28 14.10 29 14.50					
				100					B=122	30 15.10 31 15.55					
								16.10	3,8, 14, 12, 14, 16 N=56	32 16.10 33 16.50					
				100					B=129	34 17.10 35 17.55					
		0.67m at 18:00						18.10	3,7, 13, 13, 14, 14 N=54	36 18.10 37 18.50					
15/07/2013		3.76m at 08:00							B=139	38 19.10 39 19.55					
16/07/2013				100											

- Small Disturbed Sample
- Large Disturbed Sample
- ▨ SPT Liner Sample
- ▨ U76 Undisturbed Sample
- ▨ U100 Undisturbed Sample
- ▨ Mazier Sample
- ▨ Piston Sample
- ▨ Water Sample
- ✱ Water Level
- ⊥ Standard Penetration Test
- ⊥ Permeability Test
- ⊥ Piezometer Tip
- ⊥ Standpipe Tip
- ⊥ Pressuremeter Test
- ⊥ Impression Packer Test
- ⊥ Vane Shear Test

REMARKS

LOGGED M.Chiu

DATE 26/07/2013

CHECKED S.K.Wong

DATE 27/07/2013



Drillhole Record

Drillhole No. CE44-DH9

Contract No. HY/2012/11

Sheet 3 of 7

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-13**

E 834453.94

Date 15/07/13 to 23/07/13

N 818386.63

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.48 mPD**

Drilling Progress (d/mm/yy)	Casing depth (m) /Size (mm)	Water level (m) /Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L./Test Depth (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
								20.10	4,6,13,15,17,19 N=64	40 20.10 41 20.50					See previous page
				180					B=143	42 21.10 43 21.55					
								22.10	6,9,15,18,21,27 N=81	44 22.10 45 22.50					
				180					B=119	46 23.10 47 23.55					
								24.10	7,11,16,20,25,30 N=97	48 24.10 49 24.50					
				180					B=142	50 25.10 51 25.55					
								26.10	8,13,15,18,22,28 N=63	52 26.10 53 26.50					
				180					B=80	54 27.10 55 27.55					
								28.10	2,3,4,5,8,10 N=27	56 28.10 57 28.50					
				180					B=91	58 29.10 59 29.55	-23.62	29.10			

● Small Disturbed Sample	⊗ Water Level	LOGGED <u>M.Chu</u>
○ Large Disturbed Sample	⊥ Standard Penetration Test	DATE <u>16/07/2013</u>
▨ SPT Liner Sample	⊥ Permeability Test	CHECKED <u>S.K.Wong</u>
▨ U76 Undisturbed Sample	⊥ Piezometer Tip	DATE <u>27/07/2013</u>
▨ U100 Undisturbed Sample	⊥ Standpipe Tip	
▨ Mazier Sample	⊥ Pressuremeter Test	
▨ Piston Sample	⊥ Impression Factor Test	
△ Water Sample	⊥ Vane Shear Test	

REMARKS



Drillhole Record

Drillhole No. CE44-DH9

Contract No. HY/2012/11

Sheet 4 of 7

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-13**

E 834453.94

Date 15/07/13 to 23/07/13

N 818386.63

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.48 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
								30.10	7,10, 12, 16, 20, 28 N=76	60 30.10 61 30.50					See previous page
16/07/2013	0.65m at 18:00			100					B-229	62 31.10 63 31.55	-25.62	31.10			Very stiff, reddish brown occasionally light brown, slightly sandy silty CLAY. (ALLUVIUM)
17/07/2013	3.55m at 08:00							32.10	2, 3, 4, 5, 10 N=22	64 32.10 65 32.50					
				0						66 33.10 67 34.10 67 34.20					
				100				35.30	2, 3, 4, 5, 8, 12 N=29	68 35.20 69 35.30 70 35.70					
				100						71 36.20 72 37.20 73 37.30	-30.72	36.20			Very dense, yellowish brown, clayey silty fine to coarse SAND with some subangular to subrounded fine gravel. (ALLUVIUM)
17/07/2013	1.50m at 18:00							37.30	7, 12, 14, 16, 18, 18 N=66	74 37.70					
18/07/2013	5.00m at 09:00			95						75 38.20 76 39.20 77 39.30	-32.72	38.20	V		Extremely weak, pinkish brown occasionally pink, completely decomposed medium grained GRANITE. (Very stiff, slightly sandy clayey SILT.)
								39.30	6, 10, 12, 14, 16, 17 N=59	78 39.70					

<ul style="list-style-type: none"> ■ Small Disturbed Sample ■ Large Disturbed Sample ■ SPT Liner Sample ■ U76 Undisturbed Sample ■ U100 Undisturbed Sample ■ Muzler Sample ■ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ✕ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M. Cidu</u></p> <p>DATE <u>26/07/2013</u></p> <p>CHECKED <u>S.K. Wong</u></p> <p>DATE <u>27/07/2013</u></p>
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REMARKS



Drillhole Record

Drillhole No. CE44-DH9

Contract No. HY/2012/11

Sheet 5 of 7

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-13**

E 834453.94

Date 15/07/13 to 23/07/13

N 818386.63

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.48 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L./Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type/Depth					
18/07/2013				95						79	40.20				V	See previous page
19/07/2013	4.47m at 08:00							41.30	2, 3, 6, 9, 13 N=31	80 41.20 81 41.30						
19/07/2013				100						82	41.70					
19/07/2013										83	42.20					
22/07/2013	2.23m at 18:00							43.30	10, 12, 16, 18, 20, 22 N=76	84 43.20 85 43.30						
22/07/2013	4.47m at 08:00			100						86	43.70					
19/07/2013										87	44.20				V	Extremely weak, yellowish brown, completely decomposed medium grained GRANITE. (Very stiff, sandy clayey SILT.)
22/07/2013	2.23m at 18:00							45.30	20, 21, 23, 25, 25 N=96	88 45.20 89 45.30						
22/07/2013	4.47m at 08:00			95						90	45.70					
19/07/2013										91	46.20				V	Extremely weak to very weak, greenish grey occasionally pink, completely decomposed slightly chloritized medium grained GRANITE. (Silty fine to coarse SAND with some fine to coarse gravel.)
22/07/2013				0						92	46.90 47.00					
19/07/2013				95						93	47.40					
19/07/2013								48.10	50/60mm, 100/50mm (100/50mm)	94	48.16					
19/07/2013				95						95	49.00					

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▩ Mnziel Sample ▩ Riston Sample △ Water Sample 	<ul style="list-style-type: none"> ⊥ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M.Chitt</u></p> <p>DATE <u>26/07/2013</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>27/07/2013</u></p>	REMARKS
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Drillhole Record

Drillhole No. CE44-DH9

Contract No. HY/2012/11

Sheet 6 of 7

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-13**

E 834453.94

N 818386.63

Date 15/07/13 to 23/07/13

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.48 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test Depth (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
									50/65mm, 100/45mm (100/45mm)	96 50.00 97 50.16				V	See previous page
									50/60mm, 100/40mm (100/40mm)	98 51.00 99 52.00 100 52.15					
	53.00 115mm			0						101 53.00					
				60	0	0	NI			T2-101 53.50	-48.02	53.50		IV	Weak to moderately weak, greenish grey, completely decomposed slightly chloritized medium grained GRANITE.
				53	52	0	NI			T2-101 54.00	-48.52	54.00		V	
				100	89	89	5.0			T2-101 54.27	-48.79	54.27		IV	No recovery, assumed to be completely decomposed GRANITE.
				100	87	83	>20			T2-101 54.87	-49.39	54.87		III	
				100	87	83	8.3			T2-101 54.97	-49.49	54.97		IV	Moderately strong to strong occasionally very strong, pink occasionally brownish grey spotted black and grey, slightly decomposed medium grained GRANITE with occasional microfractures. Joints are closely to medium occasionally very closely and widely spaced, rough stepped and undulating, limonite stained, calcite coated (up to 1mm) joints, dipping at 0°-10°, 40°-50° and 50°-60° occasional 20°-30° and 30°-40°.
				100	87	83	>20			T2-101 55.45	-49.74	55.22		III	
				100	74	40	>20			T2-101 55.55	-50.65	56.13		II	54.00-54.27m: Weak to moderately weak, highly decomposed. 54.27-54.87m: Moderately strong, moderately decomposed. 54.87-54.97m: Weak to moderately weak, highly decomposed. 54.97-55.22m: Moderately strong, moderately decomposed.
				100	100	100	1.6			T2-101 56.13	-50.99	56.47		III	
				100	100	100	0.9			T2-101 56.47	-51.11	59.59		II	56.13-56.47m: Moderately strong, moderately decomposed.
				100	100	100	4.8			T2-101 57.07	-54.38	59.86		III	
				100	100	100	1.5			T2-101 57.95				II	59.59-59.86m: Moderately strong, moderately decomposed.
				100	100	100	1.5			T2-101 58.28				II	

● Small Disturbed Sample	⊥ Water Level	LOGGED <u>M. Chiu</u>
⊔ Large Disturbed Sample	⊥ Standard Penetration Test	DATE <u>26/07/2013</u>
⊔ SPT Liner Sample	⊥ Permeability Test	CHECKED <u>S.K. Wong</u>
⊔ U76 Undisturbed Sample	⊥ Piezometer Tip	DATE <u>27/07/2013</u>
⊔ U100 Undisturbed Sample	⊥ Standpipe Tip	
⊔ Mazier Sample	⊥ Pressuremeter Test	
⊔ Piston Sample	⊥ Impression Packer Test	
⊔ Water Sample	⊥ Vane Shear Test	

REMARKS



Drillhole Record

Drillhole No. CE44-DH9

Contract No. HY/2012/11

Sheet 7 of 7

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-13**

E 834453.94

Date 15/07/13 to 23/07/13

N 818386.63

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.48 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
23/07/2013		1.62m at 18:00		100	100	100	1.5	10.0 60.60 60.70		T2-101 -61.00 T2-101 -61.79	-56.31	61.79	+	II	See previous page
				100	100	100	1.2	61.55							Drillhole completed at 61.79m

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▧ U100 Undisturbed Sample ▦ Mnzier Sample ▤ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ⊥ Water Level ⊥ Standard Penetration Test ⊥ Permenibility Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>26/07/2013</u></p> <p>CHECKED <u>S.I.C.Wong</u></p> <p>DATE <u>27/07/2013</u></p>	REMARKS
---	--	--	---------



Drillhole Record

Drillhole No. CE44-DH10

Contract No. HY/2012/11

Sheet 1 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

E 834525.33

Machine & No. **DR-35**

N 818511.97

Date 24/07/13 to 31/07/13

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+4.81 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L./Test Depths (m)	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type	Depth					
24/07/2013										1	•	0.40	+4.31	0.50			Grey, sandy angular to subangular fine to coarse GRAVEL sized strong tuff fragments. (FILL)
										2	•	0.90					Grey, slightly clayey silty fine to coarse SAND with some angular to subangular fine gravel. (FILL)
										3	•	1.40	+3.31	1.50			
				180					D-52	4	▨	1.90					Loose to medium dense, brown occasionally brownish grey, slightly silty fine to coarse SAND with some angular to subangular fine to medium gravel. (FILL)
										5	▨	2.00					
								3.00	3, 3, 4, 4, 5, 6 N=19	7	▨	3.00					
									D-55	9	▨	4.00					
				180						10	▨	4.45					
								5.00	2, 2, 3, 3, 5, 5 N=18	11	▨	5.00					
									D-57	13	▨	6.00					
				180						14	▨	6.45					
								7.00	2, 2, 3, 3, 3, 5 N=14	15	▨	7.00					
									D-46	17	▨	8.00					
				89						18	▨	8.45					
								9.00	2, 2, 3, 3, 3, 3 N=11	19	▨	9.00					
24/07/2013		3.41m at 18:00								20	▨	9.40					
25/07/2013		3.61m at 08:00															

• Small Disturbed Sample	↕ Water Level	LOGGED <u>M.Chin</u>
▨ Large Disturbed Sample	⊥ Standard Penetration Test	DATE <u>08/08/2013</u>
▨ SPT Liner Sample	⊥ Permeability Test	CHECKED <u>S.K.Yong</u>
▨ U76 Undisturbed Sample	⊥ Piezometer Tip	DATE <u>09/08/2013</u>
▨ U100 Undisturbed Sample	⊥ Standpipe Tip	
▨ Mazier Sample	⊥ Pressuremeter Test	
▨ Piston Sample	⊥ Impression Packer Test	
Δ Water Sample	↕ Vane Shear Test	

REMARKS
1. An inspection pit was excavated by hand to a depth of 2.00m.



Drillhole Record

Drillhole No. CE44-DH10

Contract No. HY/2012/11

Sheet 2 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **DR-35**

E 834525.33

Date 24/07/13 to 31/07/13

N 818511.97

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+4.81 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) /Size (mm)	Water level (m) /Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.O.P. %	Fracture Index	F.L./Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type/Depth					
									B-74	21	10.00					See previous page
										22	10.45					
11								11.00	2, 2, 1, 2, 3, 3 N=9	23	11.40					
	12.00 168mm								B-88	24	12.00					
										25	12.45					
13								13.00	2, 2, 3, 4, 6, 6 N=19	26	13.00					
										27	13.40					
14		3.46m 18:00							B-107	28	14.00					
25/07/2013		18:00								29	14.45					
26/07/2013		3.71m 08:00								30	15.00					
15								15.00	2, 3, 3, 3, 4, 7 N=17	31	15.40					
16									B-110	32	16.00					
										33	16.45					
17								17.00	2, 4, 5, 6, 6 N=21	34	17.00	-12.19	17.00		Stiff, grey, sandy clayey SILT. (FILL)	
										35	17.40					
18									B-66	36	18.00	-13.19	18.00		Medium dense, brown occasionally brownish grey, slightly silty fine to coarse SAND with some angular to subangular fine to medium gravel. (FILL)	
										37	18.45					
19								19.00	2, 2, 3, 3, 3 N=11	38	19.00					
										39	19.40					
20																

● Small Disturbed Sample	⊠ Water Level	LOGGED <u>M.Chiu</u>
○ Large Disturbed Sample	⊡ Standard Penetration Test	DATE <u>08/08/2013</u>
□ SPT Liner Sample	⊢ Permeability Test	CHECKED <u>S.K.Wong</u>
▤ U76 Undisturbed Sample	⊣ Piezometer Tip	DATE <u>09/08/2013</u>
▥ U100 Undisturbed Sample	⊤ Standpipe Tip	
▧ Mazier Sample	⊥ Pressuremeter Test	
▨ Piston Sample	⊦ Impression Packer Test	
△ Water Sample	⊧ Vane Shear Test	

REMARKS



Drillhole Record

Drillhole No. CE44-DH10

Contract No. HY/2012/11

Sheet 5 of 5

PROJECT **Provision of Barrier - Free Access Facilities for Highway Structures - Phase 3 Contract 1**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

E 834525.33

Date 24/07/13 to 31/07/13

Machine & No. **DR-35**

N 818511.97

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+4.81 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
				100						80 40.00 81 41.00 82 41.10 83 41.50				V	Extremely weak to very weak, greyish brown, completely decomposed medium grained GRANITE. (Silty fine to coarse SAND with some fine to medium gravel.)
	41.65 / 115mm			80	25	0	NI	3.3	5.5, 9, 16, 30, 41 N=96	T2-101 41.65 41.85 42.05	-36.84 -37.04	41.65 41.85	+	IV II	Strong to very strong occasionally moderately strong, pink occasionally brown spotted pink, black and grey, slightly decomposed medium grained GRANITE with medium to widely occasionally very closely to closely spaced, rough stepped and undulating occasionally planar, limonite and manganese oxide stained, calcite coated (up to 1mm) joints, dipping at 20°-30°, 40°-50° and 50°-60° occasional 60°-70° and 70°-80°. 41.65-41.85m: Weak to moderately weak, highly decomposed.
				100	100	95	1.7			T2-101		42.64	+		
				100	96	87	1.6	20.0		T2-101		43.22	+		
		3.50m @ 18:00		100						T2-101		44.28	+		
30/07/2013		3.71m @ 08:00		100	97	97	5.2			T2-101		44.75	+		
31/07/2013				100	97	97	1.4			T2-101		46.24	+		45.76-46.02m: Subvertical joint.
				100	97	90	6.3			T2-101		46.70	+		46.73-46.80m: Subvertical joint.
31/07/2013		4.61m @ 18:00								T2-101		47.33	+		Drillhole completed at 47.33m

● Small Disturbed Sample	⊗ Water Level	LOGGED <u>M.Chiu</u>
○ Large Disturbed Sample	⊥ Standard Penetration Test	DATE <u>08/08/2013</u>
▨ SPT Liner Sample	⊥ Permeability Test	CHECKED <u>S.K.Wong</u>
▨ U76 Undisturbed Sample	⊥ Piezometer Tip	DATE <u>09/08/2013</u>
▨ U100 Undisturbed Sample	⊥ Standpipe Tip	
▨ Maxter Sample	⊥ Pressuremeter Test	
▨ Piston Sample	⊥ Impression Packer Test	
▨ Water Sample	⊥ Vane Shear Test	

REMARKS

Appendix D

(Phase 1) Chemical Test Reports

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



CERTIFICATE OF ANALYSIS

Client	: HIGHWAYS DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 8
Contact	: MS FANNY LAU	Contact	: Fung Lim Chee, Richard	Work Order	: HK1317606
Address	: ENGINEER'S REPRESENTATIVE OFFICE, TSING KING ROAD, TSING YI N.T. HON KONG	Address	: 1/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: fannylau@bfpba.com	E-mail	: Richard.Fung@alsglobal.com		
Telephone	: *****	Telephone	: +852 2610 1044		
Facsimile	: +852 2435 1638	Facsimile	: +852 2610 2021		
Project	: HY_2012_11 PROVISION OF BARRIER-FREE ACCESS FACILITIES FOR HIGHWAY STRUCTURE PHASE 3 CONTRACT 1	Quote number	: *****	Date Samples Received	: 28-JUN-2013
Order number	: *****			Issue Date	: 10-JUL-2013
P.O-C number	: *****			Nc. of samples received	: 1
File	: *****			No. of samples analysed	: 1

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 Hong Kong Accreditation Service (HKAS) has accredited this laboratory ALS Technichem (HK) Pty Ltd under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as shown 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 Wong Wing, Kenneth	Senior Chemist - Organics Assistant Supervisor - Metals	Organics Inorganics



Page Number : 2 of 8
Client : HIGHWAYS DEPARTMENT
Work Order : HK1317606

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: 13-JUL-2013

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: HK1317606

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 E-ASTM D3974-09 based on ASTM D3974-09, prior to 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 µg/kg.



Sample Number : 3 of 8
 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1317606

Analytical Results

Sub-Matrix: SEDIMENT

Compound	CAS Number	LOR	Client sampling date / time		Unit	Client sample ID
			---	---		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)	---	0.1	%			CE44-CB1 16M-17M [28-JUN-2013] HK1317606-001 31.6
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg			6
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			10
EG020: Lead	7439-92-1	1	mg/kg			21
EG020: Mercury	7439-97-6	0.05	mg/kg			<0.05
EG020: Nickel	7440-02-0	1	mg/kg			26
EG020: Silver	7440-22-4	0.1	mg/kg			<0.1
EG020: Zinc	7440-66-6	1	mg/kg			91
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	52663-66-0	3	µg/kg			<3
Total Polychlorinated biphenyls	---	18	µg/kg			<18
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs)						
Naphthalene	91-20-3	50	µg/kg			<50
Acenaphthylene	208-96-8	50	µg/kg			<50
Acenaphthene	83-32-9	50	µg/kg			<50
Fluorene	86-73-7	50	µg/kg			<50
Phenanthrene	85-01-8	50	µg/kg			<50



Page Number : 4 of 8
 Client : HIGHWAYS DEPARTMENT
 Fork Order : HK1317606

Sub-Matrix: SEDIMENT

Compound	Client sample ID		
	CAS Number	LOR	Unit
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued			
Anthracene	120-127	50	µg/kg
Fluoranthene	206-140	150	µg/kg
Pyrene	129-000	150	µg/kg
Benzo(a)anthracene	56-553	150	µg/kg
Chrysene	218-019	150	µg/kg
Benzo(b)fluoranthene	206-992	150	µg/kg
Benzo(k)fluoranthene	207-089	150	µg/kg
Benzo(a)pyrene	50-328	150	µg/kg
Indeno(1,2,3-cd)pyrene	193-395	150	µg/kg
Dibenz(a,h)anthracene	53-703	150	µg/kg
Benzo(g,h,i)perylene	19124-2	150	µg/kg
Low M.W. PAHs	---	550	µg/kg
High M.W. PAHs	---	1700	µg/kg
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates			
2-Fluorobiphenyl	32160-8	0.1	%
4-Terphenyl-d14	17185-10	0.1	%
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate			
Decachlorobiphenyl	205124-3	0.1	%
CE44-CB1 16M-17M [28-JUN-2013] HK1317606-001			
			Surrogate control limits listed at end of this report.
			Surrogate control limits listed at end of this report.
			91.8
			86.5
			113



Age Number : 5 of 8
 Client : HIGHWAYS DEPARTMENT
 Fork Order : HK1317606

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method : Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report		RPD (%)
						Original Result	Duplicate Result	
EA/ED: Physical and Aggregate Properties (QC Lot: 2950514)								
HK1317385-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%			3.0
HK1317606-001	CE44-CB1 16M-17M	EA055: Moisture Content (dried @ 103°C)		0.1	%	7.9	7.7	0.4
EG: Metals and Major Cations (QC Lot: 2949717)								
HK1317606-001	CE44-CB1 16M-17M	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	37	37	0.0
		EG020: Copper	7440-50-8	1	mg/kg	10	10	0.0
		EG020: Lead	7439-92-1	1	mg/kg	21	20	6.6
		EG020: Nickel	7440-02-0	1	mg/kg	26	25	0.0
		EG020: Zinc	7440-66-6	1	mg/kg	91	83	8.9
HK1317613-001	Anonymous	EG020: Mercury	7439-97-6	0.05	mg/kg	0.06	<0.05	0.0
		EG020: Silver	7440-22-4	0.1	mg/kg	0.2	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	9	8	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	33	33	0.0
		EG020: Copper	7440-50-8	1	mg/kg	15	15	0.0
		EG020: Lead	7439-92-1	1	mg/kg	31	32	0.0
		EG020: Nickel	7440-02-0	1	mg/kg	23	23	0.0
		EG020: Zinc	7440-66-6	1	mg/kg	92	93	1.5
EP-065: PCB Single Congeners (QC Lot: 2949721)								
HK1317606-001	CE44-CB1 16M-17M	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: 2950554)								



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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1317606

Laboratory sample ID		Client sample ID	Method: Compound	Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 2950554) - Continued								
HK1317606-001	CE44-CB1 16M-17M							
		Fluoranthene	206-44-0	150	µg/kg	<150	<150	0.0
		Pyrene	129-00-0	150	µg/kg	<150	<150	0.0
		Benzo(a)anthracene	56-55-3	150	µg/kg	<150	<150	0.0
		Chrysene	218-01-9	150	µg/kg	<150	<150	0.0
		Benzo(b)fluoranthene	205-99-2	150	µg/kg	<150	<150	0.0
		Benzo(k)fluoranthene	207-08-9	150	µg/kg	<150	<150	0.0
		Benzo(a)pyrene	50-32-8	150	µg/kg	<150	<150	0.0
		Indeno(1,2,3-cd)pyrene	193-39-5	150	µg/kg	<150	<150	0.0
		Dibenz(a,h)anthracene	53-70-3	150	µg/kg	<150	<150	0.0
		Benzo(g,h,i)perylene	191-24-2	150	µg/kg	<150	<150	0.0
		High M.W. PAHs	-----	1700	µg/kg	<1700	<1700	0.0
		Naphthalene	91-20-3	50	µg/kg	<50	<50	0.0
		Acenaphthylene	208-96-8	50	µg/kg	<50	<50	0.0
		Acenaphthene	83-32-9	50	µg/kg	<50	<50	0.0
		Fluorene	86-73-7	50	µg/kg	<50	<50	0.0
		Phenanthrene	85-01-8	50	µg/kg	<50	<50	0.0
		Anthracene	120-12-7	50	µg/kg	<50	<50	0.0
		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

Method Blank (MB) Report				Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	LCS	DCS	Recovery Limits (%)	Value	RPD (%)
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	LCS	DCS	Low	High	Control Limit
EG: Metals and Major Cations (QC Lot: 2949717)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	105	---	77	109	---
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	99.1	---	86	110	---
EG020: Chromium	7440-47-3	1	mg/kg	<1	5 mg/kg	90.9	---	88	120	---
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	96.5	---	85	109	---
EG020: Lead	7439-92-1	1	mg/kg	<1	5 mg/kg	94.6	---	84	106	---
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	105	---	80	112	---
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	93.9	---	87	111	---
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	102	---	83	105	---
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	100	---	82	126	---
EP-065: PCB Single Congeners (QC Lot: 2949721)										
PCB 8	34883-43-7	3	µg/kg	<3	5 µg/kg	117	---	51	152	---
PCB 18	37680-65-2	3	µg/kg	<3	5 µg/kg	101	---	59	148	---
PCB 28	7012-37-5	3	µg/kg	<3	5 µg/kg	103	---	45	146	---
PCB 44	41464-39-5	3	µg/kg	<3	5 µg/kg	118	---	39	143	---
PCB 52	35693-99-3	3	µg/kg	<3	5 µg/kg	115	---	43	140	---
PCB 66	32598-10-0	3	µg/kg	<3	5 µg/kg	113	---	25	145	---
PCB 77	32598-13-3	3	µg/kg	<3	5 µg/kg	114	---	66	128	---
PCB 101	37680-73-2	3	µg/kg	<3	5 µg/kg	104	---	74	130	---
PCB 105	32598-14-4	3	µg/kg	<3	5 µg/kg	118	---	63	130	---
PCB 118	31508-00-6	3	µg/kg	<3	5 µg/kg	111	---	62	128	---

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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1317606



Matrix: SOIL		Method Blank (MB) Report				Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report					
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	LCS	DCS	Recovery Limits (%)	Value	RPD (%)	Control Limit
EP-065: PCB Single Congeners (QC Lot: 2949721) - Continued											
PCB 126	57465-28-8	3	µg/kg	<3	5 µg/kg	108		68 120			
PCB 128	38380-07-3	3	µg/kg	<3	5 µg/kg	109		60 130			
PCB 138	35065-28-2	3	µg/kg	<3	5 µg/kg	116		60 130			
PCB 153	35065-27-1	3	µg/kg	<3	5 µg/kg	115		63 131			
PCB 169	32774-16-6	3	µg/kg	<3	5 µg/kg	105		53 133			
PCB 170	35065-30-6	3	µg/kg	<3	5 µg/kg	110		55 129			
PCB 180	35065-29-3	3	µg/kg	<3	5 µg/kg	117		57 129			
PCB 187	52663-68-0	3	µg/kg	<3	5 µg/kg	106		65 127			
Total Polychlorinated biphenyls											
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 2950554)											
Naphthalene	91-20-3	25	µg/kg	<50	25 µg/kg	86.6		63 117			
Acenaphthylene	208-96-8	25	µg/kg	<50	25 µg/kg	79.2		54 119			
Acenaphthene	83-32-9	25	µg/kg	<50	25 µg/kg	92.5		59 122			
Fluorene	86-73-7	25	µg/kg	<50	25 µg/kg	96.6		60 126			
Phenanthrene	85-01-8	25	µg/kg	<50	25 µg/kg	98.9		60 127			
Anthracene	120-12-7	25	µg/kg	<50	25 µg/kg	97.9		56 124			
Fluoranthene	206-44-0	25	µg/kg	<50	25 µg/kg	93.6		61 132			
Pyrene	129-00-0	50	µg/kg	<50							
Benz(a)anthracene	56-55-3	25	µg/kg	<50	25 µg/kg	91.6		61 133			
Chrysene	218-01-9	50	µg/kg	<50	25 µg/kg	99.0		57 124			
Benzo(b)fluoranthene	205-99-2	50	µg/kg	<50	25 µg/kg	90.0		60 128			
Benzo(k)fluoranthene	207-08-9	25	µg/kg	<50	25 µg/kg	90.8		48 135			
Benzo(a)pyrene	50-32-8	25	µg/kg	<50	25 µg/kg	96.7		58 133			
Indeno(1,2,3-cd)pyrene	193-39-5	50	µg/kg	<50	25 µg/kg	86.3		50 124			
Dibenz(a,h)anthracene	53-70-3	25	µg/kg	<50	25 µg/kg	90.0		48 134			
Benzo(g,h,i)perylene	191-24-2	25	µg/kg	<50	25 µg/kg	101		50 137			
Low M.W. PAHs		550	µg/kg	<550				55			
High M.W. PAHs		1700	µg/kg	<1700							

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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1317606



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

Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration		Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report				
				MS	MSD	Recovery Limits (%)	Value	RPD (%)	Control Limit	
EG: Metals and Major Cations (QC Lot: 2949717)										
HK1316881-001	Anonymous									
		EG020: Arsenic	7440-38-2	5 mg/kg	89.8	---	75	125	---	---
		EG020: Cadmium	7440-43-9	5 mg/kg	102	---	75	125	---	---
		EG020: Chromium	7440-47-3	5 mg/kg	# Not Determined	---	75	125	---	---
		EG020: Copper	7440-50-8	5 mg/kg	# Not Determined	---	75	125	---	---
		EG020: Lead	7439-92-1	50 mg/kg	80.6	---	75	125	---	---
		EG020: Mercury	7439-97-6	0.1 mg/kg	118	---	75	125	---	---
		EG020: Nickel	7440-02-0	5 mg/kg	# Not Determined	---	75	125	---	---
		EG020: Silver	7440-22-4	5 mg/kg	103	---	75	125	---	---
		EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined	---	75	125	---	---

Surrogate Control Limits

Compound	CAS Number	Recovery Limits (%)	
		Low	High
Sub-Matrix: SEDIMENT			
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



CERTIFICATE OF ANALYSIS

Client	: HIGHWAYS DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 8
Contact	: MS FANNY LAU	Contact	: Fung Lim Chee, Richard	Work Order	: HK1317612
Address	: ENGINEER'S REPRESENTATIVE OFFICE, TSING KING ROAD, TSING YI N.T. HON KONG	Address	: 1/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: fannylau@bfaipba.com	E-mail	: Richard.Fung@alsglobal.com		
Telephone	: *****	Telephone	: +852 2610 1044	Date Samples Received	: 29-JUN-2013
Facsimile	: +852 2435 1638	Facsimile	: +852 2610 2021	Issue Date	: 10-JUL-2013
Project	: HY_2012_11 PROVISION OF BARRIER-FREE ACCESS FACILITIES FOR HIGHWAY STRUCTURE PHASE 3 CONTRACT 1	Quote number	: *****	Nb. of samples received	: 4
Order number	: *****			Nb. of samples analysed	: 4
-O-C number	: *****				
File	: *****				

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Long Kong Accreditation Service (HKAS) has accredited this laboratory ALS Technichem (HK) Pty Ltd under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as stated 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
Wong Wing, Kenneth	Assistant Supervisor - Metals	Inorganics



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Client : HIGHWAYS DEPARTMENT
Work Order : HK1317612

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: 6-JUL-2013

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: HK1317612

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 E-ASTM D3974-09 based on ASTM D3974-09, prior to 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 µg/kg.



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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1317612

Analytical Results

Sub-Matrix: SEDIMENT

Compound	CAS Number	LOR	Client sample ID		Unit	%
			Client sampling date / time	Client sample ID		
EAI/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	30.4	17.8	20.2	16.0
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	8	3	6	3
EG020: Cadmium	7440-43-9	0.2	<0.2	<0.2	<0.2	<0.2
EG020: Chromium	7440-47-3	1	36	10	15	4
EG020: Copper	7440-50-8	1	10	3	5	1
EG020: Lead	7439-92-1	1	22	9	17	13
EG020: Mercury	7439-97-6	0.05	<0.05	<0.05	<0.05	<0.05
EG020: Nickel	7440-02-0	1	24	6	8	2
EG020: Silver	7440-22-4	0.1	<0.1	<0.1	<0.1	<0.1
EG020: Zinc	7440-66-6	1	129	102	192	54
EP-065: PCB Single Congeners						
PCB 8	34863-43-7	3	<3	<3	<3	<3
PCB 18	37660-65-2	3	<3	<3	<3	<3
PCB 28	7012-37-5	3	<3	<3	<3	<3
PCB 44	41464-39-5	3	<3	<3	<3	<3
PCB 52	35693-99-3	3	<3	<3	<3	<3
PCB 66	32598-10-0	3	<3	<3	<3	<3
PCB 77	32598-13-3	3	<3	<3	<3	<3
PCB 101	37680-73-2	3	<3	<3	<3	<3
PCB 105	32598-14-4	3	<3	<3	<3	<3
PCB 118	31508-00-6	3	<3	<3	<3	<3
PCB 126	57465-28-8	3	<3	<3	<3	<3
PCB 128	38380-07-3	3	<3	<3	<3	<3
PCB 138	35065-28-2	3	<3	<3	<3	<3
PCB 153	35065-27-1	3	<3	<3	<3	<3
PCB 169	32774-16-6	3	<3	<3	<3	<3
PCB 170	35065-30-6	3	<3	<3	<3	<3
PCB 180	35065-29-3	3	<3	<3	<3	<3
PCB 187	52663-68-0	3	<3	<3	<3	<3
Total Polychlorinated biphenyls		18	<18	<18	<18	<18
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs)						
Naphthalene	9120-3	50	<50	<50	<50	<50
Acenaphthylene	208-96-8	50	<50	<50	<50	<50
Acenaphthene	83-32-9	50	<50	<50	<50	<50
Fluorene	86-73-7	50	<50	<50	<50	<50
Phenanthrene	85-01-8	50	<50	<50	<50	<50



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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1317612

Sub-Matrix: SEDIMENT

Compound	CAS Number	LOR	Client sample ID			
			CE44-CB1 17M-18M [29-JUN-2013] HK1317612-001	CE44-CB1 18M-19M [29-JUN-2013] HK1317612-002	CE44-CB1 19M-20.5M [29-JUN-2013] HK1317612-003	CE44-CB1 22.5M-24M [29-JUN-2013] HK1317612-004
Client sampling date / time						
Unit						
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued						
Anthracene	120-12-7	50	<50	<50	<50	<50
Fluoranthene	206-44-0	150	<150	<150	<150	<150
Pyrene	129-00-0	150	<150	<150	<150	<150
Benz(a)anthracene	56-55-3	150	<150	<150	<150	<150
Chrysene	218-01-6	150	<150	<150	<150	<150
Benzo(b)fluoranthene	205-99-2	150	<150	<150	<150	<150
Benzo(k)fluoranthene	207-08-9	150	<150	<150	<150	<150
Benzo(a)pyrene	50-32-8	150	<150	<150	<150	<150
Indeno(1,2,3-cd)pyrene	193-39-5	150	<150	<150	<150	<150
Dibenz(a,h)anthracene	53-70-3	150	<150	<150	<150	<150
Benzo(g,h,i)perylene	191-24-2	150	<150	<150	<150	<150
Low M.W. PAHs	---	550	<550	<550	<550	<550
High M.W. PAHs	---	1700	<1700	<1700	<1700	<1700
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates						
2-Fluorobiphenyl	32160-8	0.1	98.2	99.4	96.6	91.3
4-Terphenyl-d14	1718-51-0	0.1	92.6	95.7	93.7	84.7
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate						
Decachlorobiphenyl	2051-24-3	0.1	109	104	104	93.2
Surrogate control limits listed at end of this report.						



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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1317612

Laboratory Duplicate (DUP) Report

Laboratory sample ID		Client sample ID	Method: Compound	CAS Number	LOD	Unit	Laboratory Duplicate (DUP) Report		RPD (%)
							Original Result	Duplicate Result	
EA/ED: Physical and Aggregate Properties (QC Lot: 2950514)									
HK1317385-001		Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	7.9	7.7	3.0
HK1317606-001		Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	31.6	31.7	0.4
EG: Metals and Major Cations (QC Lot: 2949717)									
HK1317606-001		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	37	37	0.0
			EG020: Copper	7440-50-8	1	mg/kg	10	10	0.0
			EG020: Lead	7439-92-1	1	mg/kg	21	20	6.6
			EG020: Nickel	7440-02-0	1	mg/kg	26	25	0.0
			EG020: Zinc	7440-66-6	1	mg/kg	91	83	8.9
HK1317613-001		Anonymous	EG020: Mercury	7439-97-6	0.05	mg/kg	0.06	<0.05	0.0
			EG020: Silver	7440-22-4	0.1	mg/kg	0.2	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	9	8	0.0
			EG020: Chromium	7440-47-3	1	mg/kg	33	33	0.0
			EG020: Copper	7440-50-8	1	mg/kg	15	15	0.0
			EG020: Lead	7439-92-1	1	mg/kg	31	32	0.0
			EG020: Nickel	7440-02-0	1	mg/kg	23	23	0.0
			EG020: Zinc	7440-66-6	1	mg/kg	92	93	1.5
EP-065: PCB Single Congeners (QC Lot: 2949721)									
HK1317606-001		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: 2950554)									



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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1317612

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report		RPD (%)
						Original Result	Duplicate Result	
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 2950554) - Continued								
HK1317606-001	Anonymous							
		Fluoranthene	206-44-0	150	µg/kg	<150	<150	0.0
		Pyrene	129-00-0	150	µg/kg	<150	<150	0.0
		Benz(a)anthracene	56-55-3	150	µg/kg	<150	<150	0.0
		Chrysene	218-01-9	150	µg/kg	<150	<150	0.0
		Benzo(b)fluoranthene	205-99-2	150	µg/kg	<150	<150	0.0
		Benzo(k)fluoranthene	207-08-9	150	µg/kg	<150	<150	0.0
		Benzo(a)pyrene	50-32-8	150	µg/kg	<150	<150	0.0
		Indeno(1,2,3-cd)pyrene	193-39-5	150	µg/kg	<150	<150	0.0
		Dibenz(a,h)anthracene	53-70-3	150	µg/kg	<150	<150	0.0
		Benzo(g,h,i)perylene	191-24-2	150	µg/kg	<150	<150	0.0
		High M.W. PAHs		1700	µg/kg	<1700	<1700	0.0
		Naphthalene	91-20-3	50	µg/kg	<50	<50	0.0
		Acenaphthylene	208-96-8	50	µg/kg	<50	<50	0.0
		Acenaphthene	83-32-9	50	µg/kg	<50	<50	0.0
		Fluorene	86-73-7	50	µg/kg	<50	<50	0.0
		Phenanthrene	85-01-8	50	µg/kg	<50	<50	0.0
		Anthracene	120-12-7	50	µg/kg	<50	<50	0.0
		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

Method: Compound	CAS Number	LOR	Unit	Result	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report			
					Spike Concentration	LCS	DCS	Recovery Limits (%)
EG: Metals and Major Cations (QC Lot: 2949717)								
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	105	77	109
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	99.1	86	110
EG020: Chromium	7440-47-3	1	mg/kg	<1	5 mg/kg	90.9	88	120
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	96.5	85	109
EG020: Lead	7439-92-1	1	mg/kg	<1	5 mg/kg	94.6	84	106
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	105	80	112
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	93.9	87	111
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	102	83	105
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	100	82	126
EP-065: PCB Single Congeners (QC Lot: 2949721)								
PCB 8	34883-43-7	3	µg/kg	<3	5 µg/kg	117	51	152
PCB 18	37680-66-2	3	µg/kg	<3	5 µg/kg	101	59	148
PCB 28	7012-37-5	3	µg/kg	<3	5 µg/kg	103	45	146
PCB 44	41464-39-5	3	µg/kg	<3	5 µg/kg	118	39	143
PCB 52	35693-99-3	3	µg/kg	<3	5 µg/kg	115	43	140
PCB 66	32598-10-0	3	µg/kg	<3	5 µg/kg	113	25	145
PCB 77	32598-13-3	3	µg/kg	<3	5 µg/kg	114	66	128
PCB 101	37680-73-2	3	µg/kg	<3	5 µg/kg	104	74	130
PCB 105	32598-14-4	3	µg/kg	<3	5 µg/kg	118	63	130
PCB 118	31508-00-6	3	µg/kg	<3	5 µg/kg	111	62	128



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

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report					
				MS	MSD	Recovery Limits (%)	RPD (%)		
EG: Metals and Major Cations (QC Lot: 2949717)									
HK1316881-001	Anonymous								
		EG020: Arsenic	7440-38-2	5 mg/kg	89.8	75	125		
		EG020: Cadmium	7440-43-9	5 mg/kg	102	75	125		
		EG020: Chromium	7440-47-3	5 mg/kg	# Not Determined	75	125		
		EG020: Copper	7440-50-8	5 mg/kg	# Not Determined	75	125		
		EG020: Lead	7439-92-1	50 mg/kg	80.6	75	125		
		EG020: Mercury	7439-97-6	0.1 mg/kg	118	75	125		
		EG020: Nickel	7440-02-0	5 mg/kg	# Not Determined	75	125		
		EG020: Silver	7440-22-4	5 mg/kg	103	75	125		
		EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined	75	125		

Surrogate Control Limits

Compound	CAS Number	Recovery Limits (%)	
		Low	High
Sub-Matrix: SEDIMENT			
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



CERTIFICATE OF ANALYSIS

Client	: HIGHWAYS DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 10
Contact	: MS FANNY LAU	Contact	: Fung Lim Chee, Richard	Work Order	: HK1318970
Address	: ENGINEER'S REPRESENTATIVE OFFICE, TSING KING ROAD, TSING YI N.T. HON KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: fannylau@bfaipba.com	E-mail	: Richard.Fung@alsglobal.com		
Telephone	: *****	Telephone	: +852 2610 1044		
Facsimile	: +852 2435 1638	Facsimile	: +852 2610 2021		
Project	: HY_2012_11 PROVISION OF BARRIER-FREE ACCESS FACILITIES FOR HIGHWAY STRUCTURE PHASE 3 CONTRACT 1	Quote number	: *****	Date Samples Received	: 10-JUL-2013
Order number	: *****			Issue Date	: 19-JUL-2013
C-O-C number	: *****			No. of samples received	: 6
Site	: *****			No. of samples analysed	: 6

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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

Anh Ngoc Huynh
Ng Chun Hoi, Michael
Wong Wing, Kenneth

Position

Senior Chemist - Organics
Chemist - Inorganics
Assistant Supervisor - Metals

Authorised results for

Organics
Inorganics
Inorganics

ALS Laboratory Group

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A Campbell Brothers Limited Company



Page Number : 2 of 10
Client : HIGHWAYS DEPARTMENT
Work Order : HK1318970

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-JUL-2013

(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: HK1318970)

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 E-ASTM D3974-09 based on ASTM D3974-09, prior to 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 µg/kg.



Analytical Results

Sub-Matrix: SEDIMENT

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	CE44-CB2 15.5M-16.5M [10-JUL-2013] HK1318970-001	CE44-CB2 16.5M-17.5M [10-JUL-2013] HK1318970-002	CE44-CB2 17.5M-18.5M [10-JUL-2013] HK1318970-003	CE44-CB2 18.5M-19.5M [10-JUL-2013] HK1318970-004	CE44-CB2 19.5M-20.5M [10-JUL-2013] HK1318970-005
EA/ED: Physical and Aggregate Properties			%	31.2	32.4	26.1	33.0	33.5
EA055: Moisture Content (dried @ 103°C)		0.1	%	31.2	32.4	26.1	33.0	33.5

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	10	9	9	6	5
EG020: Cadmium	7440-43-9	0.2	mg/kg	1.0	0.9	1.1	<0.2	<0.2
EG020: Chromium	7440-47-3	1	mg/kg	125	94	133	44	42
EG020: Copper	7440-50-8	1	mg/kg	198	172	177	12	12
EG020: Lead	7439-92-1	1	mg/kg	117	107	145	26	28
EG020: Mercury	7439-97-6	0.05	mg/kg	1.76	1.20	2.03	<0.05	<0.05
EG020: Nickel	7440-02-0	1	mg/kg	43	34	44	30	27
EG020: Silver	7440-22-4	0.1	mg/kg	3.1	2.1	2.9	<0.1	<0.1
EG020: Zinc	7440-66-6	1	mg/kg	3060	418	722	146	105

EP-065: PCB Single Congeners

PCB 8	34883-43-7	3	µg/kg	<3	<3	<3	<3	<3
PCB 18	37680-65-2	3	µg/kg	<3	<3	<3	<3	<3
PCB 28	7012-37-5	3	µg/kg	<3	<3	<3	<3	<3
PCB 44	41464-38-5	3	µg/kg	<3	<3	<3	<3	<3
PCB 52	35693-99-3	3	µg/kg	<3	<3	<3	<3	<3
PCB 66	32598-10-0	3	µg/kg	<3	<3	<3	<3	<3
PCB 77	32598-13-3	3	µg/kg	<3	<3	<3	<3	<3
PCB 101	37680-73-2	3	µg/kg	<3	<3	<3	<3	<3
PCB 105	32598-14-4	3	µg/kg	<3	<3	<3	<3	<3
PCB 118	31508-00-6	3	µg/kg	<3	<3	<3	<3	<3
PCB 126	57465-28-8	3	µg/kg	<3	<3	<3	<3	<3
PCB 128	38380-07-3	3	µg/kg	<3	<3	<3	<3	<3
PCB 138	35095-28-2	3	µg/kg	<3	<3	<3	<3	<3
PCB 153	35085-27-1	3	µg/kg	<3	<3	<3	<3	<3
PCB 169	32774-16-6	3	µg/kg	<3	<3	<3	<3	<3
PCB 170	35065-30-6	3	µg/kg	<3	<3	<3	<3	<3
PCB 180	35065-28-3	3	µg/kg	<3	<3	<3	<3	<3
PCB 187	52663-66-0	3	µg/kg	<3	<3	<3	<3	<3
Total Polychlorinated biphenyls		18	µg/kg	<18	<18	<18	<18	<18

EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs)

Naphthalene	91-20-3	50	µg/kg	<50	<50	<50	<50	<50
Acenaphthylene	208-96-8	50	µg/kg	<50	<50	54	<50	<50
Acenaphthene	83-32-9	50	µg/kg	<50	<50	<50	<50	<50
Fluorene	86-73-7	50	µg/kg	<50	<50	<50	<50	<50
Phenanthrene	85-01-8	50	µg/kg	114	76	113	<50	<50



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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1318970

Sub-Matrix: SEDIMENT

Compound	Client sample ID		Client sampling data / time					
	CAS Number	LOR	Unit	CE44-CB2 15.5M-16.5M [10-JUL-2013] HK1318970-001	CE44-CB2 16.5M-17.5M [10-JUL-2013] HK1318970-002	CE44-CB2 17.5M-18.5M [10-JUL-2013] HK1318970-003	CE44-CB2 18.5M-19.5M [10-JUL-2013] HK1318970-004	CE44-CB2 19.5M-20.5M [10-JUL-2013] HK1318970-005
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued								
Anthracene	120-127	50	µg/kg	55	<50	58	<50	<50
Fluoranthene	206-44-0	150	µg/kg	333	227	319	<150	<150
Pyrene	129-00-0	150	µg/kg	402	298	408	<150	<150
Benz(a)anthracene	56-56-3	150	µg/kg	243	157	226	<150	<150
Chrysene	218-019	150	µg/kg	234	<150	231	<150	<150
Benzo(b)fluoranthene	205-99-2	150	µg/kg	485	322	500	<150	<150
Benzo(k)fluoranthene	207-08-9	150	µg/kg	228	<150	206	<150	<150
Benzo(a)pyrene	50-32-8	150	µg/kg	371	248	359	<150	<150
Indeno(1,2,3-cd)pyrene	193-39-6	150	µg/kg	355	227	366	<150	<150
Dibenz(a,h)anthracene	53-70-3	150	µg/kg	<150	<150	<150	<150	<150
Benzo(g,h,i)perylene	191-24-2	150	µg/kg	348	223	359	<150	<150
Low M.W. PAHs	---	550	µg/kg	<550	<550	<550	<550	<550
High M.W. PAHs	---	1700	µg/kg	3380	1930	3400	<1700	<1700
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates								
2-Fluorobiphenyl	32160-8	0.1	%	99.6	90.1	96.1	96.9	99.0
4-Terphenyl-d14	1718-510	0.1	%	106	98.8	104	108	98.3
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate								
Decachlorobiphenyl	205124-3	0.1	%	79.8	102	86.4	101	103

Surrogate control limits listed at end of this report.

Surrogate control limits listed at end of this report.



Sub-Matrix: SEDIMENT

Compound	CAS Number	LOR	Client sample ID	
			Client sampling date / time	Unit
EA/ED: Physical and Aggregate Properties				
EA055: Moisture Content (dried @ 103°C)	---	0.1	%	18.9
EG: Metals and Major Cations				
EG020: Arsenic	7440-38-2	1	mg/kg	6
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2
EG020: Chromium	7440-47-3	1	mg/kg	23
EG020: Copper	7440-50-8	1	mg/kg	5
EG020: Lead	7439-92-1	1	mg/kg	16
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05
EG020: Nickel	7440-02-0	1	mg/kg	12
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1
EG020: Zinc	7440-66-6	1	mg/kg	36
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	41464-99-5	3	µg/kg	<3
PCB 52	35683-99-3	3	µg/kg	<3
PCB 66	32568-10-0	3	µg/kg	<3
PCB 77	32568-13-3	3	µg/kg	<3
PCB 101	37680-73-2	3	µg/kg	<3
PCB 105	32568-14-4	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	35065-30-5	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)				
Naphthalene	91-20-3	50	µg/kg	<50
Acenaphthylene	208-96-8	50	µg/kg	<50
Acenaphthene	83-32-9	50	µg/kg	<50
Fluorene	86-73-7	50	µg/kg	<50
Phenanthrene	85-01-8	50	µg/kg	<50
Anthracene	120-12-7	50	µg/kg	<50



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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1318970

Sub-Matrix: SEDIMENT

Compound	Client sample ID		
	CAS Number	LOR	Unit
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued			
Fluoranthene	206-44-0	150	µg/kg
Pyrene	129-00-0	150	µg/kg
Benz(a)anthracene	56-55-3	150	µg/kg
Chrysene	218-01-9	150	µg/kg
Benzo(b)fluoranthene	205-99-2	150	µg/kg
Benzo(k)fluoranthene	207-08-9	150	µg/kg
Benzo(a)pyrene	50-32-8	150	µg/kg
Indeno(1,2,3-cd)pyrene	193-39-5	150	µg/kg
Dibenz(a,h)anthracene	53-70-3	150	µg/kg
Benzo(g,h,i)perylene	19124-2	150	µg/kg
Low M.W. PAHs	---	550	µg/kg
High M.W. PAHs	---	1700	µg/kg
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates			
2-Fluorobiphenyl	32160-8	0.1	%
4-Terphenyl-d14	1718-51-0	0.1	%
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate			
Decachlorobiphenyl	205124-3	0.1	%
			91.5
			96.9
			107
			Surrogate control limits listed at end of this report.
			Surrogate control limits listed at end of this report.



Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report		RPD (%)
						Original Result	Duplicate Result	
EA/ED: Physical and Aggregate Properties (QC Lot: 2966734)								
HK1318730-021	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	16.6	16.2	2.5
HK1318730-026	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	16.3	16.3	0.0
EG: Metals and Major Cations (QC Lot: 2966866)								
HK1318753-002	Anonymous	EG020: Mercury	7439-97-6	0.05	mg/kg	0.08	0.09	14.2
		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	1	1	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	18	22	18.7
		EG020: Copper	7440-50-8	1	mg/kg	15	16	11.2
		EG020: Lead	7439-92-1	1	mg/kg	85	83	1.5
		EG020: Nickel	7440-02-0	1	mg/kg	6	7	17.3
		EG020: Zinc	7440-66-6	1	mg/kg	78	91	15.3
HK1318970-001	CE44-CB2 15.5M-16.5M	EG020: Mercury	7439-97-6	0.05	mg/kg	1.76	1.92	8.8
		EG020: Silver	7440-22-4	0.1	mg/kg	3.1	3.3	4.9
		EG020: Cadmium	7440-43-9	0.2	mg/kg	1.0	1.1	0.0
		EG020: Arsenic	7440-38-2	1	mg/kg	10	10	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	125	132	5.4
		EG020: Copper	7440-50-8	1	mg/kg	198	210	6.1
		EG020: Lead	7439-92-1	1	mg/kg	117	121	3.2
		EG020: Nickel	7440-02-0	1	mg/kg	43	44	3.0
		EG020: Zinc	7440-66-6	1	mg/kg	3060	3090	1.2
EP-065: PCB Single Congeners (QC Lot: 2966696)								
HK1318970-001	CE44-CB2 15.5M-16.5M	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: 2966697)								



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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1318970

Laboratory sample ID		Client sample ID	Method/Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
Matrix: SOIL									
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 2966697) - Continued									
HK1318970-001	CE44-CB2	15.5M-16.5M	Fluoranthene	206-44-0	150	µg/kg	333	317	4.9
			Pyrene	129-00-0	150	µg/kg	402	364	10.0
			Benz(a)anthracene	56-55-3	150	µg/kg	243	230	5.5
			Chrysene	218-01-9	150	µg/kg	234	228	2.7
			Benzo(b)fluoranthene	205-99-2	150	µg/kg	485	495	2.1
			Benzo(k)fluoranthene	207-08-9	150	µg/kg	228	204	10.7
			Benzo(a)pyrene	50-32-8	150	µg/kg	371	336	9.9
			Indeno(1,2,3-cd)pyrene	193-39-5	150	µg/kg	355	349	1.8
			Dibenz(a,h)anthracene	53-70-3	150	µg/kg	<150	<150	0.0
			Benzo(g,h,i)perylene	191-24-2	150	µg/kg	348	350	0.7
			High M.W. PAHs	---	1700	µg/kg	3380	3270	3.4
			Naphthalene	91-20-3	50	µg/kg	<50	<50	0.0
			Acenaphthylene	208-96-8	50	µg/kg	<50	<50	0.0
			Acenaphthene	83-32-9	50	µg/kg	<50	<50	0.0
			Fluorene	86-73-7	50	µg/kg	<50	<50	0.0
			Phenanthrene	85-01-8	50	µg/kg	114	117	2.3
			Anthracene	120-12-7	50	µg/kg	55	56	2.0
			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 Blank (MB) Report									
Method/Compound	CAS Number	LOR	Unit	Result	Spike Concentration	LCS	DCS	Recovery Limits (%)	RPD (%)
EG: Metals and Major Cations (QC Lot: 2966866)									
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	98.0	---	77 109	---
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	91.6	---	86 110	---
EG020: Chromium	7440-47-3	1	mg/kg	<1	5 mg/kg	101	---	88 120	---
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	104	---	85 109	---
EG020: Lead	7439-92-1	1	mg/kg	<1	5 mg/kg	97.9	---	84 106	---
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	95.8	---	80 112	---
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	103	---	87 111	---
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	87.0	---	83 105	---
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	112	---	82 126	---
EP-065: PCB Single Congeners (QC Lot: 2966696)									
PCB 8	34883-43-7	3	µg/kg	<3	5 µg/kg	74.0	---	51 152	---
PCB 18	37680-65-2	3	µg/kg	<3	5 µg/kg	70.0	---	59 148	---
PCB 28	7012-37-5	3	µg/kg	<3	5 µg/kg	101	---	45 146	---
PCB 44	41464-39-5	3	µg/kg	<3	5 µg/kg	97.0	---	39 143	---
PCB 52	35693-99-3	3	µg/kg	<3	5 µg/kg	81.8	---	43 140	---
PCB 66	32598-10-0	3	µg/kg	<3	5 µg/kg	104	---	25 145	---
PCB 77	32598-13-3	3	µg/kg	<3	5 µg/kg	92.6	---	66 128	---
PCB 101	37680-73-2	3	µg/kg	<3	5 µg/kg	82.6	---	74 130	---
PCB 105	32598-14-4	3	µg/kg	<3	5 µg/kg	89.6	---	63 130	---
PCB 118	31508-00-6	3	µg/kg	<3	5 µg/kg	88.2	---	62 128	---



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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1318970

Matrix: SOIL		Method Blank (MB) Report				Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report					
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	LCS	DCS	Recovery Limits (%)	Value	RPD (%)	Control Limit
EP-065: PCB Single Congeners (QC Lot: 2966696) - Continued											
PCB 126	57465-28-8	3	µg/kg	<3	5 µg/kg	85.2		68 120			
PCB 128	38380-07-3	3	µg/kg	<3	5 µg/kg	92.4		60 130			
PCB 138	35065-28-2	3	µg/kg	<3	5 µg/kg	91.9		60 130			
PCB 153	35065-27-1	3	µg/kg	<3	5 µg/kg	86.9		63 131			
PCB 169	32774-16-6	3	µg/kg	<3	5 µg/kg	99.8		53 133			
PCB 170	35065-30-6	3	µg/kg	<3	5 µg/kg	92.3		55 129			
PCB 180	35065-29-3	3	µg/kg	<3	5 µg/kg	90.6		57 129			
PCB 187	52663-68-0	3	µg/kg	<3	5 µg/kg	87.8		65 127			
Total Polychlorinated biphenyls		18	µg/kg	<18							
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 2966697)											
Naphthalene	91-20-3	25	µg/kg	<50	25 µg/kg	102		63 117			
Acenaphthylene	208-96-8	25	µg/kg	<50	25 µg/kg	91.0		54 119			
Acenaphthene	83-32-9	25	µg/kg	<50	25 µg/kg	95.1		59 122			
Fluorene	86-73-7	50	µg/kg	<50							
Phenanthrene	85-01-8	25	µg/kg	<50	25 µg/kg	92.4		60 126			
Anthracene	120-12-7	50	µg/kg	<50	25 µg/kg	97.7		60 127			
Fluoranthene	206-44-0	50	µg/kg	<50	25 µg/kg	91.4		56 124			
Pyrene	129-00-0	50	µg/kg	<50	25 µg/kg	99.1		61 132			
Benz(a)anthracene	56-56-3	25	µg/kg	<50	25 µg/kg	101		61 133			
Chrysene	218-01-9	25	µg/kg	<50	25 µg/kg	100		57 124			
Benzo(b)fluoranthene	205-99-2	25	µg/kg	<50	25 µg/kg	97.8		60 128			
Benzo(k)fluoranthene	207-08-9	50	µg/kg	<50	25 µg/kg	101		48 135			
Benzo(e)pyrene	50-32-8	25	µg/kg	<50	25 µg/kg	108		58 133			
Indeno(1,2,3-cd)pyrene	193-39-6	25	µg/kg	<50	25 µg/kg	94.8		50 124			
Dibenz(a,h)anthracene	53-70-3	50	µg/kg	<50	25 µg/kg	99.3		48 134			
Benzo(g,h,i)perylene	191-24-2	50	µg/kg	<50	25 µg/kg	97.6		50 137			
Low M.W. PAHs		550	µg/kg	<550	25 µg/kg	89.8		55 140			
High M.W. PAHs		1700	µg/kg	<1700							



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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1318970

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			Recovery Limits (%)		RPD (%)	
				Spike Concentration	MS	MSD	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 2966866)										
HK1318753-001	Anonymous									
		EG020: Arsenic	7440-38-2	5 mg/kg	83.4		75	125		
		EG020: Cadmium	7440-43-9	5 mg/kg	91.8		75	125		
		EG020: Chromium	7440-47-3	50 mg/kg	91.6		75	125		
		EG020: Copper	7440-50-8	5 mg/kg	79.6		75	125		
		EG020: Lead	7439-92-1	50 mg/kg	92.0		75	125		
		EG020: Mercury	7439-97-6	0.1 mg/kg	83.5		75	125		
		EG020: Nickel	7440-02-0	5 mg/kg	83.8		75	125		
		EG020: Silver	7440-22-4	5 mg/kg	85.9		75	125		
		EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined		75	125		

Surrogate Control Limits

Compound	CAS Number	Recovery Limits (%)	
		Low	High
Sub-Matrix: SEDIMENT			
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



CERTIFICATE OF ANALYSIS

Client	: HIGHWAYS DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 8
Contact	: MS FANNY LAU	Contact	: Fung Lim Chee, Richard	Work Order	: HK1319723
Address	: ENGINEER'S REPRESENTATIVE OFFICE, TSING KING ROAD, TSING YI N.T. HON KONG	Address	: 1/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: fannylau@bfpalpa.com	E-mail	: Richard.Fung@alsglobal.com		
Telephone	: *****	Telephone	: +852 2610 1044		
Facsimile	: +852 2435 1638	Facsimile	: +852 2610 2021		
Project	: HY_2012_11 PROVISION OF BARRIER-FREE ACCESS FACILITIES FOR HIGHWAY STRUCTURE PHASE 3 CONTRACT 1	Quote number	: *****	Date Samples Received	: 19-JUL-2013
Order number	: *****			Issue Date	: 29-JUL-2013
J-O-C number	: *****			No. of samples received	: 3
File	: *****			No. of samples analysed	: 3

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Hong Kong Accreditation Service (HKAS) has accredited 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

Anh Ngoc Huynh
Ng Chun Hoi, Michael
Wong Wing, Kenneth

Position

Senior Chemist - Organics
Chemist - Inorganics
Assistant Supervisor - Metals

Authorised results for

Organics
Inorganics
Inorganics



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Client : HIGHWAYS DEPARTMENT
Work Order : HK1319723

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-JUL-2013

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: HK1319723

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 E-ASTM D3974-09 based on ASTM D3974-09, prior to 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 µg/kg.



Analytical Results

Sub-Matrix: SEDIMENT

Compound	CAS Number	LOR	Unit	Client sample ID			
				Client sampling date / time	CE44-CB5 27M-28M [19-JUL-2013]	CE44-CB5 28M-28.5M [19-JUL-2013]	CE44-CB5 29M-30M [19-JUL-2013]
EA/ED: Physical and Aggregate Properties							
EA055: Moisture Content (dried @ 103° C)		---	0.1	%	17.5	13.8	16.0
EG: Metals and Major Cations							
EG020: Arsenic	7440-38-2	1		ng/kg	3	2	2
EG020: Cadmium	7440-43-9	0.2		ng/kg	<0.2	<0.2	<0.2
EG020: Chromium	7440-47-3	1		ng/kg	8	5	4
EG020: Copper	7440-50-8	1		ng/kg	4	2	1
EG020: Lead	7439-92-1	1		ng/kg	10	9	5
EG020: Mercury	7439-97-6	0.05		ng/kg	<0.05	<0.05	<0.05
EG020: Nickel	7440-02-0	1		ng/kg	5	3	3
EG020: Silver	7440-22-4	0.1		ng/kg	<0.1	<0.1	<0.1
EG020: Zinc	7440-66-6	1		ng/kg	54	47	87
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)							
Naphthalene	9120-3	50		µg/kg	<50	<50	<50
Acenaphthylene	208-96-8	50		µg/kg	<50	<50	<50
Acenaphthene	83-32-9	50		µg/kg	<50	<50	<50
Fluorene	86-73-7	50		µg/kg	<50	<50	<50
Phenanthrene	85-01-8	50		µg/kg	<50	<50	<50



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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1319723

Sub-Matrix: SEDIMENT

Compound	CAS Number	LOR	Client sample ID		
			Client sampling date / time	Unit	
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued					
Anthracene	120-127	50	CE44-CB5 27M-28M [19-JUL-2013] HK1319723-001	CE44-CB5 28M-28.5M [19-JUL-2013] HK1319723-002	CE44-CB5 29M-30M [19-JUL-2013] HK1319723-003
Fluoranthene	206-44-0	150	<50	<50	<50
Pyrene	129-00-0	150	<150	<150	<150
Benz(a)anthracene	56-55-3	150	<150	<150	<150
Chrysene	218-01-8	150	<150	<150	<150
Benzo(b)fluoranthene	205-99-2	150	<150	<150	<150
Benzo(k)fluoranthene	207-08-9	150	<150	<150	<150
Benzo(a)pyrene	50-32-8	150	<150	<150	<150
Indeno(1,2,3-cd)pyrene	193-39-5	150	<150	<150	<150
Dibenz(a,h)anthracene	53-70-3	150	<150	<150	<150
Benzo(g,h,i)perylene	191-24-2	150	<150	<150	<150
Low M.W. PAHs	---	550	<550	<550	<550
High M.W. PAHs	---	1700	<1700	<1700	<1700
EP-076S: Polycyclic Aromatic Hydrocarbons (PAHs) Surrogates					
2-Fluorobiphenyl	32150-8	0.1	94.4	93.3	101
4-Terphenyl-d14	1718-510	0.1	90.3	93.7	94.6
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate					
Decachlorobiphenyl	205124-3	0.1	74.6	54.7	79.0

Surrogate control limits listed at end of this report.

Surrogate control limits listed at end of this report.



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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1319723

Laboratory Duplicate (DUP) Report

Matrix: SOIL	Laboratory sample ID	Client sample ID	Method: Compound	Laboratory Duplicate (DUP) Report			RPD (%)	
				CAS Number	LOR	Unit		
EA/ED: Physical and Aggregate Properties (QC Lot: 2979733)								
HK1319598-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	7439-97-6	0.1	%	51.8	52.4	1.0
HK1319598-011	Anonymous	EA055: Moisture Content (dried @ 103°C)	7440-22-4	0.1	%	39.7	38.8	2.4
EA/ED: Physical and Aggregate Properties (QC Lot: 2979734)								
HK1319723-002	CE44-CB5 28M-28.5M	EA055: Moisture Content (dried @ 103°C)	7440-43-9	0.1	%	13.8	13.5	2.1
EG: Metals and Major Cations (QC Lot: 2981157)								
HK1319720-002	Anonymous	EG020: Mercury	7440-38-2	0.05	mg/kg	<0.05	<0.05	0.0
		EG020: Silver	7440-47-3	0.1	mg/kg	<0.1	<0.1	0.0
		EG020: Cadmium	7440-50-8	0.2	mg/kg	<0.2	<0.2	0.0
		EG020: Arsenic	7439-92-1	1	mg/kg	4	4	0.0
		EG020: Chromium	7440-02-0	1	mg/kg	11	9	17.9
		EG020: Copper	7440-66-6	1	mg/kg	3	3	0.0
		EG020: Lead		1	mg/kg	7	8	13.6
		EG020: Nickel		1	mg/kg	6	6	0.0
		EG020: Zinc		1	mg/kg	635	580	9.0
EP-065: PCB Single Congeners (QC Lot: 2979730)								
HK1319720-001	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: 2979724)								
HK1319666-001	Anonymous	High M.W. PAHs		1700	µg/kg	<1700	<1700	0.0
		Naphthalene	91-20-3	500	µg/kg	<500	<500	0.0
		Acenaphthylene	208-96-8	500	µg/kg	<500	<500	0.0
		Acenaphthene	83-32-9	500	µg/kg	<500	<500	0.0
		Fluorene	86-73-7	500	µg/kg	<500	<500	0.0
		Phenanthrene	85-01-8	500	µg/kg	<500	<500	0.0
		Anthracene	120-12-7	500	µg/kg	<500	<500	0.0



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 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1319723

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Laboratory Duplicate (DUP) Report		RPD (%)
					Original Result	Duplicate Result	
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 2979724) - Continued							
HK1319666-001	Anonymous	Fluoranthene	206-44-0	500	<500	<500	0.0
		Pyrene	129-00-0	500	<500	501	0.2
		Benz(a)anthracene	56-55-3	500	<500	<500	0.0
		Chrysene	218-01-9	500	<500	<500	0.0
		Benzo(b)fluoranthene	205-99-2	500	<500	<500	0.0
		Benzo(k)fluoranthene	207-08-9	500	<500	<500	0.0
		Benzo(a)pyrene	50-32-8	500	<500	<500	0.0
		Indeno(1,2,3-cd)pyrene	193-39-5	500	<500	<500	0.0
		Dibenz(a,h)anthracene	53-70-3	500	<500	<500	0.0
		Benzo(g,h,i)perylene	191-24-2	500	<500	<500	0.0
		Low M.W. PAHs	---	550	<550	<550	0.0

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

Method Blank (MB) Report											
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration			Recovery Limits (%)			RPD (%)
					LCS	High	Low	DCS	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 2981157)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	97.6	109	77	---	---	---	---
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	96.0	110	86	---	---	---	---
EG020: Chromium	7440-47-3	1	mg/kg	<1	102	120	88	---	---	---	---
EG020: Copper	7440-50-8	1	mg/kg	<1	98.0	109	85	---	---	---	---
EG020: Lead	7439-92-1	1	mg/kg	<1	95.6	106	84	---	---	---	---
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	85.8	112	80	---	---	---	---
EG020: Nickel	7440-02-0	1	mg/kg	<1	98.3	111	87	---	---	---	---
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	96.2	105	83	---	---	---	---
EG020: Zinc	7440-66-6	1	mg/kg	<1	103	126	82	---	---	---	---
EP-065: PCB Single Congeners (QC Lot: 2979730)											
PCB 8	34883-43-7	3	µg/kg	<3	56.9	152	51	---	---	---	---
PCB 18	37680-65-2	3	µg/kg	<3	59.2	148	59	---	---	---	---
PCB 28	7012-37-5	3	µg/kg	<3	64.9	146	45	---	---	---	---
PCB 44	41464-39-5	3	µg/kg	<3	60.9	143	39	---	---	---	---
PCB 52	35693-99-3	3	µg/kg	<3	66.6	140	43	---	---	---	---
PCB 66	32598-10-0	3	µg/kg	<3	61.3	145	25	---	---	---	---
PCB 77	32598-13-3	3	µg/kg	<3	96.5	128	66	---	---	---	---
PCB 101	37680-73-2	3	µg/kg	<3	82.4	130	74	---	---	---	---
PCB 105	37680-73-2	3	µg/kg	<3	81.0	130	63	---	---	---	---
PCB 118	31508-00-6	3	µg/kg	<3	89.1	128	62	---	---	---	---
PCB 126	57465-28-8	3	µg/kg	<3	77.8	120	68	---	---	---	---
PCB 128	38380-07-3	3	µg/kg	<3	77.3	130	60	---	---	---	---
PCB 138	35065-28-2	3	µg/kg	<3	89.2	130	60	---	---	---	---
PCB 153	35065-27-1	3	µg/kg	<3	93.4	131	63	---	---	---	---
PCB 169	32774-16-6	3	µg/kg	<3	81.6	133	53	---	---	---	---
PCB 170	35065-30-6	3	µg/kg	<3	90.4	129	55	---	---	---	---
PCB 180	35066-29-3	3	µg/kg	<3	98.2	129	57	---	---	---	---



Matrix: SOIL		Method Blank (MB) Report												
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	LCS	Spike Recovery (%)	DCS	Recovery Limits (%)	Low	High	Value	RPD (%)	Control Limit
EP-065: PCB Single Congeners (QC Lot: 2979730) - Continued														
PCB187	52663-68-0	3	µg/kg	<3	5 µg/kg	72.4	---	---	65	127	---	---	---	---
Total Polychlorinated biphenyls	---	18	µg/kg	<18	---	---	---	---	---	---	---	---	---	---
EP-076A: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 2979724)														
Naphthalene	91-20-3	25	µg/kg	<50	25 µg/kg	72.5	---	---	63	117	---	---	---	---
Acenaphthylene	208-96-8	25	µg/kg	<50	25 µg/kg	72.4	---	---	54	119	---	---	---	---
Acenaphthene	83-32-9	25	µg/kg	<50	25 µg/kg	87.1	---	---	59	122	---	---	---	---
Fluorene	86-73-7	25	µg/kg	<50	25 µg/kg	94.6	---	---	60	126	---	---	---	---
Phenanthrene	85-01-8	25	µg/kg	<50	25 µg/kg	71.2	---	---	60	127	---	---	---	---
Anthracene	120-12-7	50	µg/kg	<50	---	---	---	---	---	---	---	---	---	---
Fluoranthene	206-44-0	25	µg/kg	<50	25 µg/kg	76.2	---	---	56	124	---	---	---	---
Pyrene	129-00-0	25	µg/kg	<50	25 µg/kg	81.7	---	---	61	132	---	---	---	---
Benz(a)anthracene	56-56-3	50	µg/kg	<50	---	---	---	---	---	---	---	---	---	---
Chrysene	218-01-9	50	µg/kg	<50	25 µg/kg	74.7	---	---	57	124	---	---	---	---
Benzo(b)fluoranthene	205-99-2	50	µg/kg	<50	25 µg/kg	78.6	---	---	60	128	---	---	---	---
Benzo(k)fluoranthene	207-08-9	25	µg/kg	<50	25 µg/kg	80.6	---	---	48	135	---	---	---	---
Benzc(a)pyrene	50-32-8	25	µg/kg	<50	25 µg/kg	78.2	---	---	58	133	---	---	---	---
Indeno(1,2,3-cd)pyrene	193-39-5	25	µg/kg	<50	25 µg/kg	86.3	---	---	50	124	---	---	---	---
Dibenz(a,h)anthracene	53-70-3	25	µg/kg	<50	25 µg/kg	100	---	---	48	134	---	---	---	---
Benzo(g,h,i)perylene	191-24-2	50	µg/kg	<50	25 µg/kg	83.4	---	---	50	137	---	---	---	---
Low M.W. PAHs	---	550	µg/kg	<550	---	---	---	---	---	---	---	---	---	---
High M.W. PAHs	---	1700	µg/kg	<1700	---	---	---	---	---	---	---	---	---	---



Page Number : 8 of 8
 Client : HIGHWAYS DEPARTMENT
 Work Order : HK1319723

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	MS	MSD	Recovery Limits (%)	RPD (%)		
EG: Metals and Major Cations (QC Lot: 2981157)										
HK1319720-001	Anonymous									
		EG020: Arsenic	7440-38-2	5 mg/kg	87.3		75	125		
		EG020: Cadmium	7440-43-9	5 mg/kg	95.5		75	125		
		EG020: Chromium	7440-47-3	5 mg/kg	82.1		75	125		
		EG020: Copper	7440-50-8	5 mg/kg	84.1		75	125		
		EG020: Lead	7439-92-1	50 mg/kg	90.5		75	125		
		EG020: Mercury	7439-97-6	0.1 mg/kg	97.2		75	125		
		EG020: Nickel	7440-02-0	5 mg/kg	88.2		75	125		
		EG020: Silver	7440-22-4	5 mg/kg	92.8		75	125		
		EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined		75	125		

Surrogate Control Limits

Compound	CAS Number	Recovery Limits (%)	
		Low	High
Sub-Matrix: SEDIMENT			
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

Appendix E

**(Phase 1) Record of Sediment
Sampling & Collection under
ETWB TCW No. 34/2002**

HK/501A/13

(Sheet _____ of _____)

RECORD OF SEDIMENT SAMPLING & COLLECTION UNDER ETWB TCOW NO. 34/2002/PNAK ADV-21

Project Name: Barrier-Free Access Initiative Contract No: HY/2012/11
 Name of Project Proponent: for Highway Structure Phase 3 Contract 4 - Chemical and Biological Test
 Address: _____
 Contact Person: Keith Law E-mail address: keithlaw@stk.com.hk Fax No.: _____
 Telephone No.: 97362793

Sample ID No.	Sampling Date & Time	Sampling Location (latitude/longitude or Northing/Easting)	Sampling Depth (starting & finishing levels)	Method of Collection (e.g. grab, vibrocore, etc)	Analysis requested					Remarks	
					Metals	Metalloid	LMW PAHs	HMW PAHs	Total PCBs		TBT
<u>CE46-28/6/2013</u>			<u>1.6m ~ 1.5m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
<u>OBV</u>			<u>1.5m ~ 1.7m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

Sediment Sampling

Sampling Conducted by: Sun Fook Kong (GWD) Company Name: _____
 Address: Rm 3207-10 Green Eagle Centre 23 Harbour View
 Person-in-charge: Keith Law Signature: _____ Responsible Person: _____
 Phone No: 97362793 Date & Time: 28/6/13 1600

Sampling Supervised by (if any): _____
 Company Name: _____
 Address: _____
 Signature: _____ Responsible Person: _____
 Date & Time: _____ Phone No.: _____

Samples Received by: W. Lee
 Name of Laboratory: _____
 Address: _____
 Responsible Person: _____ Signature: _____
 Phone No.: _____ Date & Time: 28/6/13 1600

(Sheet _____ of _____)

RECORD OF SEDIMENT SAMPLING & COLLECTION UNDER ETWB TC/WO NO. 342002/FNAP ADV-21

Project Name: HY/2012/11 Provision of Barrier-Free Access Facilities for Highway Structure Phase 3 Contract 2 - Chemical and Biological Test
 Contract No: HY/2012/11

Name of Project Proponent: _____
 Address: _____
 Contact Person: Keith Lau
 Telephone No.: 97362793
 E-mail address: keithlau@sfk.com.hk
 Fax No.: _____

Sample ID No.	Sampling Date & Time	Sampling Location (latitude/longitude or Northing/Easting)	Sampling Depth (starting & finishing levels)	Method of Collection (e.g. grab, vibrocore, etc)	Analysis requested					Remarks	
					Metals	Metalloid	LMW PAHs	HMW PAHs	Total PCBs		TBT
<u>CE-44-29/6/2013</u>			<u>17m-17.5m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<u>CE-44-29/6/2013</u>			<u>17m-18m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<u>CE-44-29/6/2013</u>			<u>18m-18.5m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<u>CE-44-29/6/2013</u>											
<u>CE-44-29/6/2013</u>											

Sediment Sampling

Sampling Conducted by: _____
 Company Name: Sun Fook Hong (Civil) Limited.
 Address: Room 3207-3208 Great Eagle Centre, 23 Road, Mong Kok, Kowloon, Hong Kong
 Person-in-charge: Keith Lau
 Signature: _____
 Date & Time: 29/6/2013
 Phone No.: 97362793

Sampling Supervised by (if any): _____
 Company Name: _____
 Address: _____
 Responsible Person: _____
 Signature: _____
 Date & Time: _____
 Phone No.: _____

Samples Received by: Keith Lau
 Name of Laboratory: _____
 Address: _____
 Responsible Person: _____
 Signature: _____
 Date & Time: 29/6/2013
 Phone No.: 1730

RECORD OF SEDIMENT SAMPLING & COLLECTION UNDER ETVETICWV NO. 34/2002/FNAP

Contract No: HY/2012/11
 Project Name: HY/2012/11 Provision of Barrier-Free Access Facilities for Highway Structure Phase 3 Contract 2 - Chemical And Biological Test

Name of Project Proponent: _____
 Address: _____

Contact Person: Keith Lau
 Telephone No.: 97362793
 E-mail address: keithlau@sfk.com.hk
 Fax No.: _____

Sediment Sampling

Sample ID No.	Sampling Date & Time	Sampling Location (latitude/longitude or Northing/Easting)	Sampling Depth (starting & finishing levels)	Method of Collection (e.g. grab, vibrocore, etc)	Analysis requested					Remarks	
					Metals	Metalloid	LMW PAHs	HMW PAHs	TBIs/TCBs		TBT
<u>CB1 29/6/2013</u>			<u>18.5m-19m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<u>CB2 29/6/2013</u>			<u>19m-19.5m</u>	<u>Vibro core</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<u>CB3 29/6/2013</u>			<u>19.5m-20m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Sampling Conducted by:
 Company Name: Sun Fook Hong (Civil) Limited.
 Address: Room 3207-3208 Great Eagle Centre 23 Road
 Person-in-charge: Keith Lau Signature: _____ Date & Time: 29/6/2013
 Phone No: 97362793

Sampling Supervised by (if any):
 Company Name: _____
 Address: _____
 Responsible Person: _____ Signature: _____ Date & Time: _____
 Phone No.: _____

Samples Received by:
 Name of Laboratory: _____
 Address: _____
 Responsible Person: _____ Signature: _____ Date & Time: _____
 Phone No.: _____

RECORD OF SEDIMENT SAMPLING & COLLECTION UNDER ETWB TCIV NO. 342/002/RNAP ADV-21

Contract No: HY/2012/11
 Project Name: HY/2012/11 Provision of Barrier-Free Access Facilities For Highway Structure Phase 3 Contract 2 - Chemical and Biological Test

Name of Project Proponent:
 Address:
 Contact Person: Keith Lau
 Telephone No.: 97362793
 E-mail address: keithlau@sfk.com.hk
 Fax No.:

Sediment Sampling

Sample ID No.	Sampling Date & Time	Sampling Location (latitude/longitude or Northing/Easting)	Sampling Depth (starting & finishing levels)	Method of Collection (e.g. grab, vibrocore, etc)	Analysis requested					Remarks	
					Metals	Metalloid	LMW PAHs	HMW PAHs	Total PCBs		TBT
<u>CB1</u>	<u>29/6/2013</u>		<u>20m-20.5m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<u>CB2</u>	<u>29/6/2013</u>		<u>22.5m-23m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<u>CB3</u>	<u>29/6/2013</u>		<u>23m-23.5m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<u>CB4</u>	<u>29/6/2013</u>		<u>23.5m-24m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Sampling Conducted by:
 Company Name: Sun Fook Hong (Civil) Limited.
 Address: Room 3209-3206 Great Eagle Centre 25
 Person-in-charge: Keith Lau
 Signature: [Signature]
 Date & Time: 29/6/13
 Phone No.: 97362793

Sampling Supervised by (if any):
 Company Name:
 Address:
 Responsible Person:
 Signature:
 Date & Time:
 Phone No.:

Samples Received by:
 Name of Laboratory:
 Address:
 Responsible Person:
 Signature: [Signature]
 Date & Time: 29/6/13
 Phone No.: 9730

(Sheet 2 of 3)

RECORD OF SEDIMENT SAMPLING & COLLECTION UNDER E1WB TC(W) NO. 347002/FNAP ADV-21

Project Name: HY/2012/11 Provision of Barrier-Free Access Facilities Contract No: _____
 Name of Project Proponent: For Highway Structure Phase 3 Contract 4 - Chemical and Biological Test
 Address: _____
 Contact Person: Keith Lau
 Telephone No.: 97362793 E-mail address: keithlau@sfk.com.hk Fax No.: _____

Sediment Sampling

Sample ID No.	Sampling Date & Time	Sampling Location (latitude/longitude or Northing/Easting)	Sampling Depth (starting & finishing levels)	Method of Collection (e.g. grab, vibrocore, etc)	Analysis requested						Remarks	
					Metals	Metalloid	LMW PAHs	HMW PAHs	Total PCBs	TBT		Others (please specify)
CE 44	10/7/2013		17.5m-18m	Vibrocore	✓	✓	✓	✓	✓	✓		
CB 2	10/7/2013		18m-18.5m	Vibrocore	✓	✓	✓	✓	✓	✓		
CE 44	10/7/2013		18.5m-19m	Vibrocore	✓	✓	✓	✓	✓	✓		
CB 2	10/7/2013		19m-19.5m	Vibrocore	✓	✓	✓	✓	✓	✓		

Sampling Conducted by:
 Company Name: Sun Fook Hong (Civil) Limited.
 Address: Room 3207-326 Great Eagle Centre 23
 Person-in-charge: Keith Lau Signature: [Signature] Date & Time: 10/7/2013
 Phone No: 97362793

Sampling Supervised by (if any):
 Company Name: _____
 Address: _____
 Responsible Person: _____ Signature: _____ Date & Time: _____
 Phone No.: _____

Samples Received by: [Signature]
 Name of Laboratory: ALS Hong
 Address: _____
 Responsible Person: _____ Signature: [Signature]
 Phone No.: _____ Date & Time: 10/7/11

92783372

1600

(Sheet 3 of 3)

RECORD OF SEDIMENT SAMPLING & COLLECTION UNDER ETVB TC(W) NO. 34702/2/P/NAF ADV-21

Project Name: HY/2012/11 Provision of Barrier-Free Access Facilities Contract No:

Name of Project Proponent: For Highway Structure Phase 3 Contract 3 - Chemical and Biological Test

Address:

Contact Person: Keith Lau E-mail address: keithlau@sfk.com.hk Fax No.:

Telephone No.: 97362793

Sediment Sampling

Sample ID No.	Sampling Date & Time	Sampling Location (latitude/longitude or Northing/Easting)	Sampling Depth (starting & finishing levels)	Method of Collection (e.g. grab, vibrocore, etc)	Analysis requested						Remarks	
					Metals	Metalloid	LMW PAHs	HMW PAHs	Total PCBs	TBT		Others (please specify)
<u>CE44</u>	<u>10/7/2013</u>		<u>19.5m-20m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
<u>CB2</u>	<u>10/7/2013</u>		<u>20m-20.5m</u>	<u>Vibro core</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
<u>CE44</u>	<u>10/7/2013</u>		<u>20.5m-21m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
<u>CB2</u>			<u>21m-21.5m</u>	<u>Vibro core</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

Sampling Conducted by: Wai Lok

Company Name: Sun Fook Hong (Civil) Limited Company Name:

Address: Room 3207-326 Great Eagle Centre 23 Address:

Person-in-charge: Keith Lau Signature: [Signature] Responsible Person:

Phone No: 97362793 Date & Time: 10/7/13 Signature: [Signature] Date & Time: 10/7/13

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(Sheet 3 of 3)

RECORD OF SEDIMENT SAMPLING & COLLECTION UNDER ETWB TCOW NO. 347002/PNAP ADV-21

Project Name: HY/2012/11 Provision of Barrier-Free Access Facilities Contract No.: HY/2012/11

Name of Project Proponent: For Highway Structure Phase 3 Contract 2 - Chemical and Biological Test

Address: 1

Contact Person: Keith Lau E-mail address: keithlau@sfk.com.hk Fax No.:

Telephone No.: 97362793

Sediment Sampling

Sample ID No.	Sampling Date & Time	Sampling Location (latitude/longitude or Northing/Easting)	Sampling Depth (starting & finishing levels)	Method of Collection (e.g. grab, vibrocore, etc)	Analysis requested						Remarks	
					Metals	Metalloid	LMW PAHs	HMW PAHs	Total PCBs	TBT		Others (please specify)
<u>CB1</u>	<u>19/7/2013</u>		<u>26.5m-27m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
<u>CB2</u>	<u>19/7/2013</u>		<u>27m-27.5m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
<u>CB3</u>	<u>19/7/2013</u>		<u>27.5m-28m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
<u>CB4</u>	<u>19/7/2013</u>		<u>28m-28.5m</u>	<u>Vibrocore</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

Sediment Sampling

Sampling Conducted by: Sun Fook Hong Civil Limited Sampling Supervised by (if any): None

Company Name: Sun Fook Hong Civil Limited Company Name: Sun Fook Hong Civil Limited

Address: Room 3207-326 Great Eagle Centre 23 Road Address: Room 3207-326 Great Eagle Centre 23 Road

Person-in-charge: Keith Lau Signature: [Signature] Responsible Person: [Signature]

Phone No: 97362793 Date & Time: 19/7/2013 Phone No.: 1600

19 JUL 2013



PROPOSED ROAD IMPROVEMENT WORKS IN
WEST KOWLOON RECLAMATION
DEVELOPMENT

PRELIMINARY SEDIMENT QUALITY REPORT

CLIENT:

Vibro Construction Co. Ltd

CHECKED BY:

Lam Environmental Services Limited

11/F, Centre Point,
181-185 Gloucester Road
Wan Chai, H.K.

Telephone: (852) 2882-3939
Facsimile: (852) 2882-3331
E-mail: info@lamenviro.com
Website: <http://www.lamenviro.com>

APPROVED BY:

A handwritten signature in blue ink, appearing to read "Raymond Dai".

Raymond Dai
Principal Engineer/Consultant

DATE:

24 January 2017

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1 INTRODUCTION

1.1 THE PROJECT

Vibro Construction Co. Ltd (Vibro) proposes to carry out the project of Road Improvement Works in West Kowloon Reclamation Development. Lam Environmental Services Limited (Lam) was appointed to conduct a sediment quality assessment prior to the operation of piling works.

Lam comprises a team of engineers and scientists working closely with HOKLAS accredited laboratory, to combine with particular expertise in environmental monitoring and contamination investigations, fieldwork, chemical and biological analyses. The team has developed strong experience in the management of pollution related projects in environmental monitoring and audit, soil/sediment and water for a range of private and public clients.

1.2

BACKGROUND OF EXCAVATED MARINE SEDIMENT FROM PILING WORKS

In accordance with the "Management Framework for Excavated Sediment" of ETWB TC (W) No. 34/2002, sediment sampling and testing are set out for Tier II chemical Screening. Based on the testing results, the sediment will be assessed as Category L or Category M or Category H according to classification of ETWB TC (W) No. 34/2002.

The marine sediment generated under this project is a result of the piling works for the viaducts. Deep foundation in form of pre-bored H-piles has to be constructed to support the viaduct structures. As the viaducts are located in reclamation area, it is anticipated that marine sediment will be excavated during the course of the piling works.

Piling works (and hence sediment excavation) are planned to carry out in two phases, and this report deal with the second phase (Phase II) of the piling works. Piles under Phase II are shown on plans in **Figure 1** inside the 100m x 100m grids.

2 **REVIEW OF EXISTING GROUND INVESTIGATION**

2.1 **SAMPLING LOCATION**

Samplings of sediments for chemical/biological testing are proposed at 3 numbers of drill holes, namely CB6, CB7 and CB8 are proposed at locations as shown on the proposed GI plans in **Figure 2**. These CB drillholes are proposed so that the sampling arrangement adopted will be in accordance with ETWB TC(W) No. 34/2002. i.e. all future excavation sites during piling works will be within the 100 x 100 m grids of the CB drillholes.

Alignments of the proposed viaducts as far as possible, with samples taken at the excavation sites of sediment. However, some of the sampling locations have been adjusted away from the alignment due to site specific conditions (e.g. locations and presence of existing foundations, existing dense vegetation, underground utilities, etc.).

CB6 and CB7 have been completed sampling on 4 Nov 2015 and 6 May 2016 respectively. No marine deposit was found at CB6 while 6 nos. of U76 samples for CB7 were sampled and send to an appointed HOKLAS accredited laboratory for further testing.

Drillhole CB8 is located in the far-side lane and within the toll plaza of Western Harbour Crossing which is managed and operated by a private consortium. Operation of the toll plaza and safety to the motorists will be adversely affected unless the existing traffic aids (including road marking and signage) are temporarily modified and substantial temporary traffic arrangements are implemented. Processing time is required for seeking approval from the management company of Western Harbour Crossing and relevant authorities. CB8 have been completed sampling on 24 Oct 2016. 12 nos. of U76 samples were sampled and send to an appointed HOKLAS accredited laboratory for further testing. No sample can be collected at the depth 27.50m to 28.50m as the drill rig was broken.

2.2 **SAMPLING METHOD AND DEPTH OF SAMPLING**

As the layers of marine sediment are approximately 15m to 30m below the existing ground level according to the existing GI data, the proposed drillholes for sampling should be advanced by means of rotary drilling method. For safety reason, an inspection pit of 1.5m deep below ground should be excavated to inspect the presence of underground utilities at each of the proposed drillhole location.

Before drilling of each CB drillhole, depth and thickness of sediment will first be ascertained by an adjacent conventional GI drillhole sunk from existing ground level to 5m into bedrock. After that, the CB drillhole will be sunk for sampling of sediment for chemical/biological testing.

Vertical profiles of samples should be taken according to Appendix B Section 2(a)(vi) of ETWB TC (W) No. 34/2002. Samples of sediment for chemical/biological testing will be taken once the layer of marine deposit is encountered. Samples should be continuous, and the top level of the sub-samples should be the top of the marine deposit, 0.9m down, 1.9m down, 2.9m down, and then every 3m to the bottom of the marine deposit. For clarity, the last sample taken from each CB drillhole will be at the bottom level of the deepest marine deposit stratum.

The marine deposit consists of a stratum of marine mud and a subsequent stratum of marine sand according to the existing GI data. Undisturbed U76 samples should be taken. One stratum of marine sediment of approximate thickness between 0m (no sediment) to 6m is expected to encounter in the proposed CB drillholes.

2.3 *Strata Logging*

Strata logging for drillholes were taken during the course of drilling and sampling by a qualified geologist. The logs included the general stratigraphic descriptions, depth of sampling, sample notation and level of groundwater (if encountered). Details of the logs are enclosed in **Appendix A**.

3 **SEDIMENT SAMPLING AND TESTING REQUIREMENTS**

3.1 **SEDIMENT SAMPLING**

All equipment in contact with the ground should be thoroughly decontaminated between each drilling and sampling event to minimize the potential for cross contamination. The equipment (including drilling bits and samplers) should be decontaminated by steam cleaning/high pressure hot water jet, and then washed by phosphate-free detergent and finally rinsed by distilled/deionized water.

Depending on the results of chemical screening, biological screening may be required and samples of reference sediment should also be taken. In that case, reference sediment required for the test should be collected from EPD designated reference site PS6 located in Port Shelter (E850243, N820057) by grab sampler. The samples should be kept at 4°C in the dark and should not be frozen. All samples should be promptly analysed. If this is impractical, the recommended maximum holding time is:

Sample type	Maximum holding time
Chemical test	2 weeks
Biological test	8 weeks

Samples were delivered to laboratory as soon as possible for analysis. All sample bottles were labelled with the location reference, sampling date and time, together with a full description of the sample. All samples were kept at 4°C in the dark and pre-treated in accordance with the requirements in **Table 3.1** prior to the start of test within the laboratory.

Table 3.1 Sediment Sample Storage and Pre-treatment Requirements

Parameters to be tested	Sample size*	Sample bottle	Pre-treatment Procedure
Metals and metalloid	0.5 litre	HDPE bottle	USEPA SW-846 Chapter 3
Organic	0.5 litre	Borosilicate glass bottle with Teflon lined lid	USEPA SW-846 Chapter 4
Biological response	6 litres	HDPE bottle	USEPA SW-846 Chapter 3

* Quantity to be confirmed by testing laboratory. The quantity of reference sediment to be collected needs to be separately worked out for each case, especially if biological dilution tests are anticipated.



Nominated Laboratory

ALS Technichem (HK) Pty Ltd is accredited under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) and is appointed to perform all the required chemical and biological tests as specified in the ETWB TCW No. 34/2002.

The HOKLAS accredited laboratory has been accredited to the internationally recognised ISO 17025 Standards. Currently the laboratory is providing a range of environmental related testing services under a vigorous QA/QC system for a range of government and private clients in Hong Kong.

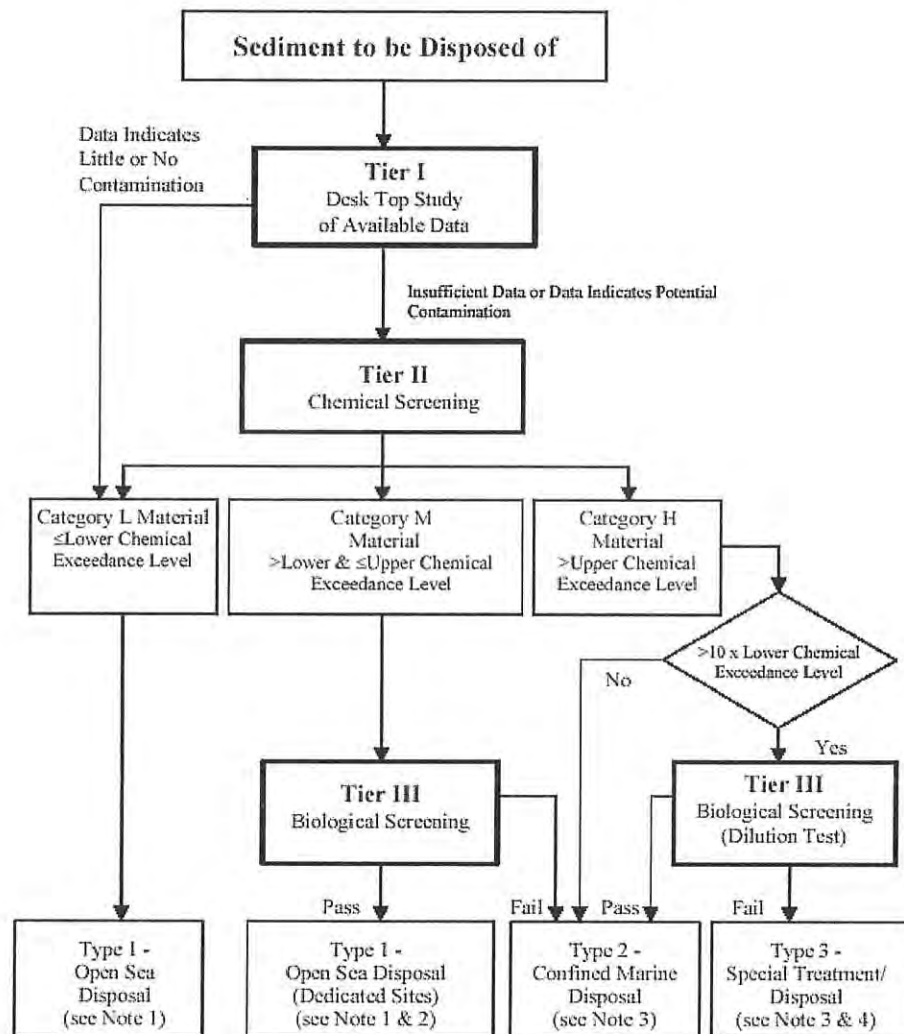
HOKLAS certificate is presented in ***Appendix B***.

3.2

METHODOLOGY OF SEDIMENT QUALITY ASSESSMENT

Classification of sediment and the corresponding disposal requirements for dredged sediment will be established in accordance with the framework laid down in ETWB TCW No. 34/2002 as shown in the diagram below.

Management Framework for Dredged/Excavated Sediment



Testing Parameter and Methods – Chemical Screening

All samples shall be tested for the contaminants as stated in **Table 3.2a**.

Table 3.2a Analytical Methodology for Chemical Screening

Parameters	ALS Method Code	In-house Method Reference (USEPA)	Reporting Limits
<u>Metals (mg/kg dry wt.)</u>			
Cadmium (Cd)			0.2
Chromium (Cr)			1
Copper (Cu)			1
Mercury (Hg)	EG020	6020	0.05
Nickel (Ni)			1
Lead (Pb)			1
Silver (Ag)			0.1
Zinc (Zn)			1
<u>Metalloid (mg/kg dry wt.)</u>			
Arsenic (As)	EG020	6020	1
<u>Organic-PAHs (µg/kg dry wt.)</u>			
Low Molecular Weight PAHs	EP076	8270	550
High Molecular Weight PAHs			1700
<u>Organic-non-PAHs (µg/kg dry wt.)</u>			
Total PCBs	EP065	8270	18

Testing Parameter and Methods – Biological Screening

In case of biological screening is required, 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 or horizontal profile.

Sediment classified as Category M shall be subjected to the following 3 toxicity tests (to be considered as one set) on each composite sample:

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

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 described in **Table 3.2b**.

Table 3.2b *Preparation of Category H sediment for Biological Screening*

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 Category 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.

Only ecologically relevant species should be used for carrying out the biological screening tests. The species to be used for each type of test can be selected according to **Table 3.2c**.

Table 3.2c *Preparation of Category H sediment for Biological Screening*

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

*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.

PSEP (Puget Sound Estuary Program) 1995. Recommended guidelines for conducting laboratory bioassays on Puget Sound sediments.

All biological tests must be conducted by laboratories with appropriate accreditation. The biological test shall include appropriate quality assurance/quality control namely (i) Negative Control; and (ii) Positive Control. Test for ancillary parameters (moisture content, grain size, total organic carbon (TOC), ammonia and salinity of porewater) and chemical contaminants are also required to compare the characteristics of the sample with a reference sediment.

4 SEDIMENT CLASSIFICATION

The requirements specified in ETWB TCW No. 34/2002 are adopted for assessment of dredging and disposal of sediment for this project. After testing, marine sediments obtained will be classified into three categories based on their contaminant levels as stated in the Technical Circular. The three categories are: Category L, M and H. The criteria for classification are shown in **Table 4a**.

Table 4a *Criteria for Classification of Sediment*

Contaminants	Lower Chemical Exceedance Level (LCEL)	Upper Chemical Exceedance Level (UCEL)
<u>Metals (mg/kg dry wt.)</u>		
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
<u>Metalloid (mg/kg dry wt.)</u>		
Arsenic (As)	12	42
<u>Organic-PAHs (µg/kg dry wt.)</u>		
Low Molecular Weight PAHs	550	3160
High Molecular Weight PAHs	1700	9600
<u>Organic-non-PAHs (µg/kg dry wt.)</u>		
Total PCBs	23	180

To identify the most appropriate disposal option for Category M and certain Category H sediments, toxicity test results shall be reviewed against the test endpoints and decision criteria summarized in **Table 4b**. The sediment is deemed to have failed the biological test if it fails in any one of the three toxicity tests.

Table 4b *Test Endpoints and Decision Criteria for Biological Screening*

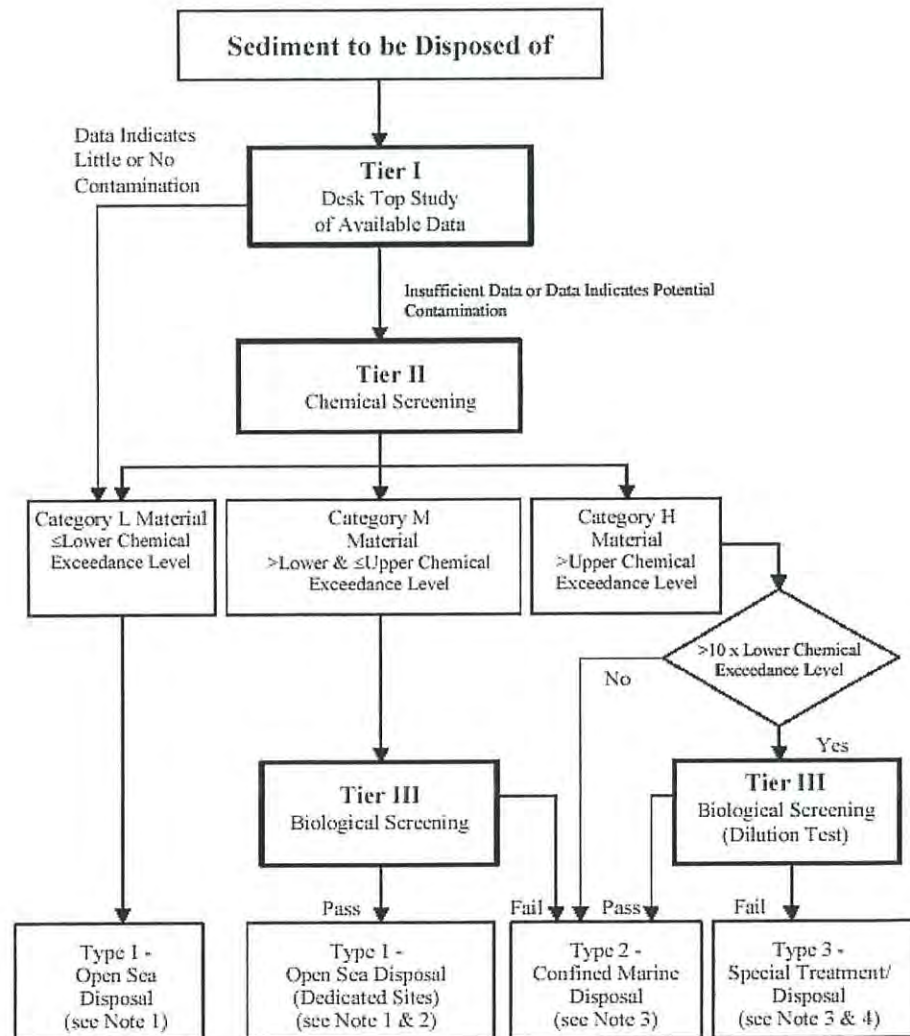
Toxicity test	Endpoints Measured	Failure criteria
10-day amphipod	Survival	Mean survival in test sediment is significantly different ($p \leq 0.05$) ¹ from mean survival in reference sediment <u>and</u> mean survival in test sediment < 80% of mean survival in reference sediment.
20-day polychaete	Dry Weight ²	Mean dry weight in test sediment is significantly different ($p \leq 0.05$) ¹ from mean dry weight in reference sediment <u>and</u> mean dry weight in test sediment < 90% of mean dry weight in reference sediment.
48-96 hour larvae (bivalve or echinodem)	Normality Survival ³	Mean normality survival in test sediment is significantly different ($p \leq 0.05$) ¹ from mean normality survival in reference sediment <u>and</u> mean normality survival in test sediment < 80% of mean normality survival in reference sediment.

Notes:

1. Statistically significant differences should be determined using appropriate two-sample comparisons (e.g. t-tests) at a probability of $p \leq 0.05$.
2. Dry weight means total dry weight after deducting dead and missing worms.
3. Normality survival integrates the normality and survival end points, and measures survival of only the normal larvae relative to the starting number.

RESULTS INTREPRETATION

Classified of sediment and the corresponding disposal requirements for excavated sediment will be established in accordance with the framework laid down in ETWB TCW No. 34/2002 as shown in the diagram below.

Management Framework for Dredged/Excavated Sediment


Chemical test results, quality control records and their categories are summarized in **Table 5**. Detail analytical test reports are detailed in **Appendix C**.

Table 5 Chemical Test Results Summary and Category of Sediment Samples

Sample ID	Depth m	Metal									PAHs		PCBs µg/kg	Sediment Category
		Cd mg/kg	Cr mg/kg	Cu mg/kg	Hg mg/kg	Ni mg/kg	Pb mg/kg	Ag mg/kg	Zn mg/kg	As mg/kg	LMW µg/kg	HMW µg/kg		
CB-7	14.30M – 15.30M	<0.2	48	3	<0.05	23	4	<0.1	8	<1	<550	<1700	<18	L
CB-7	15.30M- 16.30M	<0.2	22	9	<0.05	16	14	<0.1	45	3	<550	<1700	<18	L
CB-7	16.30M- 17.30M	<0.2	9	3	<0.05	4	5	<0.1	10	<1	<550	<1700	<18	L
CB-7	17.80M- 18.80M	<0.2	9	3	<0.05	5	7	<0.1	17	2	<550	<1700	<18	L
CB-7	18.80M- 19.80M	<0.2	8	3	<0.05	4	7	<0.1	13	<1	<550	<1700	<18	L
CB-7	19.80M- 20.80M	<0.2	16	12	<0.05	7	10	0.1	28	1	<550	<1700	<18	L
CB-8	18.50M – 19.50M	<0.2	10	1	<0.05	5	4	<0.1	9	1	<550	<1700	<18	L
CB-8	19.50M- 20.50M	<0.2	7	1	<0.05	4	4	<0.1	9	2	<550	<1700	<18	L
CB-8	20.50M- 21.50M	<0.2	7	2	<0.05	5	7	<0.1	14	3	<550	<1700	<18	L
CB-8	21.50M- 22.50M	<0.2	36	4	<0.05	20	11	<0.1	28	3	<550	<1700	<18	L
CB-8	22.50M- 23.50M	<0.2	20	4	<0.05	10	6	<0.1	15	3	<550	<1700	<18	L
CB-8	23.50M- 24.50M	<0.2	15	4	<0.05	8	7	<0.1	18	3	<550	<1700	<18	L
CB-8	24.50M- 25.50M	<0.2	17	3	<0.05	10	8	<0.1	17	3	<550	<1700	<18	L
CB-8	25.50M- 26.50M	<0.2	11	2	<0.05	6	6	<0.1	16	2	<550	<1700	<18	L
CB-8	26.50M- 27.50M	<0.2	6	1	<0.05	3	4	<0.1	8	2	<550	<1700	<18	L
CB-8	28.50M- 29.50M	<0.2	11	1	<0.05	5	4	<0.1	6	2	<550	<1700	<18	L
CB-8	29.50M- 30.50M	<0.2	10	2	<0.05	5	7	<0.1	8	<1	<550	<1700	<18	L
CB-8	30.50M- 31.50M	<0.2	2	1	<0.05	<1	20	<0.1	31	<1	<550	<1700	<18	L

No sample can be collected at the depth 27.50m-28.50m.

Note:

Underline and Italic : over Lower Chemical Exceedance Level (LCEL) ONLY

Bold & Italic : over Upper Chemical Exceedance Level (UCEL) ONLY

Bold, Italic & Underline : over 10 times the Lower Chemical Exceedance Level (LCEL)

According to ETWB No. 34/2002, all sediment samples are classified as Categories L. Type 1 – Open Sea Disposal will be applicable in accordance with the management framework as set out of ETWB TC (W) No. 34/2002.

Based on information of Phase 1 SQR, the estimated maximum quantity of marine sediment to be excavated by the piling works is approximately 1,000m³ (Phase 1 and Phase 2 together).

Referring to the memo from Secretary, Marine Fill Committee, CEDD Dated on 25 November 2013 (Ref.:(1143Z-01) in FM 4/1C/70A, **Appendix A**), the quantity of marine sediment to be excavated by the piling works is approximately 170m³. Therefore, the estimated maximum quantity of marine sediment to be excavated by the piling works for Phase 2 is approximately 830m³.

CONCLUSION AND RECOMMENDATION

All sediment samples were tested for chemical contaminants in the HOKLAS accredited laboratory (ALS Technichem (HK) Pty Ltd).

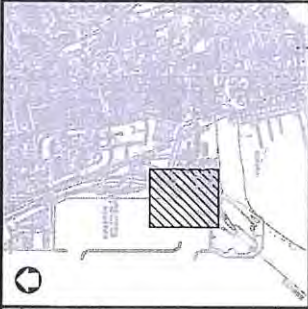
Analysis of the chemical test results for CB 7 (total 6 samples) and CB 8 (total 12 samples) indicated that the sediments should be classified as Category L. Therefore, no biological screening is required in accordance with ETWB TC (W) No. 34/2002.

Based on the results of the tested sediment, the approximately 830m³ sediment to be excavated by the piling works for Phase 2 is recommended for Open Sea Disposal (Type 1) according to ETWB No. 34/2002. Actual disposal arrangement will be subjected to the approval from EPD and CEDD FMC.

Figure 1.1
Site Location Plan



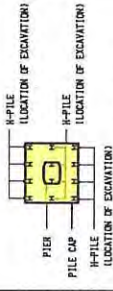
Figure 1.2
Sediment Sampling Locations



LOCATION PLAN

LEGEND :

- AS-BUILT DRILLHOLE FOR SAMPLING AND CHEMICAL / BIOLOGICAL TESTING
- 100m x 100m GRID FOR PHASE 1 SAMPLING LOCATION
- 100m x 100m GRID FOR PHASE 2 SAMPLING LOCATION



PROPOSED ROCK SOCKETER
H-PILE FOUNDATION

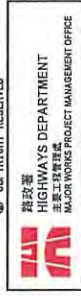
Rev	Description	By	Date

PARSONS BRINCKERHOFF

Project Site
Contract No. HY/2013/17
Road Improvement Works in
West Kowloon Reclamation
Development

Drawing Title
**AS-BUILT GROUND
INVESTIGATION PLAN WITH
SAMPLES FOR CHEMICAL
/BIOLOGICAL TESTING
(SHEET 2)**

Drawing No.	CE44/K/TB/0002	Rev.	
Drawn		Checked	AT
CD		AT WORKING	
Scale	1:1000 (A1)		



NOTES :

REFER TO DRAWING NO. CE44/K/TB/0001 FOR NOTES

PHASE 1 PROPOSED SAMPLING LOCATION (CHEMICAL / BIOLOGICAL TEST)

CS4	E 83400.00	E 83400.00	N 018511.48	N 018511.48			
CS5	E 83450.28	E 83450.28	N 018517.21	N 018517.21			

PHASE 2 PROPOSED SAMPLING LOCATION (CHEMICAL / BIOLOGICAL TEST)

CS6	E 83400.00	E 83400.00	N 018511.48	N 018511.48			
CS8	E 83450.28	E 83450.28	N 018517.21	N 018517.21			



Appendix A
Record of Sediment Sampling and Collection



Drillhole Record

Drillhole No. CB6

Contract No. HY/2013/17

Sheet 1 of 2

PROJECT **Road Improvement Works in West Kowloon Reclamation Development**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **XY-2B**

E 834596.02

Date 31/10/15 to 04/11/15

N 819567.71

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+5.64 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test	Depths (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
											No.	Type					
31/10/2015																	Wash boring
	3.50 168mm																
				70													
				75													
31/10/2015 08/11/2015		2.80m at 18:00 3.00m at 08:00		90													
				80													
				80													
				80													
				80													

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▨ Mazier Sample □ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ✕ Water Level ↓ Standard Penetration Test ⊥ Permeability Test ▣ Piezometer Tip ⊕ Standpipe Tip ⊖ Pressuremeter Test ⊖ Impression Packer Test ∨ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>05/11/2015</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>06/11/2015</u></p>
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REMARKS



Drillhole Record

Drillhole No. CB6Contract No. HY/2013/17Sheet 2 of 2PROJECT Road Improvement Works in West Kowloon Reclamation DevelopmentMETHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. XY-2BE 834596.02N 819567.71Date 31/10/15 to 04/11/15FLUSHING MEDIUM WaterORIENTATION VERTICALGROUND LEVEL +5.64 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) /Size (mm)	Water level (m) /Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test Depths (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type Depth					
				80						T6-116	10.20					See previous page
				80						T2-101	11.00	-5.36	11.00			Brown and pinkish brown, angular to subangular COBBLE with some coarse gravel sized strong rock fragments. (FILL)
				75						T2-101	12.20					
		1.95m at 18:00		80						T2-101	12.95					
02/11/2015		3.90m at 08:00		60						T2-101	14.00	-8.36	14.00			Pink and brownish pink, angular BOULDER sized moderately strong medium grained granite. (FILL)
03/11/2015				90						T2-101	15.35	-9.91	15.55			Grey and brownish grey, angular to subangular COBBLE with some angular to subangular coarse gravel sized strong rock fragments. (FILL)
				80						T2-101	16.60					
		3.00m at 18:00		90						T2-101	17.50	-11.86	17.50			16.95-17.30m: Boulder sized strong medium grained granite. 17.30-17.50m: Firm, grey, sandy silty CLAY with some angular to subangular cobble, gravel and shell fragments.
03/11/2015		4.00m at 08:00		100					B=20	1	17.95	-12.36	18.00			Firm, light grey occasionally brownish grey, slightly sandy silty CLAY. (ALLUVIUM)
04/11/2015				100					B=74	2	18.45	-12.86	18.50			Brown, slightly silty fine to coarse SAND. (ALLUVIUM)
				44					D=23	3	18.95	-13.36	19.00			Light brown, silty clayey fine to medium SAND. (ALLUVIUM)
				100					B=124	4	19.00	-13.86	19.50		VI	Firm, brown and reddish brown, slightly sandy clayey SILT with occasional fine gravel. (RESIDUAL SOIL)
	19.50			100						5	19.45	-13.86	19.50			Drillhole completed at 19.50m
04/11/2015	15mm									6						

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▩ Mazier Sample ▩ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ✕ Water Level ⊖ Standard Penetration Test ⊖ Permeability Test ⊖ Piezometer Tip ⊖ Standpipe Tip ⊖ Pressuremeter Test ⊖ Impression Packer Test ⊖ Vane Shear Test 	LOGGED <u>M.Chiu</u> DATE <u>05/11/2015</u> CHECKED <u>S.K.Wong</u> DATE <u>06/11/2015</u>	REMARKS
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Drillhole Record

Drillhole No. CB7

Contract No. HY/2013/17

Sheet 1 of 3

PROJECT Road Improvement Works in West Kowloon Reclamation Development

METHOD Rotary Drilling

CO-ORDINATES

Works Order No.

Machine & No. B-03

E 834578.02

Date 03/05/16 to 06/05/16

N 819143.58

FLUSHING MEDIUM Water

ORIENTATION VERTICAL

GROUND LEVEL +4.47 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) /Size (mm)	Water level (m) /Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test Depths (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type Depth					
05/05/2016																Wash boring
1																
2																
3																
4																
5																
6																
7																
8																
9																
10	10.00 140mm															

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▧ SPT Liner Sample ▩ U76 Undisturbed Sample ▫ U100 Undisturbed Sample ▨ Mazier Sample □ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ⊕ Water Level ⊖ Standard Penetration Test ⊘ Permeability Test ⊙ Piezometer Tip ⊚ Standpipe Tip ⊛ Pressuremeter Test ⊜ Impression Packer Test ⊝ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>09/05/2016</u></p> <p>CHECKED <u>S.K.Wong</u></p> <p>DATE <u>10/05/2016</u></p>
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REMARKS



Drillhole Record

Drillhole No. CB7
 Sheet 2 of 3

Contract No. HY/2013/17

PROJECT **Road Improvement Works in West Kowloon Reclamation Development**

METHOD Rotary Drilling	CO-ORDINATES E 834578.02 N 819143.58	Works Order No.
Machine & No. B-03		Date <u>03/05/16</u> to <u>06/05/16</u>
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	GROUND LEVEL +4.47 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I./Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type Depth					
																See previous page
				0					B-33		11.30	-6.83	11.30			Brown, slightly silty fine to coarse SAND. (FILL)
				0					B-42		11.75 11.80	-7.33	11.80			Firm, grey and brownish grey, sandy silty CLAY. (FILL)
				44					B-60		12.25 12.50	-7.83	12.30			Firm, brown, grey and brownish grey, sandy silty CLAY. (FILL)
				0					B-52		12.75 12.80	-8.33	12.80			Brown, slightly silty clayey fine to coarse SAND. (FILL)
				0					B-55		13.25 13.30					
05/05/2016				89					B-43		13.70 13.75	-9.33	13.80			Grey, brown and brownish grey, very silty clayey fine to coarse SAND. (FILL)
04/05/2016				67					B-55		14.25 14.30	-9.83	14.30			Grey, very silty clayey fine to coarse SAND with some shell fragments. (DISTURBED MARINE DEPOSIT)
				78					B-44		14.75 14.80	-10.33	14.80			Firm, grey, sandy silty CLAY with some shell fragments. (DISTURBED MARINE DEPOSIT)
				44					B-57		15.25 15.30					
				89					B-154		15.75 15.80					
				56					B-71		16.25 16.30					
				56					B-77		16.75 16.80	-12.33	16.80			Grey and brownish grey, silty clayey fine to coarse SAND with some shell fragments. (DISTURBED MARINE DEPOSIT)
				0					B-109		17.25 17.30	-12.83	17.30			Grey, very silty clayey fine to coarse SAND with occasional subangular coarse gravel and shell fragments. (DISTURBED MARINE DEPOSIT)
04/05/2016				67					B-80		17.75 17.80	-13.33	17.80			Firm, grey, sandy silty CLAY with occasional subrounded fine to medium gravel and some shell fragments. (DISTURBED MARINE DEPOSIT)
05/05/2016				78					B-67		18.25 18.30	-13.83	18.30			Firm, grey occasionally brownish grey, sandy silty CLAY with occasional subangular coarse gravel and some shell fragments. (DISTURBED MARINE DEPOSIT)
				56					B-63		18.75 18.80	-14.33	18.80			Grey occasionally brown, silty clayey fine to coarse SAND with some subangular fine to coarse gravel and some shell fragments. (DISTURBED MARINE DEPOSIT)
				67					B-81		19.25 19.30	-14.83	19.30			Grey occasionally brown, silty clayey fine to coarse SAND with some subangular fine to coarse gravel and some shell fragments. (DISTURBED MARINE DEPOSIT)
				89							19.75 19.80	-15.33	19.80			Grey, silty clayey fine to coarse SAND with some shell

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▨ U76 Undisturbed Sample ▨ U100 Undisturbed Sample ▨ Mazier Sample ▨ Piston Sample ▨ Water Sample 	<ul style="list-style-type: none"> z Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	LOGGED <u>M.Chiu</u> DATE <u>09/05/2016</u> CHECKED <u>S.K.Wong</u> DATE <u>10/05/2016</u>	REMARKS
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Drillhole Record

Drillhole No. CB7

Contract No. HY/2013/17

Sheet 3 of 3

PROJECT **Road Improvement Works in West Kowloon Reclamation Development**

METHOD **Rotary Drilling**

CO-ORDINATES

Works Order No.

Machine & No. **B-03**

E 834578.02

N 819143.58

Date 03/05/16 to 06/05/16

FLUSHING MEDIUM **Water**

ORIENTATION **VERTICAL**

GROUND LEVEL **+4.47 mPD**

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test Depths (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type Depth					
05/05/2016				89					B-69							Fragments. (MARINE DEPOSIT)
06/05/2016				89					B-58	31 20.25 32 20.30		-16.23	20.70			Grey, slightly silty clayey fine to coarse SAND with some shell fragments with occasional subrounded fine to medium gravel. (MARINE DEPOSIT)
21				78					B-64	33 20.75 34 20.80						Stiff, grey and brown, very sandy silty CLAY. (ALLUVIUM)
06/05/2016	21.80 15mm			89					B-42	35 21.25 36 21.30		-16.83	21.30			Light brown and whitish brown, silty clayey fine to coarse SAND with occasional subrounded coarse gravel. (ALLUVIUM)
										37 21.75		-17.33	21.80			Drillhole completed at 21.80m
22																
23																
24																
25																
26																
27																
28																
29																
30																

<ul style="list-style-type: none"> ○ Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▨ U76 Undisturbed Sample ▨ U100 Undisturbed Sample ▨ Mazier Sample ▨ Piston Sample △ Water Sample 	<ul style="list-style-type: none"> ▽ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Piezometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	<p>LOGGED <u>M.Chiu</u></p> <p>DATE <u>09/05/2016</u></p> <p>CHECKED <u>S.K.Wang</u></p> <p>DATE <u>10/05/2016</u></p>
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REMARKS



Transmittal Form

To: Vibro Construction Company Limited
11/F., Chevalier Commercial Centre,
No. 8 Wang Hoi Road,
Kowloon Bay, Kowloon
 Attn: Mr. Gary Wong
 Email: Gary_Wong@vibro.com.hk

Date: 9-Nov-16
 Our ref.: GRED/GID/AR0614/15/sk/139
 Contract No.: HY/2013/17
 Project: Road Improvement Works in West Kowloon
Reclamation Development

Dear Sirs,

Please find enclosed the following:

No. of Copies	Description	Date
1	Preliminary drillhole record CB8	


- | | |
|---|--|
| <input type="checkbox"/> For your review | <input type="checkbox"/> For your approval |
| <input type="checkbox"/> For your onward submission | <input type="checkbox"/> For your use |
| <input type="checkbox"/> For your reference | <input checked="" type="checkbox"/> For your comment |

Remarks : _____

Yours faithfully,
 Gold Ram Engineering and Development Limited


Wong
 SK Wong
 Geotechnical Engineer

Encl.

 Gold Ram Engineering and Development Limited	Drillhole Record	Drillhole No. <u>CB8</u>
	Contract No. <u>HY/2013/17</u>	Sheet <u>1</u> of <u>4</u>
PROJECT Road Improvement Works in West Kowloon Reclamation Development		
METHOD Rotary Drilling	CO-ORDINATES	Works Order No.
Machine & No. B-04	E 834527.33 N 818425.03	Date <u>18/10/16</u> to <u>24/10/16</u>
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	GROUND LEVEL +5.58 mPD


Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.I. / Test Depths (m)	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
18/10/2016															Wash boring.
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															

<ul style="list-style-type: none"> <input type="checkbox"/> Small Disturbed Sample <input type="checkbox"/> Large Disturbed Sample <input type="checkbox"/> SPT Liner Sample <input type="checkbox"/> U76 Undisturbed Sample <input type="checkbox"/> U100 Undisturbed Sample <input type="checkbox"/> Mazier Sample <input type="checkbox"/> Piston Sample <input type="checkbox"/> Water Sample 	<ul style="list-style-type: none"> <input type="checkbox"/> Water Level <input type="checkbox"/> Standard Penetration Test <input type="checkbox"/> Permeability Test <input type="checkbox"/> Piezometer Tip <input type="checkbox"/> Standpipe Tip <input type="checkbox"/> Pressuremeter Test <input type="checkbox"/> Impression Packer Test <input type="checkbox"/> Vane Shear Test 	LOGGED <u>M.Chiu</u> DATE <u>26/10/2016</u> CHECKED <u>S.K.Wong</u> DATE <u>27/10/2016</u>	REMARKS
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 Gold Ram Engineering and Development Limited	Drillhole Record	Drillhole No. <u>CB8</u>
	Contract No. <u>HY/2013/17</u>	Sheet <u>2</u> of <u>4</u>
PROJECT Road Improvement Works in West Kowloon Reclamation Development		
METHOD Rotary Drilling	CO-ORDINATES E 834527.33 N 818425.03	Works Order No.
Machine & No. <u>B-04</u>		Date <u>18/10/16</u> to <u>24/10/16</u>
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	GROUND LEVEL +5.58 mPD


Drilling Progress (d/m/y/yyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L./Test Depth (m)	Tests	Samples			Depth (m)	Legend	Grade	Description
										No.	Type	Depth				
18/10/2016	18.50 115mm															See previous page.
				100					B-53	0	18.50	-12.92	18.50	[Cross-hatch]		Firm, dark grey, sandy silty CLAY with occasional shell fragment. (FILL)
				40					B-99	1	18.95	-13.42	19.00	[Cross-hatch]		Grey occasionally dark grey, slightly clayey silty fine to coarse SAND with occasional shell fragment. (FILL)
				100					B-75	2	19.45		19.50	[Cross-hatch]		
										3	19.95		19.95	[Cross-hatch]		

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▧ U100 Undisturbed Sample ▤ Minier Sample ▥ Piston Sample △ Water Sample ✕ Water Level ⊥ Standard Penetration Test ⊥ Permeability Test ⊥ Picnometer Tip ⊥ Standpipe Tip ⊥ Pressuremeter Test ⊥ Impression Packer Test ⊥ Vane Shear Test 	LOGGED <u>M.Chiu</u> DATE <u>26/10/2016</u> CHECKED <u>S.K.Wong</u> DATE <u>27/10/2016</u>	REMARKS
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 Gold Ram Engineering and Development Limited	Drillhole Record	Drillhole No. <u>CB8</u>
	Contract No. <u>HY/2013/17</u>	Sheet <u>3</u> of <u>4</u>
PROJECT Road Improvement Works in West Kowloon Reclamation Development		
METHOD Rotary Drilling	CO-ORDINATES E 834527.33 N 818425.03	Works Order No.
Machine & No. B-04		Date <u>18/10/16</u> to <u>24/10/16</u>
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	GROUND LEVEL +5.58 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L./Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type					
19/10/2016				40					B-148	5	20.00					See previous page.
20/10/2016									B-63	6	20.45	-14.92	20.50			Firm, pinkish brown occasionally reddish brown, sandy silty CLAY. (FILL)
21				40					B-134	7	20.95	-15.42	21.00			Dark grey, silty fine to coarse SAND with occasional shell fragment. (FILL)
				15					B-59	9	21.45					
				40					B-122	10	21.50					
				180					B-48	11	21.95					
23				40					B-143	12	22.00					Dark grey, clayey silty fine to coarse SAND with occasional clayey pocket and shell fragment. (FILL)
				180					B-48	13	22.45					
				40					B-143	14	22.95	-17.42	23.00			
				180					B-48	15	23.00					
24				40					B-98	16	23.45					
				180					B-98	17	23.50					
				40					B-98	18	23.95					
				180					B-62	19	24.00					
25				30					B-148	20	24.45					
20/10/2016				30					B-148	21	24.50					
22/10/2016				30					B-58	22	24.95					
22/10/2016				40					B-169	23	25.45					
24/10/2016				180					B-53	24	25.50					
26				40					B-169	25	25.95					
				180					B-53	26	26.00					
27				25					B-150	27	26.45					
									B-150	28	26.50					
									B-150	29	26.95					
									B-150	30	27.00					
									B-150	31	27.45					
									B-150	32	27.50					
									B-98	33	28.00					
				180					B-98	34	28.50					
29				25					B-248	35	28.95					
				180					B-248	36	29.00					
									B-75	37	29.45					
30				180					B-75	38	29.50					
									B-75	39	29.95					

<ul style="list-style-type: none"> Small Disturbed Sample Large Disturbed Sample SPT Liner Sample U76 Undisturbed Sample U100 Undisturbed Sample Mazier Sample Piston Sample Water Sample Water Level Standard Penetration Test Permeability Test Piezometer Tip Standpipe Tip Pressuremeter Test Impression Packer Test Vane Shear Test 	LOGGED <u>M.Chiu</u> DATE <u>26/10/2016</u> CHECKED <u>S.K.Wong</u> DATE <u>27/10/2016</u>	REMARKS
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 Gold Ram Engineering and Development Limited	Drillhole Record	Drillhole No. <u>CB8</u>
	Contract No. <u>HY/2013/17</u>	Sheet <u>4</u> of <u>4</u>
PROJECT Road Improvement Works in West Kowloon Reclamation Development		
METHOD Rotary Drilling	CO-ORDINATES E 834527.33 N 818425.03	Works Order No.
Machine & No. B-04		Date <u>18/10/16</u> to <u>24/10/16</u>
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	GROUND LEVEL +5.58 mPD

Drilling Progress (dd/mm/yyyy)	Casing depth (m) / Size (mm)	Water level (m) / Time (hh:mm)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D. %	Fracture Index	F.L. / Test Depth (m)	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
										No.	Type					
				30					B=214	36	30.00					See previous page.
				40					B=34	37	30.45	-24.92	30.50			Firm to stiff, light grey, slightly sandy silty CLAY. (ALLUVIUM)
31				40					B=54	39	30.95	-25.42	31.00			Pinkish brown, silty fine to coarse SAND. (ALLUVIUM)
				100					B=171	41	31.45	-25.92	31.50			No recovery.
32				100					B=295	42	31.95		32.00			
								32.50	S, 7, 9, 13, 14 N=43	43	32.45	-26.92	32.50			
33								V 33.00	S, 8, 13, 16, 19, 24 N=72	44	32.50			V		Extremely weak, pinkish brown, completely decomposed medium grained GRANITE. (Very stiff, slightly sandy clayey SILT)
24/10/2016										45	32.90					
										46	33.00					
										47	33.40	-27.87	33.45			Drillhole completed at 33.45m
34																
35																
36																
37																
38																
39																
40																

<ul style="list-style-type: none"> ● Small Disturbed Sample ○ Large Disturbed Sample ▨ SPT Liner Sample ▩ U76 Undisturbed Sample ▩ U100 Undisturbed Sample ▨ Mazier Sample □ Piston Sample △ Water Sample ⊕ Water Level ⊖ Standard Penetration Test ⊕ Permeability Test ⊕ Piezometer Tip ⊕ Standpipe Tip ⊕ Pressuremeter Test ⊕ Impression Packer Test ⊕ Vane Shear Test 	LOGGED <u>M.Chiu</u> DATE <u>26/10/2016</u> CHECKED <u>S.K.Wong</u> DATE <u>27/10/2016</u>	REMARKS
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APPENDIX R3
APPROVED DISPOSAL SITE FOR SEDIMENTS (PHASE I)
[PS Clause 1.120]

MEMO	
From <u>Secretary, Marine Fill Committee, CEDD</u>	To <u>Chief Engineer I/Major Works, HyD</u>
Ref. <u>(1143Z-01) in FM 4/1C/70A</u>	(Attn: <u>Mr. K FLAM</u>)
Tel. No. <u>2762 5539</u>	Your Ref. _____ in _____
Fax No. <u>2714 0113</u>	dated _____ Fax No. <u>2714 5198</u>
Date <u>25 November 2013</u>	Total Pages _____ 1+ Encl.

Agreement No. CE 44/2011 (HY)
Proposed Road Improvement Works in West Kowloon Reclamation Development - Phase I
Investigation, Design and Construction
Disposal Site for Sediment Removal

We refer to Parsons Brinckerhoff (Asia) Ltd's letter ref. 2512043A-GN-07973/13 dated 14 November 2013.

2. We hereby allocate the following sediment disposal space for the respective categories of sediment arising from the above works.

Category of Sediment	In-situ Volume of Sediment	Sediment Disposal Space
Category L Sediment	140 m ³	Suitable for capping the exhausted Confined Marine Disposal Facility at East of Sha Chau (or South of The Brothers)
Category H Sediment (i.e. Category H Sediment not requiring biological test)	30 m ³	Subareas to be directed on site within the Mud Pit CMP1 of the Confined Marine Sediment Disposal Facility to the South of The Brothers (or at the East of Sha Chau)

3. The allocation is subject to the attached "General Allocation Conditions for Marine Disposal Sites" and "Special Allocation Conditions". Please note that it is the responsibility of the Allocatee to identify the appropriate party to implement the above Conditions.

4. You are reminded to submit the information indicated in Clauses 5, 6, 10 and 11 of the "General Allocation Conditions" when they are available.


(Derek Lau)

for Secretary, Marine Fill Committee
Civil Engineering and Development Department *Chia*

c.c. (w/e) EPD (Attn: Mr Jason Ling) Fax: 2305 0453
PBA (Attn: Mr Emeric Wan) Fax: 2856 9902

Internal FM 4/1C/65

FWL
File: 131125.HyD.Phase I(E3C Capping_SB 31-12-2015)

ALLOCATION OF MARINE DISPOSAL SPACE
Under ETWB TCW 34/2002 (or PNAP ADV-21 for Private Projects)

Allocation Number	Refer to referenced number of the allocation letter		
Contract /Project Name	Agreement No. CE 44/2011 (HY) – Proposed Road Improvement Works in West Kowloon Reclamation Development – Phase 1 – Investigation, Design and Construction		
Location and Details of the Works involving Dredging	Dredging/Excavation Works for West Kowloon Reclamation Development – Phase 1		
Project Proponent (Allocatee)	HyD		
Dredging Rationale Approval Date	25 March 2013	Sediment Quality Report Approval Date	13 November 2013

In accordance with ETWB TCW 34/2002 (or PNAP ADV-21 for private projects), hereinafter called the Circular, we hereby allocate to the above Allocatee the following marine disposal space for the respective categories of sediments arising from the above dredging works subject to due compliance and execution of the attached General Allocation Conditions and the following Special Conditions:

Category of Sediment	In-situ Volume of Sediment	Sediment Disposal Space
Category L Sediment	140 m ³	Suitable for capping the exhausted Confined Marine Disposal Facility at East of Sha Chau (or South of The Brothers)
Category H Sediment (i.e. Category H Sediment not requiring biological test)	30 m ³	Subareas to be directed on site within the Mud Pit CMP1 of the Confined Marine Sediment Disposal Facility to the South of The Brothers (or at the East of Sha Chau)

Special Conditions

1. "In-situ volume of the sediment" means the volume of such sediment in its original place before it is dredged/excavated. Disposal of the sediment in excess of the above specified volume is not permitted.
2. The sediment dumped has to be kept below the levels specified by the DASO permits. If sediment was found to be dumped above these levels within the concerned disposal space, the Allocatee shall propose remedial measures and rectify the situation to the satisfaction of all the parties concerned.
3. While the seabeds in some areas of the allocated marine disposal space may be less than 1.0 m below the maximum levels above, extreme care should be exercised to avoid the sediment being dumped above these levels.

4. The Allocatee will be required to carry out bathymetric surveys at the allocated disposal area.

5. For Category L sediment suitable for capping the exhausted Confined Marine Disposal Facility, the Resident Engineer of the project office shall ensure that his contractor disposes of the uncontaminated mud evenly in the contaminated mud pit as directed by the Management Team of the Confined Marine Disposal Facility. (Layouts of the Contaminated Mud Pits at East of Sha Chau and South of The Brothers are attached as Figures A and B respectively). The required fill-up levels are as follows :

CMP	Required fill-up level
CMP IVc at East of Sha Chau	-7.0 mCD to -6.0 mCD
CMP Va at East of Sha Chau	-8.0 mCD to -7.0 mCD
CMP 1 at South of The Brothers	-9.0 mCD to -4.0 mCD
CMP 2 at South of The Brothers	-5.0 mCD to -3.0 mCD

In case of non-compliance, the Resident Engineer of the project office shall request his contractor to rectify those high spots arising from excessive dumping at the contractor's own cost.

6. The allocation shall expire on 31 December 2015.

Marine Fill Committee Secretariat
Civil Engineering and Development Department
November 2013

GENERAL ALLOCATION CONDITIONS FOR MARINE DISPOSAL SPACE

Obligations of the Allocatee

1. Allocations of marine disposal space are made to a project proponent (the Allocatee), and it is the project proponent's responsibility to ensure that these Conditions are implemented. For simplicity, these Conditions refer variously to the "Contractor", the "Engineer of the Contract" and "the Authorized Person", but it is the project proponent's responsibility to identify the appropriate party to implement the Conditions.

Allocation of Sediment Disposal Space

2. The Open Sea Disposal Areas (hereinafter called ODAs) are located at South of Cheung Chau (hereinafter called SCC), East of Ninepin (hereinafter called ENP) and other empty marine borrow pits, if any, as specified in the Special Conditions. The Confined Marine Disposal Facility (hereinafter called CMF) in operation is situated at the South of The Brothers (hereinafter called SB) and any other CMF as specified in the Special Conditions. The SCC-ODA and SB-CMF receive sediment throughout a year and ENP-ODA only receives sediment from 16 March to 30 September of a year (both dates inclusive).

3. For any Category M₂ Sediment, the disposal arrangement at CMF is on a temporary basis. It may be changed to other disposal arrangements whenever available to be notified by the Secretary of the Marine Fill Committee (MFC).

4. For any Category H₂ Sediment, the disposal at CMF would not be allowed unless the Allocatee has identified and sought the agreement from EPD the most appropriate treatment on such Sediment rendering it suitable for Confined Marine Disposal.

Disposal Programme

5. Prior to the commencement of marine disposal of the sediment, the Engineer shall submit to the Director of Environmental Protection (DEP) and the MFC Secretary an estimated programme for the marine disposal of sediment at the respective ODAs and CMFs during the progress of works of the Contract. This programme shall be resubmitted whenever significant changes occur.

Notification before Commencement and after Completion of Sediment Disposal

6. The Allocatee shall notify the MFC Secretary, in writing, of the actual date of commencement and the actual date of completion of the marine disposal within one week of the occurrence of the events.

Centralized Management and Monitoring System for the ODA

7. The Fill Management Division (FMD) of the Civil Engineering and Development Department (CEDD) has been implementing a Centralized Management and Monitoring System (CMMS) for overseeing the ODAs through conducting monthly water quality monitoring, regular bathymetric surveys and ecological surveys for the ODAs, as well as

26-NOV-2013 09:43

FILE NAME

planning and assigning subareas in the ODAs for marine disposal.

8. As a management measure of the disposal activities, the Allocatee shall arrange the disposal within the assigned subareas of the ODA as shown on the relevant drawing to be attached to the allocation. Disposal activities outside the subareas are strictly prohibited.

9. If there are discrepancies between the location of the assigned subarea marked on the drawing and its coordinates stated on the drawing, the Allocatee shall clarify the location with the MFC Secretary before proceeding with disposal in the ODAs. The MFC Secretary shall not be responsible for any liabilities nor offences if the dumping operator has delayed the works or dumped the sediment outside the gazetted dumping area for whatever reasons.

Sediment Disposal Monthly Records and Forecasts

10. The Allocatee shall submit to the DEP and the MFC Secretary daily records of the barge loads at the ODAs and CMFs of a month by using the attached form in Appendix A – “Daily Record of Sediment Disposal Activities”. An estimate of the volume of sediment to be dumped in the following month shall also be provided. The disposal records above shall be checked and certified correct by the Engineer of the Contract (or AP/RSE/RGE for private projects). Within eight weeks of each bathymetric survey on the dredging site, the dredged volume based on the survey shall be reconciled with the disposal records and reported to the MFC Secretary.

11. At least one week prior to the commencement of the dredging works, the Allocatee shall submit to the MFC Secretary a table of forecast showing the volume of sediment to be dredged per month. Thereafter, the Allocatee shall submit a revised forecast on a monthly basis, taking into account the volume disposed of during the preceding month.

Permits under the Dumping at Sea Ordinance (DASO Permit)

12. The DEP controls dumping at sea by means of issuing permits under the Dumping at Sea Ordinance Cap. 466 (or called DASO permits) to the contractors or other parties responsible for the disposal of dredged/excavated sediment. The Contractor who will be undertaking the works must make a formal application to DEP for a DASO permit, and if the permit is granted, it will be the Contractor's responsibility to ensure that the permit conditions are met to DEP's satisfaction.

Disposal Procedures and Operations at the SB

13. The disposal activities at SB-CMF are managed and controlled by a site team of FMD. Access to the SB is on a non-exclusive basis and the Allocatee shall ensure that the Contractors should follow the disposal procedures in accordance with Appendix B – “Disposal Procedures and Operations at the South of The Brothers Confined Marine Disposal Facility”.

Miscellaneous

14. Trailer suction hopper dredgers disposing of sediment at South of The Brothers must use a down-a-pipe disposal method, the design of which must be approved in advance

by the Director of Civil Engineering and Development. The dredging contractor must provide equipment for such disposal.

15. The allocation of disposal space may carry a requirement for the project proponent to arrange for chemical analysis of the sediment sampled from 5% of the vessels en route to the disposal site. For Category M and certain Category H sediment, the chemical tests will be augmented by biological tests. Vessel sampling will normally entail mixing five samples to form a composite sample from the vessel and undertaking laboratory tests on this composite sample.

16. According to ETWB Technical Circular (Works) No. 34/2002, exceptionally large allocations might require some additional disposal site monitoring. These will be stipulated in the Special Conditions when appropriate.

Charges for allocations of marine disposal space to Private Projects

17. For allocations of marine disposal space to private projects, there will be a charge per cubic metre as measured *in situ* at the dredging site and as certified by the AP/RSE/RGE (authorized persons, registered structural engineers or registered geotechnical engineers) in accordance with paragraph 14 of the Practice Note for Authorized Persons and Registered Structural Engineers 252 (PNAP 252) issued by the Buildings Department.

18. The prescribed charge rates for sediment disposal at the respective ODAs and CMFs are specified in the Special Conditions. The methods of measurement and charging procedures are stipulated in Appendix C.

Assessment of Disposal Costs for private works entrusted to Government Contracts

19. For Government projects, the Allocatee shall check whether there are any private project works entrusted by others to be carried out in association with the concerned works. The Allocatee shall assess and reimburse the portion of marine disposal cost to be borne by the private parties and arrange the settlement sum to be transferred to the General Revenue.

- END -

Appendix A

Daily Record of Sediment Disposal Activities

Project or Contract Name: _____ Contract No.: _____

Project Proponent: _____

Contractor: _____

Marine Dumping Permit Holder: _____

Marine Dumping Permit No.: _____

Location of Disposal: _____

Summary of Disposal Activities			
Date of Disposal:			Page of
Time of Disposal	Name of Vessel	Maximum Hopper Capacity (m ³)	Estimated Bulk Volume of Sediment on the Barge (m ³)
Recorded by the marine dumping permit holder:		Checked and certified correct by the Engineer for the Contract (or AP/RSE/RGE for private projects):	
Signature:	_____	Signature:	_____
Name:	_____	Name:	_____
Post:	_____	Post:	_____

Note:
 This form shall be used for recording the daily disposal activities of the project concerned. The records shall be submitted, on a monthly basis, before the 10th day of the next month to the Secretary of the Marine Fill Committee at 5/F., Civil Engineering and Development Building, 101 Princess Margaret Road, Hemantha, Kowloon. Nil return is required.

Appendix B (Sheet 1 of 4)

**Disposal Procedures and Operations at the South of The Brothers
Confined Marine Disposal Facility (CMP)**

The Contaminated Mud Pit Management Scheme is administered by the Chief Engineer/Fill Management of the Civil Engineering and Development Department (CEDD). Users are required to comply with the following: -

1. **Notification of disposal**

- (a) When a barge or a trailer suction hopper dredger (TSHD) is filled up with contaminated mud and ready to depart from the site to the Contaminated Mud Pit (CMP) at South of The Brothers (CMP), the site supervisory staff shall notify the CMP Management Team at telephone number 9308 6312 with the following details:

- (i) project title;
- (ii) Dumping Permit number;
- (iii) numbers / names of the tug boat and hopper barge;
- (iv) time of leaving the dredging site and the anticipated time of arrival at CMP; and
- (v) estimated volume of mud inside the hopper of the barge or TSHD.

In addition, the above information shall be entered into the standard notification form (as attached) which shall be duly signed by the supervising engineer or his/her delegate (with name and post shown) for subsequent submission to the Management Team. For barges, the duly completed notification form shall be handed to the staff of the Management Team during reporting at the Office Barge. For TSHDs, the duly completed notification form shall be submitted to the Fill Management Division of CEDD by fax (2714 0113) on a daily basis.

- (b) The Permit Holders shall note that telephone notification does not constitute a reservation of time slot for disposal. Instead, the disposal priority along the relevant queue as referred to in para. 3 will be conducted only when the vessels arrive at the South of The Brothers.

2. **Reporting to Management Team**

- (a) When a barge arrives at the Reporting Area at the South of The Brothers (Figure 1, as attached), a representative of the barge shall report to the Management Team at the Office Barge and hand in the completed notification form to the staff of the Management Team. The Management Team will record the arrival time. A note will be given to the representative of the barge showing the arrival time of the subject barge, the possible time that disposal can be conducted and the registration number of the barge or TSHD queuing before the subject barge.
- (b) When a TSHD arrives at the Reporting Area at the South of The Brothers (Figure 1, as attached), the representative of the TSHD shall report to the Management Team at telephone number 9308 6312. The Management Team will record the arrival time and inform the representative of the TSHD of the possible time and location within CMP that disposal can be conducted and the registration number of the barge or TSHD queuing before the subject TSHD.

(Remark: - Barges with valid Dumping Permit but arriving without prior notification or without

Appendix B (Sheet 2 of 4)

completed notification form as required in para. 1 shall wait until all relevant details are verified by their relevant supervising engineer or his staff.)

3. **On-site Queuing Arrangement**
 - (a) The disposal volume in any rolling 24-hour period is to be kept within 26,700 m³. For barges, the disposal volume shall be the bulk volume of mud contained in the hopper. For TSHD, the disposal volume shall be the bulk volume of mud contained in the hopper times a factor of 0.65.
 - (b) The Management Team will compile a spreadsheet record for queuing with details of actual disposal. Barges/TSHDs reported arrival will be received on a first-come, first-served basis. The barges/TSHDs have to follow the queue and wait for instructions from the Management Team to dispose of the contaminated mud. Any barge/TSHD not ready to proceed with mud disposal when called upon by the Management Team shall lose their turn for disposal. The concerned representative of the barge/TSHD needs to report again to the Office Barge as if newly arrived and queue again after other arrived barges/TSHDs following the relevant queue and wait again for instructions to dispose of mud.
 - (c) In queuing for the disposal, the barges and tug boats need to stay outside the Reporting Area and distant from the nearby fairway. The TSHD, barges and tug boats shall strictly observe the marine safety requirements and follow instructions from the Marine Police and Marine Department.
4. **Disposal** – After receipt of permission from the Management Team to proceed with disposal, the tug boat/barge operator shall, with the aid of instructions given by the guide boat of the Management Team, manoeuvre the barge into the target dumping area in CMP1 (Figure 2, as attached). The tug boat operator shall cut off the power and allow their barge to drift along the water current during the discharge of mud. The barge shall continue to drift for at least 3 minutes after discharging mud. The tug boat operator shall strictly follow the instructions from the Management Team for disposal. The tug boat/barge operator shall not let his tug boat/barge move astern, except in an emergency situation, within the pit area during and after disposal of contaminated mud. It should be noted that it is a Marine Department requirement that the tug boat should display the “Not Under Command” signals while it is drifting. For TSHD, no guiding service will be provided by the Management Team. The TSHD shall start the disposal after receipt of permission from the Management Team and shall report to the Management Team after the completion of the disposal. The tug boat/barge operator shall contact the Management Team at telephone number 9308 6312 when there are difficulties in communication.
5. **Illegal disposal** – If any vessel is found to disobey instructions and proceed with illegal disposal and/or any irregularities spotted during disposal, its details will be recorded. The Environmental Protection Department, Marine Police or Marine Department will take action as appropriate. The resident engineer shall keep a running tally of the volume dumped under both the permit and the allocation. If either the permitted or allocated volume is reached, he shall notify the Management Team and stop sending the barge to the disposal ground.
6. **Leaving the Pit** – After discharging, the tug boat/barge/TSHD operator shall inform the Management Team of completion of disposal before leaving the pit. The tug boat/barge shall sail

Appendix B (Sheet 3 of 4)

slowly away from the disposal site until leaving the pit.

7. **Closure of Pit** – The contaminated mud disposal at the South of The Brothers Mud Pits will be suspended and the CMP will be closed during the hoisting of Typhoon Signal No. 3 or higher or in other conditions, e.g. adverse weather, when the Management Team considers that its management duties cannot be discharged safely and properly. The CMP would be closed from 6:00am on the Lunar New Year (LNY) Eve until 3:00pm on LNY Day Four when it would be reopened. There is no guarantee that prior notice will be given. Arrived barges or TSHD shall leave the disposal area immediately if the pit has been closed. For enquiries relating to the closure of the Pit, please contact the Management Team at telephone number 9308 6312.
8. **Safety Matters**
 - (a) All barges' representatives boarding/disembarking the Office Barge shall wear non-slippery shoes and life jackets. Any barge's representative not complying with this requirement will not be permitted to board /disembark from the Office Barge. Any non-compliance will be reported to the relevant Permit Holder and project management office.
 - (b) All TSHDs, tug boats and barges shall turn on their lights while working in the vicinity of Mud Pits in dark or when the visibility is poor. Any non-compliance will be reported to relevant Permit Holder, project management office, the Marine Police and Marine Department.
 - (c) Any barge while waiting in the vicinity of the Mud Pits to queue up for disposal, shall be served/looked after by a tug boat. Any non-compliance will be reported to the relevant project management office, the Marine Police and Marine Department.

Notification of Dumping of Contaminated Mud at the South of The Brothers

To: Management Team/South of The Brothers

25-100-2013 09:07

From:
 Contract No.:
 Contract Title:

Contract Tel. No.: Fax No.:

FWD / CEDD

EPD Dumping Permit No. (Allocation Volume m ³)	Dredging Location	Tug Boat Name/No.	Hopper Barge Name/No.	Quantity ¹ (m ³)	Time leaving dredging site	Accumulated Quantity (m ³)	Anticipated arrival time at the South of The Brothers

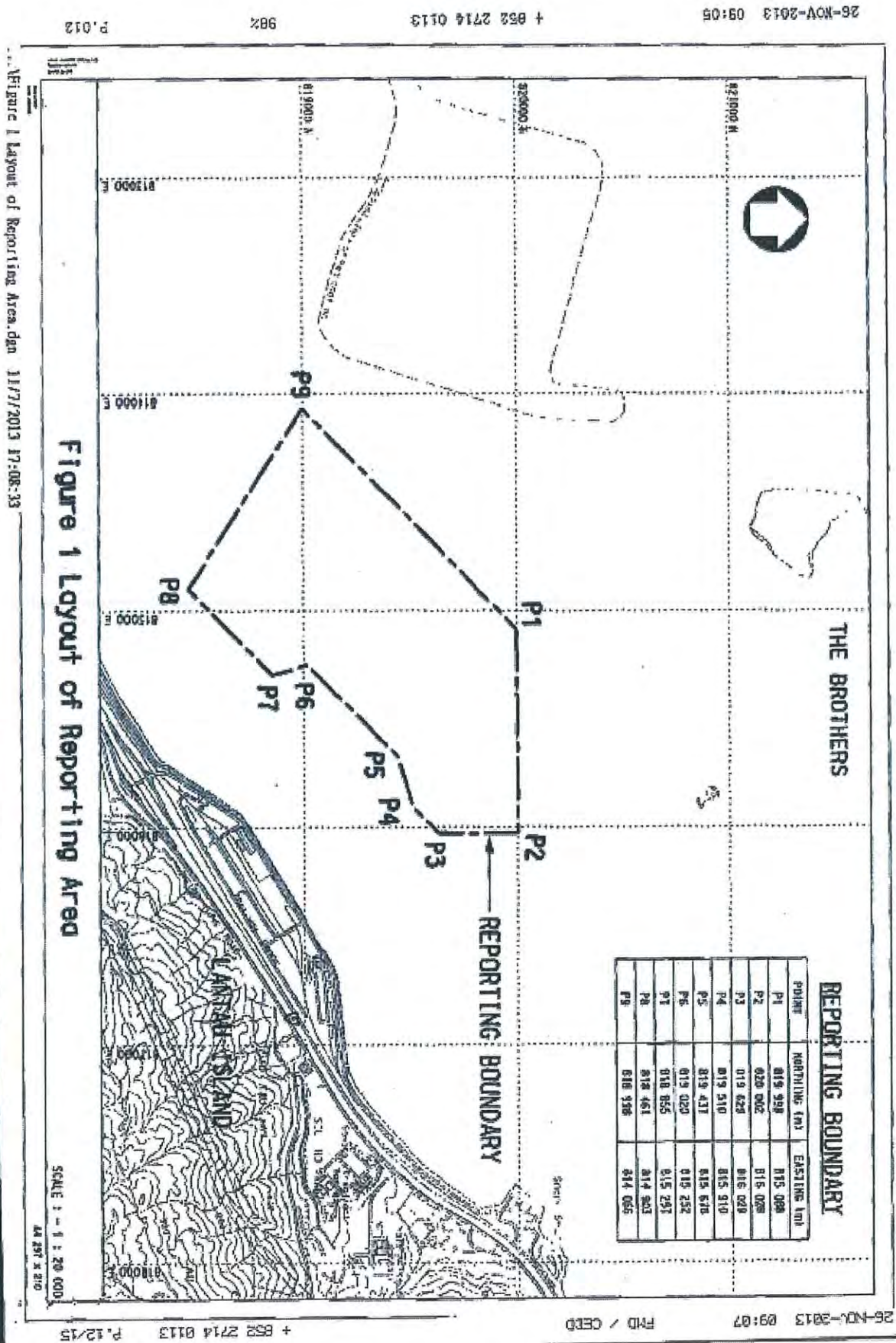
Official Use	Signature of Resident Engineer/Authorized Supervisor:
Arrival date/time	Name of Resident Engineer
Remarks	Authorized Supervisor (in block letters): (page:)
	Date/Time: (contact ref:)

- Note: -
- The quantity entered shall have allowed for bulking after dredging.
 - The permit holder shall provide contact telephone number for verification/providing details when the barge arrived at the South of The Brothers.
 - This form shall be submitted to the Management Team by fax (2714 0113) within the period between 1 and 3 hours before anticipated arrival time for TSHDs.
 - The permit holder shall notify the Management Team by phone before the barge leaves the site.
 - The representative of the barge shall submit a copy of Dumping Permit to the Management Team when requested.

Appendix B to General Allocation Conditions Version (August 2013)

P. 11/15

+ 852 2714 0113

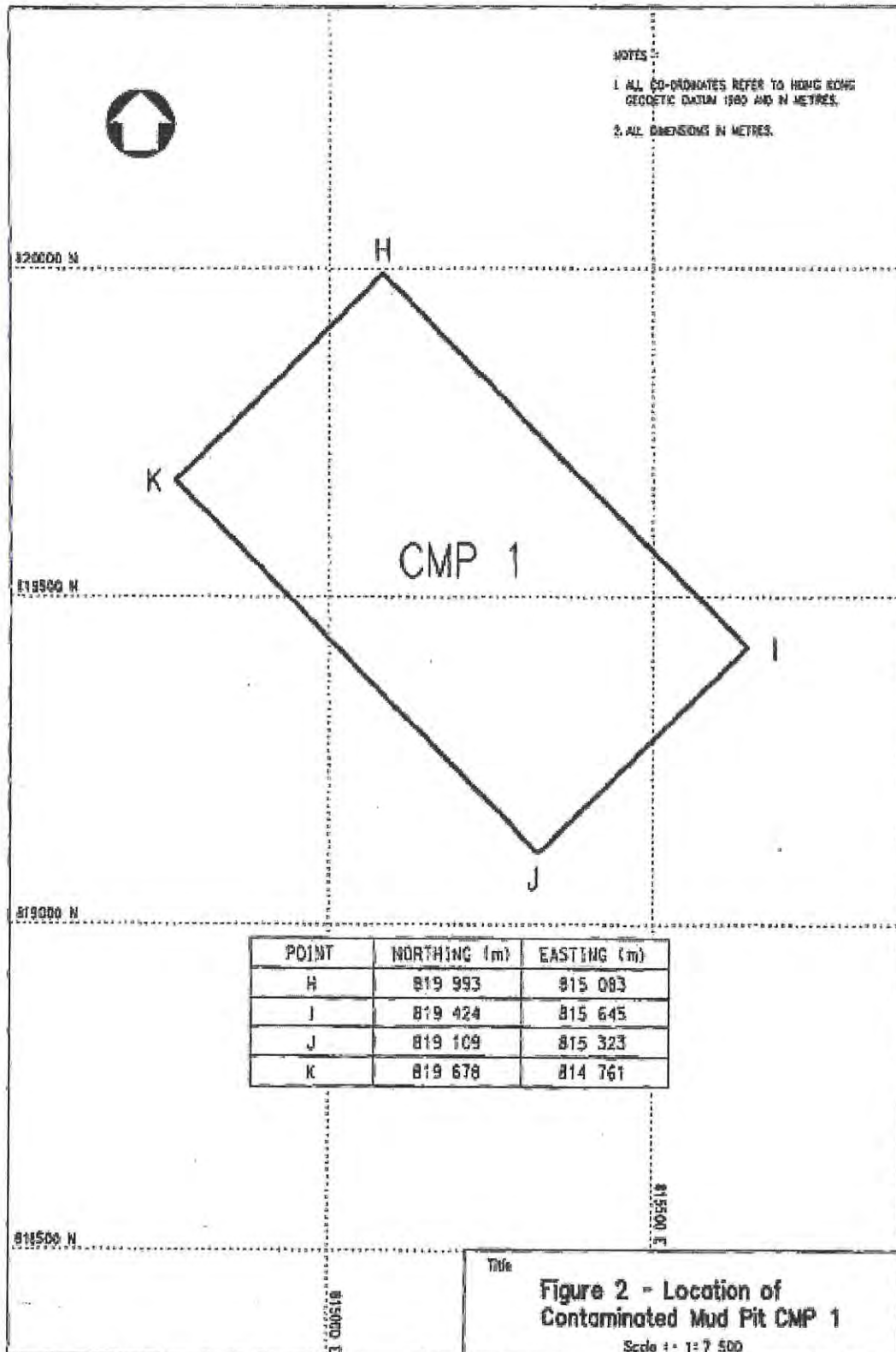


26-NOV-2013 09:07

FMD / CEDD

+ 852 2714 0113

11/7/13



... (Figure 2 Location of Contaminated Mud Pit CMP 1.dgn 11/7/2013 15:30:44

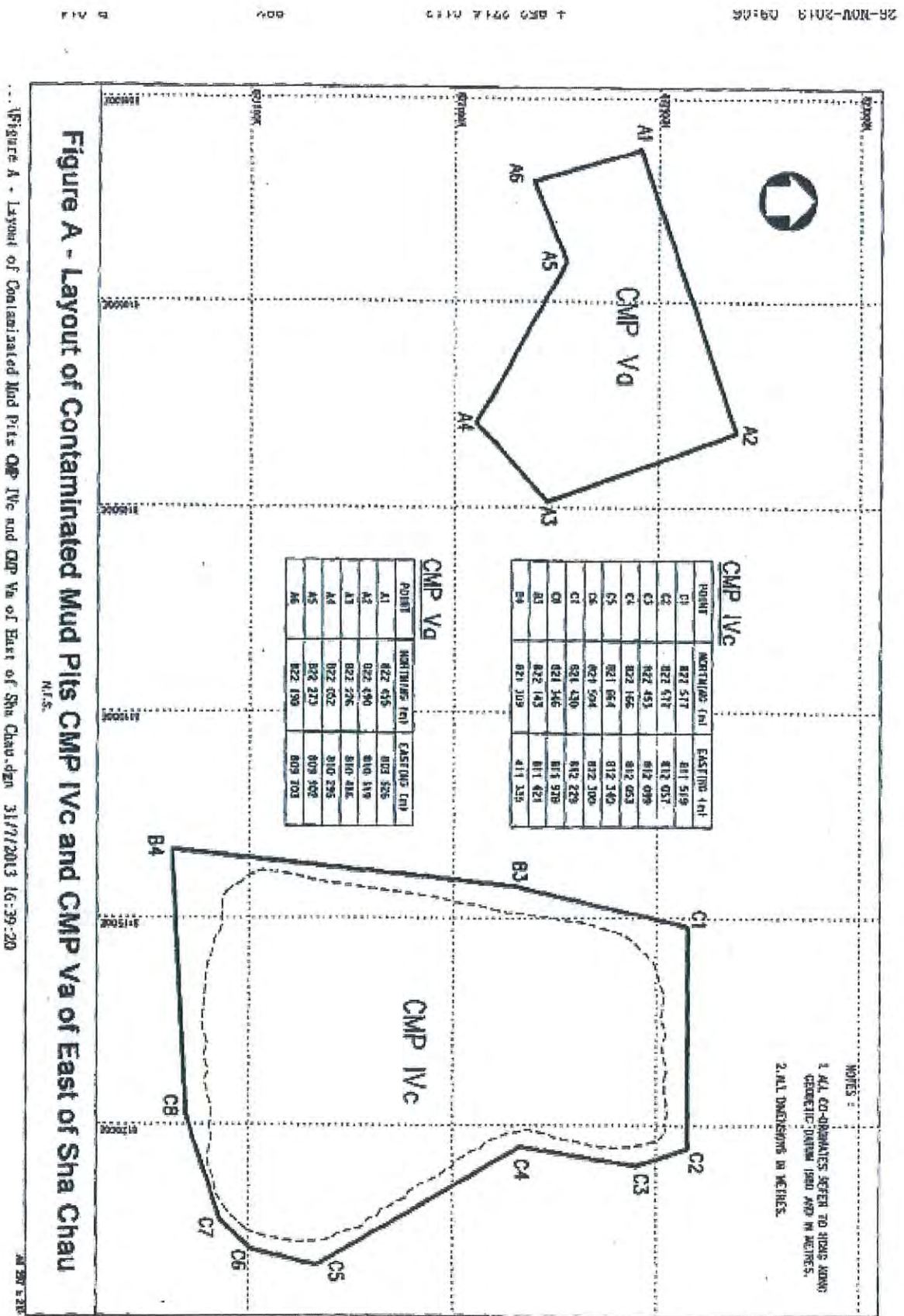
A4 297 x 210

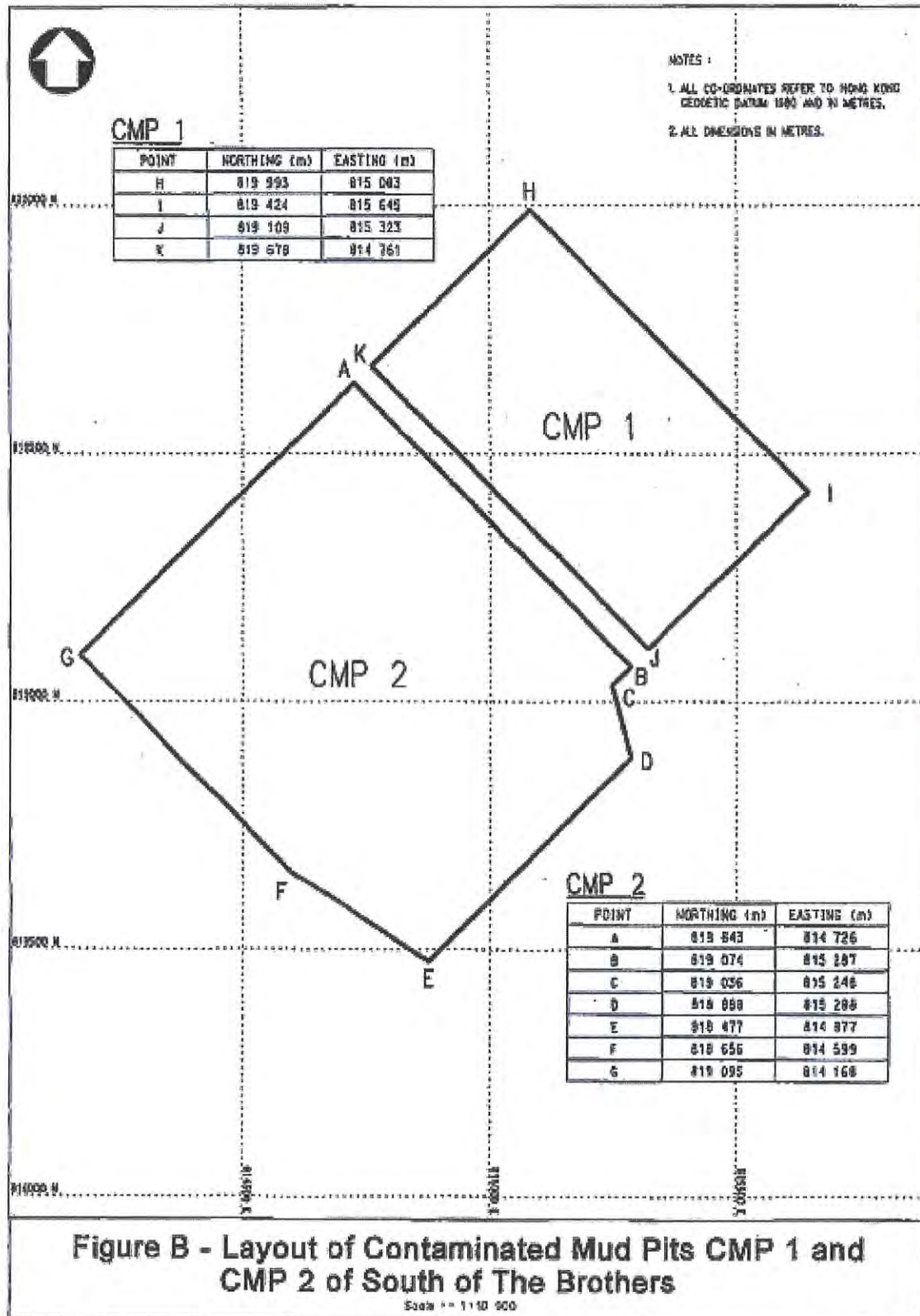
26-NOV-2013 09:06

+ 852 2714 0113

98%

P.013





...\\Figure B - Layout of Contaminated Mud Pits CMP 1 and 2 of South of The Brothers.dgn 31/7/2013 16:46:09

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Appendix B

HOKLAS Certificate



Hong Kong Accreditation Service
香港認可處

Certificate of Accreditation
認可證書

This is to certify that
特此證明

ALS TECHNICHEM (HK) PTY LIMITED

11/F., Chung Shun Knitting Centre, 1-3 Wing Yip Street, Kwai Chung, New Territories, Hong Kong
香港新界葵涌永業街1-3號忠信針織中心11樓

has been accepted by the HKAS Executive, on the recommendation of the Accreditation Advisory Board, as a
為香港認可處執行機關根據認可諮詢委員會建議而接受的

HOKLAS Accredited Laboratory
「香港實驗所認可計劃」認可實驗所

This laboratory meets the requirements of ISO / IEC 17025 : 2005 – General requirements for the competence of testing and calibration laboratories and it has been accredited for performing specific tests or calibrations as listed in the HOKLAS Directory of Accredited Laboratories within the test category of
此實驗所符合ISO / IEC 17025 : 2005 - 《測試及校正實驗所能力的通用規定》所訂的要求，獲認可進行載於香港實驗所認可計劃《認可實驗所名冊》內下述測試類別中的指定測試或校正工作

Environmental Testing
環境測試

This laboratory is accredited in accordance with the recognised International Standard ISO / IEC 17025 : 2005.
本實驗所乃根據公認的國際標準 ISO / IEC 17025 : 2005 獲得認可。

This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (see joint IAF-ILAC-ISO Communiqué).
這項認可資格演示在指定範疇所需的技術能力及實驗所質量管理體系的運作
(見國際認可論壇、國際實驗所認可合作組織及國際標準化組織的聯合公報)。

The common seal of the Hong Kong Accreditation Service is affixed hereto by the authority of the HKAS Executive
香港認可處根據認可處執行機關的權限在此蓋上通用印章

CHAN Sing Sing, Terence, Executive Administrator
執行幹事 陳成城
Issue Date : 5 May 2009
簽發日期：二零零九年五月五日

Registration Number : **HOKLAS** 066
註冊號碼：

Date of First Registration : 15 September 1995
首次註冊日期：一九九五年九月十五日





Appendix C

Chemical Test Reports and Quality Control Records

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES



CERTIFICATE OF ANALYSIS

Client	: LAM ENVIRONMENTAL SERVICES LTD	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 8
Contact	: MR DEREK LO	Contact	: Fung Lim Chee, Richard	Work Order	: HK1617829
Address	: 11/F CENTRE POINT, 181-185 GLOUCESTER ROAD, WANCHAI, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: dereklo@lamenviro.com	E-mail	: Richard.Fung@alsglobal.com		
Telephone	: +852 2839 5666	Telephone	: +852 2610 1044	Date Samples Received	: 04-MAY-2016
Facsimile	: +852 2882 3331	Facsimile	: +852 2610 2021	Issue Date	: 18-MAY-2016
Project	: *****	Quote number	: *****	No. of samples received	: 3
Order number	: *****			No. of samples analysed	: 3
C-O-C number	: *****				
Site	: *****				

This report may not be reproduced except with prior written approval from the testing laboratory.

Hong Kong Accreditation Service (HKAS) has accredited this laboratory, ALS Technichem (HK) Pty Ltd (Reg. No. HOKLAS 066) under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS Directory of Accredited Laboratories.

This document has been signed by those names that appear on this report and are the authorised signatories.

Signatories	Position	Authorised results for
Chan Ka Yu, Karen	Manager - Organics	Organics
Lin Wai Yu, Iris	Senior Chemist - Inorganics	Inorganics
Wong Wing, Kenneth	Manager - Metals	Inorganics

ALS Technichem (HK) Pty Ltd
Part of the **ALS Laboratory Group**

11/F., Chung Shun Knitting Centre, 1-3 Wing Yip Street, Kwai Chung, N.T., Hong Kong
Tel: +852 2610 1044 Fax: +852 2610 2021 www.alsenviro.com



Page Number : 2 of 8
Client : LAM ENVIRONMENTAL SERVICES LTD
Work Order : HK1617829

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: 16-MAY-2016

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: HK1617829

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 E-ASTM D3974-09 prior to determination of metals. The In-house method is developed based on ASTM D3974-09 method.

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 µg/kg. Low and High M.W. PAHs results (Method: EP076HK) are not HOKLAS accredited. Low M.W. PAHs is sum of Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene; High M.W. PAHs is sum of Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(g,h,i)perylene.



Analytical Results

Sub-Matrix: SEDIMENT

Compound	CAS Number	LOR	Client sample ID		
			Unit	Client sampling date / time	Client sample ID
EA/ED: Physical and Aggregate Properties					
EA055: Moisture Content (dried @ 103°C)	---	0.1	%	16.8	16.8
EG: Metals and Major Cations					
EG020: Arsenic	7440-38-2	1	mg/kg	<1	<1
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	<0.2
EG020: Chromium	7440-47-3	1	mg/kg	48	9
EG020: Copper	7440-50-8	1	mg/kg	3	3
EG020: Lead	7439-92-1	1	mg/kg	4	5
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	<0.05
EG020: Nickel	7440-02-0	1	mg/kg	23	4
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1
EG020: Zinc	7440-66-6	1	mg/kg	8	10
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	37680-79-2	3	µg/kg	<3	<3
PCB 105	32598-14-4	3	µg/kg	<3	<3
PCB 118	31505-00-6	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	52863-68-0	3	µg/kg	<3	<3
Total Polychlorinated biphenyls	---	18	µg/kg	<18	<18
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs)					
Naphthalene	91-20-3	50	µg/kg	<50	<50
Acenaphthylene	208-96-6	50	µg/kg	<50	<50
Acenaphthene	83-32-9	50	µg/kg	<50	<50
Fluorene	86-73-7	50	µg/kg	<50	<50
Phenanthrene	85-01-8	50	µg/kg	<50	<50



Sub-Matrix: SEDIMENT

Compound	CAS Number	LOR	Client sample ID		Unit
			Client sampling date / time	Client sample ID	
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued					
Anthracene	120-12-7	50	<50	CB-7 (14.30M - 15.30M)	CB-7 (16.30M - 17.30M)
Fluoranthene	206-44-0	150	<150	04-MAY-2016 10:20	04-MAY-2016 14:55
Pyrene	129-00-0	150	<150	HK1617829-001	HK1617829-002
Benz(a)anthracene	56-55-3	150	<150		
Chrysene	218-01-9	150	<150		
Benzo(b)fluoranthene	205-99-2	150	<150		
Benzo(k)fluoranthene	207-08-9	150	<150		
Benzo(a)pyrene	50-32-8	150	<150		
Indeno(1,2,3-cd)pyrene	193-39-5	150	<150		
Dibenz(a,h)anthracene	53-70-3	150	<150		
Benzo(g,h,i)perylene	191-24-2	150	<150		
Low M.W. PAHs	---	550	<550		
High M.W. PAHs	---	1700	<1700		
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates					
2-Fluorobiphenyl	321-60-8	0.1	106	91.9	103
4-Terphenyl-d14	1718-51-0	0.1	105	89.5	96.3
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate					
Decachlorobiphenyl	2051-24-3	0.1	62.5	53.0	56.0

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	Laboratory Duplicate (DUP) Report			
			CAS Number	LOR	Unit	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 4203655)						
HK1617789-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	---	0.1	%	74.2
HK1617829-002	CB-7 (15.30M - 16.30M)	EA055: Moisture Content (dried @ 103°C)	---	0.1	%	21.8
EG: Metals and Major Cations (QC Lot: 4199202)						
HK1617154-002	Anonymous	EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05
		EG020: Silver	7440-22-4	0.1	mg/kg	0.2
		EG020: Cadmium	7440-43-9	0.2	mg/kg	0.2
		EG020: Arsenic	7440-38-2	1	mg/kg	<1
		EG020: Chromium	7440-47-3	1	mg/kg	7
		EG020: Copper	7440-50-8	1	mg/kg	8
		EG020: Lead	7439-92-1	1	mg/kg	43
		EG020: Nickel	7440-02-0	1	mg/kg	2
		EG020: Zinc	7440-66-6	1	mg/kg	125
HK1617190-002	Anonymous	EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05
		EG020: Silver	7440-22-4	0.1	mg/kg	<0.1
		EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2
		EG020: Arsenic	7440-38-2	1	mg/kg	8



Matrix: SOIL									
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	
EG: Metals and Major Cations (QC Lot: 4199202) - Continued									
HK1617190-002	Anonymous	EG020: Chromium	7440-47-3	1	mg/kg	38	39	4.4	
		EG020: Copper	7440-50-8	1	mg/kg	15	15	0.0	
		EG020: Lead	7439-92-1	1	mg/kg	29	30	0.0	
		EG020: Nickel	7440-02-0	1	mg/kg	25	26	4.4	
		EG020: Zinc	7440-66-6	1	mg/kg	91	93	2.5	
EP-065: PCB Single Congeners (QC Lot: 4196743)									
HK1617190-001	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-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4196744)									
HK1617605-003	Anonymous	High M.W. PAHs	—	1700	µg/kg	<1700	<1700	0.0	
		Naphthalene	91-20-3	500	µg/kg	<500	<500	0.0	
		Acenaphthylene	208-96-8	500	µg/kg	<500	<500	0.0	
		Acenaphthene	83-32-9	500	µg/kg	<500	<500	0.0	
		Fluorene	86-73-7	500	µg/kg	<500	<500	0.0	
		Phenanthrene	85-01-8	500	µg/kg	<500	<500	0.0	
		Anthracene	120-12-7	500	µg/kg	<500	<500	0.0	
		Fluoranthene	206-44-0	500	µg/kg	<500	<500	0.0	
		Pyrene	129-00-0	500	µg/kg	630	691	9.3	
		Benz(a)anthracene	56-55-3	500	µg/kg	<500	<500	0.0	
		Chrysene	218-01-9	500	µg/kg	<500	<500	0.0	
		Benzo(b)fluoranthene	205-99-2	500	µg/kg	<500	<500	0.0	
		Benzo(k)fluoranthene	207-08-9	500	µg/kg	<500	<500	0.0	
		Benzo(a)pyrene	50-32-8	500	µg/kg	<500	<500	0.0	
		Indeno(1,2,3-cd)pyrene	193-39-5	500	µg/kg	<500	<500	0.0	



Laboratory Sample ID	Client Sample ID	Method: Compound	Laboratory Duplicate (DUP) Report						
			CAS Number	LOR	Unit	RPD (%)			
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4196744) - Continued									
HK1617605-003	Anonymous	Dibenz(a,h)anthracene	53-70-3	500	µg/kg	<500	<500	<500	0.0
		Benzo(g,h,i)perylene	191-24-2	500	µg/kg	<500	<500	<500	0.0
		Low M.W. PAHs	---	550	µg/kg	<550	<550	<550	0.0

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

Method: Compound	CAS Number	LOR	Unit	Result	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report					
					Spike Concentration	LCS	DCS	Recovery Limits (%)	Value	RPD (%)
EG: Metals and Major Cations (QC Lot: 4199202)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	94.5	---	75	111	---
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	91.8	---	79	109	---
EG020: Chromium	7440-47-3	1	mg/kg	<1	5 mg/kg	94.0	---	81	123	---
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	87.6	---	79	109	---
EG020: Lead	7439-92-1	1	mg/kg	<1	5 mg/kg	91.4	---	81	109	---
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	102	---	75	113	---
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	83.7	---	77	111	---
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	88.4	---	75	113	---
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	91.9	---	80	122	---

EP-065: PCB Single Congeners (QC Lot: 4196743)

Compound	CAS Number	LOR	Unit	Result	Spike Concentration	LCS	DCS	Recovery (%)	Low	High	Value	RPD (%)
PCB 8	34883-43-7	3	µg/kg	<3	5 µg/kg	73.7	---	55	111	---	---	---
PCB 18	37680-65-2	3	µg/kg	<3	5 µg/kg	65.5	---	58	105	---	---	---
PCB 28	7012-37-5	3	µg/kg	<3	5 µg/kg	77.8	---	63	105	---	---	---
PCB 44	41464-39-5	3	µg/kg	<3	5 µg/kg	77.6	---	61	111	---	---	---
PCB 52	35693-99-3	3	µg/kg	<3	5 µg/kg	75.7	---	61	111	---	---	---
PCB 66	32598-10-0	3	µg/kg	<3	5 µg/kg	80.6	---	62	111	---	---	---
PCB 77	32598-13-3	3	µg/kg	<3	5 µg/kg	72.6	---	59	114	---	---	---
PCB 101	37680-73-2	3	µg/kg	<3	5 µg/kg	73.0	---	54	117	---	---	---
PCB 105	32598-14-4	3	µg/kg	<3	5 µg/kg	74.8	---	60	115	---	---	---
PCB 118	31508-00-6	3	µg/kg	<3	5 µg/kg	72.5	---	55	117	---	---	---
PCB 126	57465-28-8	3	µg/kg	<3	5 µg/kg	73.9	---	65	112	---	---	---
PCB 128	38380-07-3	3	µg/kg	<3	5 µg/kg	76.7	---	62	116	---	---	---
PCB 138	35065-28-2	3	µg/kg	<3	5 µg/kg	75.5	---	58	117	---	---	---
PCB 153	35065-27-1	3	µg/kg	<3	5 µg/kg	74.6	---	58	117	---	---	---
PCB 169	32774-16-6	3	µg/kg	<3	5 µg/kg	89.0	---	74	111	---	---	---
PCB 170	35065-30-6	3	µg/kg	<3	5 µg/kg	78.1	---	70	112	---	---	---
PCB 180	35065-29-3	3	µg/kg	<3	5 µg/kg	78.7	---	67	114	---	---	---
PCB 187	52663-68-0	3	µg/kg	<3	5 µg/kg	74.8	---	58	118	---	---	---
Total Polychlorinated biphenyls	---	18	µg/kg	<18	---	---	---	---	---	---	---	---

EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4196744)

Compound	CAS Number	LOR	Unit	Result	Spike Concentration	LCS	DCS	Recovery (%)	Low	High	Value	RPD (%)
Naphthalene	91-20-3	25	µg/kg	<50	500 µg/kg	76.4	---	71	116	---	---	---
Acenaphthylene	208-96-8	25	µg/kg	<50	500 µg/kg	82.8	---	52	112	---	---	---



Method: Compound		Method Blank (MB) Report				Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	LCS	DCS	Recovery Limits (%)	Value	RPD (%)	Control Limit
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4196744) - Continued													
Acenaphthene	83-32-9	25	µg/kg	<50	500 µg/kg	89.3	71	112	---	---	---	---	---
Fluorene	86-73-7	25	µg/kg	<50	500 µg/kg	91.1	72	109	---	---	---	---	---
Phenanthrene	85-01-8	25	µg/kg	<50	500 µg/kg	80.7	74	115	---	---	---	---	---
Anthracene	120-12-7	25	µg/kg	<50	500 µg/kg	78.2	50	112	---	---	---	---	---
Fluoranthene	206-44-0	25	µg/kg	<50	500 µg/kg	80.6	71	118	---	---	---	---	---
Pyrene	129-00-0	25	µg/kg	<50	500 µg/kg	83.4	72	119	---	---	---	---	---
Benz(a)anthracene	56-55-3	25	µg/kg	<50	500 µg/kg	84.6	68	109	---	---	---	---	---
Chrysene	218-01-9	25	µg/kg	<50	500 µg/kg	102	78	117	---	---	---	---	---
Benzo(b)fluoranthene	205-99-2	25	µg/kg	<50	500 µg/kg	85.0	63	121	---	---	---	---	---
Benzo(k)fluoranthene	207-08-9	25	µg/kg	<50	500 µg/kg	93.1	74	123	---	---	---	---	---
Benzo(a)pyrene	50-32-8	25	µg/kg	<50	500 µg/kg	79.0	58	112	---	---	---	---	---
Indeno(1,2,3-cd)pyrene	193-39-5	25	µg/kg	<50	500 µg/kg	91.0	61	129	---	---	---	---	---
Dibenz(a,h)anthracene	53-70-3	25	µg/kg	<50	500 µg/kg	86.0	58	129	---	---	---	---	---
Benzo(g,h,i)perylene	191-24-2	25	µg/kg	<50	500 µg/kg	87.0	52	135	---	---	---	---	---
Low M.W. PAHs	---	550	µg/kg	<550	---	---	---	---	---	---	---	---	---
High M.W. PAHs	---	1700	µg/kg	<1700	---	---	---	---	---	---	---	---	---

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

Method: Compound		Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report								
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	MS	MSD	Recovery Limits (%)	Value	RPD (%)	Control Limit
EG: Metals and Major Cations (QC Lot: 4199202)										
HK1617154-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	87.4	---	75	125	---	---
		EG020: Cadmium	7440-43-9	5 mg/kg	95.6	---	75	125	---	---
		EG020: Chromium	7440-47-3	5 mg/kg	79.2	---	75	125	---	---
		EG020: Copper	7440-50-8	5 mg/kg	76.9	---	75	125	---	---
		EG020: Lead	7439-92-1	5 mg/kg	76.9	---	75	125	---	---
		EG020: Mercury	7439-97-6	0.1 mg/kg	115	---	75	125	---	---
		EG020: Nickel	7440-02-0	5 mg/kg	91.6	---	75	125	---	---
		EG020: Silver	7440-22-4	5 mg/kg	88.3	---	75	125	---	---
		EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined	---	75	125	---	---

Surrogate Control Limits

Sub-Matrix: SEDIMENT	CAS Number	Recovery Limits (%)
Compound	Low	High
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates		
2-Fluorobiphenyl	321-60-8	50
		130



Compound	CAS Number	Recovery Limits (%)	
		Low	High
Sub-Matrix: SEDIMENT			
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates - Continued			
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



CERTIFICATE OF ANALYSIS

Client	: LAM ENVIRONMENTAL SERVICES LTD	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 7
Contact	: MR DEREK LO	Contact	: Fung Lim Chee, Richard	Work Order	: HK1617830
Address	: 11/F CENTRE POINT, 181-185 GLOUCESTER ROAD, WANCHAI, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: dereklo@lamenviro.com	E-mail	: Richard.Fung@alsglobal.com		
Telephone	: +852 2839 5666	Telephone	: +852 2610 1044	Date Samples Received	: 05-MAY-2016
Facsimile	: +852 2882 3331	Facsimile	: +852 2610 2021	Issue Date	: 19-MAY-2016
Project	: -----	Quote number	: -----	No. of samples received	: 3
Order number	: -----			No. of samples analysed	: 3
C-O-C number	: -----				
Site	: -----				

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Hong Kong Accreditation Service (HKAS) has accredited this laboratory, ALS Technichem (HK) Pty Ltd (Reg. No. HOKLAS 066) under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS Directory of Accredited Laboratories.

This document has been signed by those names that appear on this report and are the authorised signatories.

<i>Signatories</i>	<i>Position</i>	<i>Authorised results for</i>
Chan Ka Yu, Karen	Manager - Organics	Organics
Wong Wing, Kenneth	Manager - Metals	Inorganics

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Page Number : 2 of 7
Client : LAM ENVIRONMENTAL SERVICES LTD
Work Order : HK1617830

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: 16-MAY-2016

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: HK1617830

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 E-ASTM D3974-09 prior to determination of metals. The In-house method is developed based on ASTM D3974-09 method.

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 µg/kg.

Low and High M.W. PAHs results (Method: EP076HK) are not HOKLAS accredited. Low M.W. PAHs is sum of Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene; High M.W. PAHs is sum of Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(g,h,i)perylene.



Analytical Results

Sub-Matrix: SEDIMENT

Compound	CAS Number	LOR	Unit	Client sample ID			
				Client sampling date / time	CB-7 (17.80M - 18.80M)	CB-7 (18.80M - 19.80M)	CB-7 (19.80M - 20.80M)
EA/ED: Physical and Aggregate Properties							
EA055: Moisture Content (dried @ 103°C)	---	0.1	%	15.9	17.1	14.9	
EG: Metals and Major Cations							
EG020: Arsenic	7440-38-2	1	mg/kg	2	<1	1	
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	<0.2	<0.2	
EG020: Chromium	7440-47-3	1	mg/kg	9	8	16	
EG020: Copper	7440-50-8	1	mg/kg	3	3	12	
EG020: Lead	7439-92-1	1	mg/kg	7	7	10	
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	<0.05	<0.05	
EG020: Nickel	7440-02-0	1	mg/kg	5	4	7	
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.1	
EG020: Zinc	7440-66-6	1	mg/kg	17	13	28	
EP-066: PCB Single Congeners							
PCB 8	34853-43-7	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	35683-99-3	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	52663-66-0	3	µg/kg	<3	<3	<3	
Total Polychlorinated biphenyls	---	18	µg/kg	<18	<18	<18	
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs)							
Naphthalene	91-20-3	50	µg/kg	<50	<50	<50	
Acenaphthylene	208-96-8	50	µg/kg	<50	<50	<50	
Acenaphthene	83-32-9	50	µg/kg	<50	<50	<50	
Fluorene	86-73-7	50	µg/kg	<50	<50	<50	
Phenanthrene	85-01-8	50	µg/kg	<50	<50	<50	



Compound	CAS Number	LOR	Unit	Client sample ID	Client sampling date / time	CB-7 (17.80M - 18.80M)	CB-7 (18.80M - 19.80M)	CB-7 (19.80M - 20.80M)
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued								
Anthracene	120-12-7	50	µg/kg			<50	<50	<50
Fluoranthene	206-44-0	150	µg/kg			240	<150	<150
Pyrene	129-00-0	150	µg/kg			318	<150	<150
Benz(a)anthracene	56-55-3	150	µg/kg			215	<150	<150
Chrysene	218-01-9	150	µg/kg			221	<150	<150
Benzo(b)fluoranthene	205-98-2	150	µg/kg			236	<150	<150
Benzo(k)fluoranthene	207-08-9	150	µg/kg			<150	<150	<150
Benzo(a)pyrene	50-32-8	150	µg/kg			184	<150	<150
Indeno(1,2,3-cd)pyrene	193-39-5	150	µg/kg			<150	<150	<150
Dibenz(a,h)anthracene	53-70-3	150	µg/kg			<150	<150	<150
Benzo(g,h,i)perylene	191-24-2	150	µg/kg			<150	<150	<150
Low M.W. PAHs	—	550	µg/kg			<550	<550	<550
High M.W. PAHs	—	1700	µg/kg			<1700	<1700	<1700
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%			120	114	103
4-Terphenyl-d14	1718-51-0	0.1	%			122	124	112
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%			54.1	57.8	55.9

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report		
						Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 4203655)								
HK1617789-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	—	0.1	%	74.0	74.2	0.3
HK1617829-002	Anonymous	EA056: Moisture Content (dried @ 103°C)	—	0.1	%	22.4	21.8	2.8
EG: Metals and Major Cations (QC Lot: 4199203)								
HK1617830-002	CB-7 (18.80M - 19.80M)	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	<1	1	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	8	8	0.0
		EG020: Copper	7440-50-8	1	mg/kg	3	4	0.0
		EG020: Lead	7439-92-1	1	mg/kg	7	7	0.0
		EG020: Nickel	7440-02-0	1	mg/kg	4	4	0.0
		EG020: Zinc	7440-66-6	1	mg/kg	13	15	14.0
EP-065: PCB Single Congeners (QC Lot: 4196743)								
HK1617190-001	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	37680-55-2	3	µg/kg	<3	<3	0.0



Matrix: SOIL		Laboratory Duplicate (DUP) Report									
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOD	Unit	Original Result	Duplicate Result	RPD (%)			
EP-065: PCB Single Congeners (QC Lot: 4196743) - Continued											
HK1617190-001	Anonymous	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-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4196744)											
HK1617605-003	Anonymous	High M.W. PAHs	—	1700	µg/kg	<1700	<1700	0.0			
		Naphthalene	91-20-3	500	µg/kg	<500	<500	0.0			
		Acenaphthylene	208-96-8	500	µg/kg	<500	<500	0.0			
		Acenaphthene	83-32-8	500	µg/kg	<500	<500	0.0			
		Fluorene	86-73-7	500	µg/kg	<500	<500	0.0			
		Phenanthrene	85-01-8	500	µg/kg	<500	<500	0.0			
		Anthracene	120-12-7	500	µg/kg	<500	<500	0.0			
		Fluoranthene	206-44-0	500	µg/kg	<500	<500	0.0			
		Pyrene	129-00-0	500	µg/kg	630	691	9.3			
		Benz(a)anthracene	56-55-3	500	µg/kg	<500	<500	0.0			
		Chrysene	218-01-9	500	µg/kg	<500	<500	0.0			
		Benzo(k)fluoranthene	205-99-2	500	µg/kg	<500	<500	0.0			
		Benzo(a)pyrene	207-08-9	500	µg/kg	<500	<500	0.0			
		Indeno(1,2,3-cd)pyrene	50-32-8	500	µg/kg	<500	<500	0.0			
		Dibenz(a,h)anthracene	193-39-5	500	µg/kg	<500	<500	0.0			
		Benzo(g,h,i)perylene	53-70-3	500	µg/kg	<500	<500	0.0			
		Low M.W. PAHs	191-24-2	500	µg/kg	<500	<500	0.0			
			—	550	µg/kg	<550	<550	0.0			

Method Blank (MB) Report									
CAS Number	LOD	Unit	Result	Spike Concentration	Spike Recovery (%)	DCS	Recovery Limits (%)	Value	RPD (%)
Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report									
Matrix: SOIL									
Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report									
Method: Compound									
EG: Metals and Major Cations (QC Lot: 4199203)									



Matrix: SOIL

Method: Compound

Method Blank (MB) Report

Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)			Value	RPD (%)	Control Limit
						LCS	DCS	High			
EG: Metals and Major Cations (QC Lot: 4199203) - Continued											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.2	—	75	111	—	—
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	92.0	—	79	109	—	—
EG020: Chromium	7440-47-3	1	mg/kg	<1	5 mg/kg	91.2	—	81	123	—	—
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	85.4	—	79	109	—	—
EG020: Lead	7439-82-1	1	mg/kg	<1	5 mg/kg	90.6	—	81	109	—	—
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	101	—	75	113	—	—
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	84.8	—	77	111	—	—
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	87.6	—	75	113	—	—
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	90.0	—	80	122	—	—
EP-065: PCB Single Congeners (QC Lot: 4196743)											
PCB 8	34883-43-7	3	µg/kg	<3	5 µg/kg	73.7	—	55	111	—	—
PCB 18	37680-65-2	3	µg/kg	<3	5 µg/kg	65.5	—	58	105	—	—
PCB 28	7012-37-5	3	µg/kg	<3	5 µg/kg	77.8	—	63	105	—	—
PCB 44	41464-39-5	3	µg/kg	<3	5 µg/kg	77.6	—	61	111	—	—
PCB 52	35693-99-3	3	µg/kg	<3	5 µg/kg	75.7	—	61	111	—	—
PCB 66	32598-10-0	3	µg/kg	<3	5 µg/kg	80.6	—	62	111	—	—
PCB 77	32598-13-3	3	µg/kg	<3	5 µg/kg	72.6	—	59	114	—	—
PCB 101	37680-73-2	3	µg/kg	<3	5 µg/kg	73.0	—	54	117	—	—
PCB 105	32598-14-4	3	µg/kg	<3	5 µg/kg	74.8	—	60	115	—	—
PCB 118	31508-00-6	3	µg/kg	<3	5 µg/kg	72.5	—	55	117	—	—
PCB 126	57485-28-8	3	µg/kg	<3	5 µg/kg	73.9	—	65	112	—	—
PCB 128	36380-07-3	3	µg/kg	<3	5 µg/kg	76.7	—	62	116	—	—
PCB 138	35065-28-2	3	µg/kg	<3	5 µg/kg	75.5	—	58	117	—	—
PCB 153	35065-27-1	3	µg/kg	<3	5 µg/kg	74.6	—	58	117	—	—
PCB 169	32774-16-6	3	µg/kg	<3	5 µg/kg	89.0	—	74	111	—	—
PCB 170	35065-30-6	3	µg/kg	<3	5 µg/kg	78.1	—	70	112	—	—
PCB 180	35065-29-3	3	µg/kg	<3	5 µg/kg	78.7	—	67	114	—	—
PCB 187	52663-68-0	3	µg/kg	<3	5 µg/kg	74.8	—	58	118	—	—
Total Polychlorinated biphenyls	—	18	µg/kg	<18	—	—	—	—	—	—	—
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4196744)											
Naphthalene	91-20-3	25	µg/kg	<50	500 µg/kg	76.4	—	71	116	—	—
Acenaphthylene	208-96-8	25	µg/kg	<50	500 µg/kg	82.8	—	52	112	—	—
Acenaphthene	83-32-9	25	µg/kg	<50	500 µg/kg	89.3	—	71	112	—	—
Fluorene	86-73-7	25	µg/kg	<50	500 µg/kg	91.1	—	72	109	—	—
Phenanthrene	85-01-8	25	µg/kg	<50	500 µg/kg	80.7	—	74	115	—	—
Anthracene	120-12-7	25	µg/kg	<50	500 µg/kg	78.2	—	50	112	—	—
Fluoranthene	206-44-0	25	µg/kg	<50	500 µg/kg	80.6	—	71	118	—	—
Pyrene	129-00-0	25	µg/kg	<50	500 µg/kg	83.4	—	72	119	—	—
Benz(a)anthracene	56-55-3	25	µg/kg	<50	500 µg/kg	84.6	—	68	109	—	—
Chrysene	218-01-9	25	µg/kg	<50	500 µg/kg	102	—	78	117	—	—



Method Blank (MB) Report				Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report									
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	LCS	DCS	Recovery Limits (%)	High	Low	Value	RPD (%)	Control Limit
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4196744) - Continued													
Benzo(b)fluoranthene	205-99-2	25	µg/kg	<50	500 µg/kg	85.0	---	63	121	---	---	---	---
Benzo(k)fluoranthene	207-06-9	25	µg/kg	<50	500 µg/kg	93.1	---	74	123	---	---	---	---
Benzo(a)pyrene	50-32-8	25	µg/kg	<50	500 µg/kg	79.0	---	58	112	---	---	---	---
Indeno(1,2,3-cd)pyrene	193-39-5	25	µg/kg	<50	500 µg/kg	91.0	---	61	129	---	---	---	---
Dibenz(a,h)anthracene	53-70-3	25	µg/kg	<50	500 µg/kg	86.0	---	58	129	---	---	---	---
Benzo(g,h,i)perylene	191-24-2	25	µg/kg	<50	500 µg/kg	87.0	---	52	135	---	---	---	---
Low M.W. PAHs	---	550	µg/kg	<550	---	---	---	---	---	---	---	---	---
High M.W. PAHs	---	1700	µg/kg	<1700	---	---	---	---	---	---	---	---	---

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

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report			Recovery Limits (%)	High	Low	Value	RPD (%)	Control Limit
					MS	MSD	MSD						
EG: Metals and Major Cations (QC Lot: 4199203)													
HK1617830-001	CB-7 (17.80M - 18.80M)		7440-38-2	5 mg/kg	89.0	---	---	75	125	---	---	---	---
			7440-43-9	5 mg/kg	92.2	---	---	75	125	---	---	---	---
			7440-47-3	5 mg/kg	99.6	---	---	75	125	---	---	---	---
			7440-50-8	5 mg/kg	78.8	---	---	75	125	---	---	---	---
			7438-92-1	5 mg/kg	104	---	---	75	125	---	---	---	---
			7439-97-6	0.1 mg/kg	117	---	---	75	125	---	---	---	---
			7440-02-0	5 mg/kg	91.2	---	---	75	125	---	---	---	---
			7440-22-4	5 mg/kg	85.4	---	---	75	125	---	---	---	---
			7440-66-6	5 mg/kg	92.6	---	---	75	125	---	---	---	---

Surrogate Control Limits

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

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



CERTIFICATE OF ANALYSIS

Client	: LAM ENVIRONMENTAL SERVICES LTD	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 10
Contact	: MR DEREK LO	Contact	: Fung Lim Chee, Richard	Work Order	: HK1643226
Address	: 11/F CENTRE POINT, 181-185 GLOUCESTER ROAD, WANCHAI, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong	Amendment	: 1
E-mail	: dereklo@lamenviro.com	E-mail	: Richard.Fung@alsglobal.com		
Telephone	: +852 2839 5666	Telephone	: +852 2610 1044	Date Samples Received	: 20-OCT-2016
Facsimile	: +852 2882 3331	Facsimile	: +852 2610 2021	Issue Date	: 14-NOV-2016
Project	: *****	Quote number	: *****	No. of samples received	: 7
Order number	: *****			No. of samples analysed	: 7
C-O-C number	: *****				
Site	: *****				

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Hong Kong Accreditation Service (HKAS) has accredited this laboratory, ALS Technichem (HK) Pty Ltd (Reg. No. HOKLAS 066) under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS Directory of Accredited Laboratories.

This document has been signed by those names that appear on this report and are the authorised signatories.

Signatories	Position	Authorised results for
Chan Ka Yu, Karen	Manager - Organics	Organics
Wong Wing, Kenneth	Manager - Metals	Inorganics

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Page Number : 2 of 10
Client : LAM ENVIRONMENTAL SERVICES LTD
Work Order : HK1643226, Amendment 1

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: 20-OCT-2016 to 08-NOV-2016

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: HK1643226

Sample(s) were received in 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 E-ASTM D3974-09 prior to determination of metals. The In-house method is developed based on ASTM D3974-09 method.

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 µg/kg. Low and High M.W. PAHs results (Method: EP076HK) are not HOKLAS accredited. Low M.W. PAHs is sum of Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene; High M.W. PAHs is sum of Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1.2.3.cd)pyrene, Dibenz(a,h)anthracene, Benzo(g,h,i)perylene.



Analytical Results

Compound	CAS Number	LOR	Unit	Client sampling date / time	Client sample ID	CB8 (18.50M - 19.50M) [19-OCT-2016]	CB8 (19.50M - 20.50M) [19-OCT-2016]	CB8 (20.50M - 21.50M) [20-OCT-2016]	CB8 (21.50M - 22.50M) [20-OCT-2016]	CB8 (22.50M - 23.50M) [20-OCT-2016]
EA/ED: Physical and Aggregate Properties										
EA055: Moisture Content (dried @ 103°C)	---	0.1	%			13.9	9.6	16.8	21.4	20.2
EG: Metals and Major Cations										
EG020: Arsenic	7440-38-2	1	mg/kg			1	2	3	3	3
EG020: Cadmium	7440-43-9	0.2	mg/kg			<0.2	<0.2	<0.2	<0.2	<0.2
EG020: Chromium	7440-47-3	1	mg/kg			10	7	7	36	20
EG020: Copper	7440-50-8	1	mg/kg			1	1	2	4	4
EG020: Lead	7439-92-1	1	mg/kg			4	4	7	11	6
EG020: Mercury	7439-97-6	0.05	mg/kg			<0.05	<0.05	<0.05	<0.05	<0.05
EG020: Nickel	7440-02-0	1	mg/kg			5	4	5	20	10
EG020: Silver	7440-22-4	0.1	mg/kg			<0.1	<0.1	<0.1	<0.1	<0.1
EG020: Zinc	7440-66-6	1	mg/kg			9	9	14	28	15
EP-065: PCB Single Congeners										
PCB 8	34883-43-7	3	µg/kg			<3	<3	<3	<3	<3
PCB 18	37680-65-2	3	µg/kg			<3	<3	<3	<3	<3
PCB 28	7012-37-5	3	µg/kg			<3	<3	<3	<3	<3
PCB 44	41464-39-5	3	µg/kg			<3	<3	<3	<3	<3
PCB 52	35693-99-3	3	µg/kg			<3	<3	<3	<3	<3
PCB 66	32598-10-0	3	µg/kg			<3	<3	<3	<3	<3
PCB 77	32598-13-3	3	µg/kg			<3	<3	<3	<3	<3
PCB 101	37680-73-2	3	µg/kg			<3	<3	<3	<3	<3
PCB 105	32598-14-4	3	µg/kg			<3	<3	<3	<3	<3
PCB 118	31508-00-6	3	µg/kg			<3	<3	<3	<3	<3
PCB 126	57465-28-8	3	µg/kg			<3	<3	<3	<3	<3
PCB 128	36380-07-3	3	µg/kg			<3	<3	<3	<3	<3
PCB 138	35065-28-2	3	µg/kg			<3	<3	<3	<3	<3
PCB 153	35065-27-1	3	µg/kg			<3	<3	<3	<3	<3
PCB 169	32774-16-6	3	µg/kg			<3	<3	<3	<3	<3
PCB 170	35065-30-6	3	µg/kg			<3	<3	<3	<3	<3
PCB 180	35065-29-3	3	µg/kg			<3	<3	<3	<3	<3
PCB 187	52663-68-0	3	µg/kg			<3	<3	<3	<3	<3
Total Polychlorinated biphenyls	---	18	µg/kg			<18	<18	<18	<18	<18
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs)										
Naphthalene	91-20-3	50	µg/kg			<50	<50	<50	<50	<50
Acenaphthylene	208-96-8	50	µg/kg			<50	<50	<50	<50	<50
Acenaphthene	83-32-9	50	µg/kg			<50	<50	<50	<50	<50
Fluorene	86-73-7	50	µg/kg			<50	<50	<50	<50	<50
Phenanthrene	85-01-8	50	µg/kg			<50	<50	<50	<50	<50
Anthracene	120-12-7	50	µg/kg			<50	<50	<50	<50	<50



Sub-Matrix: SEDIMENT

Compound	CAS Number	LOR	Client sampling date / time		Unit	CB8 (18.50M - 19.50M)	CB8 (19.50M - 20.50M)	CB8 (20.50M - 21.50M)	CB8 (21.50M - 22.50M)	CB8 (22.50M - 23.50M)
			[19-OCT-2016]	[19-OCT-2016]		[20-OCT-2016]	[20-OCT-2016]	[20-OCT-2016]	[20-OCT-2016]	
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued										
Fluoranthene	206-44-0	150	µg/kg			<150	<150	<150	<150	<150
Pyrene	129-00-0	150	µg/kg			<150	<150	<150	<150	<150
Benz(a)anthracene	56-55-3	150	µg/kg			<150	<150	<150	<150	<150
Chrysene	218-01-9	150	µg/kg			<150	<150	<150	<150	<150
Benzo(b)fluoranthene	205-99-2	150	µg/kg			<150	<150	<150	<150	<150
Benzo(k)fluoranthene	207-08-9	150	µg/kg			<150	<150	<150	<150	<150
Benzo(a)pyrene	50-32-8	150	µg/kg			<150	<150	<150	<150	<150
Indeno(1,2,3-cd)pyrene	193-39-5	150	µg/kg			<150	<150	<150	<150	<150
Dibenz(a,h)anthracene	53-70-3	150	µg/kg			<150	<150	<150	<150	<150
Benzo(g,h,i)perylene	191-24-2	150	µg/kg			<150	<150	<150	<150	<150
Low M.W. PAHs	—	550	µg/kg			<550	<550	<550	<550	<550
High M.W. PAHs	—	1700	µg/kg			<1700	<1700	<1700	<1700	<1700
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates										
2-Fluorobiphenyl	321-60-8	0.1	%			83.5	84.8	74.9	63.6	77.3
4-Terphenyl-d14	1718-51-0	0.1	%			79.6	79.7	73.7	67.6	77.2
EP-066S: PCB Congeners and Organochlorine Pesticides Surrogate										
Decachlorobiphenyl	2051-24-3	0.1	%			58.9	56.0	61.8	61.6	58.5



Compound	CAS Number	LOR	Client sample ID		Unit	%	CB8 (23.50M - 24.50M) [20-OCT-2016]	CB8 (24.50M - 25.50M) [20-OCT-2016]
			Client sampling date / time	Client sampling date / time				
Sub-Matrix: SEDIMENT								
EA/ED: Physical and Aggregate Properties								
EA056: Moisture Content (dried @ 103°C)	---	0.1				15.8	19.1	
EG: Metals and Major Cations								
EG020: Arsenic	7440-39-2	1			mg/kg	3	3	
EG020: Cadmium	7440-43-9	0.2			mg/kg	<0.2	<0.2	
EG020: Chromium	7440-47-3	1			mg/kg	15	17	
EG020: Copper	7440-50-8	1			mg/kg	4	3	
EG020: Lead	7439-92-1	1			mg/kg	7	8	
EG020: Mercury	7439-97-6	0.05			mg/kg	<0.05	<0.05	
EG020: Nickel	7440-02-0	1			mg/kg	8	10	
EG020: Silver	7440-22-4	0.1			mg/kg	<0.1	<0.1	
EG020: Zinc	7440-66-6	1			mg/kg	18	17	
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	35693-95-3	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	35065-25-3	3			µg/kg	<3	<3	
PCB 187	52663-68-0	3			µg/kg	<3	<3	
Total Polychlorinated biphenyls	---	18			µg/kg	<18	<18	
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs)								
Naphthalene	91-20-3	50			µg/kg	<50	<50	
Acenaphthylene	208-96-8	50			µg/kg	<50	<50	
Acenaphthene	83-32-9	50			µg/kg	<50	<50	
Fluorene	86-73-7	50			µg/kg	<50	<50	
Phenanthrene	85-01-8	50			µg/kg	<50	<50	
Anthracene	120-12-7	50			µg/kg	<50	<50	
Fluoranthene	206-44-0	150			µg/kg	<150	<150	



Compound	CAS Number	LOR	Unit	Client sample ID	Client sampling date / time	CB8 (23.50M - 24.50M) [20-OCT-2016]	CB8 (24.50M - 25.50M) [20-OCT-2016]	HK1643226-006	HK1643226-007
Sub-Matrix: SEDIMENT									
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued									
Pyrene	129-00-0	150	µg/kg			<150	<150		
Benz(a)anthracene	56-55-3	150	µg/kg			<150	<150		
Chrysene	218-01-9	150	µg/kg			<150	<150		
Benzo(b)fluoranthene	205-99-2	150	µg/kg			<150	<150		
Benzo(k)fluoranthene	207-08-9	150	µg/kg			<150	<150		
Benzo(a)pyrene	50-32-8	150	µg/kg			<150	<150		
Indeno(1,2,3-cd)pyrene	193-39-5	150	µg/kg			<150	<150		
Dibenz(a,h)anthracene	53-70-3	150	µg/kg			<150	<150		
Benzo(g,h,i)perylene	191-24-2	150	µg/kg			<150	<150		
Low M.W. PAHs	---	550	µg/kg			<550	<550		
High M.W. PAHs	---	1700	µg/kg			<1700	<1700		
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%			90.7	87.2		
4-Terphenyl-d14	1718-51-0	0.1	%			88.6	85.2		
EP-066S: PCB Congeners and Organochlorine Pesticides Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%			57.9	59.8		

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report		RPD (%)
						Original Result	Duplicate Result	
EA/ED: Physical and Aggregate Properties (QC Lot: 4347438)								
HK1643226-001	CB8 (18.50M - 19.50M)	EA055: Moisture Content (dried @ 103°C)	---	0.1	%	13.9	13.7	1.9
HK1643246-004	Anonymous	EA055: Moisture Content (dried @ 103°C)	---	0.1	%	13.8	14.2	2.7
EG: Metals and Major Cations (QC Lot: 4343255)								
HK1643076-001	Anonymous	EG020: Mercury	7439-97-6	0.05	mg/kg	0.08	0.07	0.0
		EG020: Silver	7440-22-4	0.1	mg/kg	233	240	3.2
		EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	<0.2	0.0
		EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	69	69	0.0
		EG020: Copper	7440-50-8	1	mg/kg	10	8	11.4
		EG020: Lead	7439-92-1	1	mg/kg	46	46	0.0
		EG020: Nickel	7440-02-0	1	mg/kg	2	3	0.0
		EG020: Zinc	7440-66-6	1	mg/kg	126	114	9.9
		EG020: Mercury	7439-97-6	0.05	mg/kg	0.10	0.09	0.0
		EG020: Silver	7440-22-4	0.1	mg/kg	0.2	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	10	10	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	15	14	8.2
		EG020: Copper	7440-50-8	1	mg/kg	9	9	0.0
		EG020: Lead	7439-92-1	1	mg/kg	68	73	7.5
HK1643172-001	Anonymous							



Matrix: SOIL		Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EG: Metals and Major Cations (QC Lot: 4343255) - Continued								
HK1643172-001	Anonymous	EG020: Nickel	7440-02-0	1	mg/kg	6	6	0.0
		EG020: Zinc	7440-66-6	1	mg/kg	94	95	1.1
EG: Metals and Major Cations (QC Lot: 4343256)								
HK1643226-006	CB8 (23.50M - 24.50M)	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	3	3	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	15	17	12.2
		EG020: Copper	7440-50-8	1	mg/kg	4	4	0.0
		EG020: Lead	7439-92-1	1	mg/kg	7	7	0.0
		EG020: Nickel	7440-02-0	1	mg/kg	8	8	0.0
		EG020: Zinc	7440-66-6	1	mg/kg	18	16	7.1
EP-065: PCB Single Congeners (QC Lot: 4342519)								
HK1643226-001	CB8 (18.50M - 19.50M)	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-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4341322)								
HK1643076-001	Anonymous	High M.W. PAHs	---	1700	µg/kg	<1700	<1700	0.0
		Naphthalene	91-20-3	500	µg/kg	<500	<500	0.0
		Acenaphthylene	208-96-8	500	µg/kg	<500	<500	0.0
		Acenaphthene	83-32-9	500	µg/kg	<500	<500	0.0
		Fluorene	86-73-7	500	µg/kg	<500	<500	0.0
		Phenanthrene	85-01-8	500	µg/kg	<500	<500	0.0
		Anthracene	120-12-7	500	µg/kg	<500	<500	0.0



Matrix: SOIL		Method: Compound		Laboratory Duplicate (DUP) Report				RPD (%)
Laboratory sample ID	Client sample ID	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4341322) - Continued								
HK1643076-001	Anonymous	206-44-0	500	µg/kg	<500	<500	0.0	
		129-00-0	500	µg/kg	<500	<500	0.0	
		56-55-3	500	µg/kg	<500	<500	0.0	
		218-01-9	500	µg/kg	<500	<500	0.0	
		205-99-2	500	µg/kg	<500	<500	0.0	
		207-08-9	500	µg/kg	<500	<500	0.0	
		50-32-8	500	µg/kg	<500	<500	0.0	
		193-39-5	500	µg/kg	<500	<500	0.0	
		53-70-3	500	µg/kg	<500	<500	0.0	
		191-24-2	500	µg/kg	<500	<500	0.0	
		—	550	µg/kg	<550	<550	0.0	

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

Matrix: SOIL		Method Blank (MB) Report				Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	LCS	Spike Recovery (%)	DCS	Recovery Limits (%)	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 4343255)													
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	87.6	—	—	75	111	111	—	—
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	100	—	—	80	108	108	—	—
EG020: Chromium	7440-47-3	1	mg/kg	<1	5 mg/kg	100	—	—	77	119	119	—	—
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	97.0	—	—	79	109	109	—	—
EG020: Lead	7439-92-1	1	mg/kg	<1	5 mg/kg	92.5	—	—	81	107	107	—	—
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	85.0	—	—	74	114	114	—	—
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	89.2	—	—	74	106	106	—	—
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	87.3	—	—	77	101	101	—	—
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	94.3	—	—	76	118	118	—	—
EG: Metals and Major Cations (QC Lot: 4343256)													
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	88.4	—	—	75	111	111	—	—
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	99.7	—	—	80	108	108	—	—
EG020: Chromium	7440-47-3	1	mg/kg	<1	5 mg/kg	89.9	—	—	77	119	119	—	—
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	89.5	—	—	79	109	109	—	—
EG020: Lead	7439-92-1	1	mg/kg	<1	5 mg/kg	97.3	—	—	81	107	107	—	—
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	85.0	—	—	74	114	114	—	—
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	94.6	—	—	74	106	106	—	—
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	86.6	—	—	77	101	101	—	—
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	108	—	—	76	118	118	—	—
EP-065: PCB Single Congeners (QC Lot: 4342519)													
PCB 8	34883-43-7	3	µg/kg	<3	5 µg/kg	74.2	—	—	45	113	113	—	—
PCB 18	37680-65-2	3	µg/kg	<3	5 µg/kg	73.8	—	—	49	109	109	—	—
PCB 28	7012-37-5	3	µg/kg	<3	5 µg/kg	89.5	—	—	58	108	108	—	—
PCB 44	41464-39-5	3	µg/kg	<3	5 µg/kg	85.7	—	—	55	121	121	—	—



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				Control Limit
				MS	MSD	Recovery Limits (%)	Value	
EG: Metals and Major Cations (QC Lot: 4343255)								
HK1643075-001	Anonymous	EG020: Arsenic	7440-38-2	86.7	---	75	125	---
		EG020: Cadmium	7440-43-9	102	---	75	125	---
		EG020: Chromium	7440-47-3	# Not Determined	---	75	125	---
		EG020: Copper	7440-50-8	81.1	---	75	125	---
		EG020: Lead	7439-92-1	# Not Determined	---	75	125	---
		EG020: Mercury	7439-97-6	90.0	---	75	125	---
		EG020: Nickel	7440-02-0	82.9	---	75	125	---
		EG020: Silver	7440-22-4	# Not Determined	---	75	125	---
		EG020: Zinc	7440-66-6	# Not Determined	---	75	125	---
EG: Metals and Major Cations (QC Lot: 4343256)								
HK1643226-005	CB8 (22.50M - 23.50M)	EG020: Arsenic	7440-38-2	97.2	---	75	125	---
		EG020: Cadmium	7440-43-9	95.8	---	75	125	---
		EG020: Chromium	7440-47-3	102	---	75	125	---
		EG020: Copper	7440-50-8	98.2	---	75	125	---
		EG020: Lead	7439-92-1	95.8	---	75	125	---
		EG020: Mercury	7439-97-6	95.0	---	75	125	---
		EG020: Nickel	7440-02-0	93.7	---	75	125	---
		EG020: Silver	7440-22-4	86.3	---	75	125	---
		EG020: Zinc	7440-66-6	96.6	---	75	125	---

Surrogate Control Limits

Compound	CAS Number	Recovery Limits (%)	
		Low	High
Sub-Matrix: SEDIMENT			
EP-076S: Polycyclic Aromatic 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



CERTIFICATE OF ANALYSIS

Client	: LAM ENVIRONMENTAL SERVICES LTD	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 7
Contact	: MR DEREK LO	Contact	: Fung Lim Chee, Richard	Work Order	: HK1643246
Address	: 11/F CENTRE POINT, 181-185 GLOUCESTER ROAD, WANCHAI, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong	Amendment	: 1
E-mail	: dereklo@lamenviro.com	E-mail	: Richard.Fung@alsglobal.com	Date Samples Received	: 24-OCT-2016
Telephone	: +852 2839 5666	Telephone	: +852 2610 1044	Issue Date	: 14-NOV-2016
Facsimile	: +852 2882 3331	Facsimile	: +852 2610 2021	No. of samples received	: 5
Project	: ----	Quote number	: ----	No. of samples analysed	: 5
Order number	: ----				
C-O-C number	: ----				
Site	: ----				

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Hong Kong Accreditation Service (HKAS) has accredited this laboratory, ALS Technichem (HK) Pty Ltd (Reg. No. HOKLAS 066) under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS Directory of Accredited Laboratories.

This document has been signed by those names that appear on this report and are the authorised signatories.

Signatories	Position	Authorised results for
Chan Ka Yu, Karen	Manager - Organics	Organics
Wong Wing, Kenneth	Manager - Metals	Inorganics

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Page Number : 2 of 7
Client : LAM ENVIRONMENTAL SERVICES LTD
Work Order : HK1643246, Amendment 1

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: 24-OCT-2016 to 08-NOV-2016

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: HK1643246

Sample(s) were received in 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 E-ASTM D3974-09 prior to determination of metals. The In-house method is developed based on ASTM D3974-09 method.

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 µg/kg. Low and High M.W. PAHs results (Method: EP076HK) are not HOKLAS accredited. Low M.W. PAHs is sum of Naphthalene, Acenaphthylene, Fluorene, Phenanthrene, Anthracene; High M.W. PAHs is sum of Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(g,h,i)perylene.



Analytical Results

Compound	CAS Number	LOR	Client sampling date / time		Unit	%	CB8 (25.50M - 26.50M)		CB8 (26.50M - 27.50M)		CB8 (28.50M - 29.50M)		CB8 (29.50M - 30.50M)		CB8 (30.50M - 31.50M)		
			[22-OCT-2016]	[22-OCT-2016]			[22-OCT-2016]	[22-OCT-2016]	[24-OCT-2016]	[24-OCT-2016]	[24-OCT-2016]	[24-OCT-2016]	[24-OCT-2016]	[24-OCT-2016]			
EA/JED: Physical and Aggregate Properties																	
EA055: Moisture Content (dried @ 103°C)		0.1					14.7		16.5		14.4		13.8			23.3	
																	HK1643246-001
																	HK1643246-002
																	HK1643246-004
																	HK1643246-005

EG: Metals and Major Cations

Compound	CAS Number	LOR	Unit	Value
EG020: Arsenic	7440-38-2	1	mg/kg	2
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2
EG020: Chromium	7440-47-3	1	mg/kg	11
EG020: Copper	7440-50-8	1	mg/kg	2
EG020: Lead	7439-92-1	1	mg/kg	6
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05
EG020: Nickel	7440-02-0	1	mg/kg	6
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1
EG020: Zinc	7440-56-6	1	mg/kg	16

EP-065: PCB Single Congeners

Compound	CAS Number	LOR	Unit	Value
PCB 8	34863-43-7	3	µg/kg	<3
PCB 18	37660-65-2	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	37660-73-2	3	µg/kg	<3
PCB 105	32598-14-4	3	µg/kg	<3
PCB 118	31608-00-6	3	µg/kg	<3
PCB 125	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-076HK: Polycyclic Aromatic Hydrocarbons (PAHs)

Compound	CAS Number	LOR	Unit	Value
Naphthalene	91-20-3	50	µg/kg	<50
Acenaphthylene	208-96-8	50	µg/kg	<50
Acenaphthene	83-32-9	50	µg/kg	<50
Fluorene	86-73-7	50	µg/kg	<50
Phenanthrene	85-01-8	50	µg/kg	<50
Anthracene	120-12-7	50	µg/kg	<50



Compound	CAS Number	LOR	Unit	Client sample ID	Client sampling date / time	CB8 (25.50M - 26.50M)	CB8 (26.50M - 27.50M)	CB8 (28.50M - 29.50M)	CB8 (29.50M - 30.50M)	CB8 (30.50M - 31.50M)
Sub-Matrix: SEDIMENT										
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued										
Fluoranthene	206-44-0	150	µg/kg			<150	<150	<150	<150	<150
Pyrene	129-00-0	150	µg/kg			<150	<150	<150	<150	<150
Benz(a)anthracene	56-55-3	150	µg/kg			<150	<150	<150	<150	<150
Chrysene	218-01-9	150	µg/kg			<150	<150	<150	<150	<150
Benzo(b)fluoranthene	205-98-2	150	µg/kg			<150	<150	<150	<150	<150
Benzo(k)fluoranthene	207-08-9	150	µg/kg			<150	<150	<150	<150	<150
Benzo(a)pyrene	50-32-8	150	µg/kg			<150	<150	<150	<150	<150
Indeno(1,2,3-cd)pyrene	183-38-5	150	µg/kg			<150	<150	<150	<150	<150
Dibenz(a,h)anthracene	53-70-3	150	µg/kg			<150	<150	<150	<150	<150
Benzo(g,h,i)perylene	191-24-2	150	µg/kg			<150	<150	<150	<150	<150
Low M.W. PAHs	---	550	µg/kg			<550	<550	<550	<550	<550
High M.W. PAHs	---	1700	µg/kg			<1700	<1700	<1700	<1700	<1700
EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates										
2-Fluorobiphenyl	321-60-8	0.1	%			90.7	58.6	80.0	74.8	71.1
4-Terphenyl-d14	1718-51-0	0.1	%			89.1	64.6	80.1	74.1	67.7
EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate										
Decachlorobiphenyl	2051-24-3	0.1	%			60.1	60.5	64.9	53.1	64.2

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report		RPD (%)
						Original Result	Duplicate Result	
EA/ED: Physical and Aggregate Properties (QC Lot: 4347438)								
HK1643226-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	---	0.1	%	13.9	13.7	1.9
HK1643246-004	CB8 (29.50M - 30.50M)	EA055: Moisture Content (dried @ 103°C)	---	0.1	%	13.8	14.2	2.7
EG: Metals and Major Cations (QC Lot: 4343256)								
HK1643226-006	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	3	3	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	15	17	12.2
		EG020: Copper	7440-50-8	1	mg/kg	4	4	0.0
		EG020: Lead	7439-92-1	1	mg/kg	7	7	0.0
		EG020: Nickel	7440-02-0	1	mg/kg	8	8	0.0
		EG020: Zinc	7440-66-6	1	mg/kg	18	16	7.1
EP-065: PCB Single Congeners (QC Lot: 4342519)								
HK1643226-001	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



Laboratory sample ID	Client sample ID	Method: Compound	Laboratory Duplicate (DUP) Report				RPD (%)	
			CAS Number	LOR	Unit	Original Result		Duplicate Result
EP-066: PCB Single Congeners (QC Lot: 4342519) - Continued								
HK1643226-001		Anonymous						
		PCB 44	41464-39-5	3	µg/kg	<3	<3	0.0
		PCB 52	35893-99-3	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-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4341322)								
HK1643076-001		Anonymous						
		High M.W. PAHs		1700	µg/kg	<1700	<1700	0.0
		Naphthalene	91-20-3	500	µg/kg	<500	<500	0.0
		Acenaphthylene	208-96-8	500	µg/kg	<500	<500	0.0
		Acenaphthene	83-32-9	500	µg/kg	<500	<500	0.0
		Fluorene	86-73-7	500	µg/kg	<500	<500	0.0
		Phenanthrene	85-01-8	500	µg/kg	<500	<500	0.0
		Anthracene	120-12-7	500	µg/kg	<500	<500	0.0
		Fluoranthene	206-44-0	500	µg/kg	<500	<500	0.0
		Pyrene	129-00-0	500	µg/kg	<500	<500	0.0
		Benzo(a)anthracene	56-55-3	500	µg/kg	<500	<500	0.0
		Chrysene	218-01-9	500	µg/kg	<500	<500	0.0
		Benzo(b)fluoranthene	205-99-2	500	µg/kg	<500	<500	0.0
		Benzo(k)fluoranthene	207-08-9	500	µg/kg	<500	<500	0.0
		Benzo(a)pyrene	50-32-8	500	µg/kg	<500	<500	0.0
		Indeno(1,2,3-cd)pyrene	193-39-5	500	µg/kg	<500	<500	0.0
		Dibenz(a,h)anthracene	53-70-3	500	µg/kg	<500	<500	0.0
		Benzo(g,h,i)perylene	191-24-2	500	µg/kg	<500	<500	0.0
		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

Method: Compound	Method Blank (MB) Report				Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report				
	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	Value	RPD (%)
EG: Metals and Major Cations (QC Lot: 4343256)									
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	88.4	75 - 111	—	—



Method Blank (MB) Report		Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report										
Matrix	SOIL	CAS Number	LOR	Unit	Result	Spike Concentration	LCS	DCS	Recovery Limits (%)	Value	RPD (%)	Control Limit
EG: Metals and Major Cations (QC Lot: 4343256) - Continued												
EG020: Cadmium		7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	99.7	---	80	108	---	---
EG020: Chromium		7440-47-3	1	mg/kg	<1	5 mg/kg	89.9	---	77	119	---	---
EG020: Copper		7440-50-8	1	mg/kg	<1	5 mg/kg	89.5	---	79	109	---	---
EG020: Lead		7439-92-1	1	mg/kg	<1	5 mg/kg	97.3	---	81	107	---	---
EG020: Mercury		7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	85.0	---	74	114	---	---
EG020: Nickel		7440-02-0	1	mg/kg	<1	5 mg/kg	84.6	---	74	106	---	---
EG020: Silver		7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	86.6	---	77	101	---	---
EG020: Zinc		7440-66-6	1	mg/kg	<1	5 mg/kg	108	---	76	118	---	---
EP-065: PCB Single Congeners (QC Lot: 4342519)												
PCB 8		34883-43-7	3	µg/kg	<3	5 µg/kg	74.2	---	45	113	---	---
PCB 18		37680-65-2	3	µg/kg	<3	5 µg/kg	73.8	---	49	109	---	---
PCB 28		7012-37-5	3	µg/kg	<3	5 µg/kg	89.5	---	58	108	---	---
PCB 44		41464-39-5	3	µg/kg	<3	5 µg/kg	85.7	---	55	121	---	---
PCB 52		35693-99-3	3	µg/kg	<3	5 µg/kg	85.0	---	60	116	---	---
PCB 66		32598-10-0	3	µg/kg	<3	5 µg/kg	88.8	---	54	129	---	---
PCB 77		32598-13-3	3	µg/kg	<3	5 µg/kg	87.6	---	58	112	---	---
PCB 101		37680-73-2	3	µg/kg	<3	5 µg/kg	82.6	---	56	116	---	---
PCB 105		32598-14-4	3	µg/kg	<3	5 µg/kg	85.1	---	60	119	---	---
PCB 118		31508-00-6	3	µg/kg	<3	5 µg/kg	90.4	---	60	115	---	---
PCB 126		57465-28-8	3	µg/kg	<3	5 µg/kg	69.2	---	59	115	---	---
PCB 128		38380-07-3	3	µg/kg	<3	5 µg/kg	84.4	---	59	127	---	---
PCB 138		35065-28-2	3	µg/kg	<3	5 µg/kg	91.3	---	59	120	---	---
PCB 153		35065-27-1	3	µg/kg	<3	5 µg/kg	91.1	---	61	117	---	---
PCB 169		32774-16-6	3	µg/kg	<3	5 µg/kg	98.2	---	67	119	---	---
PCB 170		35065-30-6	3	µg/kg	<3	5 µg/kg	89.7	---	68	123	---	---
PCB 180		35065-29-3	3	µg/kg	<3	5 µg/kg	89.7	---	65	121	---	---
PCB 187		52663-68-0	3	µg/kg	<3	5 µg/kg	87.4	---	60	116	---	---
Total Polychlorinated biphenyls		---	18	µg/kg	<18	---	---	---	---	---	---	---
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4341322)												
Naphthalene		91-20-3	25	µg/kg	<50	500 µg/kg	77.5	---	56	118	---	---
Acenaphthylene		208-96-8	25	µg/kg	<50	500 µg/kg	71.2	---	42	110	---	---
Acenaphthene		83-32-9	25	µg/kg	<50	500 µg/kg	75.1	---	54	116	---	---
Fluorene		86-73-7	25	µg/kg	<50	500 µg/kg	79.1	---	58	116	---	---
Phenanthrene		85-01-8	25	µg/kg	<50	500 µg/kg	76.9	---	60	120	---	---
Anthracene		120-12-7	25	µg/kg	<50	500 µg/kg	52.8	---	25	128	---	---
Fluoranthene		206-44-0	25	µg/kg	<50	500 µg/kg	78.3	---	72	115	---	---
Pyrene		129-00-0	25	µg/kg	<50	500 µg/kg	75.7	---	71	113	---	---
Benz(a)anthracene		56-55-3	25	µg/kg	<50	500 µg/kg	73.2	---	48	121	---	---
Chrysene		218-01-9	25	µg/kg	<50	500 µg/kg	80.8	---	70	115	---	---
Benzo(b)fluoranthene		205-99-2	25	µg/kg	<50	500 µg/kg	79.1	---	62	111	---	---



Method Blank (MB) Report				Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report				
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	RPD (%)
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4341322) - Continued								
Benzo(k)fluoranthene	207-08-9	25	µg/kg	<50	500 µg/kg	75.2	70 114	---
Benzo(a)pyrene	50-32-8	25	µg/kg	<50	500 µg/kg	55.1	37 123	---
Indeno(1,2,3-cd)pyrene	193-39-5	25	µg/kg	<50	500 µg/kg	72.4	57 116	---
Dibenz(a,h)anthracene	53-70-3	25	µg/kg	<50	500 µg/kg	70.6	57 118	---
Benzo(g,h,i)perylene	191-24-2	25	µg/kg	<50	500 µg/kg	72.1	50 132	---
Low M.W. PAHs	---	550	µg/kg	<550	---	---	---	---
High M.W. PAHs	---	1700	µg/kg	<1700	---	---	---	---

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

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report			
					MS	MSD	RPD (%)	
EG: Metals and Major Cations (QC Lot: 4343256)								
HK1843226-005	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.2	---	75 125	---
		EG020: Cadmium	7440-43-9	5 mg/kg	95.8	---	75 125	---
		EG020: Chromium	7440-47-3	5 mg/kg	102	---	75 125	---
		EG020: Copper	7440-50-8	5 mg/kg	98.2	---	75 125	---
		EG020: Lead	7439-92-1	5 mg/kg	95.8	---	75 125	---
		EG020: Mercury	7439-97-6	0.1 mg/kg	95.0	---	75 125	---
		EG020: Nickel	7440-02-0	5 mg/kg	93.7	---	75 125	---
		EG020: Silver	7440-22-4	5 mg/kg	86.3	---	75 125	---
		EG020: Zinc	7440-66-6	5 mg/kg	96.6	---	75 125	---

Surrogate Control Limits

Sub-Matrix: SEDIMENT	CAS Number	Recovery Limits (%)
Compound	Low	High
EP-076S: Polycyclic Aromatic 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

11/F, Chung Shun Knitting Centre, 1-3 Wing Yip St, Kwai Chung, N.T., Hong Kong
 Tel : (852) 2610 1044 Fax : (852) 2610 2021 Email: hongkong@alsglobal.com



SAMPLE SUBMISSION FORM (Environmental test)

Note : * The following information is required to expedite sample analysis. Please complete all the necessary details and return this form with your samples. Test(s) will not be started until a COMPLETED form is received.
 # Items will be subject to additional charge and needed further confirmation & arrangement.

Reporting information for Final Report

*Company Name: Lam Environmental Services Ltd.
 *Client Contact: Name: Derek Lo Email: dereklo@lamenviro.com
 Tel: 2839 5600 Fax: 2882 3331
 *Report address to: 11/F, Centre Point, 181-185 Gloucester Road, Wan Chai, Hong Kong
 *Postal Address (if different): _____
 Soft copy report delivery (if different from above)
 *Client Contact Name (1st): Derek Lo Email: dereklo@lamenviro.com
 *Client Contact Name (2nd): Raymond Dai Email: raymondai@lamenviro.com

Billing information for Invoice (if different from reporting information for final report)

Note : Client Name on invoice will be the company Name of the Final report.

*Invoice to (c/o company): Lam Environmental Services Ltd.
 *Client Contact Name: Derek Lo Tel: 2839 5600
 *Invoice address to: 11/F, Centre Point, 181-185 Gloucester Road, Wan Chai, Hong Kong

*Purchase Order/ Client Order No: _____
 * ALS Quotation No.: HK/615/15
 *Project Name/No: _____
 Site Name (if any): _____

ALS Technichem (HK) Pty Ltd
 Ltd
 Work Order
HK1643226



Telephone : +852 2610 1044

Sampling and delivery

Sampling by: Client # ALS others: _____
 *Sample(s) delivery by: Client # ALS others: _____

*Expected TAT (Working days): Regular (7-10) #Express (5) #Double Express (3) #Other (____)
 Other remark: _____

SAMPLE ANALYTICAL REQUIREMENTS (Supplementary sheet attached Yes, _____ pages No)

Lab ID Lab use only	*Sample ID.	Matrix	*Sampling Date/Time	*Analysis Required (Tests)

SAMPLE RECEIVE INFO (Lab Use Only)

Received Date/ Time:	20 OCT 2016 16:55	Document Received Date/Time:	20 OCT 2016 16:55
Sorting Date/ Time:	20 OCT 2016 17:30	Esky Count:	2 x cooler boxes
Condition:	Chilled	Ice Bricks / Ice:	Yes
Bottle Information:	8 x U76	Sort by:	
Tray No:	S348		

RECORD OF SEDIMENT SAMPLING & COLLECTION UNDER ETWB TC(W) NO. 34/2002/PNAP 252

(Sheet 1 of 1)

Project Name: Road Improvement Works in West Kowloon Reclamation Development Contract No: HY/2013/17

Name of Project Proponent: ALS-TECHNICHEM (HK) PTY LTD 11 FLOOR

Address: 16-17 20 OCT 2016

Contact Person: Derek Lo RECEIVED

Telephone No.: 2839 5684 BY: *Kefu*

E-mail address: dereklo@lamenviro.com Fax No.: 2882 3331

Sediment Sampling

Sample ID No.	Sampling Date & Time	Sampling Location (latitude/ longitude or Northing/ Easting)	Sampling Depth (starting & finishing levels)	Method of Collection (e.g. grab, vibrocore, etc)	Analysis requested						Remarks	
					Metals	Metalloid	LMW PAHs	HMW PAHs	Total PCBs	TBT		Others (please specify)
1	19 Oct 2016		18.50m-19.50m	2 x U76 in series	✓	✓	✓	✓	✓	✓	✓	19.00m-19.50m
2	19 Oct 2016		19.50m-20.50m	2 x U76 in series	✓	✓	✓	✓	✓	✓	✓	20.00m-20.50m
3	20 Oct 2016		20.50m-21.50m	2 x U76 in series	✓	✓	✓	✓	✓	✓	✓	21.00m-21.50m
4	20 Oct 2016		21.50m-22.50m	2 x U76 in series	✓	✓	✓	✓	✓	✓	✓	21.50m-22.00m, 22.00m-22.50m
5	20 Oct 2016		22.50m-23.50m	2 x U76 in series	✓	✓	✓	✓	✓	✓	✓	23.00m-23.50m
6	20 Oct 2016		23.50m-24.50m	2 x U76 in series	✓	✓	✓	✓	✓	✓	✓	24.00m-24.50m
7	20 Oct 2016		24.50m-25.50m	2 x U76 in series	✓	✓	✓	✓	✓	✓	✓	25.00m-25.50m

Sampling Conducted by: Company Name: Vibro Address: Person-in-charge: Signature: Date & Time: Phone No.:

Sampling Supervised by (if any): Company Name: Lam Environmental Services Ltd Address: Responsible Person: Signature: Date & Time: Phone No.:

Samples Received by: Name of Laboratory: Address: Responsible Person: Signature: Date & Time: Phone No.:



COMPANY:	Lam Environmental Services Limited	DATE:	10 July 2015
ATTENTION:	Mr Raymond Dai	PHONE:	2839 5666
EMAIL/FAX:	ravmond@daienvironmental.com	NO. OF PAGES:	5 pages
PROJECT:	Road Improvement Works in West Kowloon Reclamation Development		
FROM:	Ms Elaine Cheung	VALID UNTIL:	09 OCTOBER 2015

Dear Raymond,

Further to your enquiry, thank you for providing ALS the opportunity to submit this quotation covering your analytical testing requirements. ALS is very keen to work with you on this important, strategic, monitoring project, delivering high quality data, good communication and timely and reliable service.

This quotation has been developed based on information provided. Please refer to all sections within this quotation to ensure that we have scoped your project correctly. Please do not hesitate to contact ALS for updating or reissuing, should this be required.

Acceptance of this quotation is required within 90 days from date of issue. Please advise ALS (via email) upon acceptance, to allow this quote to be loaded into our Laboratory Information Management System and/or to order the required sample containers.

Yours Sincerely,

Elaine Cheung
Customer Services
ALS Laboratory Group
Environmental Division - Hong Kong

Reviewed and Approved by:

Ivan Leung
Manager - Customer Services
ALS Laboratory Group
Environmental Division - Hong Kong

Agreed and Accepted by:

Name of Signatory:
Company Chop and Authority Signature
Date

ADDRESS 11/F, Chung Shun Building Centre, 1-3 Wing Yip Street, Kwai Chung, NT., Hong Kong | PHONE +852 2610 1044 | FAX +852 2610 2021
ALS TECHNOLOGIES (HK) PVT. LTD. AS ALS Laboratory Group

www.alsglobal.com

RIGHT SOLUTIONS MIGHT PATTERN



Turnaround Times

Standard laboratory turnaround time is 10 working days from receipt of samples for the routine tests quoted. Turnaround time for biological testing is 6-8 weeks after the confirmation. Work orders received at the laboratory after 12pm are deemed received the following day for the calculation of turnaround times. For high end boutique analyses the turnaround time will be 10-15 working days from the receipt of samples.

Service Inclusions

The service offered by ALS will include the following additional items at no extra charge.

- Sample containers appropriately prepared, labelled and pre-dosed with preservatives.
- Cooler boxes to facilitate the "refrigeration" of samples en route to the laboratory. (We recommend the use of ice for chilling samples and ice bricks only for maintaining the temperature of samples that have already been chilled).
- On call access to ALS technical expertise.

Sample Container Requirements

ALS provides pre-treated and labelled sample containers, for all analytical work to be conducted at the laboratory. Samples for analysis should be chilled whilst en route to the laboratory. Please contact the laboratory for bottle arrangement.

Sediment samples

Test Parameters	Label Colour	Container Type (Preservation)	Sample Size
Metals and Semi-volatile Organics	White	One x 250 gram soil jar with Teflon liner	100g
Biological testing	White	6L in HDPE Plastic Bags	600g

Express Services

And we can offer express turnaround time services upon request, the additional charges as follows:

Express TAT Services	Price Schedule
5 Working days TAT express services	original prices +50%
3 Working days TAT express services	original prices +100%

** The express TAT services must be specially arranged and agreed by ALS in advance. Express service can be applied for all testing except biological testing.



Analytical Charges

Sediment Samples - Chemical Testing

ALS Method Code	In-house Method Reference	Reporting Limits (mg/kg) (as indicated)	Unit Cost (HK\$)
Metals & Metalloid			
Heavy Metals As, Cr, Cd, Cu, Pb, Zn, Ni, Ag, Hg	EG020* USEPA6020	0.1-1	
Organic-non-PAHs	EP065* USEPA8270	0.05	
Total PCBs		3 µg/kg per congener*	
Organic-PAHs			
Low Molecular Weight PAHs	EP076* USEPA8270	50 µg/kg per compound*	
High Molecular Weight PAHs	EP076* USEPA8270	150 µg/kg per compound*	

*The laboratory is HOKLAS accredited for the in-house method as quoted. The relevant method references are as listed.

Sediment Samples - Biological Testing (Provisional)

ALS Method Code	In-house Method Reference	Reporting Limits (mg/kg) (as indicated)	Unit Cost (HK\$)
Analytical Description			
ET001 10 day burrowing amphipod toxicity	USEPA 600/R-94/025 June 1994 Test Method 100.4	Not applicable	
ET002 20-day burrowing polychaeta toxicity	Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments, PSEP, July 1995	Not applicable	
ET003 48-96 hour larvae toxicity	Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments, PSEP, July 1995	Not applicable	
Ancillary Test			
Moisture	In house	0.1%	
Particle size distribution	In house - Wet sieving	1%	
Total organic carbon	APHA 5310B	0.05%	
Extraction of interstitial water from sediment - includes ammonia and pH	In house - electrode method/Calorimetric	0.1-1.0 mg/L	
Extraction of interstitial water from sediment - includes salinity	In house	0.1 ppt	

*A Note: A reference sediment shall be tested with each batch of samples submitted. The reference sediment sample is charged as one actual sample for each batch.



Notes

- ALS holds HOKLAS accreditation for all the above tests.
- The LOR's quoted refer to 'clean' samples, which exhibit minimal matrix interference (where dilution is not required), and where the moisture content is <50 %.
- Samples should be submitted with at least half the 'analytical holding time' remaining to minimize the possibility of analysis holding time breaches. ALS will endeavour to meet holding times where samples are received with less than half the holding time remaining, however accepts no responsibility for missed holding times in these cases.
- The prices quoted are based upon a minimum of 50% of the scoped sample numbers being submitted for analysis.
- Prices include one copy of analytical report in ALS standard reporting format. Additional copy will be charged as HK\$500 per each. Additional charges will be incurred if client requests specific reporting format other than ALS standard report.
- Where analysis costs are to be charged to a third party, the third party must have a valid quote and account with ALS and have provided written authorization for samples to be submitted through an alternative (named) party. In addition, the Chain of Custody must clearly state that the invoice must be directed to the third party and provide relevant details. In the event that this does not occur, any re-allocation of invoices will incur a fee of \$150 per work order.
- A minimum invoice fee of \$100.00 applies for each batch of samples submitted unless agreed otherwise.
- An Administration Fee of HK\$150.00 is applicable to each amending report generated which request by the client.
- Sample pick up cost is not included in the quoting price. Pickup charge shall be HK\$200 per trip from site to laboratory.

ALS Technichem (HK) Pty Ltd

11/F, Chung Shun Knitting Centre, 1-3 Wing Yip St, Kwai Chung, N.T., Hong Kong
 Tel : (852) 2610 1044 Fax : (852) 2610 2021 Email: hongkong@alsglobal.com



SAMPLE SUBMISSION FORM (Environmental test)

Note : * The following information is required to expedite sample analysis. Please complete all the necessary details and return this form with your samples. Test(s) will not be started until a COMPLETED form is received.

Items will be subject to additional charge and needed further confirmation & arrangement.

Reporting Information for Final Report

*Company Name: Lam Environmental Services Ltd.
 *Client Contact: Name: Derek Lo Email: dereklo@lamenviro.com
 Tel: 2839 5600 Fax: 2882 3331
 *Report address to: 11/F, Centre Point, 181-185 Gloucester Road, Wan Chai, Hong Kong
 *Postal Address (if different): _____

Soft copy report delivery (if different from above)

*Client Contact Name (1st): Derek Lo Email: dereklo@lamenviro.com
 *Client Contact Name (2nd): Raymond Dai Email: raymond dai@lamenviro.com

Billing information for invoice (if different from reporting information for final report)

Note : Client Name on Invoice will be the company Name of the Final report.

*Invoice to (c/o company): Lam Environmental Services Ltd.
 *Client Contact Name: Derek Lo Tel: 2839 5600
 *Invoice address to: 11/F, Centre Point, 181-185 Gloucester Road, Wan Chai, Hong Kong

*Purchase Order/ Client Order No: _____
 * ALS Quotation No.: HK/615/15
 *Project Name/No: _____
 Site Name (if any): _____

ALS Technichem (HK) Pty Ltd
 Ltd
 Work Order
HK1643246



Telephone : + 852 2510 1044

Sampling and delivery

Sampling by: Client # ALS others: _____
 *Sample(s) delivery by: Client # ALS others: _____

*Expected TAT (Working days): Regular (7-10) #Express (5) #Double Express (3) #Other (____)
 Other remark: _____

SAMPLE ANALYTICAL REQUIREMENTS (Supplementary sheet attached Yes, _____ pages No)

Lab ID Lab use only	*Sample ID.	Matrix	*Sampling Date/Time	*Analysis Required (Tests)

SAMPLE RECEIVE INFO. (Lab Use Only)

Received Date/ Time:	24 OCT 2016	16:50	Document Received Date/Time:	24 OCT 2016	16:50
Sorting Date/ Time:	24 OCT 2016	17:30	Esly Count:	2 x cooler boxes	
Condition:	Chilled		Ice Bricks / Ice:	Yes	
Bottle information:	7 x U76				
Tray No.:	5398		Sort by:	Hibin	

RECORD OF SEDIMENT SAMPLING & COLLECTION UNDER ETWB TC(W) NO. 34/2002/PNAP 252

(Sheet 1 of 1)

Project Name: Road Improvement Works in West Kowloon Reclamation Development
 Name of Project Proponent: ALS TECHNICHEM (HK) PTY LTD
 Address: 16-17 11 FLOOR
 Contact Person: Derek Lo
 Telephone No.: 2839 5684
 E-mail address: dereklo@lamenviro.com
 Contract No: HY/2013/17
 Fax No.: 2882 3331

20 OCT 2016
RECEIVED
 BY: *[Signature]*

Sediment Sampling

Sample ID No.	Sampling Date & Time	Sampling Location (latitude/longitude or Northing/Easting)	Sampling Depth (starting & finishing levels)	Method of Collection (c.g. grab, vibrocore, etc)	Analysis requested						Remarks
					Metals	Metalloid	LMW PAHs	HMW PAHs	Total PCBs	TBT	
① CB8	22 Oct 2016		25.50m-26.50m	2 x U76 in series	✓	✓	✓	✓	✓		25.50m-26.00m, 26.00m-26.50m
② CB8	22 Oct 2016		26.50m-27.50m	2 x U76 in series	✓	✓	✓	✓	✓		27.00m-27.50m
③ CB8	24 Oct 2016		28.50m-29.50m	2 x U76 in series	✓	✓	✓	✓	✓		29.00m-29.50m
④ CB8	24 Oct 2016		29.50m-30.50m	2 x U76 in series	✓	✓	✓	✓	✓		30.00m-30.50m
⑤ CB8	24 Oct 2016		30.50m-31.50m	2 x U76 in series	✓	✓	✓	✓	✓		30.50m-31.00m, 31.00m-31.50m

Sampling Conducted by:
 Company Name: Vibro
 Address:
 Person-in-charge: Signature: _____ Date & Time: _____
 Phone No: Signature: _____ Date & Time: _____

Sampling Supervised by (if any):
 Company Name: Lam Environmental Services Ltd
 Address:
 Responsible Person: Signature: _____ Date & Time: _____
 Phone No.: Signature: _____ Date & Time: _____

Samples Received by:
 Name of Laboratory: _____
 Address: _____
 Responsible Person: *Kefew* Signature: *[Signature]* Date & Time: *20-Oct-2016*
 Phone No.: _____



HIK/615a/15

COMPANY:	Lam Environmental Services Limited	DATE:	10 July 2015
ATTENTION:	Mr Raymond Dai	PHONE:	2839 5866
EMAIL/FAX:	Raymond.dai@lamenviro.com	NO OF PAGES:	5 pages
PROJECT:	Road Improvement Works in West Kowloon Reclamation Development	Contract No.	HY/2013/17
FROM:	Ms Elaine Cheung	VALID UNTIL:	09 OCTOBER 2015

Dear Raymond,

Further to your enquiry, thank you for providing ALS the opportunity to submit this quotation covering your analytical testing requirements. ALS is very keen to work with you on this important, strategic, monitoring project, delivering high quality data, good communication and timely and reliable service.

This quotation has been developed based on information provided. Please refer to all sections within this quotation to ensure that we have scoped your project correctly. Please do not hesitate to contact ALS for updating or reissuing, should this be required.

Acceptance of this quotation is required within 90 days from date of issue. Please advise ALS (via email) upon acceptance, to allow this quote to be loaded into our Laboratory Information Management System and/or to order the required sample containers.

Yours Sincerely,

Elaine Cheung
Customer Services
ALS Laboratory Group
Environmental Division - Hong Kong

Reviewed and Approved by:

Ivan Leung
Manager - Customer Services
ALS Laboratory Group
Environmental Division - Hong Kong

Agreed and Accepted by:

Name of Signatory:
Company Chop and Authority Signature
Date

ADDRESS 11/F, Chung Shun Knitting Centre, 1-3 Wing Yip Street, Kwai Chung, N.T., Hong Kong | PHONE +852 2610 1044 | FAX +852 2610 2021
ALS TECHNISCHEN (HK) PVT LTD An ALS Laboratory Group

www.alsglobal.com

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Turnaround Times

Standard laboratory turnaround time is 10 working days from receipt of samples for the routine tests quoted. Turnaround time for biological testing is 6-8 weeks after the confirmation. Work orders received at the laboratory after 12pm are deemed received the following day for the calculation of turnaround times. For high end boutique analyses the turnaround time will be 10-15 working days from the receipt of samples.

Service Inclusions

- The service offered by ALS will include the following additional items at no extra charge.
 - Sample containers appropriately prepared, labelled and pre-dosed with preservatives.
 - Cooler boxes to facilitate the "refrigeration" of samples en route to the laboratory. (We recommend the use of ice for chilling samples and ice bricks only for maintaining the temperature of samples that have already been chilled).
 - On call access to ALS technical expertise.

Sample Container Requirements

ALS provides pre-treated and labelled sample containers, for all analytical work to be conducted at the laboratory. Samples for analysis should be chilled whilst en route to the laboratory. Please contact the laboratory for bottle arrangement.

Sediment samples

Test Parameter	Label Colour	Container Type (Preservation)	Sample Size
Metals and Semi-volatile Organics	White	One x 250 gram soil jar with Teflon liner	1000g
Biological testing	White	65. In HDPE Plastic Bags	500g

Express Services

And we can offer express turnaround time services upon request, the additional charges as follows:

Express TAT Services	Price Schedule
5 Working days TAT express services	original prices + 50%
3 Working days TAT express services	original prices + 100%

Express TAT services must be specially arranged and agreed by ALS in advance. Express service can be applied for all testing except biological testing.



Analytical Charges

Sediment Samples - Chemical Testing

Analyte Description	ALS Method Code	In-house Method Reference	Reporting Limits (mg/kg or µg/kg)	Unit Cost (HK\$)
Metals & Metalloid	EG020*	USPFA6020	0.1-1	
			As, Cr, Cd, Cu, Pb, Zn, Ni, Ag	
Hg			0.05	
Organic-norp-PAHs	EP065*	USEPA8270	3 µg/kg per congener*	
Total PCBs				
Organic-PAHs	EP076*	USEP8270	50 µg/kg per compound*	
High Molecular Weight PAHs	EP076*	USEP8270	150 µg/kg per compound*	

*The laboratory is HOKLAS accredited for the in-house method as quoted. The relevant method references are as listed.

Sediment Samples - Biological Testing (Provisional)

Analyte Description	ALS Method Code	In-house Method Reference	Reporting Limit (mg/kg or µg/kg)	Unit Cost (HK\$)
10 day burrowing amphipod toxicity	ET001	USEPA 600/R-94/025 June 1994 Test Method 100.4	Not applicable	
20-day burrowing polychaete toxicity	ET002	Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments, PSSEP, July 1995	Not applicable	
48-96 hour larvae toxicity	ET003	Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments, PSSEP, July 1995	Not applicable	
Ancillary Test				
Moisture	EP055	In house	0.1%	
Particle size distribution		In house - Wet sieving	1%	
Total organic carbon	EP005	APHA 5310B	0.05%	
Extraction of interstitial water from sediment - Includes ammonia and pH		In house - electrode method/Colorimetric	0.1-1.0 mg/L	
Extraction of interstitial water from sediment - Includes salinity		In house	0.1 ppt	

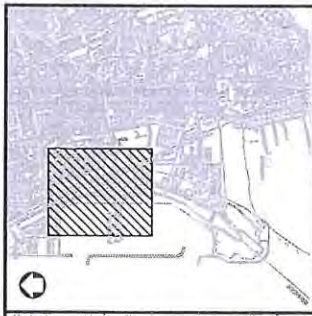
* Note: A reference sediment shall be tested with each batch of samples submitted. The reference sediment sample is charged as one actual sample for each batch.



Notes

1. ALS holds HOKLAS accreditation for all the above tests.
2. The LOR's quoted refer to 'clean' samples, which exhibit minimal matrix interference (where dilution is not required), and where the moisture content is <50%.
3. Samples should be submitted with at least half the 'analytical holding time' remaining to minimize the possibility of analysis holding time breaches, ALS will endeavour to meet holding times where samples are received with less than half the holding time remaining, however accepts no responsibility for missed holding times in these cases.
4. The prices quoted are based upon a minimum of 50% of the scoped sample numbers being submitted for analysis.
5. Prices include one copy of analytical report in ALS standard reporting format. Additional copy will be charged as HK\$500 per each. Additional charges will be incurred if client requests specific reporting format other than ALS standard report.
6. Where analysis costs are to be charged to a third party, the third party must have a valid quote and account with ALS and have provided written authorization for samples to be submitted through an alternative (named) party. In addition, the Chain of Custody must clearly state that the invoice must be directed to the third party and provide relevant details. In the event that this does not occur, any re-allocation of invoices will incur a fee of \$150 per work order.
7. A minimum invoice fee of \$100.00 applies for each batch of samples submitted unless agreed otherwise.
8. An Administration Fee of HK\$150.00 is applicable to each amending report generated which request by the client.
9. Sample pick up cost is not included in the quoting price. Pickup charge shall be HK\$200 per trip from site to laboratory.

Appendix C: As-built GI Plans with Samples for Chemical Testing for Phase 1



LOCATION PLAN

LEGEND :

- PHASE 11 AS-BUILT DRILLHOLE OF SAMPLES FOR CHEMICAL TESTING
- PHASE 11 AS-BUILT DRILLHOLE FOR GRASS INVESTIGATION
- 100m x 100m GRID FOR PHASE 11 SAMPLING LOCATION
- PIER (LOCATION OF EXCAVATION)
- PIER CAP (LOCATION OF EXCAVATION)
- H-PILE (LOCATION OF EXCAVATION)
- H-PILE (LOCATION OF EXCAVATION)

PROPOSED ROCK SOCKETER H-PILE FOUNDATION

Rev	Description	By	Date

PARSONS BRINCKERHOFF

Project No. HY2012/11

PROVISION OF BARRIER-FREE ACCESS FACILITIES FOR HIGHWAY STRUCTURES- PHASE 3 CONTRACT 1

Contract No. CE44/K/TB/0001

Rev. A

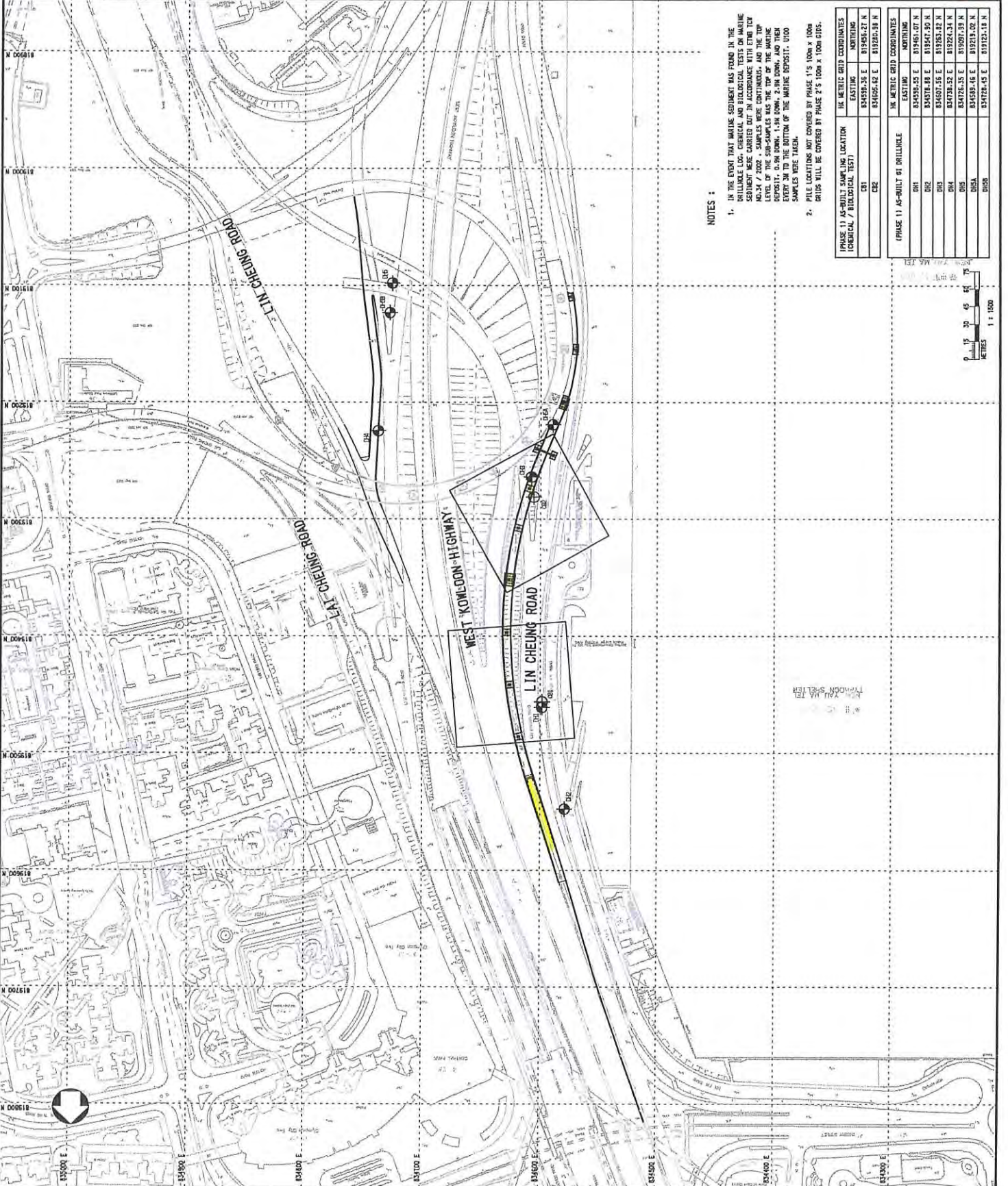
Checked AT (S) [Signature]

Drawn BY [Signature]

Scale 1:1500 (A1)

Sheet WORKING

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- NOTES :**
- IN THE EVENT THAT MARINE SEDIMENT HAS FOUND IN THE DRILLHOLE LOG, CHEMICAL AND BIOLOGICAL TESTS ON MARINE SEDIMENT WERE CARRIED OUT IN ACCORDANCE WITH ENVIRONMENTAL 4/2002. SAMPLES WERE CONTIGUOUS, AND THE TOP LEVEL OF THE SUB-SAMPLES WAS THE TOP OF THE MARINE DEPOSIT. 0.5M DOWN, 1.5M DOWN, 2.5M DOWN, AND THEN EVERY 2M TO THE BOTTOM OF THE MARINE DEPOSIT. 1000 SAMPLES WERE TAKEN.
 - PILE LOCATIONS NOT COVERED BY PHASE 1'S 100m x 100m GRIDS WILL BE COVERED BY PHASE 2'S 100m x 100m GRIDS.

PHASE 11 AS-BUILT SAMPLING LOCATION (CHEMICAL / BIOLOGICAL TEST)	IN METRIC GRID COORDINATES	
	EASTING	NORTHING
D1	814505.52 E	819455.27 N
D2	814505.52 E	819255.18 N

PHASE 11 AS-BUILT BY DRILLHOLE	IN METRIC GRID COORDINATES	
	EASTING	NORTHING
D1	814505.52 E	819455.107 N
D2	814505.52 E	819455.20 N
D3	814507.52 E	819255.12 N
D4	814728.52 E	819224.34 N
D5	814726.52 E	819207.59 N
D5A	814503.52 E	819213.02 N
D5B	814728.52 E	819123.18 N





CE44/K/TB/0002
 Rev. A
 Drawing No.
 Project No.
 Project Name
 Client

CONTRACT NO. HV72012/11
 PROVISION OF BARRIER-FREE ACCESS
 FACILITIES FOR HIGHWAY STRUCTURES-
 PHASE 3 CONTRACT 1

PARSONS
 BRINCKERHOFF

Rev.	Description	By	Date



LOCATION PLAN

LEGEND :

- PHASE 1) AS-BUILT DRILLHOLE OF SAMPLES FOR CHEMICAL TESTING
- PHASE 1) AS-BUILT DRILLHOLE FOR GROUND INVESTIGATION
- 100m x 100m GRID FOR PHASE 1 SURVEILANCE LOCATION
- H-PILE LOCATION OF EXCAVATION
- PILE CAP
- PIER
- PROPOSED ROCK SOCKET
- PILE FOUNDATION



NOTES :

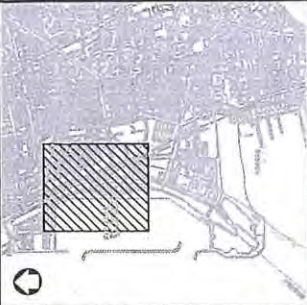
REFER TO DRAWING NO. CE44/K/TB/0001 FOR NOTES

PHASE 1) AS-BUILT SAMPLE LOCATION (CHEMICAL / BIOLOGICAL TEST)	IR METRIC GRID COORDINATES	
	EASTING	NORTHING
CB*	834626.66 E	811851.48 N
CB5	834626.25 E	811851.21 N

PHASE 1) AS-BUILT 01 DRILLHOLE	IR METRIC GRID COORDINATES	
	EASTING	NORTHING
CB*	834626.66 E	811851.48 N
CB5	834626.17 E	811844.70 N
DB9	834631.54 E	811836.63 N
DB10	834626.33 E	811851.57 N

*SAMPLE BILLED FROM EXISTING GROUND LEVEL TO SH BELOW ROCK HEAD LEVEL (IR SURVEILANCE POINT)

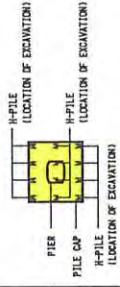
Appendix D: As-built GI Plans with Samples for Chemical/Biological Testing



LOCATION PLAN

LEGEND :

- PROPOSED DRILLABLE LOCATIONS FOR CHEMICAL / BIOLOGICAL TESTING
- 100m x 100m GRID FOR PHASE 1 SAMPLING LOCATION
- 100m x 100m GRID FOR PHASE 2 SAMPLING LOCATION



**PROPOSED ROCK SOCKETER
H-PILE FOUNDATION**

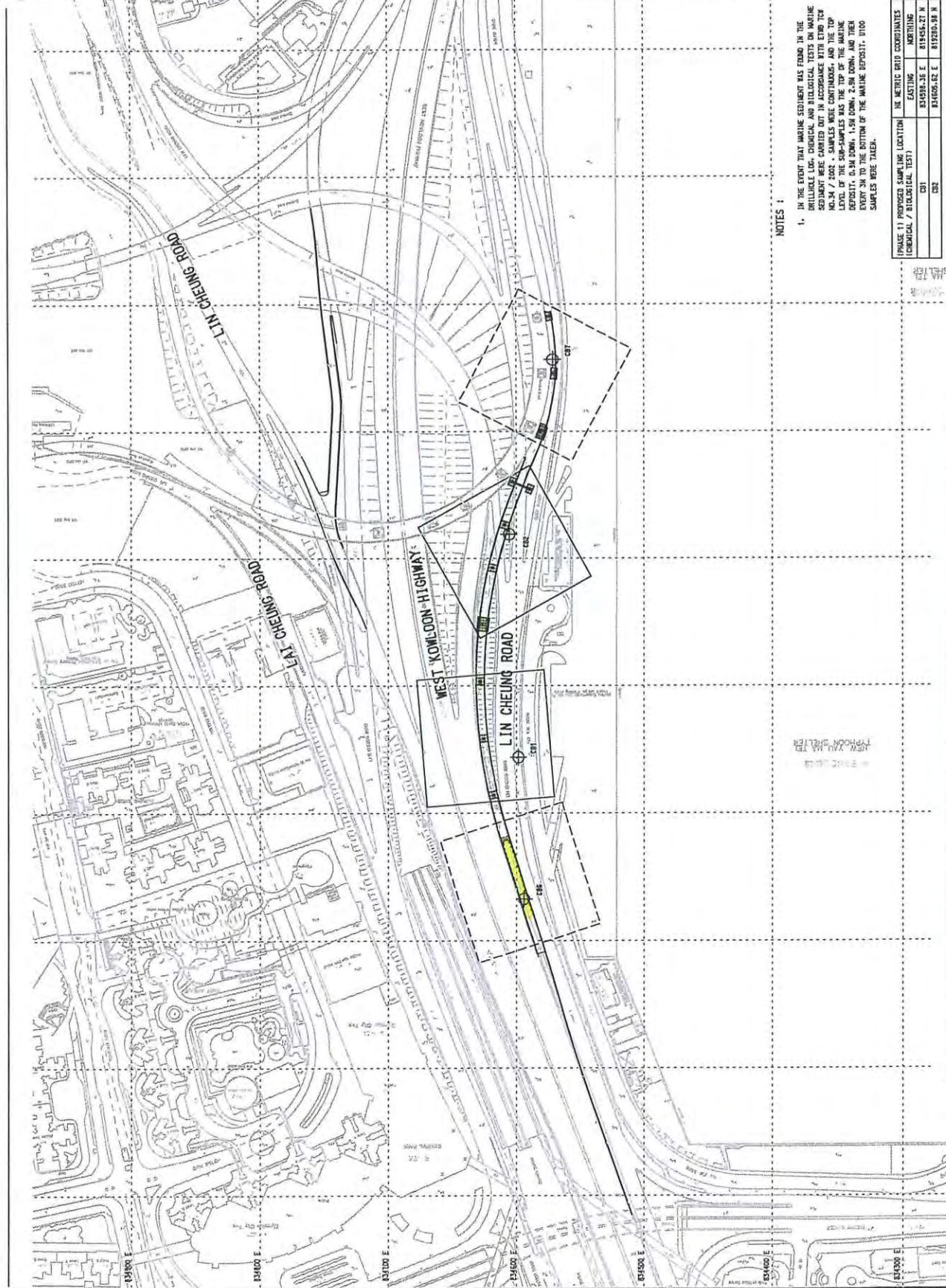
Rev	Description	By	Date

**PARSONS
BRINCKERHOFF**

Project No. HY/2013/17
Contract No. HY/2013/17
Road Improvement Works in
West Kowloon Reclamation
Development

Drawing No. AS-BUILT GROUND
INVESTIGATION PLAN WITH
SAMPLES FOR CHEMICAL
/BIOLOGICAL TESTING
(SHEET 1)

Scale	1:1000 (A3)	Scale	WORKING
Drawn	BY 2012	Checked	AT 17
Author	BY 2012	Approved	BY



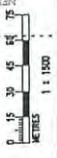
NOTES :

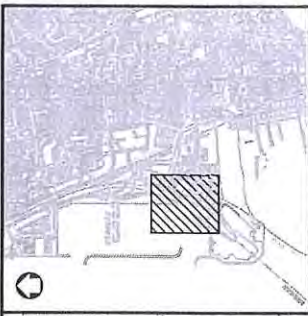
- IN THE EVENT THAT MARINE SEDIMENT WAS FOUND IN THE DRILLABLE LOG, CHEMICAL AND BIOLOGICAL TESTS ON MARINE SEDIMENT WERE CARRIED OUT IN ACCORDANCE WITH TD 704 (M-34 / 2002). SAMPLES WERE CONTINGUOUS, AND THE TOP LEVEL OF THE SUB-SAMPLES WAS THE TOP OF THE MARINE DEPOSIT. SUB-SAMPLES WERE TAKEN AT 100mm INTERVALS FROM THE BOTTOM OF THE MARINE DEPOSIT. 1000 SAMPLES WERE TAKEN.

PHASE 1 PROPOSED SAMPLING LOCATION (CHEMICAL / BIOLOGICAL TEST)	HE METRIC GRID COORDINATES
CBI	EASTING: 834933.26 E NORTHING: 814645.57 N
CB2	EASTING: 834935.76 E NORTHING: 814720.18 N

PHASE 2 PROPOSED SAMPLING LOCATION (CHEMICAL / BIOLOGICAL TEST)	HE METRIC GRID COORDINATES
CB6	EASTING: 834933.82 E NORTHING: 814967.45 N
CB7	EASTING: 834971.21 E NORTHING: 814943.57 N

PSR1/12
Parsons Brinckerhoff (Asia) Ltd
E-HY_2013_17-PS-APP-R1-00





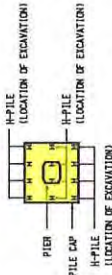
LOCATION PLAN

LEGEND :

AS BUILT DRILLHOLE FOR SAMPLING AND
CHEMICAL / BIOLOGICAL TESTING

100M X 100M GRID FOR
PHASE 1 SAMPLING LOCATION

100M X 100M GRID FOR
PHASE 2 SAMPLING LOCATION



**PROPOSED ROCK SOCKETTER
H-PILE FOUNDATION**

Rev	Description	By	Date

**PARSONS
BRINCKERHOFF**

Project No. HY/2013/17
Contract No. HY/2013/17
Road Improvement Works in
West Kowloon Reclamation
Development

Drawing Title
**AS-BUILT GROUND
INVESTIGATION PLAN WITH
SAMPLES FOR CHEMICAL
/BIOLOGICAL TESTING
(SHEET 2)**

Drawn by	Checked by	Approved by	Rev.



NOTES :

REFER TO WORKING NO. CE447K/TB/0001 FOR NOTES

[PHASE 1] PROPOSED SAMPLING LOCATION (CHEMICAL / BIOLOGICAL TEST)	IR. METRIC GRID COORDINATES	
	EASTING	NORTHING
CS4	83482.46 E	81851.48 N
CS5	83482.25 E	81851.21 N

[PHASE 2] PROPOSED SAMPLING LOCATION (CHEMICAL / BIOLOGICAL TEST)	IR. METRIC GRID COORDINATES	
	EASTING	NORTHING
CS6	83483.28 E	81854.26 N

PSR/1/13

Parsons Brinckerhoff (Asia) Ltd
E-HY_2013_17-PS-APP-R1-00

Appendix E: Allocation of Marine Disposal Space of Phase 1 and 2

APPENDIX R3
APPROVED DISPOSAL SITE FOR SEDIMENTS (PHASE I)
[PS Clause 1.120]

MEMO	
From <u>Secretary, Marine Fill Committee, CEDD</u>	To <u>Chief Engineer I/Major Works, HyD</u>
Ref. <u>(1143Z-01) in FM 4/1C/70A</u>	(Attn: <u>Mr. K F LAM</u>)
Tel. No. <u>2762 5539</u>	Your Ref. _____ in _____
Fax No. <u>2714 0113</u>	dated _____ Fax No. <u>2714 5198</u>
Date <u>25 November 2013</u>	Total Pages _____ l+ Encl.

Agreement No. CE 44/2011 (HY)
Proposed Road Improvement Works in West Kowloon Reclamation Development – Phase 1
Investigation, Design and Construction
Disposal Site for Sediment Removal

We refer to Parsons Brinckerhoff (Asia) Ltd's letter ref. 2512043A-GN-07973/13 dated 14 November 2013.

2. We hereby allocate the following sediment disposal space for the respective categories of sediment arising from the above works.

Category of Sediment	In-situ Volume of Sediment	Sediment Disposal Space
Category L Sediment	140 m ³	Suitable for capping the exhausted Confined Marine Disposal Facility at East of Sha Chau (or South of The Brothers)
Category H Sediment (i.e. Category H Sediment not requiring biological test)	30 m ³	Subareas to be directed on site within the Mud Pit CMP1 of the Confined Marine Sediment Disposal Facility to the South of The Brothers (or at the East of Sha Chau)

3. The allocation is subject to the attached "General Allocation Conditions for Marine Disposal Sites" and "Special Allocation Conditions". Please note that it is the responsibility of the Allocatee to identify the appropriate party to implement the above Conditions.

4. You are reminded to submit the information indicated in Clauses 5, 6, 10 and 11 of the "General Allocation Conditions" when they are available.


(Derek Lau)

for Secretary, Marine Fill Committee
Civil Engineering and Development Department

c.c. (w/e) EPD (Attn: Mr Jason Ling) Fax: 2305 0453
PBA (Attn: Mr Emeric Wan) Fax: 2856 9902

Internal FM 4/1C/65

FWL
File: 131125.HyD.Phase1(ESC Capping_SB 31-13-2015)

ALLOCATION OF MARINE DISPOSAL SPACE
Under ETWB TCW 34/2002 (or PNAP ADV-21 for Private Projects)

Allocation Number	Refer to referenced number of the allocation letter		
Contract /Project Name	Agreement No. CE 44/2011 (HY) – Proposed Road Improvement Works in West Kowloon Reclamation Development – Phase 1 – Investigation, Design and Construction		
Location and Details of the Works involving Dredging	Dredging/Excavation Works for West Kowloon Reclamation Development – Phase 1		
Project Proponent (Allocatee)	HyD		
Dredging Rationale Approval Date	25 March 2013	Sediment Quality Report Approval Date	13 November 2013

In accordance with ETWB TCW 34/2002 (or PNAP ADV-21 for private projects), hereinafter called the Circular, we hereby allocate to the above Allocatee the following marine disposal space for the respective categories of sediments arising from the above dredging works subject to due compliance and execution of the attached General Allocation Conditions and the following Special Conditions:

Category of Sediment	In-situ Volume of Sediment	Sediment Disposal Space
Category L Sediment	140 m ³	Suitable for capping the exhausted Confined Marine Disposal Facility at East of Sha Chau (or South of The Brothers)
Category H Sediment (i.e. Category H Sediment not requiring biological test)	30 m ³	Subareas to be directed on site within the Mud Pit CMP1 of the Confined Marine Sediment Disposal Facility to the South of The Brothers (or at the East of Sha Chau)

Special Conditions

1. "In-situ volume of the sediment" means the volume of such sediment in its original place before it is dredged/excavated. Disposal of the sediment in excess of the above specified volume is not permitted.
2. The sediment dumped has to be kept below the levels specified by the DASO permits. If sediment was found to be dumped above these levels within the concerned disposal space, the Allocatee shall propose remedial measures and rectify the situation to the satisfaction of all the parties concerned.
3. While the seabeds in some areas of the allocated marine disposal space may be less than 1.0 m below the maximum levels above, extreme care should be exercised to avoid the sediment being dumped above these levels.

4. The Allocatee will be required to carry out bathymetric surveys at the allocated disposal area.

5. For Category L sediment suitable for capping the exhausted Confined Marine Disposal Facility, the Resident Engineer of the project office shall ensure that his contractor disposes of the uncontaminated mud evenly in the contaminated mud pit as directed by the Management Team of the Confined Marine Disposal Facility. (Layouts of the Contaminated Mud Pits at East of Sha Chau and South of The Brothers are attached as Figures A and B respectively). The required fill-up levels are as follows :

CMP	Required fill-up level
CMP IVc at East of Sha Chau	-7.0 mCD to -6.0 mCD
CMP Va at East of Sha Chau	-8.0 mCD to -7.0 mCD
CMP 1 at South of The Brothers	-9.0 mCD to -4.0 mCD
CMP 2 at South of The Brothers	-5.0 mCD to -3.0 mCD

In case of non-compliance, the Resident Engineer of the project office shall request his contractor to rectify those high spots arising from excessive dumping at the contractor's own cost.

6. The allocation shall expire on 31 December 2015.

Marine Fill Committee Secretariat
Civil Engineering and Development Department
November 2013

GENERAL ALLOCATION CONDITIONS FOR MARINE DISPOSAL SPACE

Obligations of the Allocatee

1. Allocations of marine disposal space are made to a project proponent (the Allocatee), and it is the project proponent's responsibility to ensure that these Conditions are implemented. For simplicity, these Conditions refer variously to the "Contractor", the "Engineer of the Contract" and "the Authorized Person", but it is the project proponent's responsibility to identify the appropriate party to implement the Conditions.

Allocation of Sediment Disposal Space

2. The Open Sea Disposal Areas (hereinafter called ODAs) are located at South of Cheung Chau (hereinafter called SCC), East of Ninospin (hereinafter called ENP) and other empty marine borrow pits, if any, as specified in the Special Conditions. The Confined Marine Disposal Facility (hereinafter called CMF) in operation is situated at the South of The Brothers (hereinafter called SB) and any other CMF as specified in the Special Conditions. The SCC-ODA and SB-CMF receive sediment throughout a year and ENP-ODA only receives sediment from 16 March to 30 September of a year (both dates inclusive).

3. For any Category M₂ Sediment, the disposal arrangement at CMF is on a temporary basis. It may be changed to other disposal arrangements whenever available to be notified by the Secretary of the Marine Fill Committee (MFC).

4. For any Category H₂ Sediment, the disposal at CMF would not be allowed unless the Allocatee has identified and sought the agreement from EPD the most appropriate treatment on such Sediment rendering it suitable for Confined Marine Disposal.

Disposal Programme

5. Prior to the commencement of marine disposal of the sediment, the Engineer shall submit to the Director of Environmental Protection (DEP) and the MFC Secretary an estimated programme for the marine disposal of sediment at the respective ODAs and CMFs during the progress of works of the Contract. This programme shall be resubmitted whenever significant changes occur.

Notification before Commencement and after Completion of Sediment Disposal

6. The Allocatee shall notify the MFC Secretary, in writing, of the actual date of commencement and the actual date of completion of the marine disposal within one week of the occurrence of the events.

Centralized Management and Monitoring System for the ODA

7. The Fill Management Division (FMD) of the Civil Engineering and Development Department (CEDD) has been implementing a Centralized Management and Monitoring System (CMMS) for overseeing the ODAs through conducting monthly water quality monitoring, regular bathymetric surveys and ecological surveys for the ODAs, as well as

26-HY-2013 PS-15

PSR/3/5

planning and assigning subareas in the ODAs for marine disposal.

8. As a management measure of the disposal activities, the Allocatee shall arrange the disposal within the assigned subareas of the ODA as shown on the relevant drawing to be attached to the allocation. Disposal activities outside the subareas are strictly prohibited.

9. If there are discrepancies between the location of the assigned subarea marked on the drawing and its coordinates stated on the drawing, the Allocatee shall clarify the location with the MFC Secretary before proceeding with disposal in the ODAs. The MFC Secretary shall not be responsible for any liabilities nor offences if the dumping operator has delayed the works or dumped the sediment outside the gazetted dumping area for whatever reasons.

Sediment Disposal Monthly Records and Forecasts

10. The Allocatee shall submit to the DEP and the MFC Secretary daily records of the barge loads at the ODAs and CMFs of a month by using the attached form in Appendix A – "Daily Record of Sediment Disposal Activities". An estimate of the volume of sediment to be dumped in the following month shall also be provided. The disposal records above shall be checked and certified correct by the Engineer of the Contract (or AP/RSE/RGE for private projects). Within eight weeks of each bathymetric survey on the dredging site, the dredged volume based on the survey shall be reconciled with the disposal records and reported to the MFC Secretary.

11. At least one week prior to the commencement of the dredging works, the Allocatee shall submit to the MFC Secretary a table of forecast showing the volume of sediment to be dredged per month. Thereafter, the Allocatee shall submit a revised forecast on a monthly basis, taking into account the volume disposed of during the preceding month.

Permits under the Dumping at Sea Ordinance (DASO Permit)

12. The DEP controls dumping at sea by means of issuing permits under the Dumping at Sea Ordinance Cap. 466 (or called DASO permits) to the contractors or other parties responsible for the disposal of dredged/excavated sediment. The Contractor who will be undertaking the works must make a formal application to DEP for a DASO permit, and if the permit is granted, it will be the Contractor's responsibility to ensure that the permit conditions are met to DEP's satisfaction.

Disposal Procedures and Operations at the SB

13. The disposal activities at SB-CMF are managed and controlled by a site team of FMD. Access to the SB is on a non-exclusive basis and the Allocatee shall ensure that the Contractors should follow the disposal procedures in accordance with Appendix B – "Disposal Procedures and Operations at the South of The Brothers Confined Marine Disposal Facility".

Miscellaneous

14. Trailer suction hopper dredgers disposing of sediment at South of The Brothers must use a down-a-pipe disposal method, the design of which must be approved in advance

by the Director of Civil Engineering and Development. The dredging contractor must provide equipment for such disposal.

15. The allocation of disposal space may carry a requirement for the project proponent to arrange for chemical analysis of the sediment sampled from 5% of the vessels en route to the disposal site. For Category M and certain Category H sediment, the chemical tests will be augmented by biological tests. Vessel sampling will normally entail mixing five samples to form a composite sample from the vessel and undertaking laboratory tests on this composite sample.

16. According to ETWB Technical Circular (Works) No. 34/2002, exceptionally large allocations might require some additional disposal site monitoring. These will be stipulated in the Special Conditions when appropriate.

Charges for allocations of marine disposal space to Private Projects

17. For allocations of marine disposal space to private projects, there will be a charge per cubic metre as measured *in situ* at the dredging site and as certified by the AP/RSE/RGE (authorized persons, registered structural engineers or registered geotechnical engineers) in accordance with paragraph 14 of the Practice Note for Authorized Persons and Registered Structural Engineers 252 (PNAP 252) issued by the Buildings Department.

18. The prescribed charge rates for sediment disposal at the respective ODAs and CMFs are specified in the Special Conditions. The methods of measurement and charging procedures are stipulated in Appendix C.

Assessment of Disposal Costs for private works entrusted to Government Contracts

19. For Government projects, the Allocatee shall check whether there are any private project works entrusted by others to be carried out in association with the concerned works. The Allocatee shall assess and reimburse the portion of marine disposal cost to be borne by the private parties and arrange the settlement sum to be transferred to the General Revenue.

- END -

Appendix A

Daily Record of Sediment Disposal Activities

Project or Contract Name: _____ Contract No.: _____

Project Proponent: _____

Contractor: _____

Marine Dumping Permit Holder: _____

Marine Dumping Permit No.: _____

Location of Disposal: _____

Summary of Disposal Activities			
Date of Disposal:			Page of
Time of Disposal	Name of Vessel	Maximum Hopper Capacity (m ³)	Estimated Bulk Volume of Sediment on the Barge (m ³)
Recorded by the marine dumping permit holder:		Checked and certified correct by the Engineer for the Contract (or AP/RSE/RGE for private projects):	
Signature:	_____	Signature:	_____
Name:	_____	Name:	_____
Post:	_____	Post:	_____

Note:
 This form shall be used for recording the daily disposal activities of the project concerned. The records shall be submitted, on a monthly basis, before the 10th day of the next month to the Secretary of the Marine Fill Committee at 5/F., Civil Engineering and Development Building, 101 Princess Margaret Road, Hong Kong, Kowloon. Nil return is required.

Appendix B (Sheet 1 of 4)

Disposal Procedures and Operations at the South of The Brothers
Confined Marine Disposal Facility (CMF)

The Contaminated Mud Pit Management Scheme is administered by the Chief Engineer/Fill Management of the Civil Engineering and Development Department (CEDD). Users are required to comply with the following: -

1. Notification of disposal

- (a) When a barge or a trailer suction hopper dredger (TSHD) is filled up with contaminated mud and ready to depart from the site to the Contaminated Mud Pit (CMP) at South of The Brothers (CMP), the site supervisory staff shall notify the CMP Management Team at telephone number 9308 6312 with the following details:
- (i) project title;
 - (ii) Dumping Permit number;
 - (iii) numbers / names of the tug boat and hopper barge;
 - (iv) time of leaving the dredging site and the anticipated time of arrival at CMP; and
 - (v) estimated volume of mud inside the hopper of the barge or TSHD.

In addition, the above information shall be entered into the standard notification form (as attached) which shall be duly signed by the supervising engineer or his/her delegate (with name and post shown) for subsequent submission to the Management Team. For barges, the duly completed notification form shall be handed to the staff of the Management Team during reporting at the Office Barge. For TSHDs, the duly completed notification form shall be submitted to the Fill Management Division of CEDD by fax (2714 0113) on a daily basis.

- (b) The Permit Holders shall note that telephone notification does not constitute a reservation of time slot for disposal. Instead, the disposal priority along the relevant queue as referred to in para. 3 will be conducted only when the vessels arrive at the South of The Brothers.

2. Reporting to Management Team

- (a) When a barge arrives at the Reporting Area at the South of The Brothers (Figure 1, as attached), a representative of the barge shall report to the Management Team at the Office Barge and hand in the completed notification form to the staff of the Management Team. The Management Team will record the arrival time. A note will be given to the representative of the barge showing the arrival time of the subject barge, the possible time that disposal can be conducted and the registration number of the barge or TSHD queuing before the subject barge.
- (b) When a TSHD arrives at the Reporting Area at the South of The Brothers (Figure 1, as attached), the representative of the TSHD shall report to the Management Team at telephone number 9308 6312. The Management Team will record the arrival time and inform the representative of the TSHD of the possible time and location within CMP that disposal can be conducted and the registration number of the barge or TSHD queuing before the subject TSHD.

(Remark: - Barges with valid Dumping Permit but arriving without prior notification or without

Appendix B (Sheet 2 of 4)

completed notification form as required in para. 1 shall wait until all relevant details are verified by their relevant supervising engineer or his staff.)

3. **On-site Queuing Arrangement**
 - (a) The disposal volume in any rolling 24-hour period is to be kept within 26,700 m³. For barges, the disposal volume shall be the bulk volume of mud contained in the hopper. For TSHD, the disposal volume shall be the bulk volume of mud contained in the hopper times a factor of 0.65.
 - (b) The Management Team will compile a spreadsheet record for queuing with details of actual disposal. Barges/TSHDs reported arrival will be received on a first-come, first-served basis. The barges/TSHDs have to follow the queue and wait for instructions from the Management Team to dispose of the contaminated mud. Any barge/TSHD not ready to proceed with mud disposal when called upon by the Management Team shall lose their turn for disposal. The concerned representative of the barge/TSHD needs to report again to the Office Barge as if newly arrived and queue again after other arrived barges/TSHDs following the relevant queue and wait again for instructions to dispose of mud.
 - (c) In queuing for the disposal, the barges and tug boats need to stay outside the Reporting Area and distant from the nearby fairway. The TSHD, barges and tug boats shall strictly observe the marine safety requirements and follow instructions from the Marine Police and Marine Department.
4. **Disposal** – After receipt of permission from the Management Team to proceed with disposal, the tug boat/barge operator shall, with the aid of instructions given by the guide boat of the Management Team, manoeuvre the barge into the target dumping area in CMP1 (Figure 2, as attached). The tug boat operator shall cut off the power and allow their barge to drift along the water current during the discharge of mud. The barge shall continue to drift for at least 3 minutes after discharging mud. The tug boat operator shall strictly follow the instructions from the Management Team for disposal. The tug boat/barge operator shall not let his tug boat/barge move astern, except in an emergency situation, within the pit area during and after disposal of contaminated mud. It should be noted that it is a Marine Department requirement that the tug boat should display the "Not Under Command" signals while it is drifting. For TSHD, no guiding service will be provided by the Management Team. The TSHD shall start the disposal after receipt of permission from the Management Team and shall report to the Management Team after the completion of the disposal. The tug boat/barge operator shall contact the Management Team at telephone number 9308 6312 when there are difficulties in communication.
5. **Illegal disposal** – If any vessel is found to disobey instructions and proceed with illegal disposal and/or any irregularities spotted during disposal, its details will be recorded. The Environmental Protection Department, Marine Police or Marine Department will take action as appropriate. The resident engineer shall keep a running tally of the volume dumped under both the permit and the allocation. If either the permitted or allocated volume is reached, he shall notify the Management Team and stop sending the barge to the disposal ground.
6. **Leaving the Pit** – After discharging, the tug boat/barge/TSHD operator shall inform the Management Team of completion of disposal before leaving the pit. The tug boat/barge shall sail

Appendix B (Sheet 3 of 4)

slowly away from the disposal site until leaving the pit.

7. **Closure of Pit** – The contaminated mud disposal at the South of The Brothers Mud Pits will be suspended and the CMP will be closed during the hoisting of Typhoon Signal No. 3 or higher or in other conditions, e.g. adverse weather, when the Management Team considers that its management duties cannot be discharged safely and properly. The CMP would be closed from 6:00am on the Lunar New Year (LNY) Eve until 3:00pm on LNY Day Four when it would be reopened. There is no guarantee that prior notice will be given. Arrived barges or TSHD shall leave the disposal area immediately if the pit has been closed. For enquiries relating to the closure of the Pit, please contact the Management Team at telephone number 9308 6312.
8. **Safety Matters**
 - (a) All barges' representatives boarding/disembarking the Office Barge shall wear non-slippery shoes and life jackets. Any barge's representative not complying with this requirement will not be permitted to board /disembark from the Office Barge. Any non-compliance will be reported to the relevant Permit Holder and project management office.
 - (b) All TSHDs, tug boats and barges shall turn on their lights while working in the vicinity of Mud Pits in dark or when the visibility is poor. Any non-compliance will be reported to relevant Permit Holder, project management office, the Marine Police and Marine Department.
 - (c) Any barge while waiting in the vicinity of the Mud Pits to queue up for disposal, shall be served/looked after by a tug boat. Any non-compliance will be reported to the relevant project management office, the Marine Police and Marine Department.

Appendix B (Sheet 4 of 4)

Notification of Dumping of Contaminated Mud at the South of The Brothers

To: Management Team/South of The Brothers

From:
 Contract No.:
 Contract Title:
 Contract Tel. No.:

Fax No.:

EPD Dumping Permit No. (Allocations Volume m ³)	Dredging Location	Tug Boat Name/No.	Hopper Barge Name/No.	Quantity ¹ (m ³)	Time leaving dredging site	Accumulated Quantity (m ³)	Anticipated arrival time at the South of The Brothers

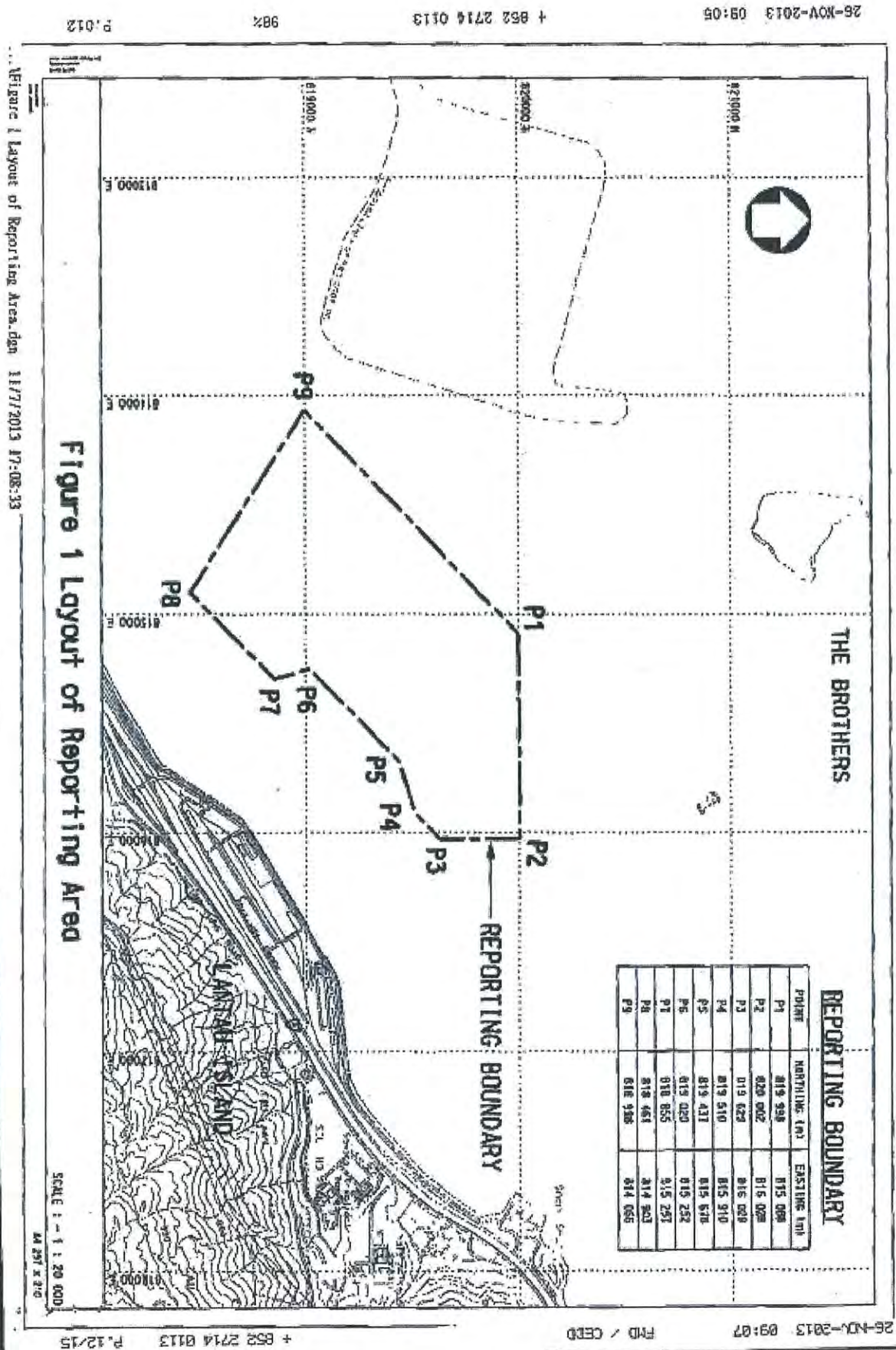
Official Use
 Arrival date/time
 Remarks

Signature of Resident Engineer/Authorized Supervisor:
 Name of Resident Engineer /Authorized Supervisor (in block letters):
 Date/Time: (post) (contact ref.)

- Note: -
- The quantity entered shall have allowed for bulking after dredging.
 - The permit holder shall provide contact telephone number for verification/providing details when the barge arrived at the South of The Brothers.
 - This form shall be submitted to the Management Team by fax (2714 0113) within the period between 1 and 3 hours before anticipated arrival time for TSHDs.
 - The permit holder shall notify the Management Team by phone before the barge leaves the site.
 - The representative of the barge shall submit a copy of Dumping Permit to the Management Team when requested.

Appendix B to General Allocation Conditions

Version (August 2013)

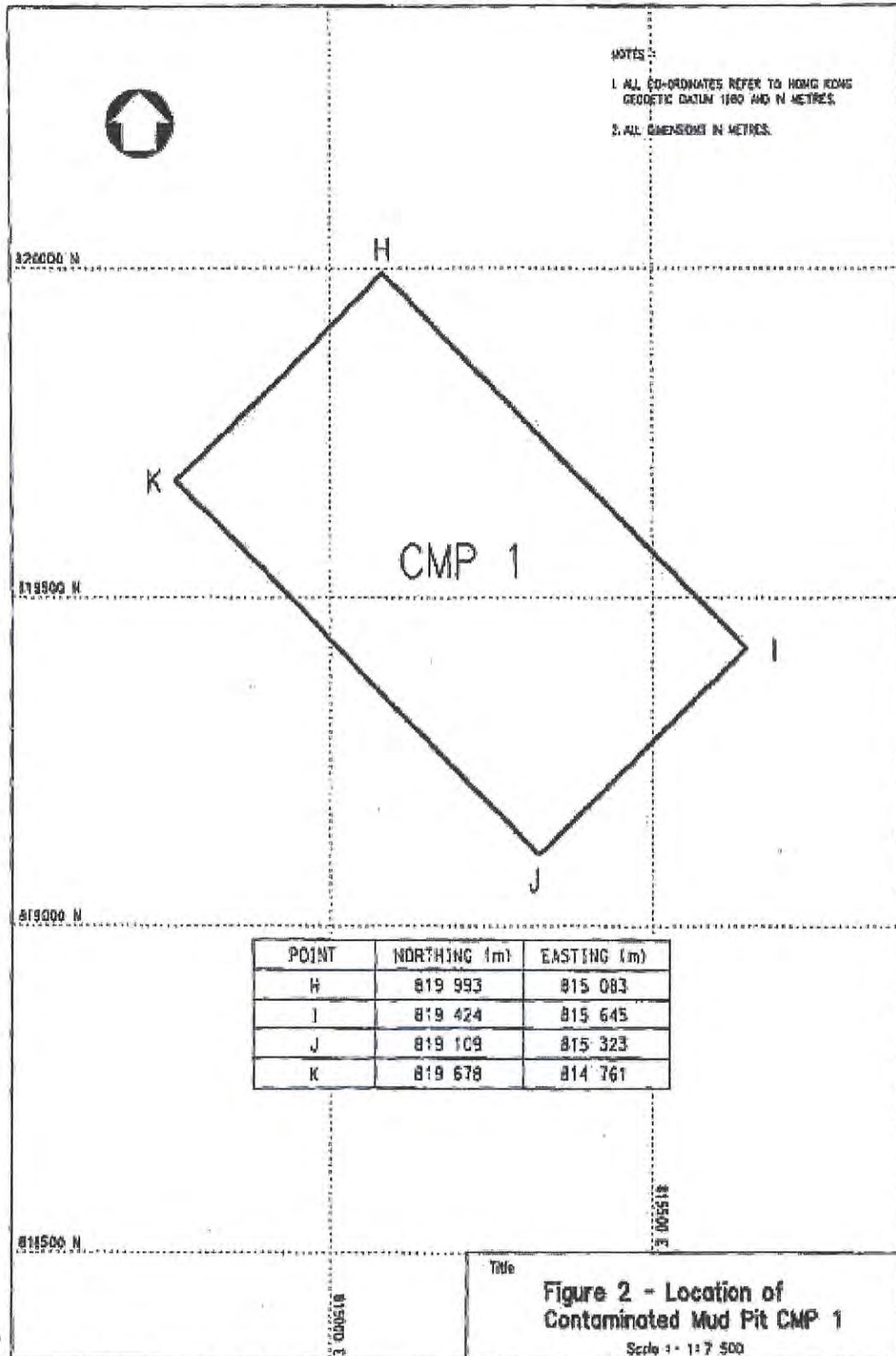


25-NOV-2013 09:07

FMD / CEDD

852 2714 0113

P.013



...Figure 2 Location of Contaminated Mud Pit CMP 1.dgn 11/7/2013 15:30:44

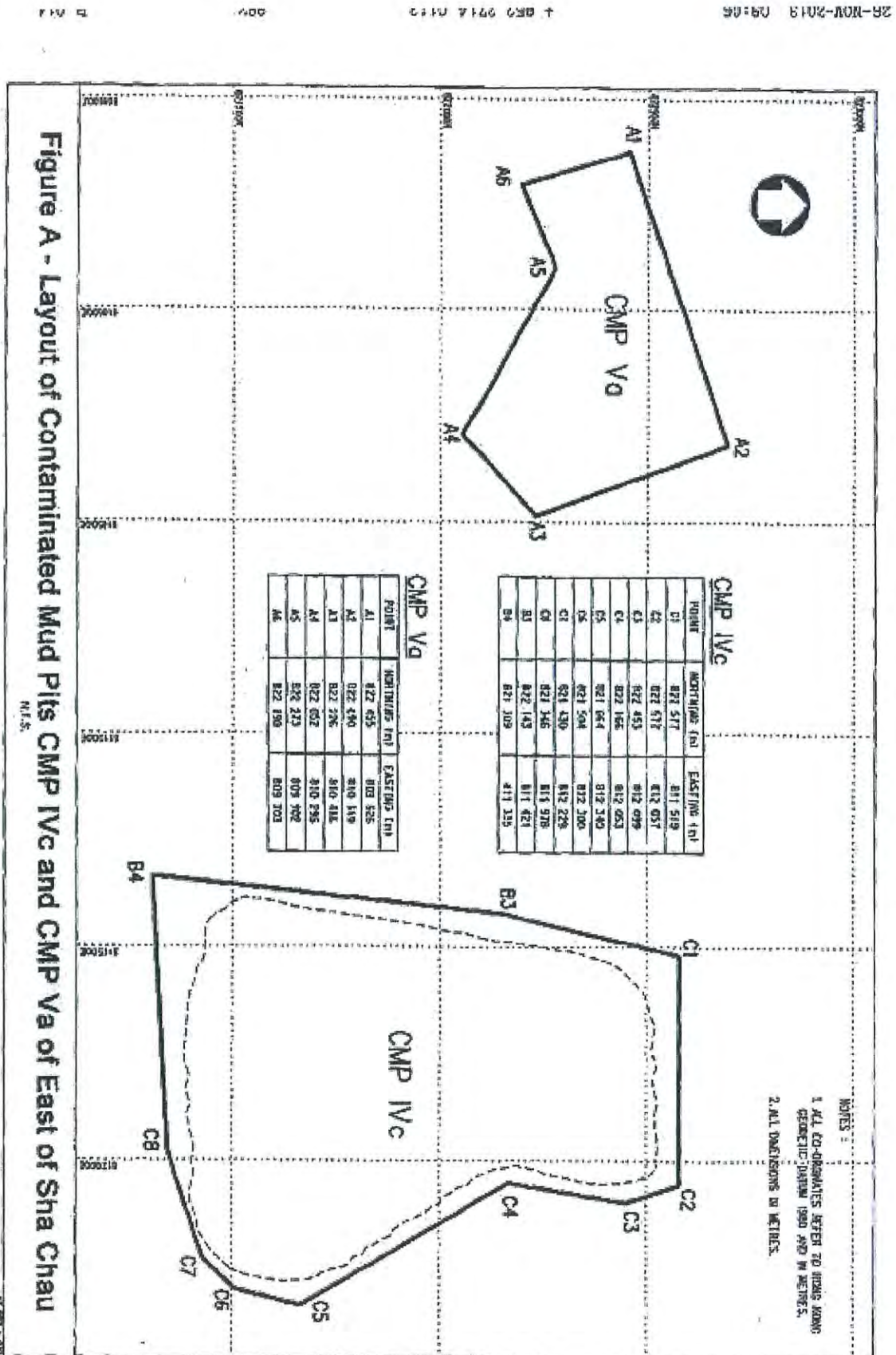
A4 297 x 210

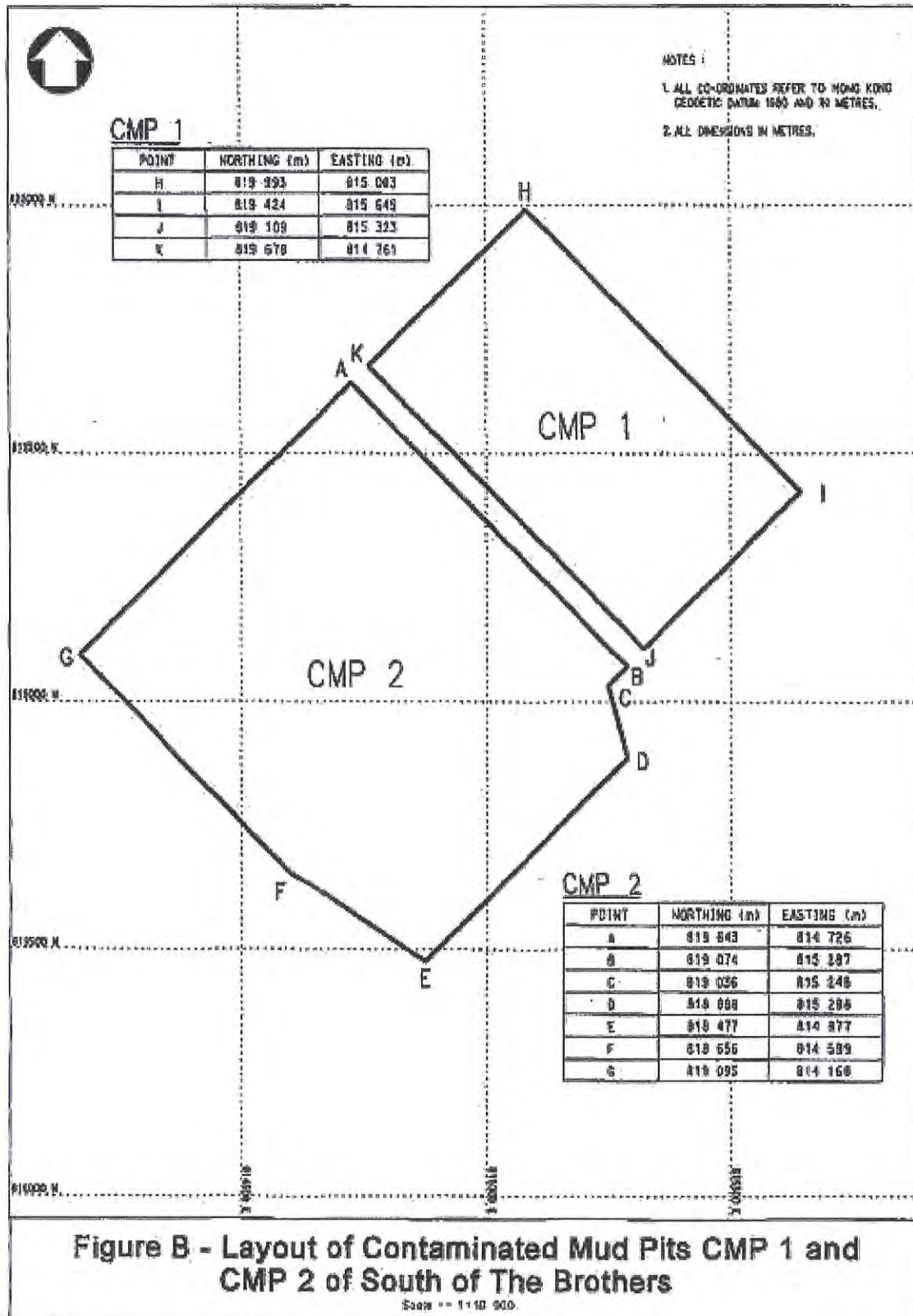
25-NOV-2013 09:06

852 2714 0113

98%

P.013





...\\Figure B - Layout of Contaminated Mud Pits CMP 1 and 2 of South of The Brothers.dgn 31/7/2013 16:46:09

土木工程拓展署
 **CEDD Civil Engineering and Development Department**

Web site 網址 : <http://www.cedd.gov.hk>
 E-mail 電子郵件: fallxowlo@cedd.gov.hk
 Telephone 電話 : 2762 5543
 Facsimile 傳真 : 2714 0113
 Our reference 本署編號: (1KAZJ-01) In FM 4/1C/70A
 Your reference 來函檔號: WKRD/(HY/2013/17)/M45/240/17A003884

Parsons Brinckerhoff (Asia) Ltd.
 SRE's Office
 24 Hoi Fan Road
 Tai Kok Tsui
 Kowloon
 (Attention: Ms. Tina S Y Chan)

土木工程處
 Civil Engineering Office

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

6 March 2017

BY FAX: 2488 5633

Dear Sir,

Contract No. HY/2013/17
Road Improvement Works in West Kowloon Reclamation Development

Allocation of Sediment Disposal Space

We refer to your letter of the above reference dated 17.2.2017 and the email from your Mr. Tommy Lam dated 1.3.2017 advising the updated programme. We hereby enclose the allocation of the marine disposal space for the category of sediment arising from the above works.

Category of Sediment	In situ Volume of Sediment	Sediment Disposal Space	Remark
Category L Sediment	830 m ³	Subareas "WKRD" within the South Cheung Chau Open Sea Sediment Disposal Area as shown on Drawing No. MFC/002-WKRD	

2. The allocation is subject to the attached "General Allocation Conditions for Marine Disposal Sites" and "Special Allocation Conditions". Please note that it is the responsibility of the Allocatee to identify the appropriate party to implement the above Conditions.

3. You are reminded to submit the information indicated in Clauses 5, 6, 10 and 11 of the "General Allocation Conditions" when they are available.

Yours faithfully,



(Felix LO)

for Secretary, Marine Fill Committee
Civil Engineering and Development Department

c.c. HyD/Works Div. (Attn.: Mr. K F Lam) Fax: 3188 3418
DEP Fax: 2305 0453

ALLOCATION OF MARINE DISPOSAL SPACE
Under ETWB TCW 34/2002 (or PNAP 252 for Private Projects)

Allocation Number	Refer to referenced number of the allocation letter		
Contract /Project Name	Contract No. HY/2013/17 - Road Improvement Works in West Kowloon Reclamation Development		
Location and Details of the Works involving Dredging	Road Improvement Works in West Kowloon Reclamation Development		
Project Proponent (Allocatee)	Works Division, HyD		
Dredging Rationale Approval Date	25 Mar 2013	Sediment Quality Report Approval Date	3 Feb 2017

In accordance with ETWB TCW 34/2002 (or PNAP252 for private projects), hereinafter called the Circular, we hereby allocate to the above Allocatee the following marine disposal space for the respective categories of sediments arising from the above dredging works subject to due compliance and execution of the attached General Allocation Conditions and the following Special Conditions:

Category of Sediment	In situ Volume of Sediment	Sediment Disposal Space.	Remark
Category L Sediment	830 m ³	Subareas "WKRD" within the South Cheung Chau Open Sea Sediment Disposal Area as shown on Drawing No. MFC/002-WKRD	

Special Conditions

1. "In-situ volume of the sediment" means the volume of such sediment in its original place before it is dredged/excavated. Disposals of the sediments in excess of their volumes above are not permitted.
2. The sediments dumped have to be kept below the levels specified by the DASO permits. If sediments were found to be dumped above these levels within the concerned disposal space, the Allocatee shall propose remedial measures and rectify the situations to the satisfaction of all the parties concerned.
3. While the seabeds at some areas of the allocated marine disposal space may be less than 1.0 m below the maximum levels above, extreme care should be exercised to avoid the sediments being resided above these levels.
4. The Allocatee may be required to carry out bathymetry survey at the allocated disposal area when consider necessary.
5. For Category L sediment suitable for capping the exhausted Confined Marine Disposal Facility, the Resident Engineer of the project office shall ensure that his contractor disposes of the uncontaminated mud evenly in the contaminated mud pit as directed by the Management Team of the Confined Marine Disposal Facility. (Location of the Contaminated Mud Pits of East of Sha Chau and South of The Brothers are shown on Figures 3 and 4 of the

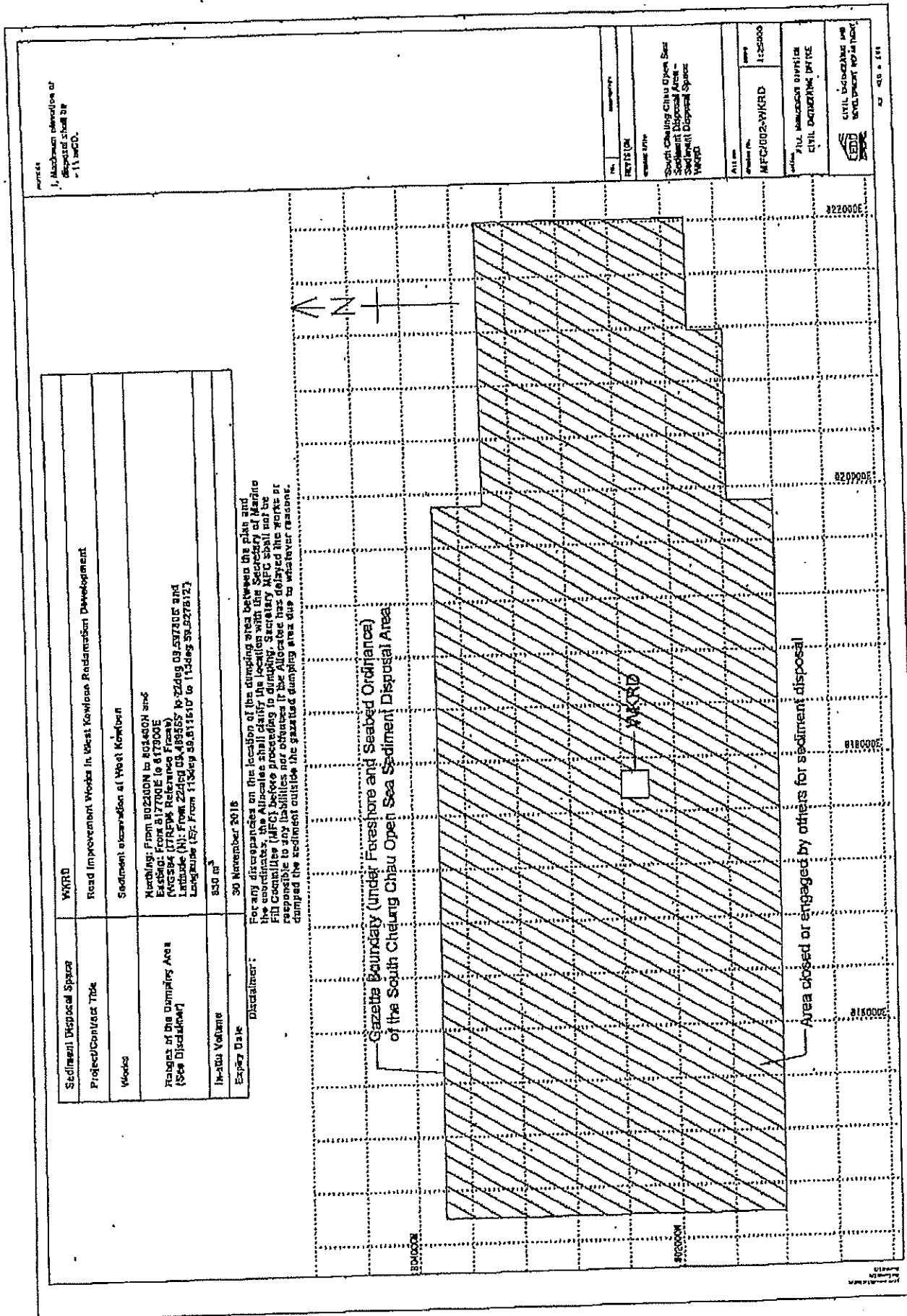
Appendix B to the General Allocation Conditions for Marine Disposal Space respectively).
The required fill-up levels are as follows :

CMP	Required fill-up level
CMP Va at East of Sha Chau	-8.0 mCD to -7.0 mCD
CMP 2 at South of The Brothers	-5.0 mCD to -3.0 mCD

In case of non-compliance, the Resident Engineer of the project office shall request his contractor to rectify those high spots arising from excessive dumping at the contractor's own cost.

6. The expiry date of the allocation is 30 November 2018.

Marine Fill Committee Secretariat
Civil Engineering and Development Department
March 2017



1. Maximum extension of disposal shall be 11m x 11m.

Sediment Disposal Space	WARRD
Project/Contract Title	Reclamation Works in West Kowloon Reclamation Development
Works	Sediment Disposal at West Kowloon
Radius of the Dumping Area (See Disclaimer)	Marching: From 802000N to 801400N and Existing: From 817000E to 8173000E WGS84 (TRIPs Retrieved From: Longitude (E): From 22459 03.483333 to 22460 03.597205 and Longitude (S): From 113459 59.811610 to 113460 59.927812)
In-situ Volume	330 m ³
Expiry Date	30 November 2018

Disclaimer: For any discrepancies on the location of the dumping area between the plan and the coordinates, the Applicant shall clarify the location with the Secretary of Marine Fill Committee (MFC) before proceeding in any works. The Secretary MFC shall not be responsible to any liabilities nor offences if the Applicant has delayed the works or dumped the sediment outside the gazetted dumping area due to whatever reasons.

Gazette Boundary (Under Foreshore and Seabed Ordinance) of the South Cheung Chau Open Sea Sediment Disposal Area

Area closed or engaged by others for sediment disposal

Project No. MFC/002-WARRD
 Project Name: South Cheung Chau Open Sea Sediment Disposal Area - Sediment Disposal Space WARRD
 Applicant: MFC/002-WARRD
 Date: 12/2000
 Scale: 1:10000
 Drawing No. CIVIL/002-WARRD/01/01
 Drawing Title: CIVIL/002-WARRD/01/01
 Drawing Date: 12/2000
 Drawing Scale: 1:10000
 Drawing No. CIVIL/002-WARRD/01/01
 Drawing Title: CIVIL/002-WARRD/01/01
 Drawing Date: 12/2000
 Drawing Scale: 1:10000

GENERAL ALLOCATION CONDITIONS FOR MARINE DISPOSAL SPACE

Obligations of the Allocatee

1. Allocations of marine disposal space are made to a project proponent (the Allocatee), and it is the project proponent's responsibility to ensure that these Conditions are implemented. For simplicity, these Conditions refer variously to the "Contractor", the "Engineer of the Contract" and "the Authorized Person", but it is the project proponent's responsibility to identify the appropriate party to implement the Conditions.

Allocation of Marine Disposal Space

2. The Open Sea Disposal Areas (hereinafter called ODAs) are located at South of Cheung Chau (hereinafter called SCC), East of Ninepin (hereinafter called BNP) and other empty marine borrow pits, if any, as specified in the Special Conditions. The Confined Marine Disposal Facility (hereinafter called CMF) in operation is situated at East of Sha Chau (hereinafter called BSC)/South of The Brothers (hereinafter called SB). The SCC-ODA and BSC-CMF/SB-CMF receive marine disposal throughout a year and BNP-ODA only receives marine disposal from 16 March to 30 September of a year (both dates inclusive).

3. For any Category M_p Sediment, the disposal arrangement at CMF is on a temporary basis. It may be changed to other disposal arrangements whenever available to be notified by the Secretary of the Marine Fill Committee (MFC).

4. For any Category H_f Sediment, the disposal at CMF would not be allowed unless the Allocatee has identified and sought the agreement from EPD the most appropriate treatment on such Sediment rendering it suitable for Confined Marine Disposal.

Disposal Programme

5. Prior to the commencement of marine disposal, the Engineer shall submit to the Director of Environmental Protection (DEP) and the MFC Secretary an estimated programme for marine disposal at the respective ODAs and CMFs during the progress of works of the Contract. This programme shall be resubmitted whenever significant changes occur.

Notification before Commencement and after Completion of Marine Disposal

6. The Allocatee shall notify the MFC Secretary, in writing, of the actual date of commencement and the actual date of completion of the marine disposal within one week of the occurrence of the events.

Centralized Management and Monitoring System for the ODA

7. The Fill Management Division (FMD) of the Civil Engineering and Development Department (CEDD) has been implementing a Centralized Management and Monitoring System (CMMS) for overseeing the ODAs through conducting monthly water quality monitoring, regular bathymetric surveys and ecological surveys for the ODAs, as well as

planning and assigning subareas in the ODAs for marine disposal.

8. As a management measure of the disposal activities, the Allocatee shall arrange the disposal within the assigned subareas of the ODA as shown on the relevant drawing to be attached to the allocation. Disposal activities outside the subareas are strictly prohibited.

9. If there are discrepancies between the location of the assigned subarea marked on the drawing and its coordinates stated on the drawing, the Allocatee shall clarify the location with the MFC Secretary before proceeding with disposal in the ODAs. The MFC Secretary shall not be responsible for any liabilities nor offences if the dumping operator has delayed the works or dumped the sediment outside the gazetted dumping area for whatever reasons.

Marine Disposal Monthly Records and Forecasts

10. The Allocatee shall submit to the DEP and the MFC Secretary daily records of the barge loads at the ODAs and CMFs of a month by using the attached form in Appendix A – “Daily Record of Marine Disposal Activities”. An estimate of the volume of sediment/uncontaminated naturally excavated materials for marine disposal shall also be provided for the following month. The disposal records above shall be checked and certified correct by the Engineer of the Contract (or AP/RSE/RGE for private projects). Within eight weeks of each bathymetric survey on the site, the dredged/excavated volume based on the survey shall be reconciled with the disposal records and reported to the MFC Secretary.

11. At least one week prior to the commencement of the dredging/excavation works, the Allocatee shall submit to the MFC Secretary a table of forecast showing the volume of sediment/uncontaminated naturally excavated materials for marine disposal per month. Thereafter, the Allocatee shall submit a revised forecast on a monthly basis, taking into account the volume disposed of during the preceding month.

Permits under the Dumping at Sea Ordinance (DASO Permit)

12. The DEP controls dumping at sea by means of issuing permits under the Dumping at Sea Ordinance Cap. 466 (or called DASO permits) to the contractors or other parties responsible for the marine disposal of sediment/uncontaminated naturally excavated materials. The Contractor who will be undertaking the works must make a formal application to DEP for a DASO permit, and if the permit is granted, it will be the Contractor's responsibility to ensure that the permit conditions are met to DEP's satisfaction.

Disposal Procedures and Operations at the ESC/SB

13. The disposal activities at ESC-CMF/SB-CMF are managed and controlled by a site team of FMD. Access to the SB is on a non-exclusive basis and the Allocatee shall ensure that the Contractors should follow the disposal procedures in accordance with Appendix B – “Disposal Procedures and Operations at the East of Sha Chau/South of The Brothers Confined Marine Disposal Facility”.

Miscellaneous

14. Trailer suction hopper dredgers disposing of sediment at East of Sha Chau/South of The Brothers must use a down-a-pipe disposal method, the design of which must be approved in advance by the Director of Civil Engineering and Development. The dredging/excavation contractor must provide equipment for such disposal.

15. (a) Sediment

The allocation of disposal space may carry a requirement for the project proponent to arrange for chemical analysis of the sediment sampled from 5% of the vessels en route to the disposal site. For Category M and certain Category H sediment, the chemical tests will be augmented by biological tests. Vessel sampling will normally entail mixing five samples to form a composite sample from the vessel and undertaking laboratory tests on this composite sample.

(b) Uncontaminated Naturally Excavated Materials for Capping (for Government projects only)

The project proponent must implement a high level of control on the capping work of Contaminated Mud Pits (CMPs) at ESC/SB using uncontaminated naturally excavated materials, including the material selection, loading, transportation and placing at CMPs. Project proponents must first inspect the uncontaminated naturally excavated materials on the generating site to ensure that the materials satisfy the requirements specified in the method statement. Project proponents must also conduct inspections on the barges to ensure the compliance of requirements on control of loading, transportation and placing at CMPs. The Management Team at the Office Barge at ESC/SB will conduct visual inspections on incoming barges and reject any barges in case of identification of irregularities.

16. According to ETWB Technical Circular (Works) No. 34/2002, exceptionally large allocations might require some additional disposal site monitoring. These will be stipulated in the Special Conditions when appropriate.

Charges for allocations of marine disposal space to Private Projects

17. For allocations of marine disposal space to private projects, there will be a charge per cubic metre as measured *in situ* at the site and as certified by the AP/RSE/RGE (authorized persons, registered structural engineers or registered geotechnical engineers) in accordance with paragraph 14 of the Practice Note for Authorized Persons and Registered Structural Engineers 252 (PNAP 252) issued by the Buildings Department.

18. The prescribed charge rates for sediment disposal at the respective ODAs and CMPs are specified in the Special Conditions. The methods of measurement and charging procedures are stipulated in Appendix C.

Assessment of Disposal Costs for private works entrusted to Government Contracts

19. For Government projects, the Allocatee shall check whether there are any private project works entrusted by others to be carried out in association with the concerned works. The Allocatee shall assess and reimburse the portion of marine disposal cost to be borne by the private parties and arrange the settlement sum to be transferred to the General Revenue.

- END -

Appendix A

Daily Record of Marine Disposal Activities

Project or Contract Name: _____ Contract No.: _____
 Project Proponent: _____
 Contractor: _____
 Marine Dumping Permit Holder: _____
 Marine Dumping Permit No.: _____
 Location of Disposal: _____

Summary of Disposal Activities			
Date of Disposal:			Page of
Time of Disposal	Name of Vessel	Maximum Hopper Capacity (m ³)	Estimated Bulk Volume of Sediment or Uncontaminated Naturally Excavated Materials on the Barge (m ³)
Recorded by the marine dumping permit holder:		Checked and certified correct by the Engineer for the Contract (or AP/RSE/RGE for private projects):	
Signature: _____		Signature: _____	
Name: _____		Name: _____	
Post: _____		Post: _____	

Note:
 This form shall be used for recording the daily disposal activities of the project concerned. The records shall be submitted, on a monthly basis, before the 10th day of the next month to the Secretary of the Marine Fill Committee at 5/F., Civil Engineering and Development Building, 101 Princess Margaret Road, Homantin, Kowloon. Nil return is required.

Appendix B (Sheet 1 of 4)Disposal Procedures and Operations at the East of Sha Chau/South of The Brothers
Confined Marine Disposal Facility (CMF)

The Contaminated Mud Pit Management Scheme is administered by the Chief Engineer/Fill Management of the Civil Engineering and Development Department (CEDD). Users are required to comply with the following: -

1. Notification of disposal

- (a) When a barge or a trailer suction hopper dredger (TSHD) is filled up with disposal materials and ready to depart from the site to the Contaminated Mud Pit (CMP) at East of Sha Chau (ESC)/South of The Brothers (SB), the site supervisory staff shall notify the CMP Management Team at telephone number 9308 6312 with the following details:

- (i) project title;
- (ii) Dumping Permit number;
- (iii) numbers / names of the tug boat and hopper barge;
- (iv) time of leaving the site and the anticipated time of arrival at CMP; and
- (v) estimated volume of disposal materials inside the hopper of the barge or TSHD.

In addition, the above information shall be entered into the standard notification form (as attached) which shall be duly signed by the supervising engineer or his/her delegate (with name and post shown) for subsequent submission to the Management Team. For barges, the duly completed notification form shall be handed to the staff of the Management Team during reporting at the Office Barge. For TSHDs, the duly completed notification form shall be submitted to the Fill Management Division of CEDD by fax (2714 0113) on a daily basis.

- (b) The Permit Holders shall note that telephone notification does not constitute a reservation of time slot for disposal. Instead, the disposal priority along the relevant queue as referred to in para. 3 will be conducted only when the vessels arrive at ESC/SB.

2. Reporting to Management Team

- (a) When a barge arrives at the Reporting Area of ESC/SB (Figures 1 and 2, as attached), a representative of the barge shall report to the Management Team at the Office Barge and hand in the completed notification form to the staff of the Management Team. The Management Team will record the arrival time. A note will be given to the representative of the barge showing the arrival time of the subject barge, the possible time that disposal can be conducted and the registration number of the barge or TSHD queuing before the subject barge.

- (b) When a TSHD arrives at the Reporting Area of ESC/SB (Figures 1 and 2, as attached), the representative of the TSHD shall report to the Management Team at telephone number 9308 6312. The Management Team will record the arrival time and inform the representative of the TSHD of the possible time and location within CMP that disposal can be conducted and the registration number of the barge or TSHD queuing before the subject TSHD.

(Remark: - Barges with valid Dumping Permit but arriving without prior notification or without completed notification form as required in para. 1 shall wait until all relevant details are verified by their relevant supervising engineer or his staff.)

3. On-site Queuing Arrangement

Appendix B (Sheet 2 of 4)

- (a) The disposal volume of CMP Va and Vd of ESC and CMP2 of SB in any rolling 24-hour period is to be kept within 26,700 m³. For barges, the disposal volume shall be the bulk volume of disposal materials contained in the hopper. For TSHD, the disposal volume shall be the bulk volume of mud contained in the hopper times a factor of 0.65.
- (b) The Management Team will compile a spreadsheet record for queuing with details of actual disposal. Barges/TSHDs reported arrival will be received on a first-come, first-served basis. The barges/TSHDs have to follow the queue and wait for instructions from the Management Team before disposal. Any barge/TSHD not ready to proceed with disposal when called upon by the Management Team shall lose their turn for disposal. The concerned representative of the barge/TSHD needs to report again to the Office Barge as if newly arrived and queue again after other arrived barges/TSHDs following the relevant queue and wait again for instructions to proceed with disposal.
- (c) In queuing for the disposal, the barges and tug boats need to stay outside the Reporting Area and distant from the nearby fairway. The TSHD, barges and tug boats shall strictly observe the marine safety requirements and follow instructions from the Marine Police and Marine Department.
4. (a) Disposal of Uncontaminated Mud/Uncontaminated Naturally Excavated Materials as Capping
After receipt of permission from the Management Team to proceed with disposal, the tug boat/barge operator shall manoeuvre the barge into the target dumping area in the CMP Va at ESC or CMP 2 at SB for capping (Figures 3 and 4, as attached). Disposal shall proceed slowly and steadily. The tug boat/barge operator shall contact the Management Team at telephone number 9308 6312 when there are difficulties in communication.
- (b) Disposal of Contaminated Mud
After receipt of permission from the Management Team to proceed with disposal, the tug boat/barge operator shall, with the aid of instructions given by the guide boat of the Management Team, manoeuvre the barge into the target dumping area in CMP Vd at ESC (Figure 5, as attached). The tug boat operator shall cut off the power and allow their barge to drift along the water current during the discharge of mud. The barge shall continue to drift for at least 3 minutes after discharging mud. The tug boat operator shall strictly follow the instructions from the Management Team for disposal. The tug boat/barge operator shall not let his tug boat/barge move astern, except in an emergency situation, within the pit area during and after disposal of contaminated mud. It should be noted that it is a Marine Department requirement that the tug boat should display the "Not Under Command" signals while it is drifting. For TSHD, no guiding service will be provided by the Management Team. The TSHD shall start the disposal after receipt of permission from the Management Team and shall report to the Management Team after the completion of the disposal. The tug boat/barge operator shall contact the Management Team at telephone number 9308 6312 when there are difficulties in communication.
5. Illegal disposal – If any vessel is found to disobey instructions and proceed with illegal disposal and/or any irregularities spotted during disposal, its details will be recorded. The Environmental Protection Department, Marine Police or Marine Department will take action as appropriate. The resident engineer shall keep a running tally of the volume dumped under both the permit and the allocation. If either the permitted or allocated volume is reached, he shall notify the Management Team and stop sending the barge to the disposal ground.

Appendix B (Sheet 3 of 4)

6. Leaving the Pit – After discharging, the tug boat/barge/TSHD operator shall inform the Management Team of completion of disposal before leaving the pit. The tug boat/barge shall sail slowly away from the disposal site until leaving the pit.
7. Closure of Pit – The disposal at ESC/SB will be suspended and the CMP will be closed during the hoisting of Typhoon Signal No. 3 or higher or in other conditions, e.g. adverse weather, when the Management Team considers that its management duties cannot be discharged safely and properly. The CMP would be closed from 6:00am on the Lunar New Year (LNY) Eve until 3:00pm on LNY Day Four when it would be reopened. There is no guarantee that prior notice will be given. Arrived barges or TSHD shall leave the disposal area immediately if the pit has been closed. For enquiries relating to the closure of the Pit, please contact the Management Team at telephone number 9308 6312.
8. Capping level – The Resident Engineer of the project office shall ensure that his contractor disposes of the uncontaminated mud/uncontaminated naturally excavated materials evenly in the contaminated mud pit as directed by the Management Team. The required fill-up levels are as follows :

CMP	Required fill-up level
CMP Va at East of Sha Chau	-8.0 mCD to -7.0 mCD
CMP 2 at South of The Brothers	-5.0 mCD to -3.0 mCD

In case of non-compliance, the Resident Engineer of the project office shall request his contractor to rectify those high spots arising from excessive dumping at the contractor's own cost.

9. Safety Matters
- (a) All barges' representatives boarding/disembarking the Office Barge shall wear non-slippery shoes and life jackets. Any barge's representative not complying with this requirement will not be permitted to board /disembark from the Office Barge. Any non-compliance will be reported to the relevant Permit Holder and project management office.
- (b) All TSHDs, tug boats and barges shall turn on their lights while working in the vicinity of Mud Pits in dark or when the visibility is poor. Any non-compliance will be reported to relevant Permit Holder, project management office, the Marine Police and Marine Department.
- (c) Any barge while waiting in the vicinity of the Mud Pits to queue up for disposal, shall be served/looked after by a tug boat. Any non-compliance will be reported to the relevant project management office, the Marine Police and Marine Department.

Appendix B. (Sheet 4 of 4)

Notification of Dumping at East of Sha Chau/South of The Brothers

To: Management Team

From: _____
 Contract No.: _____
 Contract Title: _____
 Contact Tel. No.: _____ Fax No. _____

Disposal Materials (Contaminated Mud/ Uncontaminated Mud/ Uncontaminated Naturally Excavated Materials):

EPD Dumping Permit No. (Allocation Volume m ³)	Location	Tug Boat Name/No.	Hopper Barge Name/No.	Quantity ¹ (m ³)	Time leaving site	Accumulated Quantity (m ³)	Anticipated arrival time at the East of Sha Chau/ South of The Brothers

Official Use
Arrival date/time
Remarks

Signature of Resident Engineer/Authorized Supervisor:

Name of Resident Engineer /Authorized Supervisor (in block letters):

_____ (post.)
 (contact tel.)

Date/Time: _____

- Note: -
1. The quantity entered shall have allowed for bulking after dredging/excavation.
 2. The permit holder shall provide contact telephone number for verification/providing details when the barge arrived at East of Sha Chau/ South of The Brothers.
 3. This form shall be submitted to the Management Team by fax (2714 0113) within the period between 1 and 3 hours before anticipated arrival time for TSHDs.
 4. The permit holder shall notify the Management Team by phone before the barge leaves the site.
 5. The representative of the barge shall submit a copy of Dumping Permit to the Management Team when requested.

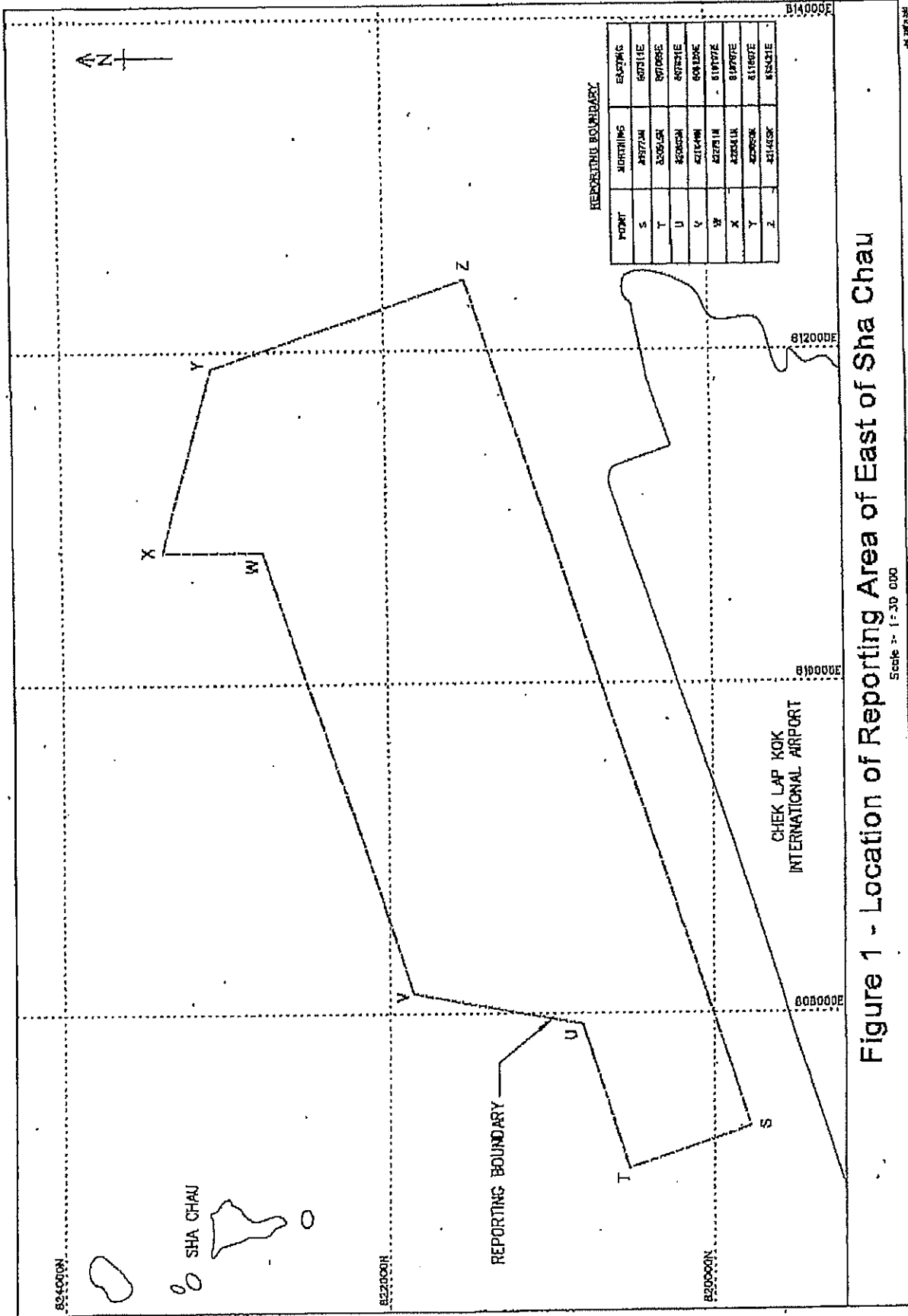


Figure 1 - Location of Reporting Area of East of Sha Chau

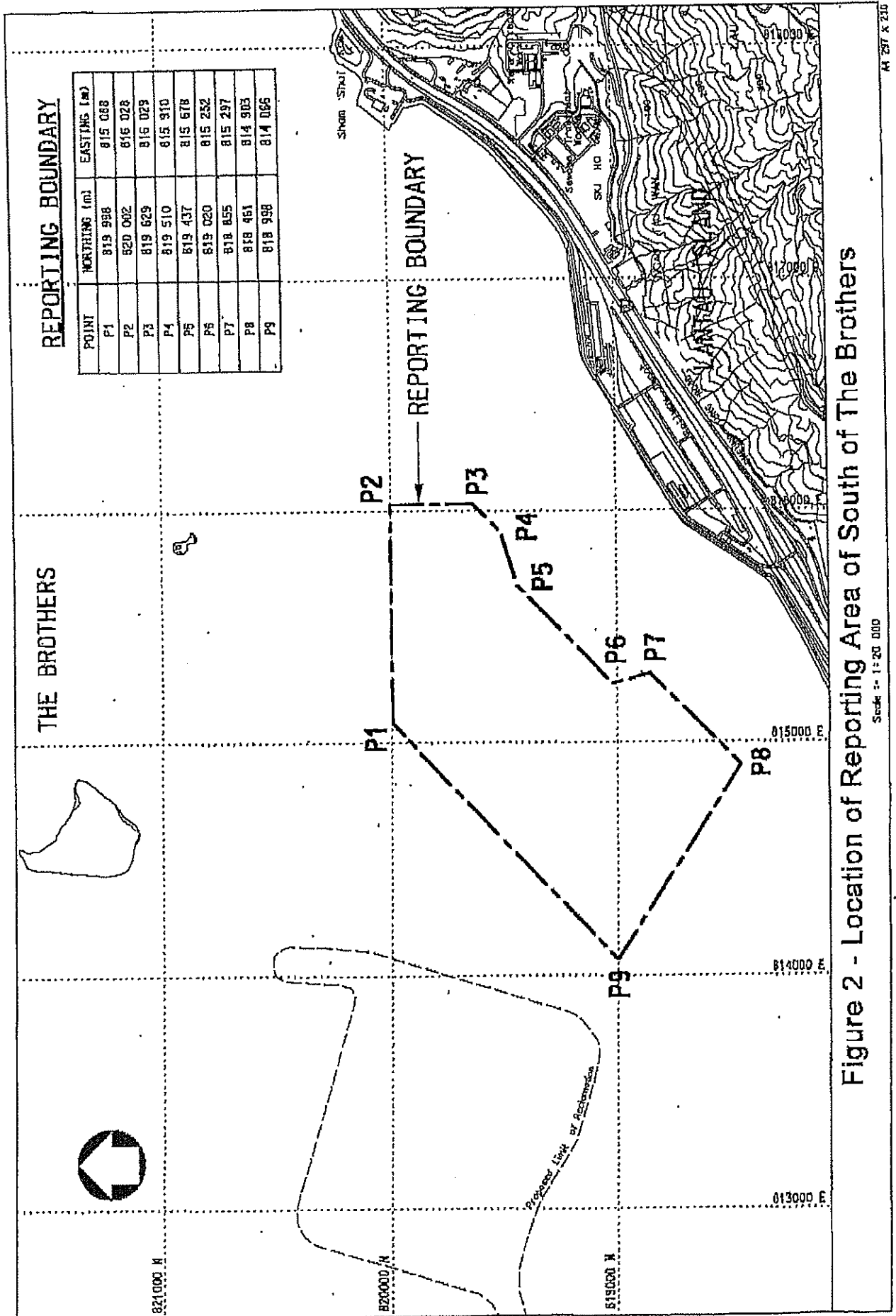
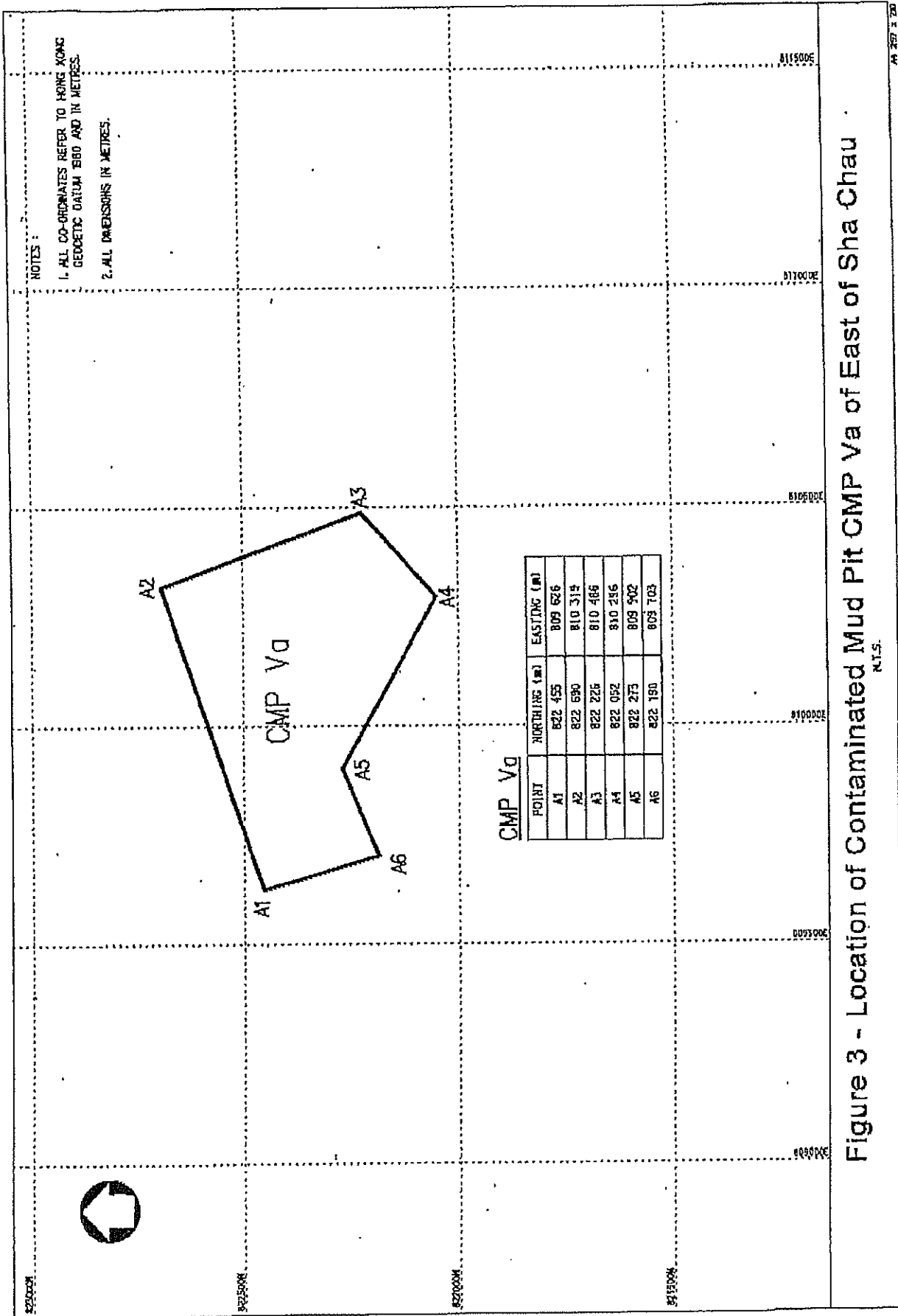


Figure 2 - Location of Reporting Area of South of The Brothers



... Figure 3 - Location of Contaminated Mud Pit CMP Va of East of Sha Chau.dgn 5/1/2016 12:04:57

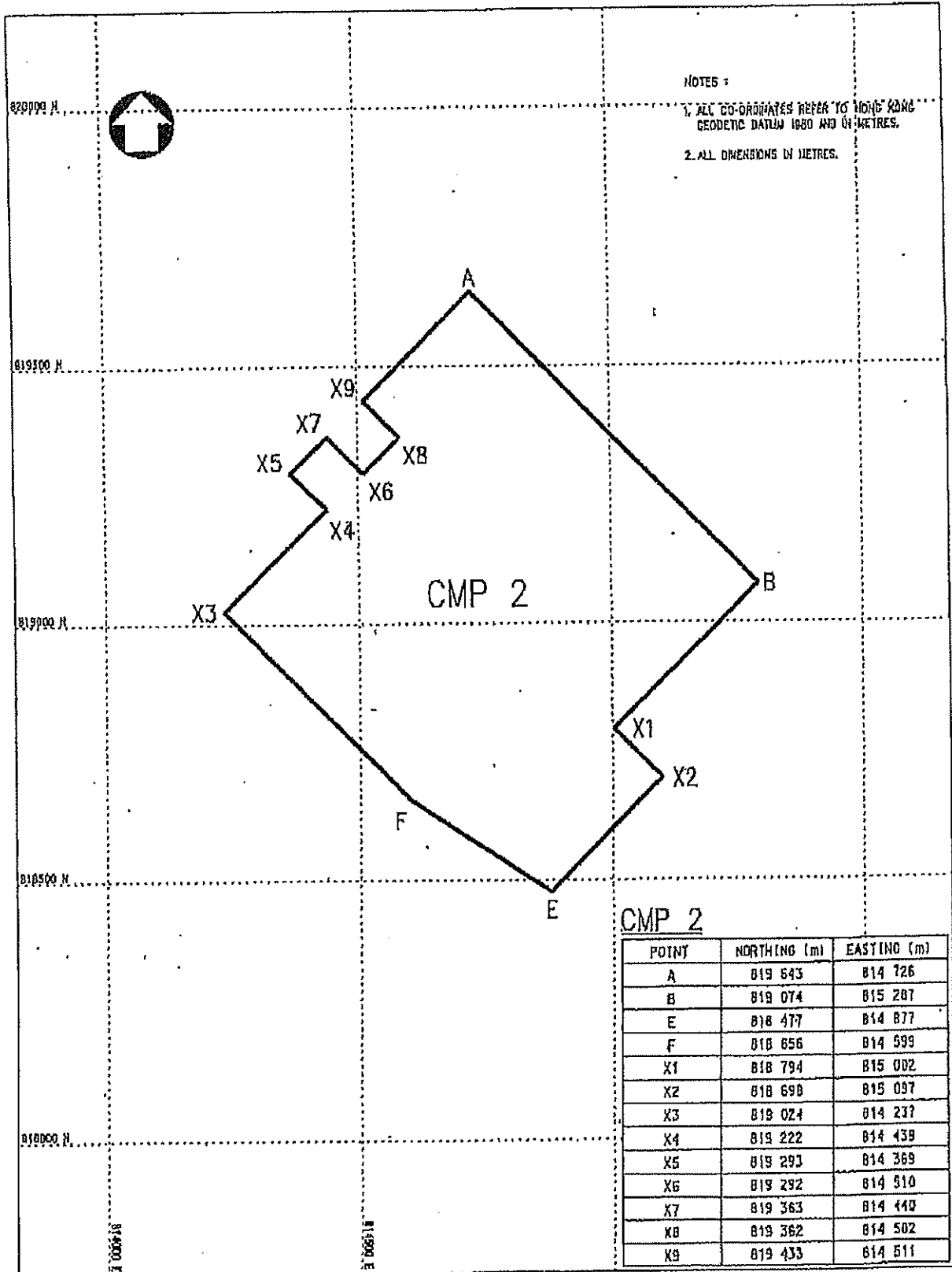
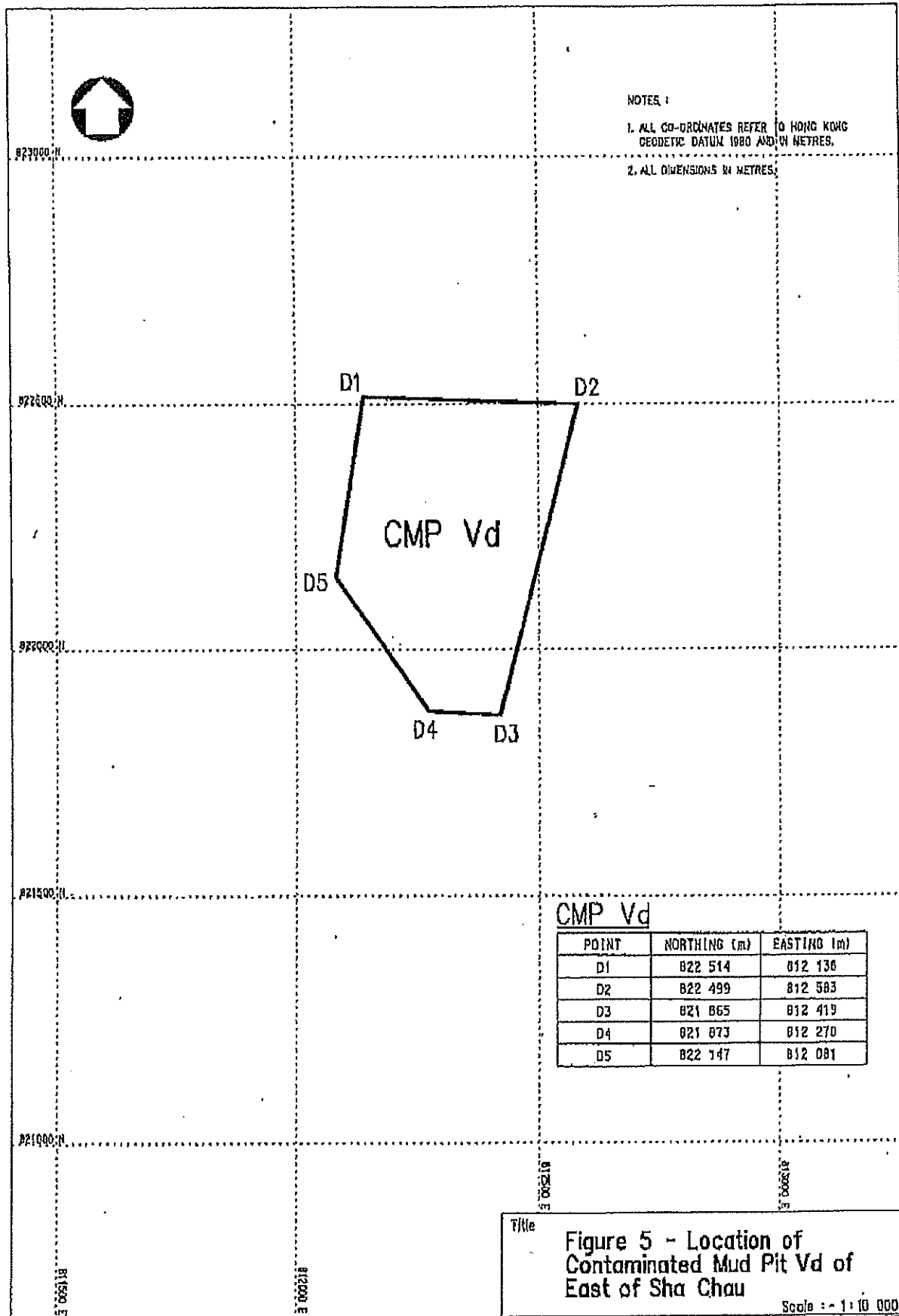


Figure 4 - Location of Contaminated Mud Pit CMP 2 of South of The Brothers

Scale 1 : 10 000



...\\Figure 5 - Location of Contaminated Mud Pit Vd of East of Sha Chau.dgn 5/1/2016 15:24:51