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**BLACK & VEATCH HONG KONG LIMITED**

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OUR REF 180579-0401

YOUR REF (15) in EP2/N7/75 pt.2

DATE 4 March 2016

Environmental Protection Department  
27/F, Southorn Centre,  
130 Hennessy Road,  
Wanchai, Hong Kong

For the attention of Ms. Holy To

Dear Sirs,

**Agreement No. CE 63/2012 (DS)**  
**Expansion of Sha Tau Kok Sewage Treatment Works, Phase 1**  
**- Investigation, Design and Construction**  
**Preliminary Sediment Quality Report**

We refer to your letter (ref. (15) in EP2/N7/75 pt.2) dated 19 November 2015 expressing no comment on the Sediment Sampling and Testing Plan (Issue 3) for the above captioned Project. Please find enclosed a copy of the Preliminary Sediment Quality Report (PSQR) for your review.

Since only Category L sediments are found, further biological screening is not required. Subject to DEP approval, the PSQR is therefore deemed to be the formal Sediment Quality Report (SQR).

Should you have any queries, please do not hesitate to contact the undersigned or our Mr. Manuel Chua at 26087314 ([chuawo@bv.com](mailto:chuawo@bv.com)).

Yours faithfully,  
For and on behalf of  
BLACK & VEATCH HONG KONG LIMITED

CHRISTINA S. C. KO  
PROJECT MANAGER

MC  
Encl.

cc: DSD/CM - attn.: Mr. Oliver Au-Yeung  
MFC/CEDD - attn.: Mr. Derek Lau  
EPD/MDS - attn.: Ms. Ruby Hung  
EPD/SIG - attn.: Mr. Calvary Wong



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Certificate No.: HKG6017620



ISO 9001 : 2008



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Agreement No. CE 63/2012 (DS)  
Expansion of Sha Tau Kok Sewage  
Treatment Works, Phase 1 – Investigation,  
Design and Construction

Sediment Quality Report

February 2016

Drainage Services Department (DSD)

Agreement No. CE 63/2012  
(DS) Expansion of Sha Tau Kok  
Sewage Treatment Works,  
Phase 1 – Investigation, Design  
and Construction

Sediment Quality Report

February 2016

Drainage Services Department (DSD)

# Contents

<b>Chapter</b>	<b>Title</b>	<b>Page</b>
1	Introduction	2
1.1	Project Background _____	2
1.2	Purpose of the Report _____	3
2	Sediment Sampling	4
2.1	Sampling Date, Locations and Method _____	4
2.2	Sample Handling, Preservation and Storage _____	4
3	Chemical Screening	6
3.1	Analytical Methodology _____	6
3.2	Classification Criteria of Sediment _____	7
3.3	Testing Laboratory _____	7
3.4	Quality Control Measures _____	7
3.5	Chemical Testing Results and Sediment Classification _____	7
4	Sediment Disposal	9
5	Conclusion	10
	<b>Appendices</b>	<b>11</b>
	Appendix A. Chain of Custody (COC) Forms _____	12
	Appendix B. Chemical Testing Laboratory Reports _____	13

## Figures

Figure 1 Proposed Layout Plan

Figure 2 Location Plan of Sediment Sampling

# 1 Introduction

## 1.1 Project Background

Drainage Services Department (DSD) is undertaking a project named Expansion of Sha Tau Kok Sewage Treatment Works, Phase 1 – Investigation, Design and Construction (the Project) under Agreement No. CE 63/2012 (DS). The Project is to expand the treatment capacity of the existing Sha Tau Kok Sewage Treatment Works (STKSTW) from 1,660 m<sup>3</sup>/day to 10,000 m<sup>3</sup>/day in 2 phases.

The works for this Project in Sha Tau Kok mainly comprises of the following items and the layout plan is shown in **Figure 1**.

- Increase the treatment capacity of Sha Tau Kok Sewage Treatment Works (STKSTW) to 5,000 m<sup>3</sup>/day at Average Dry Weather Flow (ADWF) by 2020, with suitable allowance to cater for a further increase of treatment capacity to 10,000 m<sup>3</sup>/day at ADWF after 2030 in Phase 2.
- Construct a temporary sewage treatment plant (TSTP).
- Demolish the existing Sha Tau Kok Sewage Pumping Station (STKSPS) and decommission the rising main between STKSPS and STKSTW.
- Construct a new gravity sewer.
- Decommission the existing submarine outfall and construct a new one.

The existing submarine outfall is inadequate to cope with the increased sewage flow in the future after expansion of the STKSTW. In addition, the existing submarine outfall is discharging near-shore of Starling Inlet which may lead to unacceptable water quality impact to surrounding marine water sensitive receivers including the nearby Sha Tau Kok Fish Culture Zone. A new submarine outfall is required to be constructed to discharge the treated effluent further from shore within Starling Inlet. The discharge point of the proposed submarine outfall will be located in the water near Ah Kung Au.

The proposed submarine outfall of 1.7 km long and diameter of 450 mm will be constructed by trenchless method under the seabed of Starling Inlet to minimize the need for marine sediment dredging works. A diffuser is proposed at the discharge location. Localised excavation of marine sediment is required to facilitate its construction. Based on the engineering design, the existing seabed will be exposed for a length of approximately 54m by excavation method. The trapezoidal trench will be approximately 22m top wide (3m bottom wide) and 4.5m deep. The total volume of marine sediment requiring disposal is expected to be about 3,040 m<sup>3</sup>. The location of the proposed excavation area is shown in **Figure 2**.

The Project is a Designated Project (DP) under the Environmental Impact Assessment Ordinance (EIAO) (Cap 499). The Environmental Impact Assessment (EIA) Study Brief (No. ESB-253/2012) has been issued by Environmental Protection Department (EPD) on 17 December 2012.

In order to fulfil the requirement in Appendix F, para. 3(i) of EIA Study Brief (No. ESB-253/2012), a Sediment Sampling and Testing Plan (SSTP), which presented the review of existing sediment data and the proposal for sampling and chemical testing of the sediment, was submitted and approved by EPD on 19 November 2015. A separate SSTP/Sediment Quality Report in accordance with ETWB TC(W) No. 34/2002 – Management of Dredged/Excavated Sediment will be prepared when applying for the dumping

permit under the Dumping at Sea Ordinance (DASO). The rationale for sediment removal / disposal will be agreed with Marine Fill Committee (MFC) of CEDD.

## **1.2 Purpose of the Report**

The purpose of this report is to:

- Report the findings of the sampling and testing work
- Present corresponding chemical testing results
- Estimate the volume of different types of sediment disposal

## 2 Sediment Sampling

### 2.1 Sampling Date, Locations and Method

The sediment sampling was conducted in accordance with the approved SSTP by the Contractor on 12 February 2016.

At the sampling location, surface grab sample was taken using Van Veen Grab Sampler lowered from a boat. For sampling below seabed level, gravity coring was employed. The sampling tube was manually driven from the boat into the seabed to obtain the sediment sample at the required depth.

The actual coring locations are shown in **Table 2.1** and illustrated in **Figure 2**. The actual coring locations are only slightly deviated from the proposed ones in the approved SSTP and are still within the proposed 54m x 22m dredging area.

Table 2.1: Actual Gravity Coring Sampling Locations

Sample Location	Easting	Northing	Sample Depth	No. of sample
S1	842479.2	845010.7	Surface (grab sample)	1
			0m – 0.3m below seabed	
			0.3m – 0.9m below seabed	1

### 2.2 Sample Handling, Preservation and Storage

The surface grab sample was transferred to sampling containers (sampling bottles and heavy duty plastic bags) provided by the laboratory.

The sampling tube was sealed with close fitting lids / caps at both ends of the sampling tubes.

All samples were labelled immediately after being taken. Each sample was clearly labelled, where appropriate, with "top", "bottom" and sample identity (e.g. sampling number, location, depth and date).

Sampling equipment used during the course of the investigation was decontaminated by manual washing and water rinsing before and after each sampling event. All disposable equipment was discarded after each use.

According to ETWB TC(W) No. 34/2002, 7L of sample was collected for chemical testing and biological testing as summarised in **Table 2.2**.

Table 2.2: Size of Samples Collected for Chemical and Biological Testing

Testing Parameters	Sample Size
Metals and metalloid	0.5 L
Organic	0.5 L
Biological response	6 L

**Table 2.3** shows the sampling bottle and pre-treatment methods which was used and followed after the samples were delivered to the laboratory for testing.

**Table 2.3: Types of Sample Bottle and Pre-treatment Methods**

Testing Parameters	Sampling Bottle	Pre-treatment Procedure <sup>#</sup>
Metals and metalloid	High density polyethylene bottles	USEPA SW-846+ Chapter 3
Organic	Wide mouth Borosilicate glass bottles with Teflon lined lid	USEPA SW-846 Chapter 4
Biological Response	Wide mouth Borosilicate glass bottles with Teflon lined lid or high density polyethylene bottles	USEPA SW-846 Chapter 3 or Chapter 4 as appropriate

All samples were kept at 4°C in the dark but were not frozen. Samples were delivered to laboratory at the end of each working day and promptly analysed.



## 3 Chemical Screening

### 3.1 Analytical Methodology

Chemical Screening was undertaken for the parameters using the analytical methods and reporting limits described in **Table 3.1**.

Table 3.1: Parameters Proposed for Chemical Screening for Sediment Samples

Parameters	Preparation Method US EPA Method	Determination Method US EPA Method	Reporting Limit
<b>Metals (mg/ kg dry wt.)</b>			
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
<b>Metalloids (mg/ kg dry wt.)</b>			
Arsenic (As)	3050B	6020A or 7000A or 7061A	1
<b>Organic-PAH (µg/kg dry wt.)</b>			
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
<b>Organic-non-PAH (µg/kg dry wt.)</b>			
Total PCBs+++	3550B or 3540C and 3665A	8082	3
<b>Organometallics (µg TBT/L in interstitial water)</b>			
Tributyltin	Krone et al. (1989)*- GC/MS UNEP/ IOC/ IAEA**	Krone et al. (1989)*- GC/MS UNEP/ IOC/ IAEA	0.015

Note:

- (i) The reporting limits shown in this table are the most stringent limits which will be specified by Director of Environmental Protection (DEP). Project proponents should consult DEP on the required limits in the preparation of proposals for sampling and chemical testing of the sediments.
- (ii) Other equivalent methods may be used subject to the approval of DEP.
- (iii) +: Low molecular weight PAHs include acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene
- (iv) ++: High molecular weight PAHs include benzo[a]anthracene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-c,d]pyrene and benzo[g,h,i]perylene
- (v) +++: The reporting limit is for individual PCB congeners. Total PCBs include 2,4' diCB, 2,2',5 triCB, 2,4,4'triCB, 2,2',3,5'tetraCB, 2,2',5,5'tetraCB, 2,3',4,4'tetraCB, 3,3',4,4'tetraCB, 2,2',4,5,5'pentaCB, 2,3,3',4,4'pentaCB, 2,3',4,4',5 pentaCB, 3,3',4,4',5 pentaCB, 2,2',3,3',4,4' hexaCB, 2,2',3,4,4',5' hexaCB, 2,2',4,4',5,5' hexaCB, 3,3',4,4',5,5' hexaCB, 2,2',3,3',4,4',5 heptaCB, 2,2',3,4,4',5,5' heptaCB, 2,2',3,4',5,5',6 heptaCB (ref: the "summation" column of Table 9.3 of Evaluation of Dredge Material Proposed for Discharge in Walters of the U.S.- Testing Manual (The Inland Testing Manual) published by USEPA).

- (vi) \*: Krone et al. (1989), A method for analysis of butyltin species and measurement of butyltins in sediment and English Sole livers from Puget Sound, Marine Environmental Research 27 (1989) 1-18. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.
- (vii) \*\*: UNEP/ICO/IAEA's Marine Environment Laboratory reference methods. These methods are available free of charge from UNEP/ Water or Marine Environment Studies Laboratory at IAEA's Marine Environment Laboratory. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.

### 3.2 Classification Criteria of Sediment

The sediment is classified into 3 categories based on its contaminant levels:

- Category L: Sediment with all contaminant levels not exceeding the Lower Chemical Exceedance Level (LCEL).
- 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).
- Category H: Sediment with any one or more contaminant levels exceeding the Upper Chemical Exceedance Level (UCEL).

### 3.3 Testing Laboratory

The chemical screening was conducted by ALS Technichem (HK) Pty Ltd.

### 3.4 Quality Control Measures

The laboratory Quality Assurance (QA) / Quality Control (QC) schedule as required by Hong Kong Laboratory Accreditation Scheme (HOKLAS) was conducted as follows:

- Method Blank:  
For each batch of 20 samples, at least 1 method blank was analysed together with the samples.
- Sample Duplicate:  
For each batch of 20 samples, at least 1 sample duplicate was tested.
- Method Analyte Spike:  
For each batch of 20 samples, at least 1 method analyte spike was conducted.

### 3.5 Chemical Testing Results and Sediment Classification

**Table 3.2** summarises the chemical testing results of the sediment samples at the sampling location S1. Based on the testing results, the two sediment samples belong to Category L. As sediment samples of Category L are identified, biological screening is not required in accordance with ETWB TC(W) No. 34/2002.

The Chain of Custody (COC) forms and the chemical testing laboratory reports are presented in **Appendix A** and **Appendix B** respectively.

Table 3.2: Chemical Testing Results of Sediment Samples at Sampling Location S1

ALS Lab ID		HK1606127001	HK1606127002	Lower Chemical Exceedance Level (LCEL)	Upper Chemical Exceedance Level (UCEL)	10 x LCEL
Sample ID		S1 - Surface (Grab) + 0m-0.3m below seabed	S1 - 0.3m-0.9m below seabed			
Parameters	Unit (in dry wt. basis)					
Cadmium	mg/kg	0.3	<0.2	1.5	4	15
Chromium	mg/kg	36	21	80	160	800
Copper	mg/kg	37	25	65	110	650
Mercury	mg/kg	0.08	0.07	0.5	1	5
Nickel	mg/kg	20	11	40	40	400
Lead	mg/kg	58	43	75	110	750
Silver	mg/kg	0.9	0.2	1	2	10
Zinc	mg/kg	124	66	200	270	2000
Arsenic	mg/kg	9	7	12	42	120
Low Molecular Weight PAHs	µg/kg	<550	<550	550	3160	5500
High Molecular Weight PAHs	µg/kg	<1700	<1700	1700	9600	17000
Total PCBs	µg/kg	<18	<18	23	180	230
Tributyltin	µg TBT/L	<0.015	<0.015	0.15	0.15	1.5
<b>Classification</b>		<b>L</b>	<b>L</b>			

## 4 Sediment Disposal

From the chemical testing results in **Section 3**, only Category L sediment was identified. In accordance with ETWB TC(W) No. 34/2002, Type 1 – Open Sea Disposal should be used for Category L sediment. The volume of different types of sediment disposal are summarised in **Table 4.1**.

Table 4.1: Sediment Disposal Volume

Type of Disposal	Volume (m <sup>3</sup> )
Type 1 – Open Sea Disposal	3,040
Type 1 – Open Sea Disposal (Dedicated Sites)	0
Type 2 – Confined Marine Disposal	0
Type 3 – Special Treatment / Disposal	0
<b>Total Disposal Volume</b>	<b>3,040</b>

## 5 Conclusion

On 12 February 2016, the sediment sampling work was conducted in accordance with the requirements of the approved SSTP. The sediment samples were first tested with chemical screening, and only Category L sediment samples were identified at sampling location S1. Therefore, in accordance with ETWB TC(W) No. 34/2002, no biological test was carried out and 3,040 m<sup>3</sup> of dredged sediment would be disposed with Type 1 – Open Sea Disposal.

# Appendices

Appendix A. Chain of Custody (COC) Forms	12
Appendix B. Chemical Testing Laboratory Reports	13

# Appendix A. Chain of Custody (COC) Forms

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

(Sheet 1 of 1)

Project Name: Expansion of Sha Tau Kok Sewage Treatment Works, Phase 1 - Investigation, Design and Construction	Contract No:
Name of Project Proponent: Drainage Services Department	
Address: 20/F, AIA Kowloon Tower, Landmark East, 100 How Ming Street, Kwun Tong, Kowloon, Hong Kong (Mott MacDonald Hong Kong Limited)	
Contact Person: Mr. Gary Chow / Mr. Patrick Liu (Mott MacDonald Hong Kong Limited)	
Telephone No.: 28285874 (Gary) / 25858515 (Patrick)	E-mail address: Gary.Chow@mottmac.com / Patrick.Liu@mottmac.com
Fax No.: 28271823	

**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	Metallloid	LMW PAHs	HMW PAHs	Total PCBs	TBT		Others (please specify)
S1 - Surface (grab) 0.0m - 0.3m below seabed	12 Feb 2016	E 8424792 N 844107	Surface - 0.3m	Grab & Gravity Coring	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
S1 - 0.3m - 0.9m below seabed	12 Feb 2016	11	0.3m - 0.9m	Gravity Coring	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

ALS TECHNICHEM (HK) LTD  
 11 FLOOR  
 12 FEB 2016  
 BY: RECEIVED

<b>Sampling Conducted by:</b>		<b>Sampling Supervised by (if any):</b>		<b>Samples Received by:</b>	
Company Name: EGS (Asia) Ltd.	Company Name: Mott MacDonald Hong Kong Limited	Company Name: Mott MacDonald Hong Kong Limited		Company Name: ALS Technichem (HK) Pty Ltd	
Address:	Address:	Address:		Address:	
Person-in-charge: Signature: <i>KWFA</i>	Responsible Person: Patrick Liu. Signature: <i>Patrick Liu</i>	Responsible Person: <i>Patrick Liu</i> . Signature: <i>Patrick Liu</i>		Responsible Person: <i>Kevin</i> . Signature: <i>Kevin</i>	
Phone No: 92393489	Date & Time: 12 FEB 16	Date & Time: 12 FEB 16		Date & Time: 12 FEB 2016	

18-00



## Appendix B. Chemical Testing Laboratory Reports

# ALS Technichem (HK) Pty Ltd

**ALS Laboratory Group**  
ANALYTICAL CHEMISTRY & TESTING SERVICES



## CERTIFICATE OF ANALYSIS

Client	Laboratory	Page	Page
Contact	ALS Technichem (HK) Pty Ltd	: 1 of 9	Work Order
Address	Contact Fung Lim Chee, Richard	: HK1606127	
	Address 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	E-mail Richard.Fung@alsglobal.com		
Telephone	Telephone +852 2610 1044		
Facsimile	Facsimile +852 2610 2021		
Project	Quote number : ----	Date Samples Received	: 12-FEB-2016
		Issue Date	: 22-FEB-2016
Order number		Nc. of samples received	: 2
C-O-C number		Nc. of samples analysed	: 2
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
Wong Wing, Kenneth	Manager - Metals	Inorganics

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

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Page Number : 2 of 9  
Client : MOTT MACDONALD HONG KONG LIMITED  
Work Order : HK1606127

#### 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-FEB-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: HK1606127

Sample(s) were collected by ALS Technichem (HK) staff.

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		S1 - SURFACE (GRAB) + OM-0.3M BELOW SEABED [12-FEB-2016] HK1606127-001	S1 - 0.3M-0.9M BELOW SEABED [12-FEB-2016] HK1606127-002
				Client sampling date / time	Client sample ID		
<b>EA/ED: Physical and Aggregate Properties</b>							
EA055: Moisture Content (dried @ 103°C)	---	0.1	%			59.4	47.6
<b>EG: Metals and Major Cations</b>							
EG020: Arsenic	7440-38-2	1	mg/kg			9	7
EG020: Cadmium	7440-43-9	0.2	mg/kg			0.3	<0.2
EG020: Chromium	7440-47-3	1	mg/kg			36	21
EG020: Copper	7440-50-8	1	mg/kg			37	25
EG020: Lead	7439-92-1	1	mg/kg			68	43
EG020: Mercury	7439-97-6	0.05	mg/kg			0.08	0.07
EG020: Nickel	7440-02-0	1	mg/kg			20	11
EG020: Silver	7440-22-4	0.1	mg/kg			0.9	0.2
EG020: Zinc	7440-66-6	1	mg/kg			124	66
<b>EP-065: PCB Single Congeners</b>							
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	41464-38-5	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	37680-78-2	3	µg/kg			<3	<3
PCB 105	32598-14-4	3	µg/kg			<3	<3
PCB 118	31508-00-6	3	µg/kg			<3	<3
PCB 126	57465-28-8	3	µg/kg			<3	<3
PCB 128	38380-07-3	3	µg/kg			<3	<3
PCB 138	35065-28-2	3	µg/kg			<3	<3
PCB 153	35065-27-1	3	µg/kg			<3	<3
PCB 169	32774-16-6	3	µg/kg			<3	<3
PCB 170	35065-30-6	3	µg/kg			<3	<3
PCB 180	35065-29-3	3	µg/kg			<3	<3
PCB 187	52663-68-0	3	µg/kg			<3	<3
Total Polychlorinated biphenyls	---	18	µg/kg			<18	<18
<b>EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs)</b>							
Naphthalene	91-20-3	50	µg/kg			<50	<50
Acenaphthylene	205-96-8	50	µg/kg			<50	<50
Acenaphthene	85-32-9	50	µg/kg			<50	<50
Fluorene	86-73-7	50	µg/kg			<50	<50



Sub-Matrix: SEDIMENT

Compound	CAS Number	LOR	Client sample ID		Unit	Client sampling date / time	S1 - SURFACE (GRAB) + 0M-0.3M BELOW SEABED [12-FEB-2016]		S1 - 0.3M-0.9M BELOW SEABED [12-FEB-2016]	
			HK1606127-001	HK1606127-002			HK1606127-001	HK1606127-002		
<b>EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) - Continued</b>										
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
Pyrene	129-00-0	150			µg/kg			<150		<150
Benzo(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
<b>EP-076S: Polycyclic Aromatics Hydrocarbons (PAHs) Surrogates</b>										
2-Fluorobiphenyl	321-60-8	0.1			%			63.7		59.1
4-Terphenyl-d14	1718-51-0	0.1			%			67.5		68.5
<b>EP-065S: PCB Congeners and Organochlorine Pesticides Surrogate</b>										
Decachlorobiphenyl	2051-24-3	0.1			%			56.8		60.3



Sub-Matrix: INTERSTITIAL WATER	Client sample ID	S1 - SURFACE (GRAB) + 0M-0.3M BELOW SEABED	S1 - 0.3M-0.9M BELOW SEABED
Compound	Client sampling date / time	[12-FEB-2016]	[12-FEB-2016]
EP-390: Triorganotins	LOR	HK1606127-001	HK1606127-002
Tributyltin	Unit		
	µg TBT / L	<0.015	<0.015

**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	
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 4136080)</b>								
HK1606127-001	S1 - SURFACE (GRAB) + 0M-0.3M BELOW SEABED	EA055: Moisture Content (dried @ 103°C)	---	0.1	%	59.4	59.1	0.5
<b>EG: Metals and Major Cations (QC Lot: 4136010)</b>								
HK1601855-012	Anonymous	EG020: Mercury	7439-97-6	0.05	mg/kg	0.08	0.08	0.0
		EG020: Cadmium	7440-43-9	0.1	mg/kg	0.1	0.1	0.0
		EG020: Silver	7440-22-4	0.1	mg/kg	0.1	0.1	0.0
		EG020: Arsenic	7440-38-2	1	mg/kg	8	7	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	6	5	18.6
		EG020: Copper	7440-50-8	1	mg/kg	8	8	0.0
		EG020: Lead	7439-92-1	1	mg/kg	34	38	10.8
		EG020: Nickel	7440-02-0	1	mg/kg	3	3	0.0
		EG020: Zinc	7440-66-6	10	mg/kg	51	48	5.6
HK1606127-001	S1 - SURFACE (GRAB) + 0M-0.3M BELOW SEABED	EG020: Mercury	7439-97-6	0.05	mg/kg	0.08	0.09	0.0
		EG020: Silver	7440-22-4	0.1	mg/kg	0.9	0.9	0.0
		EG020: Cadmium	7440-43-9	0.2	mg/kg	0.3	0.3	0.0
		EG020: Arsenic	7440-38-2	1	mg/kg	9	9	0.0
		EG020: Chromium	7440-47-3	1	mg/kg	36	35	4.7
		EG020: Copper	7440-50-8	1	mg/kg	37	36	3.5
		EG020: Lead	7439-92-1	1	mg/kg	58	63	7.5
		EG020: Nickel	7440-02-0	1	mg/kg	20	20	0.0
		EG020: Zinc	7440-66-6	1	mg/kg	124	117	5.7
<b>EP-065: PCB Single Congeners (QC Lot: 4133305)</b>								
HK1605397-001	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





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 Recovery (%)		Recovery Limits (%)		Value	RPD (%)	Control Limit
					LCS	DCS	Low	High			
<b>EG: Metals and Major Cations (QC Lot: 4136010) - Continued</b>											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	---	75	111	---	---	---
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	---	79	109	---	---	---
EG020: Chromium	7440-47-3	1	mg/kg	<1	5 mg/kg	---	81	123	---	---	---
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	---	79	109	---	---	---
EG020: Lead	7439-92-1	1	mg/kg	<1	5 mg/kg	---	81	109	---	---	---
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	---	75	113	---	---	---
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	---	77	111	---	---	---
EG020: Silver	7440-22-4	0.1	mg/kg	<0.1	5 mg/kg	---	75	113	---	---	---
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	---	80	122	---	---	---
<b>EP-065: PCB Single Congeners (QC Lot: 4133305)</b>											
PCB 8	34883-43-7	3	µg/kg	<3	5 µg/kg	---	55	111	---	---	---
PCB 18	37680-65-2	3	µg/kg	<3	5 µg/kg	---	58	105	---	---	---
PCB 28	7012-37-5	3	µg/kg	<3	5 µg/kg	---	63	105	---	---	---
PCB 44	41464-39-5	3	µg/kg	<3	5 µg/kg	---	61	111	---	---	---
PCB 52	35693-99-3	3	µg/kg	<3	5 µg/kg	---	61	111	---	---	---
PCB 66	32598-10-0	3	µg/kg	<3	5 µg/kg	---	62	111	---	---	---
PCB 77	32598-13-3	3	µg/kg	<3	5 µg/kg	---	59	114	---	---	---
PCB 101	37680-73-2	3	µg/kg	<3	5 µg/kg	---	54	117	---	---	---
PCB 105	32598-14-4	3	µg/kg	<3	5 µg/kg	---	60	115	---	---	---
PCB 118	31508-00-6	3	µg/kg	<3	5 µg/kg	---	55	117	---	---	---
PCB 126	57485-28-8	3	µg/kg	<3	5 µg/kg	---	65	112	---	---	---
PCB 128	36380-07-3	3	µg/kg	<3	5 µg/kg	---	62	116	---	---	---
PCB 138	35065-28-2	3	µg/kg	<3	5 µg/kg	---	58	117	---	---	---
PCB 153	35065-27-1	3	µg/kg	<3	5 µg/kg	---	58	117	---	---	---
PCB 169	32774-16-6	3	µg/kg	<3	5 µg/kg	---	74	111	---	---	---
PCB 170	35065-30-6	3	µg/kg	<3	5 µg/kg	---	70	112	---	---	---
PCB 180	35065-29-3	3	µg/kg	<3	5 µg/kg	---	67	114	---	---	---
PCB 187	52663-68-0	3	µg/kg	<3	5 µg/kg	---	58	118	---	---	---
Total Polychlorinated biphenyls	---	18	µg/kg	<18	---	---	---	---	---	---	---
<b>EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4133306)</b>											
Naphthalene	91-20-3	25	µg/kg	<50	500 µg/kg	---	80	114	---	---	---
Acenaphthylene	208-96-8	25	µg/kg	<50	500 µg/kg	---	53	111	---	---	---
Acenaphthene	83-32-9	25	µg/kg	<50	500 µg/kg	---	73	117	---	---	---
Fluorene	86-73-7	25	µg/kg	<50	500 µg/kg	---	82	117	---	---	---
Phenanthrene	85-01-8	25	µg/kg	<50	500 µg/kg	---	82	116	---	---	---
Anthracene	120-12-7	25	µg/kg	<50	500 µg/kg	---	39	126	---	---	---
Fluoranthene	206-44-0	25	µg/kg	<50	500 µg/kg	---	78	119	---	---	---
Pyrene	129-00-0	25	µg/kg	<50	500 µg/kg	---	72	122	---	---	---
Benz(a)anthracene	56-55-3	25	µg/kg	<50	500 µg/kg	---	69	111	---	---	---
Chrysene	218-01-9	25	µg/kg	<50	500 µg/kg	---	87	119	---	---	---





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 (%)	RPD (%)
EP-076HK: Polycyclic Aromatic Hydrocarbons (PAHs) (QC Lot: 4133306) - Continued							
Benzo(b)fluoranthene	205-99-2	25	µg/kg	<50	500 µg/kg	77.3	69
Benzo(k)fluoranthene	207-08-9	25	µg/kg	<50	500 µg/kg	111	74
Benzo(a)pyrene	50-32-8	25	µg/kg	<50	500 µg/kg	84.7	40
Indeno(1,2,3-cd)pyrene	193-39-5	25	µg/kg	<50	500 µg/kg	88.4	47
Dibenz(a,h)anthracene	53-70-3	25	µg/kg	<50	500 µg/kg	73.2	54
Benzo(g,h,i)perylene	191-24-2	25	µg/kg	<50	500 µg/kg	80.2	59
Low M.W. PAHs	---	550	µg/kg	<550	---	---	---
High M.W. PAHs	---	1700	µg/kg	<1700	---	---	---
Matrix: WATER							
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 (%)	RPD (%)
EP-390: Triorganotins (QC Lot: 4137485)							
Tributyltin	56573-85-4	5	ngSn/L	<5	2 ngSn/L	76.0	70

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) 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	Spike Recovery (%)	RPD (%)
EP-390: Triorganotins (QC Lot: 4137485)							
Tributyltin	56573-85-4	5	ngSn/L	<5	2 ngSn/L	76.0	70

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	MS	MSD	RPD (%)
EG: Metals and Major Cations (QC Lot: 4136010)							
HK1601855-011	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	82.2	---	---
		EG020: Cadmium	7440-43-9	5 mg/kg	93.7	---	---
		EG020: Chromium	7440-47-3	5 mg/kg	79.8	---	---
		EG020: Copper	7440-50-8	5 mg/kg	104	---	---
		EG020: Lead	7439-92-1	5 mg/kg	# Not Determined	---	---
		EG020: Mercury	7439-97-6	0.1 mg/kg	101	---	---
		EG020: Nickel	7440-02-0	5 mg/kg	78.8	---	---
		EG020: Silver	7440-22-4	5 mg/kg	75.0	---	---
		EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined	---	---

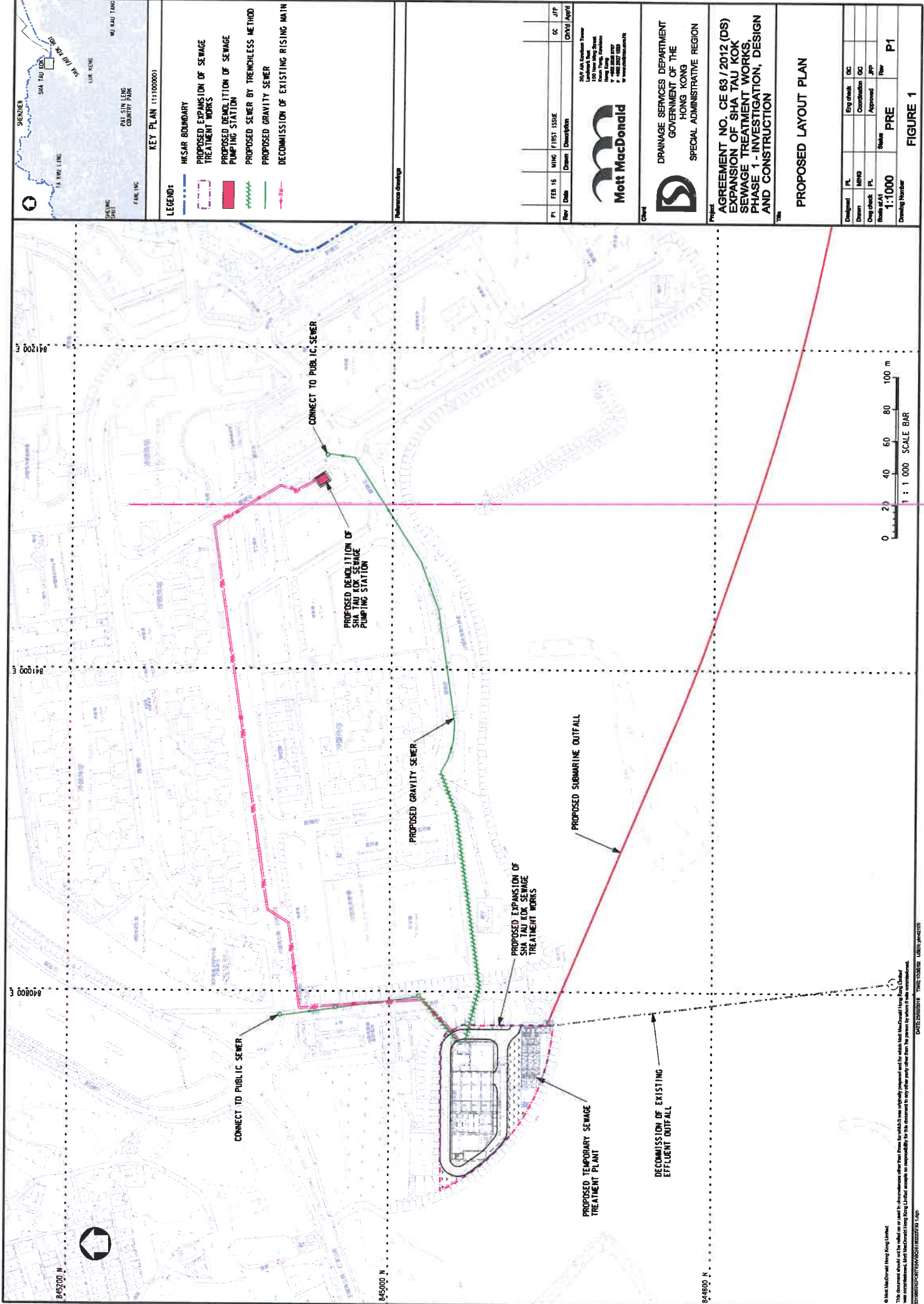
  

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	MS	MSD	RPD (%)
EP-390: Triorganotins (QC Lot: 4137485)							
HK1606127-001	S1 - SURFACE (GRAB) + OM-0.3M BELOW SEABED	Tributyltin	56573-85-4	2 ngSn/L	101	---	---



**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



**KEY PLAN (1:100000)**

**LEGEND:**

- HKSAR BOUNDARY
- PROPOSED EXPANSION OF SEWAGE TREATMENT WORKS
- PROPOSED DEMOLITION OF SEWAGE PUMPING STATION
- PROPOSED SEWER BY TRENCHLESS METHOD
- PROPOSED GRAVITY SEWER
- DECOMMISSION OF EXISTING RISING MAIN

Reference Drawing

PI	FEB 16	WING	FIRST ISSUE	GC	JFP
Rev	Date	Drawn	Description	Checked	Approved

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**Client**

DRAINAGE SERVICES DEPARTMENT  
 GOVERNMENT OF THE  
 HONG KONG  
 SPECIAL ADMINISTRATIVE REGION

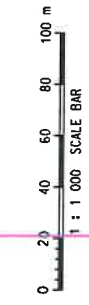
**Project**

AGREEMENT NO. CE 69 / 2012 (DS)  
 EXPANSION OF SHA TAU KOK  
 SEWAGE TREATMENT WORKS,  
 PHASE 1 - INVESTIGATION, DESIGN  
 AND CONSTRUCTION

**PROPOSED LAYOUT PLAN**

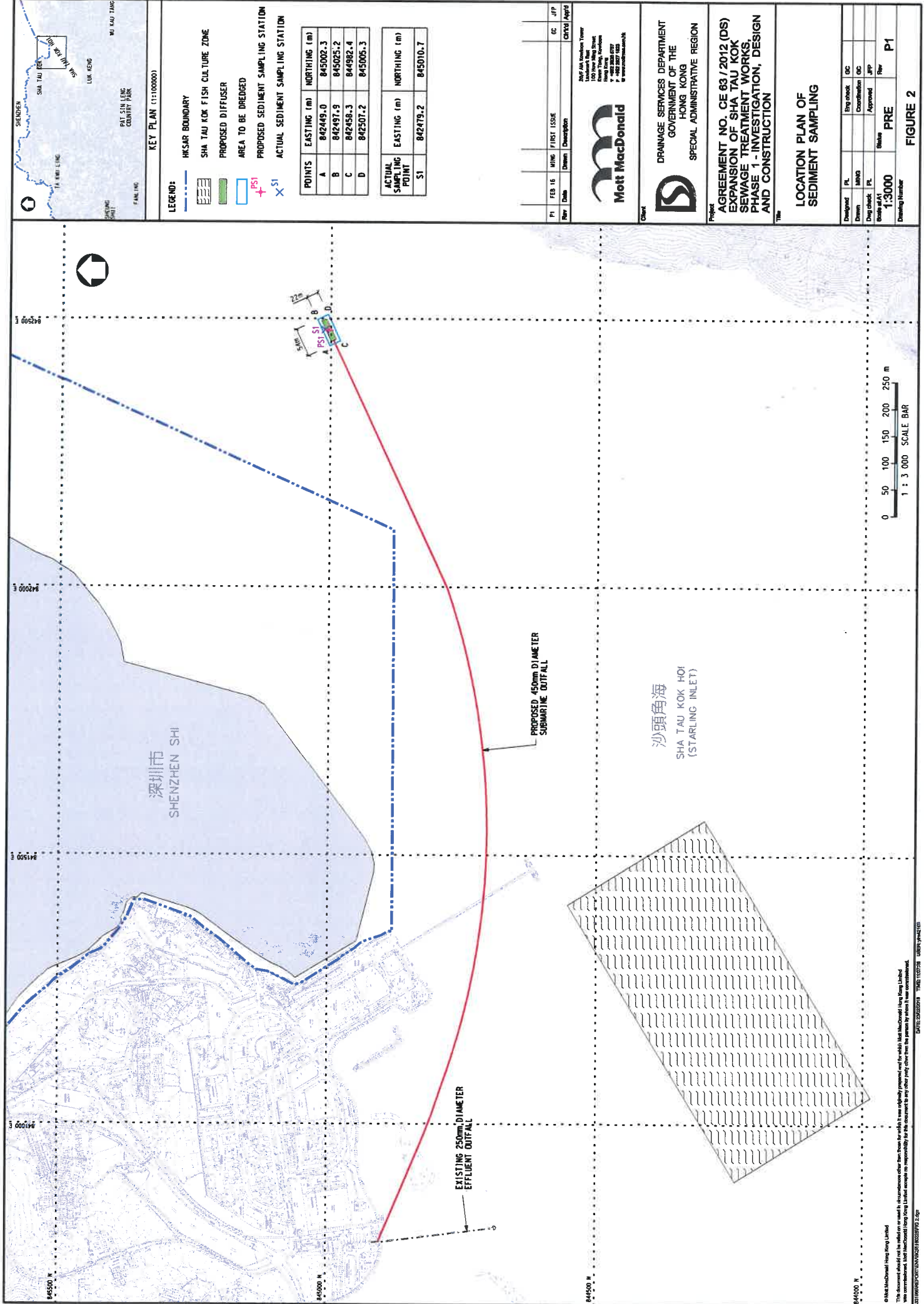
Designed	PL	Eng check	GC
Drawn	HWB	Coordination	GC
Eng check	PL	Approved	JFP
Scale	1:1000	State	PRE
Drawing Number			P1

**FIGURE 1**



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DATE: 2012/02/16 TIME: 09:56:02 USER: jw441616



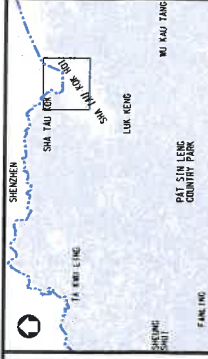
POINTS	EASTING (m)	NORTHING (m)
A	84249.0	84500.3
B	84249.9	84502.2
C	84248.3	84492.4
D	84250.2	84500.3

ACTUAL SAMPLING POINT	EASTING (m)	NORTHING (m)
S1	84249.2	84500.7

- LEGEND:**
- HKSAR BOUNDARY
  - SHA TAU KOK FISH CULTURE ZONE
  - PROPOSED DIFFUSER
  - AREA TO BE DREDGED
  - PROPOSED SEDIMENT SAMPLING STATION
  - ACTUAL SEDIMENT SAMPLING STATION

KEY PLAN (1:100000)



No.	Date	Revision	Description	Drawn	Checked	App'd
01	FEB 16	1	ISSUE			JFP
						GC



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Project  
**AGREEMENT NO. CE 63 / 2012 (DS)**  
**EXPANSION OF SHA TAU KOK**  
**SEWAGE TREATMENT WORKS.**  
**PHASE 1 - INVESTIGATION, DESIGN**  
**AND CONSTRUCTION**

Title  
**LOCATION PLAN OF**  
**SEDIMENT SAMPLING**

Designed	PL	Eng check	GC
Drawn	MKB	Drawn/checked	GC
Eng check	PL	Approved	JFP
Scale	1:3000	Sheet	PRE
Drawing Number		Rev	P1

FIGURE 2

