

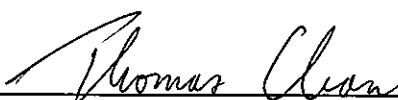
MTR Corporation Limited

South Island Line (East)

On-site Reuse Sediment Trial Test Results Report

April 2013

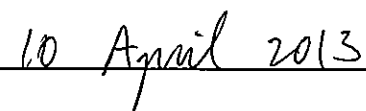
Verified by:

  
\_\_\_\_\_

Thomas Chan

Independent Environmental Checker

Date:

  
\_\_\_\_\_

MTR Corporation Limited

South Island Line (East)

On-site Reuse Sediment Trial Test Results Report

April 2013

Certified by:



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Richard Kwan

Environmental Team Leader

Date:

10 APR 2013

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## **Mass Transit Railway Corporation South Island Line (East) Contract 903 - Ocean Park Station, Wong Chuk Hang Station, Viaducts and Aberdeen Channel Bridge**

### **Trial Mix testing Result of excavated marine sediment treatment to replace marine disposal**

#### 1/. Background

LCA, the Contractor of 903 of SIL(E), proposed to reuse the excavated marine sediment on site. According to the EP – 407/2010/B conditions 2.17 and 2.18, LCA proposed to carry out Cement Stabilization/ Solidification (CS/S) Treatment for On-site Re-use of excavated marine sediment, and the trial test result would be submitted to EPD for approval.

#### 2/. Before treatment

Sample of excavated marine sediment had been collected and tested in March 2012 before any treatment. TCLP testing method had been conducted by a HOKLAS accredited laboratory, the concentration in TCLP leachate result had been shown, please refer to the section 4 Table 1 as below.

#### 3/. Trial Mix Treatment Requirement

According to our proposal which approved by EPD and recorded in the EP clause 2.17, the Cement Stabilization/ Solidification (CS/S) Treatment is identified as the final remediation methods for the excavated marine sediment. The trail mix of CS/S Treatment sampling is required to collect and conducted with the TCLP testing. The sample testing result in accordance with requirements as set out in Table 1 which recorded in the VEP application document, shown as below:

**Table 1 – Summary of treatment target for metals**

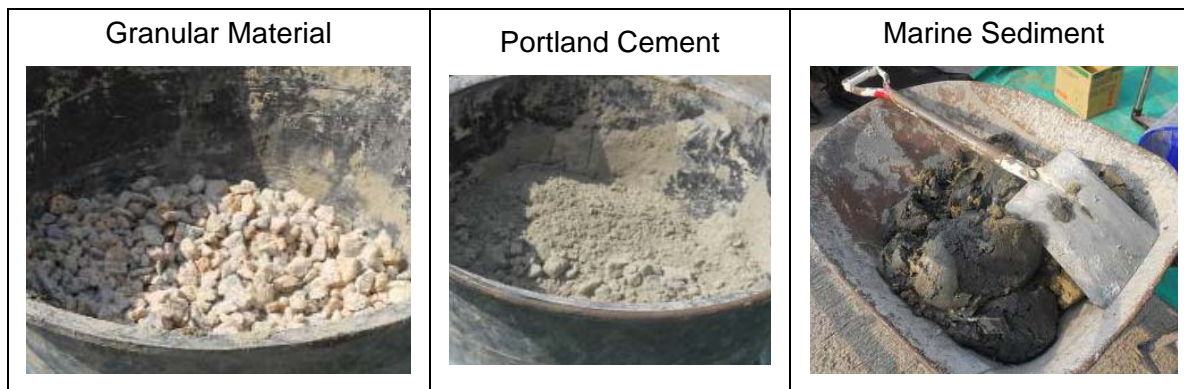
Metal	Concentration in TCLP leachate before treatment (mg/L)	Test requirement	Target concentration in TCLP leachate after treatment (mg/L)
Antimony	< 0.1	< 1.15 mg/L	NA
Arsenic	< 0.1	< 5 mg/L	NA
Barium	0.2	< 21 mg/L	NA
Cadmium	< 0.01	< 0.11 mg/L	NA
Chromium	< 0.1	< 0.6 mg/L	NA
Cobalt	< 0.1	Reduction of 90% in mobility	NA
Copper	0.3	Reduction of 90% in mobility	Undetectable*
Lead	< 0.1	< 0.75 mg/L	NA
Manganese	4.5	Reduction of 90% in mobility	< 0.45
Molybdenum	< 0.1	Reduction of 90% in mobility	NA
Nickel	< 0.1	< 11 mg/L	NA
Tin	< 0.1	Reduction of 90% in mobility	NA
Zinc	0.8	< 4.3 mg/L	NA
Mercury	< 0.002	< 0.025 mg/L	NA

\* Since the limit of reporting (LOR) of Copper is 0.1 mg/L, the target concentration in TCLP leachate after treatment, where should be 0.03 mg/L, is undetectable.

**4/.Trial Mix Measure**

The trial mix had been carried out on 24 January 2013 under the ET and IEC supervision on site.

Raw Material for mixing:



Proportion of mixing material:

Trial Mix Item	Mix Proportions (lbs)		
	Granular Material	Portland Cement	Marine Sediment
Sediment Trial_01	1.5	1.5	7
Sediment Trial_02	2	1	7
Sediment Trial_03	1	2	7

\* Total weight of each sample is 10lbs

Procedure:

- (1) Weighting the granular material, portland cement and marine sediment according to the above table listed proportion
- (2) Mixing the weighted raw material as a sample
- (3) Sampling is required to collect by cube mold and sampling bottle for each trial
- (4) Put the remain mixed material into the storage tank, and wait for the bulk mix implementation

Once the sample of the trial mixture is confirmed satisfactory against all required standards with both TCLP and UCS test, the remaining marine sediment will be mixed with the proposed ratio of granular material and cement to form the CS/S product. Again, all of the above tests will be conducted by a HOKLAS accredited laboratory.

#### 5/. Trial Mix Testing Result

Three samples result are shown in Appendix 1 (TCLP Test) and Appendix 2 (UCS Test). According to the test result, three samples are satisfied the Table 1 concentration target concentration in TCLP leachate and the compressive strength are also comply with the acceptance criterion in UCS Test leachate after treatment.

From the engineer perspective, "Sediment Trial\_01" would be adopted for the further bulk mix due to the strength concern as it is the most strongest amongst the three samples in UCS Test leachate.

# Appendix 1



### CERTIFICATE OF ANALYSIS

Client	: LEIGHTON CONTRACTORS (ASIA) LTD	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 5
Contact	: MS KIMBERLY WONG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1302370
Address	: LEIGHTON CONTRACTORS (ASIA) LIMITED SIL (E) 903 SITE OFFICE, G/F, 25 OCEAN PARK ROAD, ABERDEEN HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong	Amendment	: 1
E-mail	: Kimberly.wong@leightonasia.com	E-mail	: Godfrey.Chan@alsglobal.com	Date Samples Received	: 25-JAN-2013
Telephone	: ----	Telephone	: +852 2610 1044	Issue Date	: 15-FEB-2013
Facsimile	: ----	Facsimile	: +852 2610 2021	No. of samples received	: 6
Project	: MTR SIL(E) CONTRACT 903	Quote number	: ----	No. of samples analysed	: 3
Order number	: 196361				
C-O-C number	: ----				
Site	: ----				

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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*

*Position*

*Authorised results for*

**Fung Lim Chee, Richard**

**General Manager**

**Inorganics**



### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 06-FEB-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: **HK1302370**

Project name: MTR SIL(E) Contract 903 - Ocean Park Station, Wong Chuk Hang Station, Viaducts and Aberdeen Channel Bridge.

Sample(s) were picked up from client by ALS Technichem (HK) staff in a chilled condition.

TCLP leachate sample(s) were filtered prior to dissolved metal analysis.

The metal concentrations reported are those determined on the TCLP leachate. Extraction Fluid #1 pH 4.88 - 4.98.



**Analytical Results**

Sub-Matrix: TCLP LEACHATE

				Client sample ID	SEDIMENT TRIAL_01	SEDIMENT TRIAL_02	SEDIMENT TRIAL_03		
				Client sampling date / time	24-JAN-2013 15:45	24-JAN-2013 15:55	24-JAN-2013 16:00		
Compound	CAS Number	LOR	Unit		HK1302370-001	HK1302370-002	HK1302370-003		
<b>EG: Metals and Major Cations - Filtered</b>									
EG020: Antimony	7440-36-0	0.1	mg/L		<0.1	<0.1	<0.1		
EG020: Arsenic	7440-38-2	0.1	mg/L		<0.1	<0.1	<0.1		
EG020: Barium	7440-39-3	0.1	mg/L		<b>0.3</b>	<b>0.2</b>	<b>0.2</b>		
EG020: Cadmium	7440-43-9	0.01	mg/L		<0.01	<0.01	<0.01		
EG020: Chromium	7440-47-3	0.1	mg/L		<0.1	<0.1	<0.1		
EG020: Cobalt	7440-48-4	0.1	mg/L		<0.1	<0.1	<0.1		
EG020: Copper	7440-50-8	0.1	mg/L		<0.1	<0.1	<0.1		
EG020: Lead	7439-92-1	0.1	mg/L		<0.1	<0.1	<0.1		
EG020: Manganese	7439-96-5	0.1	mg/L		<0.1	<0.1	<0.1		
EG020: Molybdenum	7439-98-7	0.1	mg/L		<0.1	<0.1	<0.1		
EG020: Nickel	7440-02-0	0.1	mg/L		<0.1	<0.1	<0.1		
EG020: Tin	7440-31-5	0.1	mg/L		<0.1	<0.1	<0.1		
EG020: Zinc	7440-66-6	0.1	mg/L		<0.1	<0.1	<0.1		
EG036: Mercury	7439-97-6	0.002	mg/L		<0.002	<0.002	<0.002		
<b>Sample Preparation Method</b>									
E-TCLP: Extraction Fluid Number	----	-	--		1	1	1		



**Laboratory Duplicate (DUP) Report**

Matrix: WATER				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
<b>EG: Metals and Major Cations - Filtered (QC Lot: 2714867)</b>								
HK1302370-003	SEDIMENT TRIAL_03	EG020: Cadmium	7440-43-9	0.01	mg/L	<0.01	<0.01	0.0
		EG020: Antimony	7440-36-0	0.1	mg/L	<0.1	<0.1	0.0
		EG020: Arsenic	7440-38-2	0.1	mg/L	<0.1	<0.1	0.0
		EG020: Barium	7440-39-3	0.1	mg/L	0.2	0.2	0.0
		EG020: Chromium	7440-47-3	0.1	mg/L	<0.1	<0.1	0.0
		EG020: Cobalt	7440-48-4	0.1	mg/L	<0.1	<0.1	0.0
		EG020: Copper	7440-50-8	0.1	mg/L	<0.1	<0.1	0.0
		EG020: Lead	7439-92-1	0.1	mg/L	<0.1	<0.1	0.0
		EG020: Manganese	7439-96-5	0.1	mg/L	<0.1	<0.1	0.0
		EG020: Molybdenum	7439-98-7	0.1	mg/L	<0.1	<0.1	0.0
		EG020: Nickel	7440-02-0	0.1	mg/L	<0.1	<0.1	0.0
		EG020: Tin	7440-31-5	0.1	mg/L	<0.1	<0.1	0.0
		EG020: Zinc	7440-66-6	0.1	mg/L	<0.1	<0.1	0.0
<b>EG: Metals and Major Cations - Filtered (QC Lot: 2714868)</b>								
HK1302370-003	SEDIMENT TRIAL_03	EG036: Mercury	7439-97-6	0.002	mg/L	<0.002	<0.002	0.0

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

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 (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
<b>EG: Metals and Major Cations - Filtered (QC Lot: 2714867)</b>												
EG020: Antimony	7440-36-0	0.001	mg/L	<0.1	1 mg/L	91.9	----	78	106	----	----	
EG020: Arsenic	7440-38-2	0.01	mg/L	<0.1	1 mg/L	93.7	----	81	109	----	----	
EG020: Barium	7440-39-3	0.001	mg/L	<0.1	1 mg/L	93.7	----	83	113	----	----	
EG020: Cadmium	7440-43-9	0.0002	mg/L	<0.01	1 mg/L	94.2	----	81	109	----	----	
EG020: Chromium	7440-47-3	0.001	mg/L	<0.1	1 mg/L	92.6	----	80	110	----	----	
EG020: Cobalt	7440-48-4	0.001	mg/L	<0.1	1 mg/L	93.3	----	82	110	----	----	
EG020: Copper	7440-50-8	0.001	mg/L	<0.1	1 mg/L	89.1	----	83	107	----	----	
EG020: Lead	7439-92-1	0.001	mg/L	<0.1	1 mg/L	92.7	----	82	108	----	----	
EG020: Manganese	7439-96-5	0.001	mg/L	<0.1	1 mg/L	90.8	----	80	114	----	----	
EG020: Molybdenum	7439-98-7	0.001	mg/L	<0.1	1 mg/L	99.5	----	84	114	----	----	
EG020: Nickel	7440-02-0	0.001	mg/L	<0.1	1 mg/L	90.4	----	83	109	----	----	
EG020: Tin	7440-31-5	0.01	mg/L	<0.1	1 mg/L	97.9	----	32	148	----	----	
EG020: Zinc	7440-66-6	0.01	mg/L	<0.1	1 mg/L	88.3	----	77	111	----	----	
<b>EG: Metals and Major Cations - Filtered (QC Lot: 2714868)</b>												
EG036: Mercury	7439-97-6	0.00005	mg/L	<0.002	0.002 mg/L	104	----	85	115	----	----	



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

Matrix: WATER

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
					MS	MSD	Low	High	Value	Control Limit
<b>EG: Metals and Major Cations - Filtered (QC Lot: 2714867)</b>										
HK1302370-001	SEDIMENT TRIAL_01	EG020: Antimony	7440-36-0	1 mg/L	95.1	96.3	75	125	1.3	----
		EG020: Arsenic	7440-38-2	1 mg/L	94.4	94.6	75	125	0.2	----
		EG020: Barium	7440-39-3	1 mg/L	101	102	75	125	1.0	----
		EG020: Cadmium	7440-43-9	1 mg/L	99.0	98.1	75	125	0.8	----
		EG020: Chromium	7440-47-3	1 mg/L	94.5	96.4	75	125	1.9	----
		EG020: Cobalt	7440-48-4	1 mg/L	95.6	96.5	75	125	1.0	----
		EG020: Copper	7440-50-8	1 mg/L	97.2	97.5	75	125	0.2	----
		EG020: Lead	7439-92-1	1 mg/L	92.5	90.9	75	125	1.8	----
		EG020: Manganese	7439-96-5	1 mg/L	91.0	91.8	75	125	0.9	----
		EG020: Molybdenum	7439-98-7	1 mg/L	107	105	75	125	2.3	----
		EG020: Nickel	7440-02-0	1 mg/L	92.7	93.1	75	125	0.5	----
		EG020: Tin	7440-31-5	1 mg/L	98.5	98.3	75	125	0.2	----
EG020: Zinc	7440-66-6	1 mg/L	88.7	90.2	75	125	1.7	----		
<b>EG: Metals and Major Cations - Filtered (QC Lot: 2714868)</b>										
HK1302370-001	SEDIMENT TRIAL_01	EG036: Mercury	7439-97-6	0.002 mg/L	98.0	----	75	125	----	----

# Appendix 2



## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES

### SUB-CONTRACTING REPORT

CONTACT	: MS KIMBERLY WONG	WORK ORDER	: <b>HK1304250</b>
CLIENT	: <b>LEIGHTON CONTRACTORS (ASIA) LTD</b>	SUB-BATCH	: 1
ADDRESS	: LEIGHTON CONTRACTORS (ASIA) LIMITED SIL (E) 903 SITE OFFICE, G/F, 25 OCEAN PARK ROAD, ABERDEEN HONG KONG	DATE RECEIVED	: 18-FEB-2013
PROJECT	: MTR SIL(E) CONTRACT 903	DATE OF ISSUE	: 27-FEB-2013
		NO. OF SAMPLES	: 3
		CLIENT ORDER	: 196361

### General Comments

- Project name: MTR SIL(E) Contract 903 - Ocean Park Station, Wong Chuk Hang Station, Viaducts and Aberdeen Channel Bridge.
- Sample(s) were picked up from client by ALS Technichem (HK) staff in a chilled condition.
- Sediment sample(s) analysed on an as received basis. Result(s) reported on a dry weight basis.
- UCS was subcontracted to and analysed by Geotechnics & Concrete Engineering ( H.K.) Ltd (GCE).

### Signatories

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

Richard Fung

General Manager

This is the Final Report and supersedes any preliminary report with this batch number.  
Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

WORK ORDER : HK1304250  
SUB-BATCH : 1  
CLIENT : LEIGHTON CONTRACTORS (ASIA) LTD  
PROJECT : MTR SIL(E) CONTRACT 903



ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK1304250-001	SEDIMENT TRIAL_01	SEDIMENT	15-FEB-2013 14:25	GCD130204805
HK1304250-002	SEDIMENT TRIAL_02	SEDIMENT	15-FEB-2013 14:35	GCD130204805
HK1304250-003	SEDIMENT TRIAL_03	SEDIMENT	15-FEB-2013 14:40	GCD130204805



**REPORT ON DETERMINATION OF COMPRESSIVE STRENGTH OF CONCRETE CUBE**

Report No. : GCD130204805(A)

Date of Issue : 18-03-2013

**Sample Details as Supplied by Client :**

Client : ALS Technichem (HK) Pty Ltd. Contract No. : - W.O. No. / Job No. : -  
 Address : 11/F., Chung Shun Knitting Centre, 1-3 Wing Yip St., Kwai Chung, N.T., Hong Kong Audit / Request No. : -  
 Project / Site : -

Location in Works of Concrete Batch Sampled : -

Supplier	: -	Plant	: -		
Source of Coarse Agg.	: -	Source of Fine Agg.	: -		
Cement Brand	: -	Admixture Brand	: -	Dosage	: -
Concrete Mix I.D. No.	: -	Concrete Grade	: -	Designed / Measured Slump	: -
Cement Content	: -	W/C Ratio	: -	A/C Ratio	: -
PFA Content	: -	PFA Source	: -		
Date Cast	: 15-02-2013	Time of Adding Water to Mix	: -		
Date of Sampling	: 15-02-2013	Time of Sampling	: -		
Place of Sampling	: -	Place / Time of Making Cube	: -		
Method of Compaction	: -	Name of Person Making Cube	: -		
Site Curing Method	: -	Site Max. / Min. Temperature	: -		
No. of Cubes	: 3	Nominal Size	: 100 mm	Test at Age of	: 4 days

**Certificate of Sampling, Slump Test, Cube Making and Curing :**

A Certificate of Sampling, Slump Test, Cube Making and Curing is not available.

**Laboratory Test Results :**

Date Received : 19-02-2013 Date / Time Tested : 19-02-2013 14:15 GCE Test Unit Reg. No. : MI13012  
 Curing Method : In Air Max. / Min. Temp. : - / - Cube Age at Test : 4 days  
 Test Location : No. 6, Ko Shan Road, Ground Floor, Hung Hom, Kowloon, Hong Kong

Laboratory Reference Number	--	--	--	--	--	--
Cube Mark	HK1304250-001 SEDIMENT TRIAL_01	HK1304250-002 SEDIMENT TRIAL_02	HK1304250-003 SEDIMENT TRIAL_03	--	--	--
Mould No.	--	--	--	--	--	--
Mass of Specimen in Air	kg 1.715	1.700	1.720	--	--	--
Mass of Specimen in Water	kg --	--	--	--	--	--
Length of Specimen	mm 100.4	100.6	100.3	--	--	--
Width of Specimen	mm 100.5	100.5	100.6	--	--	--
Height of Specimen	mm 100.0	101.0	100.4	--	--	--
As-received Density	-Vol. by Calculation	kg/m <sup>3</sup> 1700	1660	1700	--	--
	-Vol. by Water Displacement	kg/m <sup>3</sup> --	--	--	--	--
Maximum Load at Failure	kN 25.3	23.4	16.5	--	--	--
Compressive Strength	kPa 2520.0	2310.0	1630.0	--	--	--
Observation Code	P	P	P	--	--	--
Failure Mode	S	S	S	--	--	--

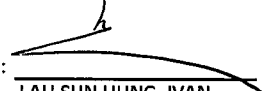
**Legend :**

A - Dry on Receipt; B - Poor Compaction; C - Honeycombing; D - Damaged Edge; E - Damaged Corner; F - Irregular; G - Oversize;  
 H - Undersize; P - No Irregularity in Squareness; S - Satisfactory Failure; U - Unsatisfactory Failure.

Remarks : 1) Martix : Cement Cube  
 2) The maximum load at failure of the specimens are lower than the minimum calibrated range of compression machine (i.e. 50kN).  
 3) This report is an amendment of and supplement to report no. GCD130204805.

-END-

Tested By : Y.F. Fung

Approved Signatory :   
 LAU SUN HUNG, IVAN  
 Post : Senior Testing Manager

Checked By : 