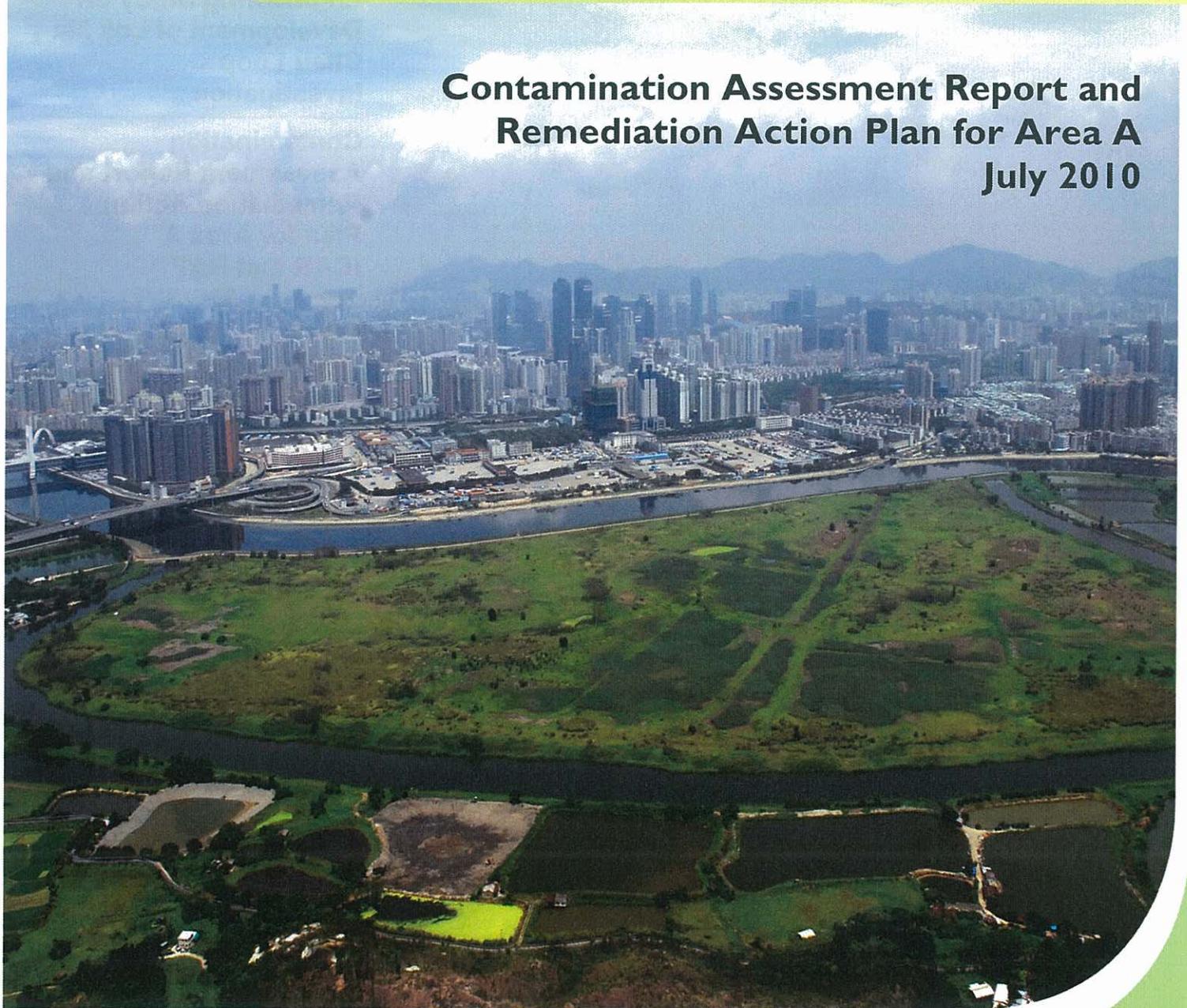


Agreement No. CE 53/2008 (CE)

PLANNING AND ENGINEERING
STUDY ON DEVELOPMENT OF
LOK MA CHAU LOOP
- INVESTIGATION

**Contamination Assessment Report and
Remediation Action Plan for Area A**
July 2010



Planning Department and
Civil Engineering and
Development Department

**Agreement No.
CE6153/20072008(CE)
Planning and
Engineering Study on
Development of Lok Ma
Chau Loop -
Investigation**

**Contamination
Assessment Report and
Remediation Action
Plan for Area A
(CAR and RAP
for Area A)**

July 2010

Ove Arup & Partners Hong Kong Ltd
Level 5, Festival Walk, 80 Tat Chee Avenue, Kowloon Tong, Kowloon, Hong Kong
Tel +852 2528 3031 Fax +852 2268 ____
www.arup.com

This report takes into account the particular instructions and requirements of our client.

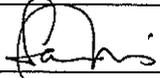
It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party

Job number 209840

Job title	Agreement No. CE6153/20072008(CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation	Job number 209840
-----------	---	----------------------

Document title	Contamination Assessment Report and Remediation Action Plan for Area A	File reference
----------------	--	----------------

Document ref

Revision	Date	Filename	Loop-Draft CAR_Area A_Rev0		
Draft 0	10/05/10	Description	First submission to EPD for review and comment		
			Prepared by	Checked by	Approved by
		Name	Various	Thomas Chan	Sam Tsoi
		Signature			
Draft 1	06/07/10	Filename	Loop-Draft CAR_Area A_Rev1		
		Description	Revised in accordance with EPD's comments on 28 May 2010		
			Prepared by	Checked by	Approved by
		Name	Various	Thomas Chan	Sam Tsoi
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			

Issue Document Verification with Document

Contents

	Page	
1	Introduction	4
	1.1 Background	4
	1.2 Study Area	4
	1.3 Objective	5
	1.4 Statutory Legislation and Evaluation Criteria	5
2	Summary of Sampling and Testing Strategy	6
	2.1 Background of Potentially Contaminated Site	6
	2.2 Chemicals of Concern	7
	2.3 Proposed Sampling Locations and Depths	8
3	Site Investigation Works	9
	3.1 Soil and Groundwater Sampling	9
	3.2 Analytical Parameters	11
	3.3 HOKLAS Accredited Laboratory	12
	3.4 Strata Logging	12
4	Assessment Criteria	13
5	Interpretation of Laboratory Testing Results	15
	5.1 Soil Contamination	15
	5.2 Groundwater Contamination	16
	5.3 Elutriate Test	16
6	Possible Soil Contamination Extent	17
	6.1 Estimation of Possible Soil Contamination Extent	17
	6.2 Remediation Strategy	19
7	Remediation Action Plan	21
	7.1 Objective	21
	7.2 Potential Remediation Methods	21
	7.3 Nature of Arsenic	23
	7.4 Proposed Remediation Method	23
	7.5 Outline Process and Operation of Remediation	24
	7.6 Mitigation Measures and Safety Measures	28
	7.7 Remediation Report	29
8	Conclusion and Recommendation	30

Figures

- Figure 1.1 Study Area Plan
- Figure 2.1 Location of Potentially Contaminated Site A
- Figure 2.2 Locations of Proposed Sampling Boreholes in Site A
- Figure 3.1 Locations of As-built Sampling Boreholes in Site A
- Figure 5.1 Locations of 5 Concerned Boreholes with Arsenic Contamination
- Figure 5.2 Locations of Additional Boreholes
 - Figure 5.2.1 Locations of Additional Boreholes for A-S01
 - Figure 5.2.2 Locations of Additional Boreholes for A-S03
 - Figure 5.2.3 Locations of Additional Boreholes for A-S20
 - Figure 5.2.4 Locations of Additional Boreholes for A-S24
 - Figure 5.2.5 Locations of Additional Boreholes for A-SG10
- Figure 6.1 Locations of Possible Contaminated Zones
 - Figure 6.1.1 Location of Possible Contaminated Zone A-S01
 - Figure 6.1.2 Location of Possible Contaminated Zone A-S03
 - Figure 6.1.3 Location of Possible Contaminated Zone A-S20
 - Figure 6.1.4 Location of Possible Contaminated Zone A-S24
 - Figure 6.1.5 Location of Possible Contaminated Zone A-SG10

Appendices

- Appendix A Strata Log Records of Boreholes
- Appendix B RBRGs Criteria
- Appendix C Intervention Value downloaded from the website of Ministry of Housing, Spatial Planning and Environment, Netherland
- Appendix D Analytical Results of Soil Samples
- Appendix E Analytical Results of Soil Samples of 15 Additional Boreholes
- Appendix F Analytical Results of Groundwater Samples
- Appendix G Analytical Results of Elutriate Samples
- Appendix H Laboratory Testing Reports of Soil Samples, Groundwater Samples and Elutriate Samples
- Appendix I Laboratory Testing Reports of Soil Samples of 15 Additional Boreholes

1 Introduction

1.1 Background

On 26 May 2009, Planning Department (PlanD) in association with Civil Engineering and Development Department (CEDD) commissioned Ove Arup & Partners Hong Kong Limited (Arup) as the Consultant for undertaking the “Planning and Engineering Study on Development of Lok Ma Chau Loop – Investigation” (the Study).

The Study commenced on 1 June 2009 and is expected to complete before end of 2011 in 28 months' time to carry out planning, environmental and engineering feasibility studies and associated site investigation works with a view to formulating land use and development proposals, confirming the feasibility of implementing the land use and development proposals, carrying out preliminary engineering design, and formulating the implementation strategies and programme for delivering the Development and Infrastructure.

Section 3.4.9.4 of the EIA Study Brief No.: ESB-201/2008 for the LMC Loop Development project dated January 2009 issued by the EPD specified that a land contamination assessment shall be undertaken and that a Contamination Assessment Plan (CAP) shall be submitted to the EPD prior to conducting the assessment.

The CAP for Area A has been prepared and submitted to EPD in July 2009. EPD indicated no further comments on the CAP for Area A in October 2009. Environmental site investigation works were carried out between 25 November 2009 and 1 February 2010.

1.2 Study Area

As a result of the training of the Shenzhen River, which serves as the administrative boundary between Hong Kong and Shenzhen, an area of about 87 ha, previously lying to the north of the river course, became situated to the south of the re-aligned river course and falls within the boundary of the HKSAR. The area, commonly known as the Lok Ma Chau Loop (the Loop), was used as a dumping ground for mud dredged from the river training work, some of which were contaminated.

The study area comprises the area within the LMC Loop (Area A in **Figure 1.1**) together with the adjoining area in Hong Kong (Area B in **Figure 1.1**). A separate study for the adjoining area in Shenzhen (i.e. Area C of **Figure 1.1**) has been commissioned by the Shenzhen side.

The LMC Loop is located near several major cross-boundary transport nodes including the Lok Ma Chau Control Point, the Lok Ma Chau Station of the Lok Ma Chau Spur Line and the San Tin Interchange. To the north across the Shenzhen River is the Huanggang Control Point of Shenzhen. To the southwest is the Mai Po Nature Reserve and to the northeast is Hoo Hok Wai, comprising fish ponds of high ecological value.

Site characteristics of the LMC Loop and its surrounding land uses are:

- predominantly flat land with grasses and shrubs on it;

- surrounding area mainly rural in nature, comprising mostly wetland, natural landscape, hilly terrain, woodland, village settlements, agricultural land and fishponds;
- the Mai Po Nature Reserve, i.e. the Ramsar Site, is at about 5.4 km to the southwest of the Loop;
- the LMC Station of the LMC Spur Line and the LMC Spur Line Boundary Control Point (BCP) is located in close proximity to the southwest;
- across the Shenzhen River to the north is the Futian CBD of Shenzhen, where the Huanggang Station of Shenzhen Metro Line can be connected to the LMC Station via the LMC Spur Line BCP; and
- apart from the LMC Spur Line BCP, the Loop also lies in close proximity to the Lok Ma Chau BCP.

1.3 Objective

Land contamination impact is one of the issues to be addressed in the EIA Study. An assessment shall be conducted prior to the construction in Area A to assess any potential land contamination.

EPD indicated no further comment on the Contamination Assessment Plan (CAP) for Area A in October 2009. Site investigation works were carried out between 25 November 2009 and 1 February 2010 by Tysan Foundation Limited. This Contamination Assessment Report (CAR) and Remediation Action Plan (RAP) summarize the following issues:

- Contamination assessment program;
- Investigation procedures and methodologies;
- Analytical results of soil and groundwater samples;
- Scope of any remedial work required; and
- The particular health and safety requirement that may be required during the works.

1.4 Statutory Legislation and Evaluation Criteria

This CAR and RAP is prepared in accordance with the following Technical Memorandum and Guidance Notes:

- Annex 19 of the Technical Memorandum on Environmental Impact Assessment Process (TM-EIA), Guidelines for Assessment of Impact On Sites of Cultural Heritage and Other Impacts (Section 3 : Potential Contaminated Land Issues);
- Guidance Notes for Investigation Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repairing/Dismantling Workshops, EPD, 1999;
- Guidance Notes for Contaminated Land Assessment and Remediation; and
- Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management, EPD, 2007.

2 Summary of Sampling and Testing Strategy

2.1 Background of Potentially Contaminated Site

Area A (i.e. former agricultural land and fish ponds in 1980s and early 1990s) was used as a dumping ground for mud extracted from Shenzhen River Training Works Stages 1 and 2. Approximately 1Mm³ contaminated mud and 3Mm³ uncontaminated mud were dredged and disposed of in Area A from year 1995 to 2000. The depth of the disposed mud in Area A was approximately 5m (i.e. include about 1m to 1.5m thick top layer of uncontaminated mud for capping). However, the disposal pattern, e.g. the disposal location and area of contaminated mud in Area A is unknown. Therefore, the entire Area A is considered as a potentially contaminated site, namely “Site A” (Figure 2.1 and Table 2.1).

Table 2.1 Potentially contaminated land use

Site ID	Location	Current Land Use	Potential Sources of Contamination	Approximate Area (m ²)	Recommended No. of Boreholes
A	Entire Lok Ma Chau Loop (Area A)	Flat land with Grasses and Shrubs	Approx. 1Mm ³ contaminated mud and 3Mm ³ uncontaminated mud were dredged from the Shenzhen River and disposed of in Area A from year 1995 to 2000. Total filling depth in Area A is about 5m, which include 1m to 1.5m thick top layer of uncontaminated mud for capping.	870,000 (87ha)	35

2.2 Chemicals of Concern

The proposed sampling and testing schedule for the chemicals of concern (COCs) associated with potential contaminants in Area A are summarized in **Table 2.2**.

Table 2.2 Sampling and testing schedule

Site ID	Borehole No.	Sample Type	No. of Samples	Testing Parameter								
				SVOCs ⁽¹⁾	Metals ⁽²⁾	PCBs	Dioxins	Cyanide, free	Chlorinated Pesticides	TOC	Grain Size / Moisture Content	
A	A-S01 to A-S25, and A-SG01 to A-SG10 (Total 35)	Soil at all 3 sampling depths	105	✓	✓	✓	✓	✓	✓	✓	✓	✓
	A-SG01 to A-SG10 (Total 10) ⁽⁴⁾	Groundwater	10	✓	✓	✓			✓	✓		
	A-SG01 to A-SG10 (Total 10) ⁽⁴⁾	Deepest soil sample (for elutriate test) ⁽³⁾	10	✓	✓	✓				✓		

Note:

- (1) Only 11 out of 19 SVOCs parameters are required for groundwater sample and soil elutriate test (refer to Appendix B for details)
- (2) Only "Mercury" test is required for groundwater sample and soil elutriate test.
- (3) The objective of Elutriate Test is to assess any potential release of contaminants from the filled mud during excavation in Area A, if required in the future.
- (4) The exact borehole locations of groundwater sampling and elutriate testing are different from the proposed locations (refer to Section 3.1.3 for details)

2.3 Proposed Sampling Locations and Depths

The sampling locations and sampling depths proposed in the CAP for Area A are in **Table 2.3**. The proposed sampling locations are shown in **Figure 2.2**.

Table 2.3 Sampling strategy for Site A

Site ID	Locations		Coordinates		Sampling Strategy	
	Area (m ²)	Borehole No.	Easting	Northing	Termination Level for Env. Sampling ⁽¹⁾	Frequency of Sampling ⁽¹⁾
A (Figure 2.1)	870,000 (87ha)	A-S01	826297	842935	5 mbgl	Drilling of borehole & collection of soil samples at the depths of 1.5m, 3.0m and 4.5m.
		A-S02	826457	842866		
		A-S03	826627	842800		
		A-S04	826089	842857		
		A-S05	826256	842804		
		A-S06	826592	842698		
		A-S07	826203	842637		
		A-S08	826370	842583		
		A-S09	826538	842530		
		A-S10	826706	842476		
		A-S11	825981	842522		
		A-S12	826149	842469		
		A-S13	826485	842361		
		A-S14	846094	842301		
		A-S15	826263	842248		
		A-S16	826431	842194		
		A-S17	826551	842192		
		A-S18	825875	842187		
		A-S19	826042	842133		
		A-S20	826341	842035		
		A-S21	825696	842043		
		A-S22	825989	841966		
		A-S23	826156	841912		
		A-S24	825822	841887		
		A-S25	825944	841825		
		A-SG01	826142	843025	5 mbgl	Drilling of borehole & collection of soil samples at the depths of 1.5m, 3.0m and 4.5m. One groundwater sample should be collected, if encountered.
		A-SG02	826423	842751		
		A-SG03	826738	842631		
		A-SG04	826035	842690		
		A-SG05	826317	842415		
A-SG06	826622	842323				
A-SG07	825928	842354				
A-SG08	826210	842080				
A-SG09	825821	842019				
A-SG10	826067	841813				

Note: (1) The proposed Termination Levels and Sampling Frequency are just for reference purpose. The exact termination levels and no. of soil/ groundwater samples of each borehole should be decided by the on-site Land Contamination Specialist.

3 Site Investigation Works

3.1 Soil and Groundwater Sampling

3.1.1 Borehole Locations

Site investigation works were carried out by Tysan Foundation Limited between 25 November 2009 and 23 December 2009. 35 boreholes were drilled for soil and groundwater sampling in accordance with the CAP for Area A. The entire SI programme was supervised by the on-site Land Contamination Specialist. The actual locations and drilling depths are summarized in **Table 3.1**.

Table 3.1 Sampling location and drilling depths

Borehole No.	Proposed Borehole in CAP for Area A		Actual Borehole Location		Termination Level for Env Sampling (mbgl)		Ground Level (mPD)
	Easting	Northing	Easting	Northing	Proposed	Actual	
A-S01	826297	842935	Same as in CAP		5	5	5.83
A-S02	826457	842866	Same as in CAP				6.22
A-S03	826627	842800	Same as in CAP				3.98
A-S04	826089	842857	Same as in CAP				6.06
A-S05	826256	842804	Same as in CAP				5.40
A-S06	826592	842698	Same as in CAP				5.15
A-S07	826203	842637	Same as in CAP				5.14
A-S08	826370	842583	Same as in CAP				5.67
A-S09	826538	842530	Same as in CAP				4.22
A-S10	826706	842476	Same as in CAP				4.63
A-S11	825981	842522	Same as in CAP				6.05
A-S12	826149	842469	826162	842481			4.42
A-S13	826485	842361	826479	842379			4.55
A-S14	846094	842301	Same as in CAP				5.37
A-S15	826263	842248	826246	842239			4.60
A-S16	826431	842194	826464	842214			4.55
A-S17	826551	842192	Same as in CAP				4.78
A-S18	825875	842187	825891	842177			5.52
A-S19	826042	842133	Same as in CAP				5.77
A-S20	826341	842035	Same as in CAP				4.57
A-S21	825696	842043	Same as in CAP				4.55
A-S22	825989	841966	Same as in CAP				4.08
A-S23	826156	841912	Same as in CAP				5.33
A-S24	825822	841887	Same as in CAP				3.55
A-S25	825944	841825	Same as in CAP				4.29
A-SG01	826142	843025	Same as in CAP				6.12
A-SG02	826423	842751	Same as in CAP				6.64
A-SG03	826738	842631	Same as in CAP				3.16
A-SG04	826035	842690	Same as in CAP				5.74
A-SG05	826317	842415	826367	842408			4.05
A-SG06	826622	842323	Same as in CAP				4.82
A-SG07	825928	842354	Same as in CAP				5.84
A-SG08	826210	842080	826180	842055			5.79
A-SG09	825821	842019	825827	842012			4.94
A-SG10	826067	841813	Same as in CAP				5.14

The as-built drawing showing the actual environmental boreholes locations is given in **Figure 3.1**.

Eight boreholes have been shifted from the original proposed locations ranged from approximately 10m to 50m due to the actual site situation and constrain, e.g. to avoid the damage of reedbed and trees. Deviation from original proposed boreholes locations are summarized in **Table 3.2**.

Table 3.2 Change of borehole locations due to site constraints

Borehole No.	Deviation from Original Location	Justification
A-S12	18m north-east of original location	Avoid damage to reedbed
A-S13	19m north-west of original location	Avoid damage to reedbed
A-S15	10m south-east of original location	Avoid damage to reedbed
A-S16	44m south-east of original location	Avoid damage to reedbed
A-S18	19m east of original location	Avoid damage to forest
A-SG05	50m south-east of original location	Avoid damage to reedbed
A-SG08	39m south-west of original location	Avoid damage to banana trees
A-SG09	10m south-east of original location	Original proposed drilling point located in water pond

3.1.2 Soil Sampling

Inspection pits from ground surface to 1.5 meter below ground level (mbgl) were excavated at each borehole location before drilling in order to determine the thickness of the top soil (i.e. Area A was capped by a layer of clean top soil after the disposal of dredged mud from Shenzhen River). The on-site observation of inspection pits indicated that the thickness of the top soil ranged approximately from 0.8mbgl to 1.5mbgl. Three U-100 undisturbed soil samples were then collected from each borehole at the depths of 1.5m (1.5-1.95mbgl), 3.0m (3.0-3.45mbgl) and 4.5m (4.5-4.95mbgl).

3.1.3 Groundwater Sampling

The Land Contamination Specialist also re-assigned the groundwater sampling locations as groundwater was not encountered at some of the original proposed groundwater sampling boreholes. Nevertheless, total of 10 groundwater samples were collected during the SI. The final groundwater sampling locations were relatively evenly distributed in Area A. The locations of groundwater sampling boreholes are shown in **Figure 3.1**.

The drill-rig casings were removed from the environmental drillhole after completion of soil sampling, and the drillhole could stand hollow without collapse as the depth of drillholes was relatively shallow (i.e. only 5m depth). As the drill-rig casing, core-head and other accessories have been decontaminated prior to the drilling, and dry drilling method (i.e. refer to **Section 3.1.4** for details) was used during the drilling, the on-site Contamination Specialist decided not to install the groundwater standpipe in

order to avoid the cross-contamination of groundwater due to placing the sand filter pack and bentonite seal during well installation. Well flushing is considered not required as no standpipe was installed and no sand filter pack/bentonite was used. The drillholes were then purged for approximately three times volumes of the drillholes by a Teflon bailer prior to groundwater sampling in order to collect freshly refilled groundwater samples. No free product was encountered during the groundwater sampling.

The pH level and temperature of the collected groundwater samples were in-situ measured. The groundwater levels before purging were also recorded. The groundwater levels, pH and temperature of groundwater samples are summarized in **Table 3.3**.

Table 3.3 Groundwater level, pH and temperature of collected groundwater samples

Borehole No.	Groundwater Level (mbgl)	pH	Temperature (°C)
A-S02	2.50	6.32	22.4
A-S07	1.36	6.25	23.2
A-S09	3.85	6.34	21.7
A-S14	3.90	6.79	21.2
A-S16	2.82	6.73	22.0
A-S24	1.70	7.18	23.8
A-SG01	3.65	6.91	23.3
A-SG03	1.85	66.7	22.9
A-SG06	2.15	6.82	21.2
A-SG09	1.45	6.78	23.3

3.1.4 Decontamination Procedures

Before drilling / excavation, the sampler and all equipment in contact with the ground were thoroughly decontaminated by phosphate-free detergent between each sampling event to minimize potential cross contamination. All drilling machines were decontaminated by phosphate free detergent and high pressure hot water jet before mobilization to site. During sampling and decontamination activities, disposable latex gloves were worn to prevent the transfer of contaminants from other sources.

Moreover, dry drilling method was adopted for the entire environmental SI in order to prevent any influence of flushing medium to the soil and groundwater testing results.

3.2 Analytical Parameters

The collected soil and groundwater samples were analyzed for the parameters in accordance with the sampling and testing schedule shown in **Table 2.2**. The testing parameters include:

- **Semi Volatile Organic Compounds (SVOCs):** Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Bis-(2-Ethylhexyl)phthalate, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Hexachlorobenzene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, Phenol, Pyrene
- **Metals:** Antimony, Arsenic, Barium, Cadmium, Chromium III, Chromium VI, Cobalt, Copper, Lead, Manganese, Mercury, Molybdenum, Nickel, Tin, Zinc
- **Dioxins / PCBs:** Dioxins (I-TEQ), PCBs
- **Cyanide:** Cyanide, free
- **Chlorinated Pesticides:** alpha-BHC, beta-BHC & gamma-BHC, delta-BHC, p,p'-DDE, p,p'-DDD, p,p'-DDT.
- **Total Organic Carbon (TOC)**
- **Grain Size / Moisture Content:** Grain Size (% <63µm) and Moisture Content (%)

3.3 HOKLAS Accredited Laboratory

A testing laboratory “ALS Technichem (HK) Pty Ltd”, accredited under Hong Kong Laboratory Accreditation Scheme (HOKLAS) was appointed to conduct chemical testing for the soil and groundwater samples. All laboratory testing methods were accredited by the HOKLAS or one of its Mutual Recognition Arrangement Partners, except the testing of metal “Chromium III”. However, the laboratory is accredited for the testing of “Total Chromium” and “Hexavalent Chromium” (Chromium IV), and the difference of these 2 testing results is reported as the concentration of Chromium III.

3.4 Strata Logging

Strata logging for boreholes was undertaken during the course of drilling and sampling by qualified geologists. The logs included the general stratigraphic descriptions, depth of soil sampling, and sample notation etc.

The strata logs indicated that the site was mainly covered by “Fill” material with “Swamp Deposit” underneath. The strata logs of boreholes are given in **Appendix A**.

Of the 35 environmental investigation drillholes, a total of 10 drillholes A-S01, A-S07, A-S11, A-S16, A-S19, A-S21, A-S23, A-S24, A-SG05 and A-SG09 were further drilled down after completion of first 5m environmental drilling and soil & groundwater sampling in order to collect geotechnical information (i.e. geotechnical investigation) for assessing the geotechnical character of Area A, and water was used as “flushing medium” during the geotechnical investigation. As such, the “flushing medium” in the drillhole records of these 10 drillholes was recorded as “Air / Water”. The “Remarks” of these 10 drillhole records have also stated that “Flushing medium for first 5m is air”.

4 Assessment Criteria

The assessment criteria for the proposed testing parameters are described below:

• SVOCs, Metals, Dioxins / PCBs, Cyanide

The chemicals of concern (COCs) listed in EPD's *Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management* were referred to when proposing the analytical parameters of SVOCs, Metals, Dioxins / PCBs, and Cyanide. The RBRGs for soil and soil saturation limits and RBRGs for groundwater and groundwater solubility limits are given in **Appendix B**.

The RBRGs have developed four different post-restoration land uses, namely "Urban Residential", "Rural Residential", "Industrial" and "Public Parks", to reflect the actual settings which people could be exposed to contaminated soil or groundwater. Definition of post-restoration land uses are given in EPD's *Guidance Note for Contaminated Land Assessment and Remediation and RBRGs Guidance Manual*.

The planning study for the future land uses of Area A is still ongoing. At this stage, only a Preliminary Outline Development Plan (PODP) is available and the future land uses still could not be confirmed yet. For the sake of the present assessment (i.e. interpretation of the soil and groundwater testing results), the most stringent set of "Rural Residential" RBRG has been adopted for the interpretation of the soil and groundwater testing results.

• Chlorinated Pesticides

The testing results provided in the Shenzhen River Regulation Project Final EIA Study Report indicated that the total concentration of alpha-BHC, beta-BHC, gamma-BHC and delta-BHC, and the total concentration of DDE, DDD and DDT in Shenzhen River sediment were at detectable levels. Hence, testing of these 7 Chlorinated Pesticide parameters is proposed in order to determine the level of pesticide / insecticide residuals left in the filled mud of Area A. The "Intervention Value" for soil remediation published in the Netherlands Government Gazette of the 24th February 2000 was referred to establishing the assessment criteria for soil contamination. The assessment criteria of BHCs (i.e. equivalent to HCHs), DDE, DDD and DDT are summarized in **Table 4.2**. The relevant summary tables of the Intervention Value downloaded from the website of Ministry of Housing, Spatial Planning and Environment, Netherland is given in **Appendix C**.

Table 4.2 Assessment criteria extracted from Intervention Value for soil remediation

Contaminant	Soil Sediment (mg/kg dry weight)
DDT / DDD / DDE (total) ⁽¹⁾	4
BHC combined ⁽²⁾	2

Note: (1) DDT / DDD / DDE is the total of DDT, DDD, DDE

(2) BHC combined is the total of alpha, beta, gamma and delta BHC.

It should be noted that Netherlands is using groundwater for potable purpose, and its stringent "Intervention Value" of groundwater is considered inappropriate in Hong Kong. Therefore, the laboratory's "Reporting Limits"

are adopted as preliminary screening goals for assessing the groundwater quality. In case elevated level of pesticide is detected (i.e. higher than the reporting limits), a site-specific screening levels would be developed to deal with that particular contaminant(s).

- **TOC, Grain Size, and Moisture Content**

Testing of TOC, Grain Size and Moisture Content is mainly for information gathering.

5 Interpretation of Laboratory Testing Results

5.1 Soil Contamination

A total of 105 soil samples were collected from 35 boreholes (i.e. 3 soil samples per borehole) from 25 November 2009 to 23 December 2009. All available laboratory testing results of the soil samples have been reviewed.

The testing results indicated that nearly all the soil samples were below the value of RBRG for Rural Residential (i.e. the stringent set of RBRGs for SVOCs, Metals, Dioxins / PCBs, Cyanide) and Intervention Value (i.e. for Chlorinated Pesticides), except 6 soil samples collected from 5 boreholes. In these 6 samples, the concentration of only the metal “Arsenic (As)” marginally exceeded the RBRGs of Rural Residential and Urban Residential land uses. The laboratory testing results exceeding the RBRGs are given in **Table 5.1** and those for all soil samples are detailed in **Appendix D**. The laboratory testing reports are given in **Appendix H**. The locations of the 5 concerned boreholes are shown in **Figure 5.1**.

Table 5.1 Summary of soil samples exceeding RBRGs

Borehole No.	Depth of Soil Sampling (mbgl)	Contaminant	Concentration (mg/kg dry soil)	RBRGs of Arsenic (mg/kg dry soil)
A-S01	3.0 – 3.45	Arsenic	22.2	Rural Residential RBRG : 21.8 Urban Residential RBRG : 22.1 Public Parks RBRG : 73.5 Industrial RBRG : 196
	4.5 – 4.95	Arsenic	24.0	
A-S03	3.0 – 3.45	Arsenic	26.8	
A-S20	3.0 – 3.45	Arsenic	23.0	
A-S24	3.0 – 3.45	Arsenic	27.7	
A-SG10	4.5 – 4.95	Arsenic	27.3	

5.1.1 Additional Soil Sampling and Testing

In order to further ascertain the extent of contamination at these 5 locations, 3 additional boreholes near each of the 5 contaminated boreholes were drilled (i.e. total 15 additional boreholes were drilled) from 26 January 2010 to 1 February 2010 for additional soil sampling and testing. The locations of the additional boreholes were chosen roughly mid-way between the contaminated boreholes and their respective adjacent boreholes, as shown in **Figure 5.2** and depicted in **Figures 5.2.1 to 5.2.5**.

The same soil sampling strategy was adopted, in which three U-100 undisturbed soil samples were collected from each additional borehole at the depths of 1.5m (1.5-1.95mbgl), 3.0m (3.0-3.45mbgl) and 4.5m (4.5-4.95mbgl). The soil samples collected from the additional boreholes were tested for metals in order to further define the extent of arsenic contamination. The laboratory testing results of the additional soil samples show compliance with the RBRG for Rural Residential (i.e. the stringent set of RBRGs). The testing results of the additional soil samples are detailed in **Appendix E**, and the laboratory testing reports are given in **Appendix I**.

The estimation of the quantity of contaminated soils is given in **Section 6**. It is Government policy that soils containing contaminants in exceedance of the RBRGs should be remediated. Details of the soil remediation method and the disposal criteria of the contaminated soils are described in **Section 7**.

5.2 Groundwater Contamination

Groundwater samples were taken from 10 boreholes as shown in **Figure 3.1**. The testing results indicated that none of the groundwater samples exceeded the RBRG levels for Rural Residential land use (i.e. the stringent set of RBRGs). Chlorinated Pesticides were not detected in the groundwater samples. The analytical results of all groundwater samples are presented in **Appendix F**. The laboratory testing reports are given in **Appendix H**.

5.3 Elutriate Test

The objective of Elutriate Test is to assess any potential release of contaminants from the filled mud during excavation, if required, in Area A.

Elutriate test was conducted for the deepest soil samples (i.e. 4.5mbgl) collected from 10 boreholes of groundwater sampling as shown in **Figure 3.1**. The testing results indicated that the potential of contaminants releasing from the filled mud during excavation was insignificant as only non-detected levels of contaminants were recorded in all 10 soil samples. The analytical results of all elutriate soil samples are presented in **Appendix G**. The laboratory testing reports are given in **Appendix H**.

6 Possible Soil Contamination Extent

6.1 Estimation of Possible Soil Contamination Extent

The possible extent of contamination was estimated based on the results from the SI works. The estimation made the best use of available information to delineate the possible vertical and horizontal extents of soil contamination present at the site and would be used for preliminarily appraising any soil remediation needed in connection with the development of the Loop. Nevertheless, the deduced volume based on the possible vertical and horizontal extents should only be seen as a first estimation to indicate a conservative order of quantity for reference. The actual extent of contamination requiring remediation would be subject to confirmation by further environmental investigation boreholes before the commencement of remediation works on site.

6.1.1 Estimation of the Horizontal Extent of Contamination

With reference to **Figures 5.2.1 to 5.2.5**, the areas of horizontal contamination extent is estimated by the curvilinear area formed by taking the contaminated borehole at the centre and the boundary joining the adjacent additional boreholes (i.e. which reveal no contamination), or along site boundary (i.e. Shenzhen meander). A software called “MicroStation” (i.e. common graphical software similar to “AutoCad”) was used to draw the curvilinear plan area in which the horizontal extent of contamination lies. The areas so automatically computed by the software present a first estimation on the conservative side. It should be noted that the plan areas in which the horizontal contamination extents lie are subject to further investigation before commencing remediation works on site.

It should be noted that the 5 contaminated boreholes only marginally exceeded the RBRG (i.e. testing results of arsenic 22.2-27.7mg/L against the respective Rural Residential RBRG 21.8mg/L), and this estimation is considered conservative. As the estimated quantity of contaminated soil is highly sensitive to how the plan area (in which the actual horizontal extent of contamination lies) is estimated in the preceding paragraph, the Project Proponent should conduct further investigation to confirm the actual horizontal extent of contamination prior to the commencement of remediation works on site in order to avoid over-remediation (Refer to **Section 6.2.2** for details).

6.1.2 Estimation of Vertical Extent of Contamination

For such sample with contaminated laboratory testing results, the full depth of soil sampling is taken as contaminated. Besides, a depth of 0.5m above and below that sampling depth respectively will be taken as contaminated as a conservative estimate. For example, for the sampling depth of 3.0–3.5mgbl with contaminated laboratory testing finding, the vertical extent of contamination will be estimated from 2.5mgbl (i.e. 3mgbl - 0.5m) to 4mgbl (i.e. 3.5mgbl + 0.5m), and the vertical extent of contamination is therefore estimated as 1.5m.

6.1.3 Conservative Estimation of Contaminated Soil Quantity

Based on the above conservative approach, an estimate of the quantity order of contaminated soil is summarized in **Tables 6.1**. The extents of 5 estimated plan areas in which the contaminated zones lie are depicted in **Figure 6.1** and **Figures 6.1.1 to 6.1.5**. It should be noted that this first estimation of a conservative order of contaminated soil quantity is subject to variation after the completion of further investigation to confirm the horizontal extent of contamination before commencing the remediation works on site.

Table 6.1 Estimation of the order of quantity of contaminated soil by conservative approach

Contaminated Borehole (Contaminated Zone ID)	Additional Borehole ID	Distance from Contaminated Borehole to the Additional Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Plan Area in which Contaminated Area Lies (m ²) ⁽¹⁾	Estimated of Order of Quantity of Contaminated Materials (m ³)
A-S01	A-S01a	90	3.0 (2.5m-5.5m)	18,519	55,557
	A-S01b	69			
	A-S01c	87			
A-S03	A-S03a	91	1.5 (2.5m-4.0m)	12,684	19,026
	A-S03b	54			
	A-S03c	102			
A-S20	A-S20a	96	1.5 (2.5m-4.0m)	26,131	39,197
	A-S20b	112			
	A-S20c	82			
A-S24	A-S24a	63	1.5 (2.5m-4.0m)	14,361	21,542
	A-S24b	92			
	A-S24c	68			
A-SG10	A-SG10a	62	1.5 (4.0m-5.5m)	12,749	19,124
	A-SG10b	86			
	A-SG10c	67			
Total ⁽²⁾ :				84,444	154,446

- Note (1) The "Estimated Plan Area in which the Horizontal Contaminated Area (m²) Lies" was computed by a software call "MicroStation". (i.e. common graphical software similar to "AutoCad")
- (2) The data presented based on the conservative approach are subject to variation after the completion of further investigation to confirm the actual horizontal extent of contamination (Refer to Sections 6.1.1, 6.1.3 and 6.2.2 for details).

6.2 Remediation Strategy

6.2.1 Proposed Remediation

The planning study for the future land uses of Area A is ongoing. However, based on the most updated planning information (i.e. the Preliminary Outline Development Plan, PODP), the 5 contaminated zones are either within the land uses of "Public Park" or "Industrial" under RBRGs as summarized in **Table 6.2** though such planned land uses may still need to be confirmed after the present assessment.

Table 6.2 Possible future land uses of the contaminated zones

Contaminated Zone	Proposed Future Land Uses	Corresponding RBRGs	Exceed the Corresponding RBRGs
A-S01	<ul style="list-style-type: none"> Public Transport Interchange Commercial Building 	<ul style="list-style-type: none"> Industrial Public Park 	No
A-S03	<ul style="list-style-type: none"> Sewage Treatment Works 	<ul style="list-style-type: none"> Industrial 	No
A-S20	<ul style="list-style-type: none"> Flood Retention Ponds Reedbed Compensation Area 	<ul style="list-style-type: none"> Public Park Public Park 	No

Contaminated Zone	Proposed Future Land Uses	Corresponding RBRGs	Exceed the Corresponding RBRGs
A-S24	<ul style="list-style-type: none"> District Cooling System 	<ul style="list-style-type: none"> Industrial 	No
A-SG10	<ul style="list-style-type: none"> Flood Retention Ponds Reedbed Compensation Area 	<ul style="list-style-type: none"> Public Park Public Park 	No

Although the testing results do not exceed the corresponding RBRGs based on the proposed land uses in the current PODP, excavation is not unexpected at the 5 contaminated zones for the proposed future land uses during the construction stage. The chance of construction workers and other site staff having contact with the contaminated soil cannot be ruled out. In view of the safety concerns about human contact with the contaminated soil, it is recommended to remediate all the contaminated soil within the confirmed horizontal extent as determined in **Section 6.2.2** below. The proposed remediation allows higher flexibility in proposed land uses as an added advantage.

Details of the soil remediation method of the contaminated soils are described in **Section 7**. As the remediated soil would be fully reused within Area A and off-site disposal or reuse of the remediated soil is not allowed (i.e. refer to **Section 7** for details), the full scale remediation would not increase the disposal loading of the landfill sites or other disposal sites.

6.2.2 Further Investigation in Horizontal Extent of Contamination

As mentioned in **Section 6.1.1**, the deduced quantity of contaminated soil highly depends on how the horizontal contamination extent is assumed with limited test results. Therefore, the Project Proponent should conduct further investigation to confirm the horizontal extent of contamination prior to the commencement of remediation work so as to minimize the over-remediation of uncontaminated soil.

The further investigation should include the drilling of new boreholes at such locations between the contaminated boreholes and their respective adjacent additional uncontaminated boreholes within the possible plan area conservatively identified in **Section 6.1.1** so as to confirm the horizontal extent of contamination. Soil samples should be collected in the new boreholes at the respective depths of contamination detected in the 5 contaminated boreholes, and tested for Arsenic. The further investigation should be conducted strictly in compliance with the technical procedures in the approved Contamination Assessment Plan (CAP for Area A) such as dry drilling of boreholes, decontamination requirements, soil sampling procedures and the analytical methodologies etc.

The quantity of contaminated soil should be comprehensively updated based on the further investigation results which should be submitted to EPD for approval/agreement prior to the commencement of remediation work.

7 Remediation Action Plan

7.1 Objective

This section presents possible remediation proposals and recommends appropriate remediation actions for the contaminated areas found.

The objectives of the Remediation Action Plan (RAP) are as follows:

- To propose remediation method(s) for the soil contamination;
- To propose a mean to confirm completed excavation of contaminated soil; and
- To provide guidelines regarding the handling and/or disposal of contaminated soil.

7.2 Potential Remediation Methods

7.2.1 Selection Criteria

Soil remediation options applicable to the contaminated areas in Area A were addressed based on the followings:

- Technical and cost effectiveness;
- Technology development status;
- Environmental benefits and disbenefits;
- Commercial availability;
- Experience; and
- Expertise requirement.

7.2.2 Available Soil Remediation Methods

A number of soil remediation technologies considered suitable for the nature of contaminant (i.e. metal “arsenic”) found in Area A are selected for detailed examination. The applicability and limitations of the candidate treatment technologies are detail in **Table 7.1**.

In assisting the formulation of appropriate remedial measures, the following factors suggested in the Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repair/Dismantling Workshops issued by EPD would also be taken into consideration when evaluating different available remediation methods:

- Degree and extent of the contamination;
- Anticipated future use of the site;
- Nature of the contaminants;
- Soil characteristics; and
- Time available for remediation.

Table 7.1 List of possible soil remediation methods for metal contaminated soil

Remediation Option	Descriptions	Applicability / Environmental Benefits	Limitations / Environmental Disbenefits
Solidification / Stabilization	Ex-situ immobilization technique treating contaminated soil by mixing soil with binding agents, e.g. cement so as to physically bind contaminants into stable mass.	<ul style="list-style-type: none"> Applicable to clean-up inorganic contaminants such as heavy metals. Solidification/stabilization are used on certain contaminated sites in Hong Kong and successfully demonstrated treatment method for inorganic contaminated soil, e.g. decontamination works at the Cheoy Lee Shipyard at Penny's Bay, reclamation works at North Tsing Yi Shipyard site and few isolated sites identified in the Deep Bay Link project. 	<ul style="list-style-type: none"> The effectiveness reduces with the presence of organic contaminants Large boulders may hinder the mixing process. Soil sorting is necessary prior to the treatment taken place.
Soil Washing	An Ex-situ soil separation method primarily based on mineral processing techniques. A water-based process for scrubbing soils ex-situ to remove contaminants.	<ul style="list-style-type: none"> Applicable to clean inorganic contaminants such as heavy metals from coarse-grained soils. 	<ul style="list-style-type: none"> Effectiveness of treatment dependent on soil coarseness. Fine soil particles may require addition of polymer for removal of contaminant by the washing fluid. Complex waste mixtures make formulating washing fluid difficult. Further treatment and disposal for residuals required.
Electrokinetic Separation	This In-situ method uses electrochemical and electrokinetic processes to desorb and remove metals and polar organics from soil. Low intensity direct current is applied to the soil to mobilize the charged species.	<ul style="list-style-type: none"> Applicable to treat soil with low permeability and heavily contaminated with metals. 	<ul style="list-style-type: none"> Effectiveness dependent on moisture content of soil and decreases with moisture content less than 10%. Require further treatment for removal of desorbed contaminants and thus increase cost of remediation. Variability of electrical conductivity in soil may be induced by presence of anomalies such as large gravels and insulating material. This may reduce treatment effectiveness.
Excavation and Landfill Disposal	Ex-situ method whereby contaminants are removed by excavation of the contaminated soil and direct disposal to landfill	<ul style="list-style-type: none"> Most simple and quickest way to dispose of large volume of contaminated soil Contamination is removed definitely Higher certainty of success Wide experience in Hong Kong Applicable to all waste or mixture that meet land disposal restriction treatment standards. Common practice for shallow, highly-contaminated soils. 	<ul style="list-style-type: none"> Pre-treatment may be required for contaminated soil to meet landfill disposal criteria Landfill space limited and valuable. Indirect costs to the landfill management on monitoring and maintenance. Potential long-term liabilities to landfill Need large volume of clean backfill materials No access to the working site until completion of backfilling Least desirable management option.

7.3 Nature of Arsenic

Arsenic is a naturally occurring element that is widely distributed in the Earth's crust. Arsenic is classified chemically as a metalloid, having both properties of a metal and a nonmetal; however, it is frequently referred to as a metal. Elemental arsenic (sometimes referred to as metallic arsenic) is a steel grey solid material. However, arsenic is usually found in the environment combined with other elements such as oxygen, chlorine, and sulfur. Arsenic combined with these elements is called inorganic arsenic. Arsenic combined with carbon and hydrogen is referred to as organic arsenic.

Most inorganic and organic arsenic compounds are white or colorless powders that do not evaporate. They have no smell, and most have no special taste. Many arsenic compounds sorb strongly to soils and are therefore transported only over short distance in groundwater and surface water.

In the past, inorganic arsenic compounds were predominantly used as pesticides. Nevertheless, Inorganic arsenic compounds can no longer be used in agriculture. Organic arsenic compounds are still used as pesticides. Some organic arsenic compounds are also used as additives in animal feed. Small quantities of elemental arsenic are added to other metals to form metal mixtures or alloys with improved properties. The greatest use of arsenic in alloys is in lead-acid batteries for automobiles. Another important use of arsenic compounds is in semiconductors and light-emitting diodes.

Arsenic was also widely used as a preservative for wood to make it resistant to rotting and decay. The preservative is copper chromated arsenate (CCA) and the treated wood is referred to as "pressure-treated." Nevertheless, this preservative had been phased out in many developed countries, such as U.S. in year 2003.

7.4 Proposed Remediation Method

Considering the cost effectiveness and applicability of different remediation methods listed in **Table 7.1**, "*Excavation*" followed by "*Solidification/Stabilization*" are regarded as the most practical and cost-effective method to remediate the arsenic contaminated soil.

7.4.1 Solidification/Stabilization

Solidification/Stabilization (S/S) is an immobilisation technique applicable to the treatment of soil contaminated with inorganic contaminants such as metals. By mixing contaminated soil with binders such as Portland cement or lime, the metal contaminants in soil become physically bound within a stable mass. The solid monolithic block is extremely resistant to the leaching of inorganic contaminants. Additives such as phosphate or sulfur reagents could also be added not only to reduce the setting or curing time and leachability of contaminants, but also to assist in chemically binding the contaminants in a matrix that typically shows unconfined compressive strengths similar to a soil-cement mix.

Beside several local successful case studies as listed in **Table 7.1**, other overseas case studies, as stipulated in "*Solidification/Stabilization Use at*

Superfund Sites” published by U.S. Environmental Protection Agency’s Technology Innovation Office under EPA Contract Number 68-W-99-003 (<http://www.clu-in.org/s.focus/c/pub/i/611/>), also reveals that inorganic contaminants in USEPA superfund remedial sites could be successfully treated by S/S method.

Another technical document “*Arsenic Treatment Technologies for Soil, Waste, and Water*” published by U.S. Environmental Protection Agency’s Technology Innovation Office under EPA Contract Numbers 68-W-99-003 and 68-W-02-034”

(http://www.clu-in.org/download/remed/542r02004/arsenic_report.pdf) also indicates that S/S method has been widely applied for treating the arsenic-contaminated soil and was the most common remediation method for arsenic-contaminated soil.

The recommended remediation method as discussed above is summarized in **Table 7.2**. The design and operation of the recommended remediation method is presented in the outline process in the following sections.

Table 7.2 Recommended remediation method for arsenic-contaminated soil

Soil Contaminant	Remediation Method	Justification
Arsenic	Excavation followed by Solidification/Stabilization.	<ul style="list-style-type: none"> • Well developed technology with operation experience in Hong Kong • Higher certainty of success • Simple operation without necessity of further treatment • Cost effective • Treated soil is acceptable to be reused as backfill

7.5 Outline Process and Operation of Remediation

7.5.1 Excavation

Detailed design drawings for planned excavations in the indicated areas should be prepared by the Remediation Contractor. Factors such as excavation areas and depths, engineering properties and stability of the soils should be considered for safe working conditions. The excavations should be designed in accordance with the geotechnical properties of the soils and appropriate safety factors as determined by the Engineer. The excavated areas should be set out by an appropriate qualified and licensed land surveyor. Proposed contaminated zones requiring excavation are shown in **Figures 6.1.1 to 6.1.5** respectively. It should be noted that the horizontal extent of contaminated zones within the estimated plan areas is subject to further investigation as detailed in **Sections 6.1.1 and 6.2.2**.

The excavation sequence would be as follows:

- At each location as set out by the surveyor, the clean top soil above the identified contamination depth would be excavated and transferred to a designated area for stockpiling.
- After the clean top soil is removed, the contaminated soil at the identified contamination depth would be excavated and transferred to a designated

area for treatment. The contaminated soil should be on heavy-duty impermeable sheeting within the soil treatment area.

- Both the stockpiles of clean top soil and contaminated soil should be fully covered by impermeable sheeting to prevent dust emission and runoff.
- Any free product (if encountered) during excavation should be recovered and drummed properly and collected by licensed chemical waste collector for proper handling and treatment.
- Closure Assessment (i.e. refer to **Section 8.5.2**) should be undertaken to confirm the closure/completion for the excavation work.
- Backfill the excavation with suitable imported or reworked site materials.

7.5.2 Closure Assessment

The objective of closure assessment is to determine if all contaminated soil has been excavated before backfilling takes place.

Following excavation and prior to the backfilling, confirmatory sampling and analysis should be carried out at the limits/sidewalls and base of the excavations to confirm that all the contaminated soil has been excavated.

As the contaminated areas are relatively large (i.e. over 1,000m² in size), confirmation samples should be collected from sidewalls of the excavation with a lateral spacing of not more than 15m. The depth of sidewall samples should be at the depth where the contamination was identified. Confirmation samples from the bottom of excavation areas should be collected on grid spacing not larger than 15m x 15m (i.e. one sample per approximately every 225m²).

The collected confirmation soil samples should be analysed for the defined contaminant (arsenic). If the analytical results exceed the Rural Residential RBRG, additional soil samples should be excavated in 0.5m increments vertically and 7.5m in horizontal increments depending on whether the exceeding confirmation sample is collected from a sidewall or excavation base. Additional samples should be collected and analysed until all confirmation samples are below the Rural Residential RBRG. If the analytical results are below the Rural Residential RBRG, removal of contaminated soil should be considered complete and the open excavations then backfilled with suitable imported or reworked site materials.

All construction activities should be carried out by persons appropriately trained in health and safety and appropriated personal protective equipment should be used by the person engaged in decontamination activities. The following guidelines of health and safety should be strictly followed by all site personal working on the contaminated areas at all times:

- Temporary fencing or warning ribbons should be provided to the boundary of excavation, slope crest and temporarily stockpiled areas. Where necessary, the exposed areas should be temporarily covered with impermeable sheeting during heavy rainstorm.
- Workers are required to wear appropriate protective clothing and safety equipment.

- Smoking, eating and drinking are strictly prohibited.
- Relevant occupational health and safety regulations and guidelines during excavation should be observed.

The excavation and confirmatory sampling works should be supervised by a qualified Land Contamination Specialist. Subsequent construction activities could only be carried out after closure assessment or remediation at the subject site is completed as agreed by the Land Contamination Specialist.

7.5.3 Solidification/Stabilization (S/S)

A treatment area should be confined for carrying out the S/S mixing and temporary soil stockpile. Prior to solidification, the contaminated soils should be screened to segregate soil from debris, rock fragments and other materials and to break soil clumps into sizes allow effective mixing solidifying agents.

During the S/S process, Ordinary Portland Cement (OPC) (or other equivalent), water and/or other additive(s) (such as fly ash, lime and soluble silicates etc) should be added to the contaminated soils to form a solid matrix. Uniform mixing of contaminated soils, cement, water and other additives(s) should be undertaken within a pugmill, lorry mixer or equivalent at the designated treatment area to minimise the potential leaching during solidification process. Detail S/S method statements, include but not limit to the proposed solidify agents and additives, mixing ratio, mixing equipment, and mixing trial test proposal etc should be prepared by the Remediation Contractor and verified and approved by the Land Contamination Specialist prior to the commencement of S/S treatment.

The total volume of the concrete blocks could be increased by up to 10% from the original soil volume. The solidified blocks should be of suitable size to allow easy handling and transporting, and large blocks should be broken up into smaller size for transportation.

The soil mixture in the concrete blocks would be solidified within about 1 week. After setting, the samples of the blocks should be collected for testing to confirm if the contaminated materials meet the:

- (i) Toxicity Characteristic Leaching Procedure (TCLP) Test; and
- (ii) Unconfined Compressive Strength (UCS) Test.

which indicate the achievement of the stabilization targets.

7.5.4 Toxicity Characteristic Leaching Procedure (TCLP) Test

The sampling frequency for the TCLP test should be 1 TCLP sample per 100m³ of broken up hardened mixture after S/S treatment. Each TCLP sample should be a composite sample collected at 5 locations throughout the 100m³ broken up hardened mixture. Same volume of sample should be collected at each of the 5 locations in order to facilitate unbiased sample compositing.

Any hardened samples to be submitted to laboratory for TCLP analysis should be broken up to small pieces with maximum diameter of 10cm. The sample preparation method of USEPA Method 1311 will be followed for the

TCLP analysis. It is specified in USEPA Method 1311 that the maximum grain size of samples to be analysed is 1cm. As such, the samples should be further broken up in the laboratory prior to TCLP analysis.

TCLP tests should be conducted in accordance with USEPA Method 1311 and USEPA Method 6020 for metal arsenic. The EPD's TCLP limits as specified in *EPD's Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repairing/Dismantling Workshops* are standard leachability test standards. However, this set of standards is only applicable to disposal to landfill. For on-site reuse, these standards are not applicable.

"Universal Treatment Standards" (UTS) could be used for interpretation of the TCLP testing results in this Study. The UTS were derived from the performance of the Best Demonstrated Available Technologies (BDAT) for treating most prohibited hazardous wastes and were adopted in previous local land contamination studies e.g. decontamination works at the Cheoy Lee Shipyard at Penny's Bay and reclamation works at North Tsing Yi Shipyard site. The UTS for the metal arsenic is given in **Table 7.3**.

Table 7.3 Universal Treatment Standards (UTS) for metal arsenic

Parameter	Universal Treatment Standard ⁽¹⁾
Arsenic	5 mg/L as TCLP

Note: (1) Reference to Universal Treatment Standards (UTS) of U.S. Resource Conservation and Recovery Act (RCRA) in Title 40 of the Codes of Federal Regulations (CFR) Parts 268.

Any pile of broken up solidified mixture that does not meet the UTS of arsenic should be crushed and re-treated by S/S. The re-treated pile should be tested again for TCLP to confirm if it could be reused on site.

7.5.5 Unconfined Compressive Strength (UCS)

The treated material should be allowed to set to achieve the Unconfined Compressive Strength (UCS) of not less than 1mPa with reference to the USEPA guideline (1986) – Handbook of Stabilization / Solidification of Hazardous Wastes, EPA/540/2-86-00. The test procedure of UCS test should be based on BS 1377 - Methods of test for soils for civil engineering purposes.

7.5.6 Handling of Treated Material

Upon completion of the leachability testing and meeting the UTS and the UCS requirements, the solidified materials should be fully reused on site as backfilling or stockpiled for future reuse. As the maximum grain size of filling material is 250mm (i.e. according to the general practice), the solidified soil should be broken down to below this size before being used as filling materials. The solidified material for reuse as filling materials should be put below at least 1m of clean fill layer. Off-site disposal or reuse of the solidified material is not allowed.

7.6 Mitigation Measures and Safety Measures

7.6.1 Environmental Mitigation Measure

In order to minimise the potentially environmental impacts arising from the handling of contaminated materials, the following environmental mitigation measures are recommended during the course of the site remediation:

Excavation and Transportation

- Excavation profiles must be properly designed and executed with attention to the relevant requirements for environment, health and safety;
- In case the soil to be excavated is situated beneath the groundwater table, it may be necessary to lower the groundwater table by installing well points or similar means;
- Excavation should be carried out during dry season as far as possible to minimise contaminated runoff from contaminated soils;
- Stockpiling site(s) should be lined with impermeable sheeting and bunded. Stockpiles should be properly covered by impermeable sheeting to reduce dust emission during dry season or contaminated run-off during rainy season. Watering should be avoided on stockpiles of contaminated soil to minimise contaminated runoff;
- Supply of suitable clean backfill material after excavation, if require;
- Vehicles containing any excavated materials should be suitably covered to limit potential dust emissions or contaminated run-off, and truck bodies and tailgates should be sealed to prevent any discharge during transport or during wet season;
- Speed control for the trucks carrying contaminated materials should be enforced; and
- Vehicle wheel washing facilities at the site's exit points should be established and used.

Solidification / Stabilization

- The loading, unloading, handling, transfer or storage of cement should be carried out in an enclosed system;
- Mixing process and other associated material handling activities should be properly scheduled to minimise potential noise impact and dust emission;
- The mixing facilities should be sited as far apart as practicable from the nearby noise sensitive receivers;
- Mixing of contaminated soil and cement / water / other additive(s) should be undertaken at a solidification plant to minimise the potential for leaching;
- Runoff from the solidification / stabilization area should be prevented by constructing a concrete bund along the perimeter of the solidification / stabilization area;

- If stockpile of treated soil is required, the stockpiling site(s) should be lined with impermeable sheeting and bunded. Stockpiles should be properly covered by impermeable sheeting to reduce dust emission during dry season or site run-off during rainy season; and
- If necessary, there should be clear and separated areas for stockpiling of untreated and treated materials.

7.6.2 Safety Measures

In order to minimize the potential adverse effects on health and safety of construction workers during the course of site remediation, the Occupation Safety and Health Ordinance (OSHO) (Charter 509) and its subsidiary Regulations should be followed by all site personnel working on the site at all times. In addition, basic health and safety measures should be implemented, including but not limited to the followings:

- Set up a list of safety measures for site workers;
- Provide written information and training on safety for site workers;
- Keep a log-book and plan showing the contaminated zones and clean zones;
- Maintain a hygienic working environment;
- Avoid dust generation;
- Provide face and respiratory protection gear to site workers if necessary;
- Provide personal protective clothing (e.g. chemical resistant jackboot, liquid tight gloves) to site workers if necessary;
- Provide first aid training and materials to site worker;
- Bulk earth moving equipment should be utilized as much as possible to minimize workers' handling and contact of the contaminated materials; and
- Eating, drinking and smoking should not be allowed in contaminated areas to avoid inadvertent ingestion of contaminant.

7.7 Remediation Report

Remediation Report (RR) for identified contaminated zones upon completion of remediation should be prepared by the Land Contamination Specialist to report the remediation process and demonstrate that contaminated soil are all removed, properly handled, decontaminated and reinstated. All relevant information, including details of closure assessment and photographic records, should be included in the RR. The RR should be submitted to EPD for record and agreement prior to the commencement of any construction works.

8 Conclusion and Recommendation

Site investigation works involving sampling and testing of soil and groundwater were conducted from 25 November 2009 to 1 February 2010 with reference to the CAP for Area A that EPD indicated no further comment in October 2009. This CAR/RAP presents the findings together with necessary remediation actions.

A total of 105 soil samples were collected from 35 boreholes (i.e. 3 soil samples per borehole) from 25 November 2009 to 23 December 2009. 6 soil samples collected from 5 boreholes, in which the concentration of the metal “Arsenic (As)” marginally exceeded the Rural Residential RBRG.

3 additional boreholes near each of the 5 contaminated boreholes were drilled (i.e. total 15 additional boreholes were drilled) from 26 January 2010 to 1 February 2010 for additional soil sampling and testing. The soil samples collected from the additional boreholes were tested for metals in order to define the extent of arsenic contamination. The testing results of the additional soil samples showed compliance with the RBRG for Rural Residential (i.e. the stringent set of RBRGs). Based on the entire plan area in which the horizontal extent of contamination lies, the quantity of arsenic-contaminated soil was estimated to be approximately 154,446m³ representing only a conservative order of quantity for reference at this stage. It should be noted that further investigation to ascertain the horizontal extent of contamination should be conducted prior to the commencement of remediation work in order to minimize over-remediation of uncontaminated soil.

10 groundwater samples were collected and tested. The testing results indicated that none of the groundwater samples exceeded the RBRGs levels for Rural Residential land use. Chlorinated Pesticides were not detected in the groundwater samples. Remediation of groundwater is not required.

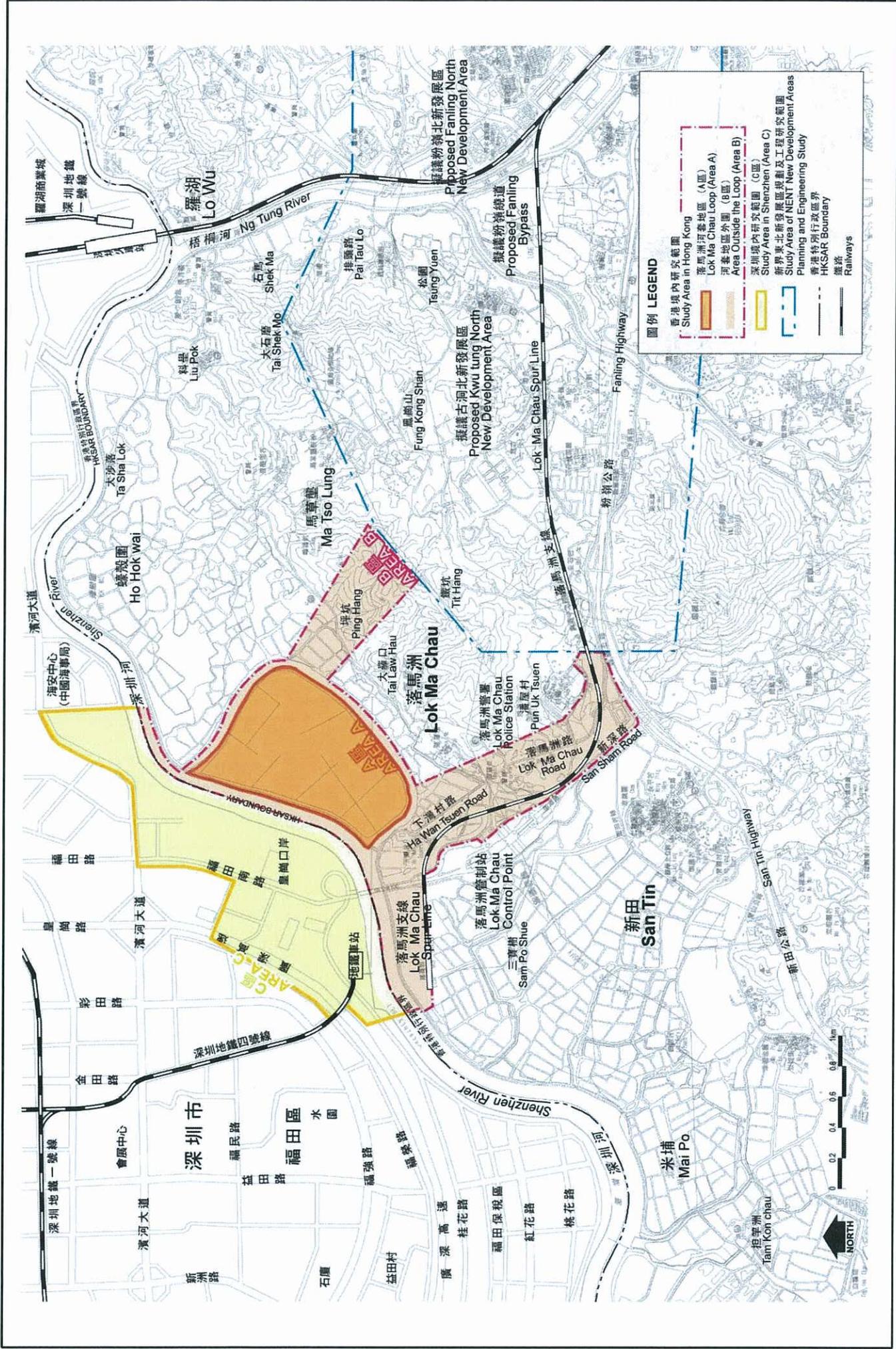
Elutriate test was conducted for the deepest soil samples (i.e. 4.5mbgl) collected from 10 boreholes of groundwater sampling. The testing results indicated that the potential of contaminants releasing from the filled mud during excavation was insignificant as only non-detected levels of contaminants were recorded in all 10 soil samples.

After review of various remediation methods, “Solidification/Stabilization” (S/S) treatment method was proposed for the remediation of arsenic-contaminated soil. Toxicity Characteristic Leaching Procedure (TCLP) test should be undertaken after S/S in order to ensure that the contaminant will not leach to the environment. Unconfined Compressive Strength (UCS) test should be conducted, and not less than 1mPa should be met prior to the backfilling or stockpiled for future reuse within the study area. Off-site disposal or reuse of the solidified material is not allowed.

For complete removal of contaminated soil, a closure assessment in the form of confirmatory test should be conducted after excavation to confirm complete clean-up of the contaminated zones/concerned areas. A Remediation Report (RR) should be submitted to EPD for agreement upon completion of all remediation works.

Appropriate environmental mitigation measures have been proposed to minimize the potential environmental impacts of the remediation activities. Health and safety measures should be followed to minimize safety hazard posed to site workers.

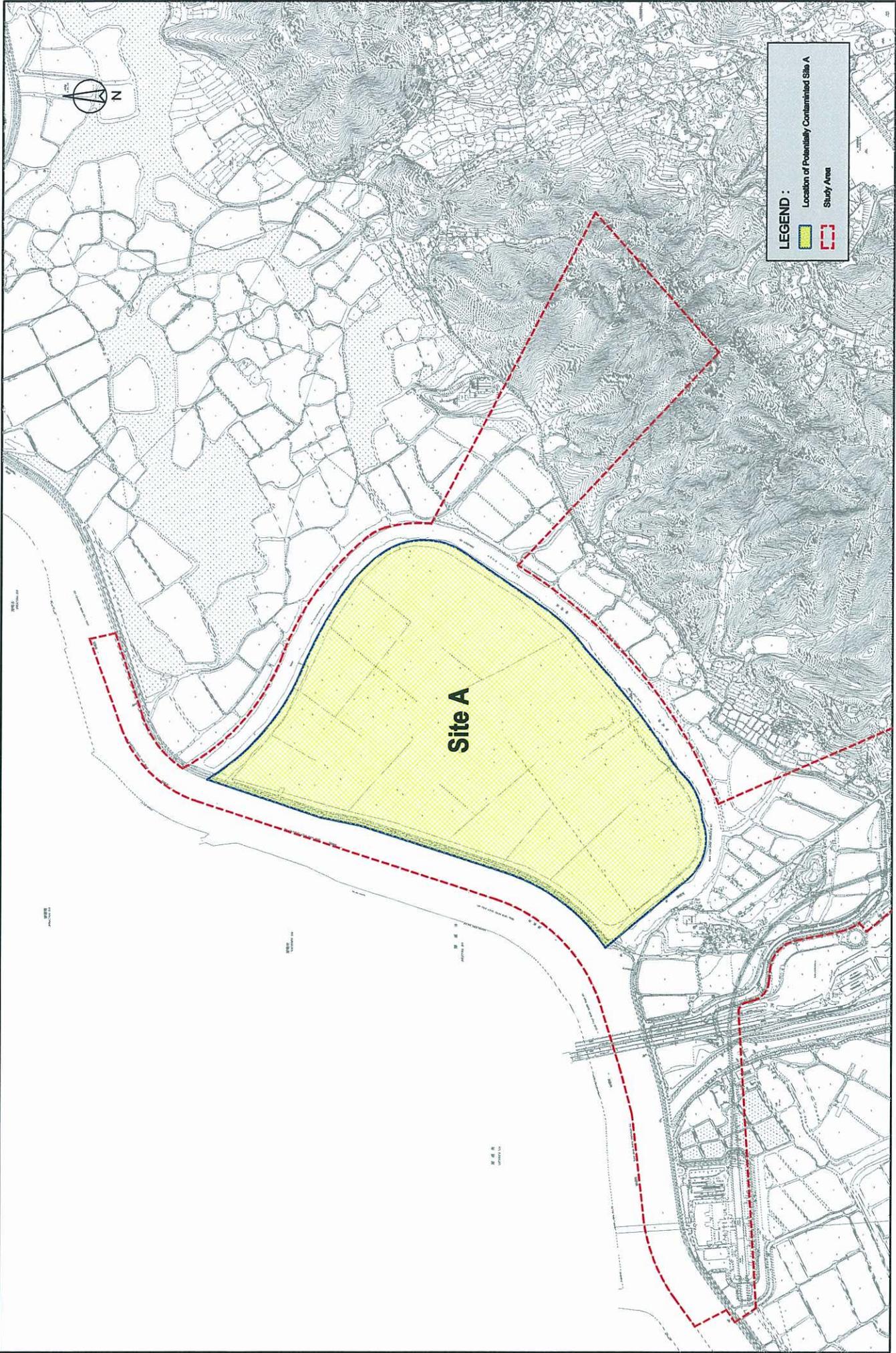
Figures



圖例 LEGEND

- 香港境內研究範圍 Study Area in Hong Kong
- 落馬洲河套地區 (A區) Lok Ma Chau Loop (Area A)
- 河套地區外圍 (B區) Area Outside the Loop (Area B)
- 深圳境內研究範圍 (C區) Study Area in Shenzhen (Area C)
- 新界東北新發展區規劃及工程研究範圍 Study Area of NENT New Development Areas Planning and Engineering Study
- 香港特別行政區界線 HK SAR Boundary
- 鐵路 Railways

 土木工程師學會 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	 規劃署 PLANNING DEPARTMENT	 ARUP Hong Kong Limited	Job Title Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation	Drawing Title Study Area Plan	Drawing No. Figure 1.1
			Date 06/09	Approved ST	Scale As Shown



LEGEND :

- Location of Potentially Contaminated Site A
- Study Area

Drawn	LK	Date	04/10	Drawing No.	Figure 2.1
Checked	TC	Approved	ST		
Scale	1:10000 ON A3		Rev.		
Rev.	Description		Date		
	FIRST ISSUE		04/10		

Location of Potentially Contaminated Site A

Job Title
**Agreement No. CE 53/2008 (CE)
 Planning and Engineering Study on
 Development of Lok Ma Chau Loop - Investigation**



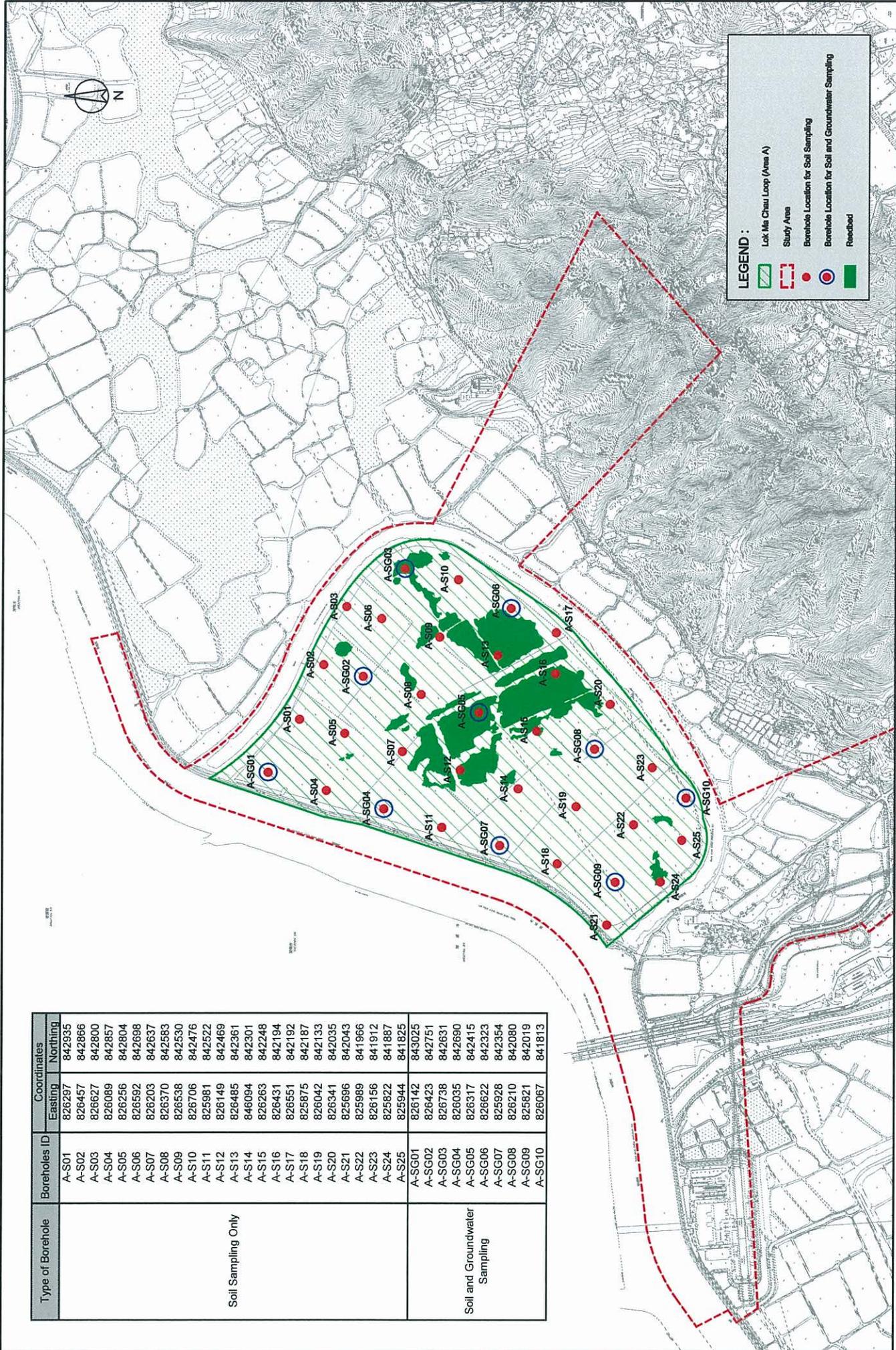
**規劃署
 PLANNING
 DEPARTMENT**



**土木工程拓展署
 CIVIL ENGINEERING
 AND DEVELOPMENT
 DEPARTMENT**



Type of Borehole	Boreholes ID	Coordinates	
		Eastings	Northings
Soil Sampling Only	A-S01	826297	842935
	A-S02	826457	842866
	A-S03	826627	842800
	A-S04	826089	842857
	A-S05	826256	842804
	A-S06	826592	842698
	A-S07	826203	842637
	A-S08	826370	842583
	A-S09	826538	842530
	A-S10	826706	842476
	A-S11	825981	842522
	A-S12	826149	842469
	A-S13	826485	842361
	A-S14	846094	842301
	A-S15	826263	842248
	A-S16	826431	842194
	A-S17	826551	842192
	A-S18	825875	842187
	A-S19	826042	842133
	A-S20	826341	842035
	A-S21	825696	842043
	A-S22	825989	841966
	A-S23	826156	841912
	A-S24	825822	841887
	A-S25	825944	841825
Soil and Groundwater Sampling	A-SG01	826142	843025
	A-SG02	826423	842751
	A-SG03	826738	842631
	A-SG04	826035	842690
	A-SG05	826317	842415
	A-SG06	826622	842323
	A-SG07	825928	842354
	A-SG08	826210	842080
	A-SG09	825821	842019
	A-SG10	826067	841813



LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Borehole Location for Soil Sampling
- Borehole Location for Soil and Groundwater Sampling
- Roadbed

土木工程發展部 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	規劃部 PLANNING DEPARTMENT	ARUP One Step & Partner Doing Things Differently	Job Title	Development of Lok Ma Chau Loop - Investigation
			Agreement No. CE 53/2008 (CE)	Planning and Engineering Study on
Locations of Proposed Sampling Boreholes in Site A		Drawing Title Locations of Proposed Sampling Boreholes in Site A	Drawing No. Figure 2.2	
Rev.	Description	Date	Scale	1:10000 ON A3
Checked	TC	04/10	Date	04/10
Drawn	LK	Approved	ST	Rev.

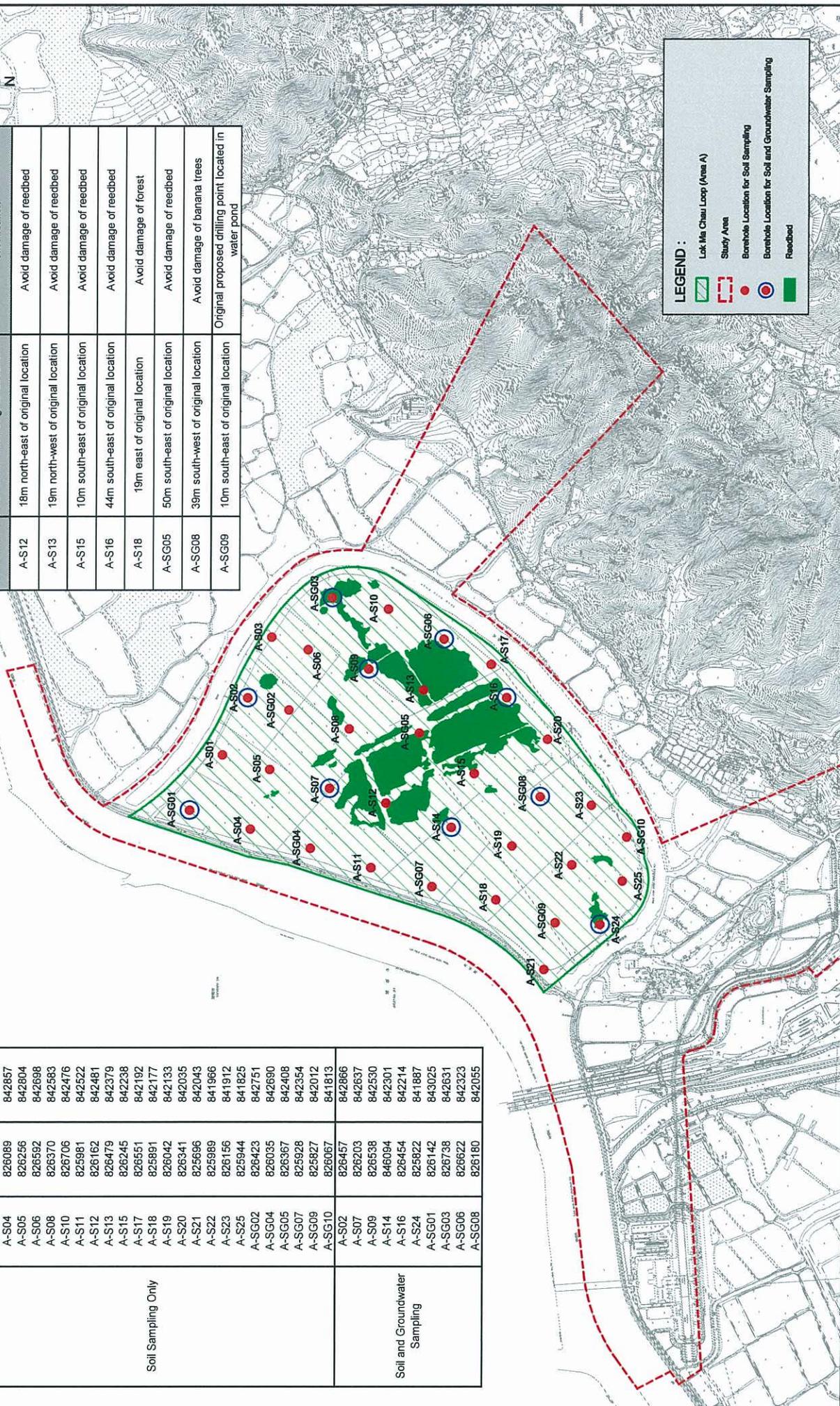
Type of Borehole	Boreholes ID	Coordinates	
		Easting	Northing
Soil Sampling Only	A-S01	826297	842935
	A-S03	826627	842800
	A-S04	826089	842857
	A-S05	826256	842804
	A-S06	826592	842698
	A-S08	826370	842583
	A-S10	826706	842476
	A-S11	825981	842522
	A-S12	826162	842481
	A-S13	826479	842379
A-S15	826245	842238	
A-S17	826551	842192	
A-S18	825891	842177	
A-S19	826042	842133	
A-S20	826341	842035	
A-S21	825696	842043	
A-S22	825989	841966	
A-S23	826156	841912	
A-S25	825944	841825	
A-SG02	826423	842751	
A-SG04	826035	842690	
A-SG05	826367	842408	
A-SG07	825928	842354	
A-SG09	825827	842012	
A-SG10	826067	841813	
Soil and Groundwater Sampling	A-S02	826457	842866
	A-S07	826203	842637
	A-S09	826538	842530
	A-S14	846094	842301
	A-S16	826454	842214
	A-S24	825822	841887
	A-SG01	826142	843025
	A-SG03	826738	842631
	A-SG06	826622	842323
	A-SG08	826180	842055

Change of borehole locations due to site constraints

Borehole ID	Deviation from Original Location	Justification
A-S12	18m north-east of original location	Avoid damage of reebed
A-S13	19m north-west of original location	Avoid damage of reebed
A-S15	10m south-east of original location	Avoid damage of reebed
A-S16	44m south-east of original location	Avoid damage of reebed
A-S18	19m east of original location	Avoid damage of forest
A-SG05	50m south-east of original location	Avoid damage of reebed
A-SG08	39m south-west of original location	Avoid damage of banana trees
A-SG09	10m south-east of original location	Original proposed drilling point located in water pond

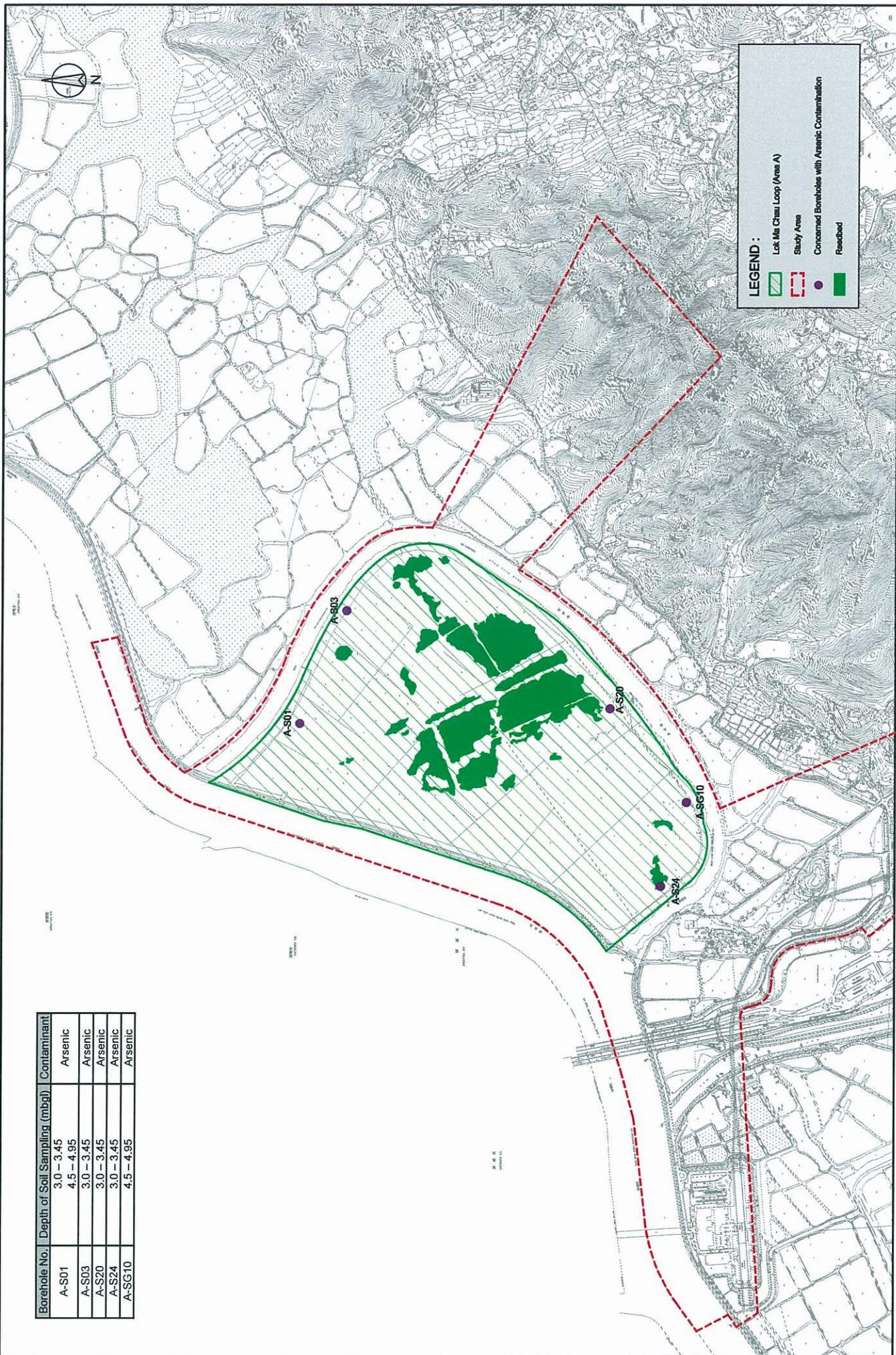
LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Borehole Location for Soil Sampling
- Borehole Location for Soil and Groundwater Sampling
- Reebed



 土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	 規劃署 PLANNING DEPARTMENT	 ARUP Hong Kong Limited	Job Title	Development of Lok Ma Chau Loop - Investigation
			Agreement No. CE 53/2008 (CE)	Planning and Engineering Study on
Locations of As-built Sampling Boreholes in Site A		Drawing Title	Locations of As-built Sampling Boreholes in Site A	
Rev	Description	Date	Scale	1:10000 ON A3
Checked	TC	04/10	Approved	ST
Drawn	LK	04/10	Date	
Drawing No.		Figure 3.1		
Rev.		Date		

Borehole No.	Depth of Soil Sampling (mbgl)	Contaminant
A-S01	3.0 – 3.45	Arsenic
A-S03	4.5 – 4.95	Arsenic
A-S20	3.0 – 3.45	Arsenic
A-S24	3.0 – 3.45	Arsenic
A-SG10	4.5 – 4.95	Arsenic

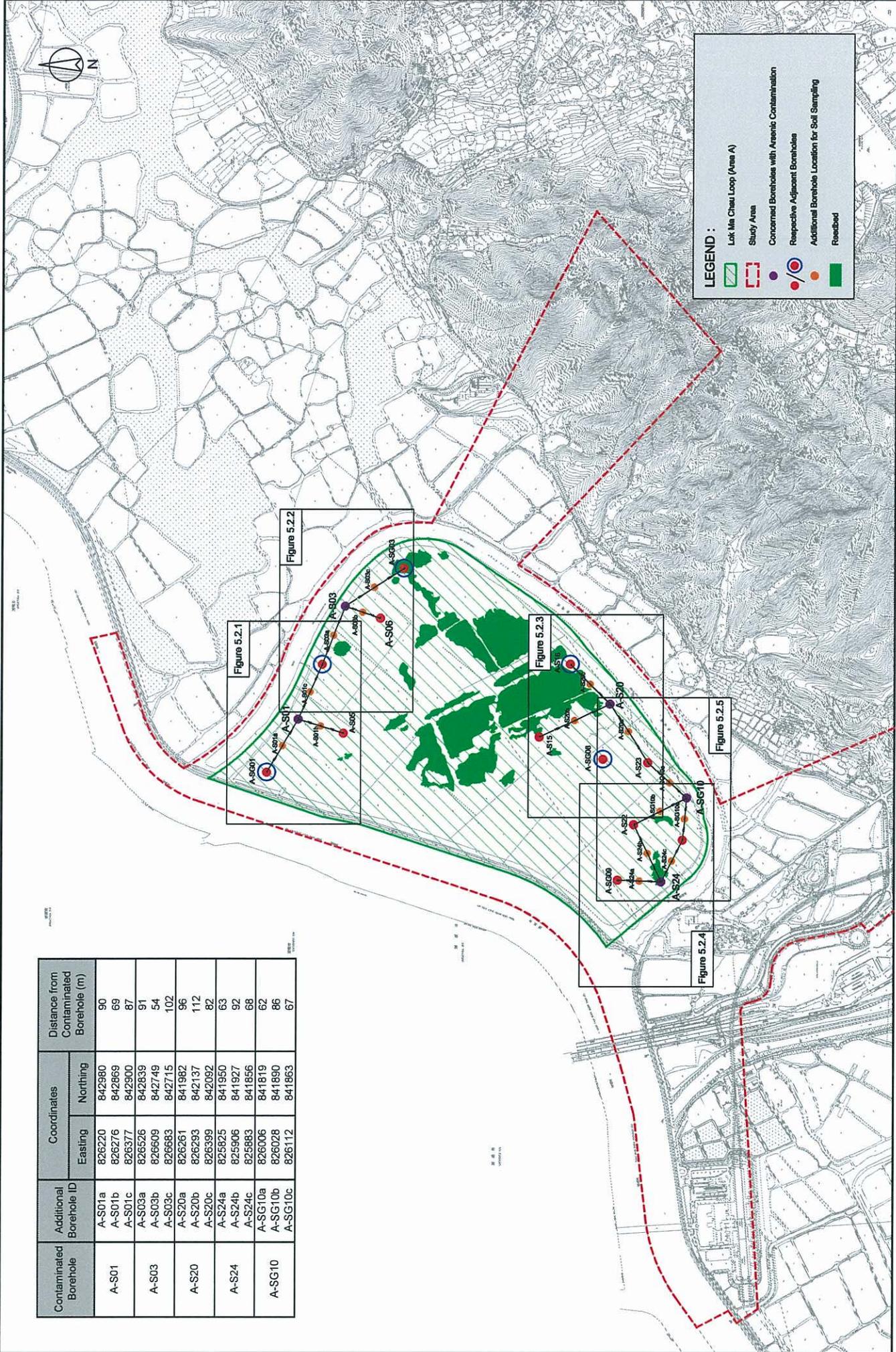


LEGEND :

- Lot Ma Chau Loop (Area A)
- Study Area
- Concerned Boreholes with Arsenic Contamination
- Roadbed

 土木工程發展部 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	 規劃部 PLANNING DEPARTMENT	 ARUP One Stop & Partner Hong Kong Limited	Job Title	Drawing Title	Drawn	Date	Drawing No.
			Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation	Locations of 5 Concerned Boreholes with Arsenic Contamination	LK	04/10	Approved
			Checked	TC	Scale	1:10000 ON A3	Rev.
			FIRST ISSUE	Date	04/10		
			Description	Rev.			

Contaminated Borehole	Additional Borehole ID	Coordinates		Distance from Contaminated Borehole (m)
		Easting	Northing	
A-S01	A-S01a	826220	842980	90
	A-S01b	826276	842969	69
	A-S01c	826377	842900	87
A-S03	A-S03a	826526	842839	91
	A-S03b	826609	842749	54
	A-S03c	826683	842715	102
A-S20	A-S20a	826261	841982	96
	A-S20b	826293	842137	112
	A-S20c	826399	842092	82
A-S24	A-S24a	825825	841950	63
	A-S24b	825906	841927	92
	A-S24c	825983	841856	68
A-SG10	A-SG10a	826006	841819	62
	A-SG10b	826028	841890	86
	A-SG10c	826112	841863	67



LEGEND :

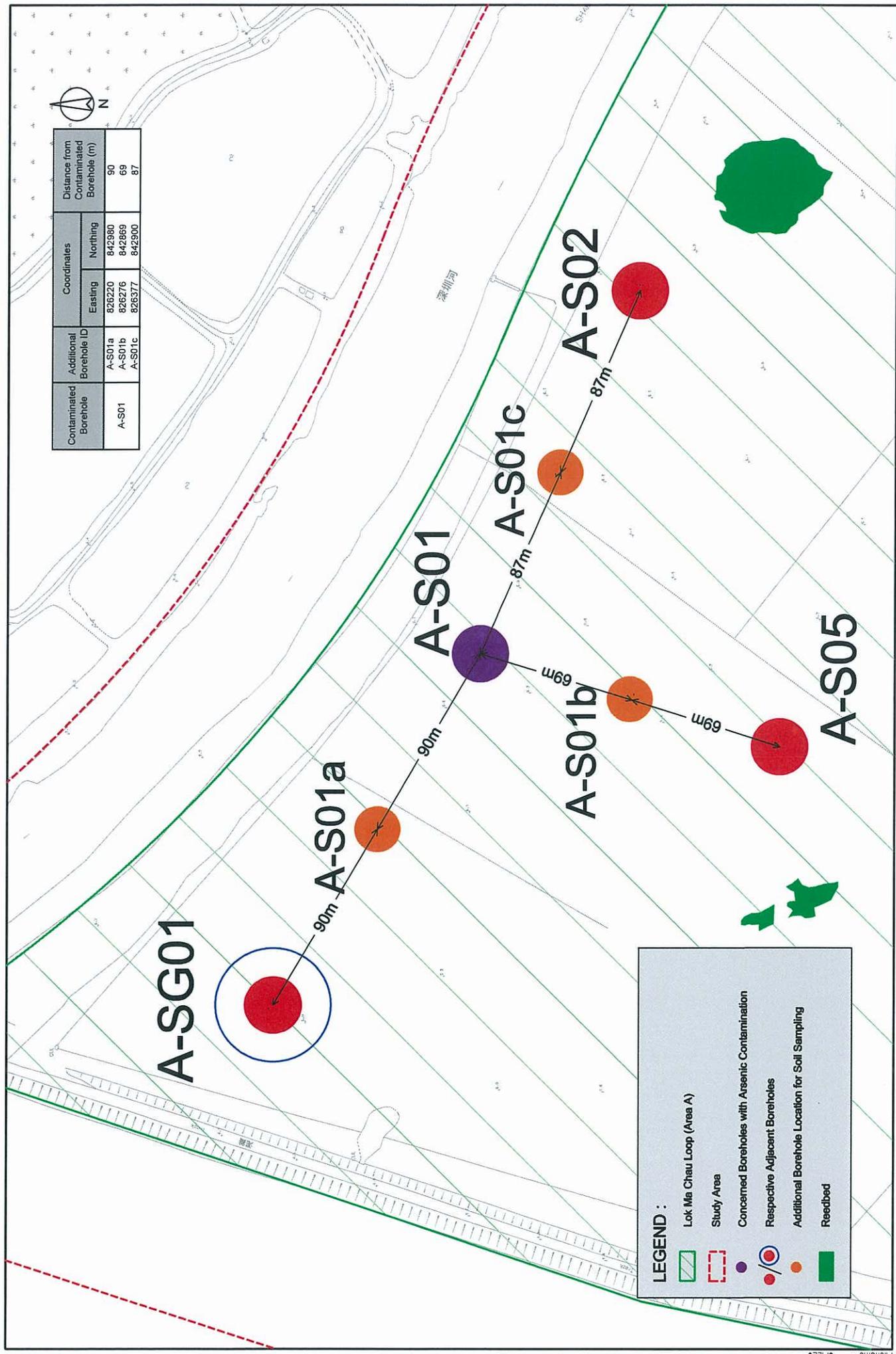
- Lok Ma Chau Loop (Area A)
- Study Area
- Contaminated Boreholes with Arsenic Contamination
- Respective Adjacent Boreholes
- Additional Borehole Location for Soil Sampling
- Roadbed

Printed by : SD/LES
 File name : SFL13

 土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	 規劃署 PLANNING DEPARTMENT	 ARUP One Asia & Premier Hong Kong Limited	Job Title	Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation			Drawing Title	Locations of Additional Boreholes					
			Rev	Description	Date	Scale	1:10000 ON A3	Checked	TC	Approved	ST	Date	04/10



Contaminated Borehole	Additional Borehole ID	Coordinates		Distance from Contaminated Borehole (m)
		Easting	Northing	
A-S01	A-S01a	826220	842980	90
	A-S01b	826276	842869	69
	A-S01c	826377	842900	87



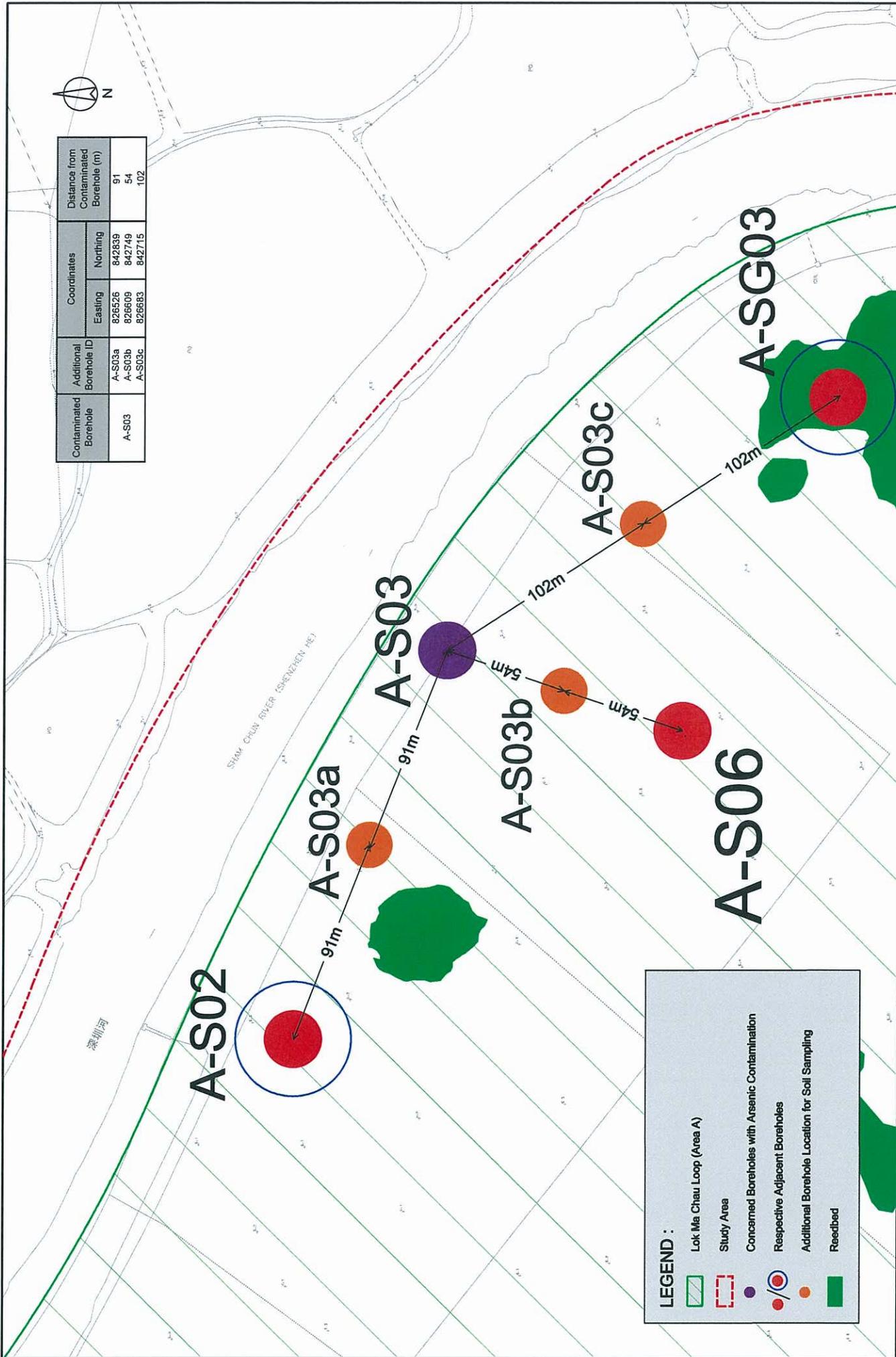
LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Contaminated Boreholes with Arsenic Contamination
- Respective Adjacent Boreholes
- Additional Borehole Location for Soil Sampling
- Reedbed

 土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	 規劃署 PLANNING DEPARTMENT	 ARUP One Stop & Partner Hong Kong Limited	Job Title	Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation			Drawing Title	Locations of Additional Boreholes for A-S01		
			Description	Date	Scale	Checked	TC	Approved	Date	Drawing No.
			Rev	Date	Scale	Approved	Date	Drawing No.	Figure 5.2.1	
			Rev	Date	Scale	Approved	Date	Drawing No.	Figure 5.2.1	



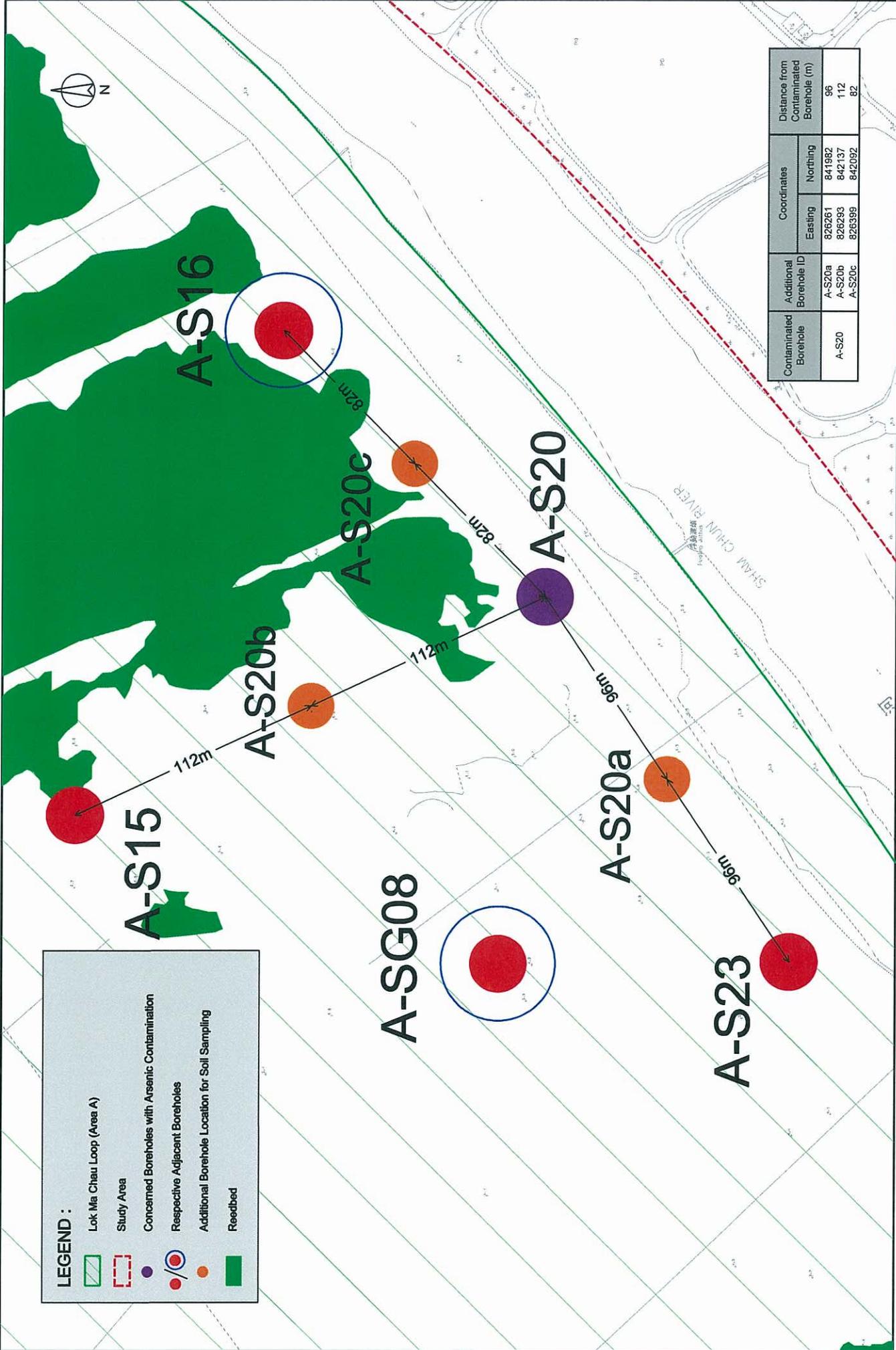
Contaminated Borehole	Additional Borehole ID	Coordinates		Distance from Contaminated Borehole (m)
		Easting	Northing	
A-S03	A-S03a	826526	842839	91
	A-S03b	826609	842749	54
	A-S03c	826683	842715	102



LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Boreholes with Arsenic Contamination
- Respective Adjacent Boreholes
- Additional Borehole Location for Soil Sampling
- Reedbed

 土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	 規劃署 PLANNING DEPARTMENT	 ARUP CONSULTANTS (HONG KONG) LIMITED	Job Title Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation	Drawing Title Locations of Additional Boreholes for A-S03	Rev Description Date	Date 04/10	LK TC	Checked Scale 1:1500 ON A3	Drawing No. Figure 5.2.2	Rev. ST
			F FIRST ISSUE	04/10	Approved	Approved	ST			



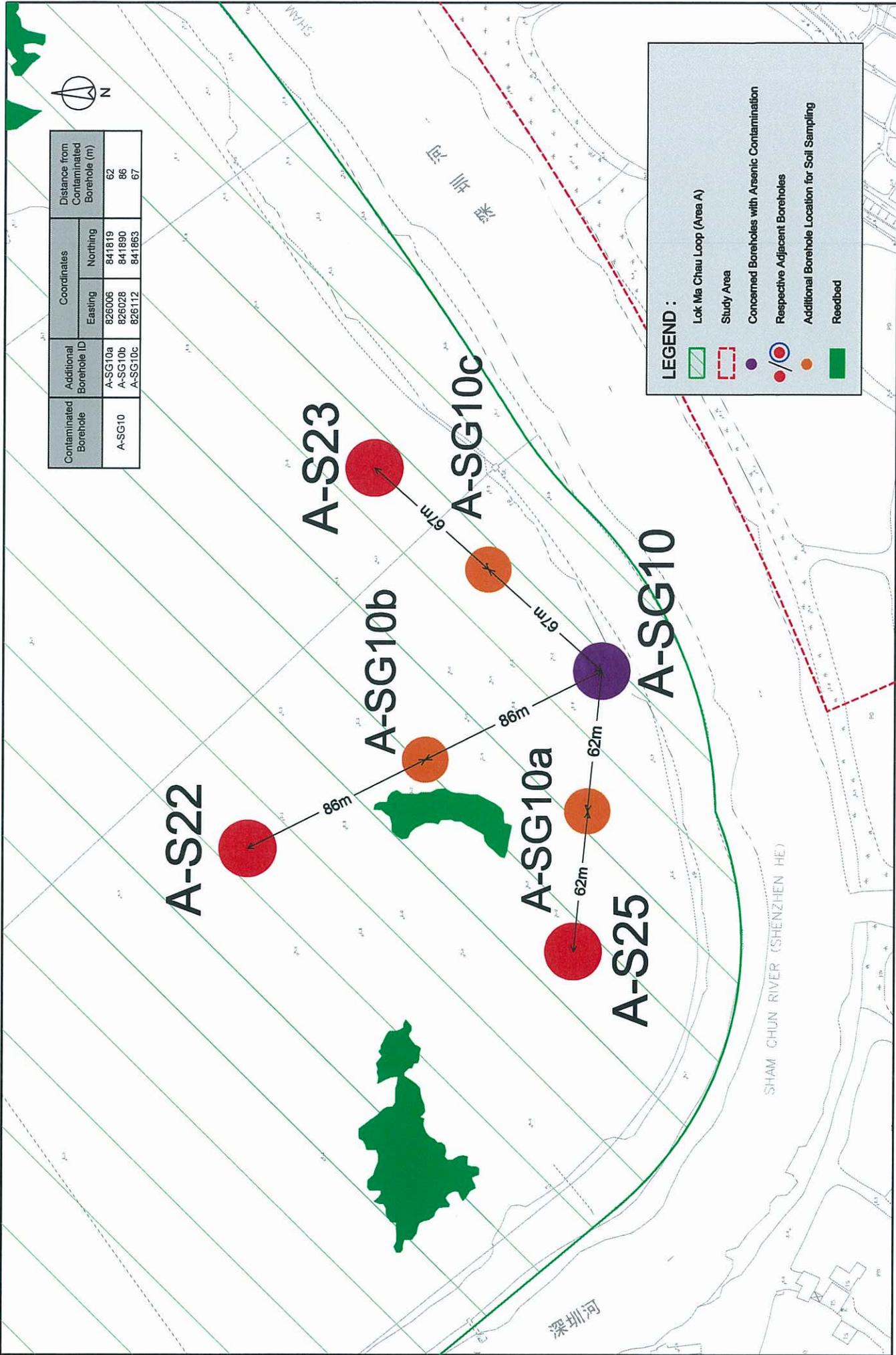
LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Boreholes with Arsenic Contamination
- Respective Adjacent Boreholes
- Additional Borehole Location for Soil Sampling
- Reefbed

Contaminated Borehole	Additional Borehole ID	Coordinates		Distance from Contaminated Borehole (m)
		Easting	Northing	
A-S20	A-S20a	826261	841982	96
	A-S20b	826293	842137	112
	A-S20c	826399	842092	82

土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	ARUP One Step & Partner Hong Kong Limited	規劃署 PLANNING DEPARTMENT	Drawing Title Locations of Additional Boreholes for A-S20		Drawing No. Figure 5.2.3
			Job Title Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation		Date 04/10
			Drawn LK	Date 04/10	Approved TC
			Checked TC	Date 04/10	Approved ST
			Scale 1:1500 ON A3		
			Description		
			Rev.		

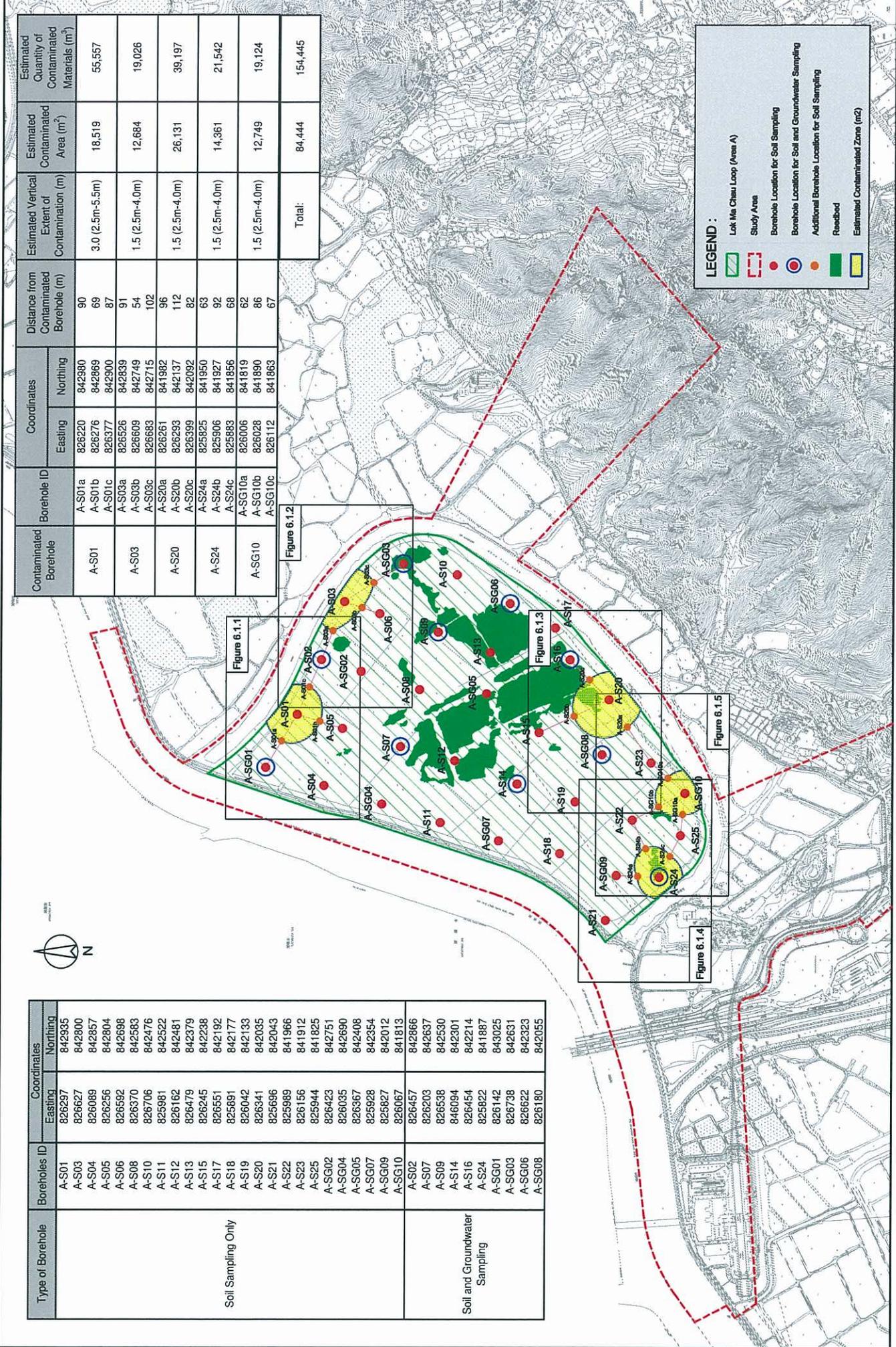
Contaminated Borehole	Additional Borehole ID	Coordinates		Distance from Contaminated Borehole (m)
		Easting	Northing	
A-SG10	A-SG10a	826006	841819	62
	A-SG10b	826028	841890	86
	A-SG10c	826112	841863	67



LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Boreholes with Arsenic Contamination
- Respective Adjacent Boreholes
- Additional Borehole Location for Soil Sampling
- Reedbed

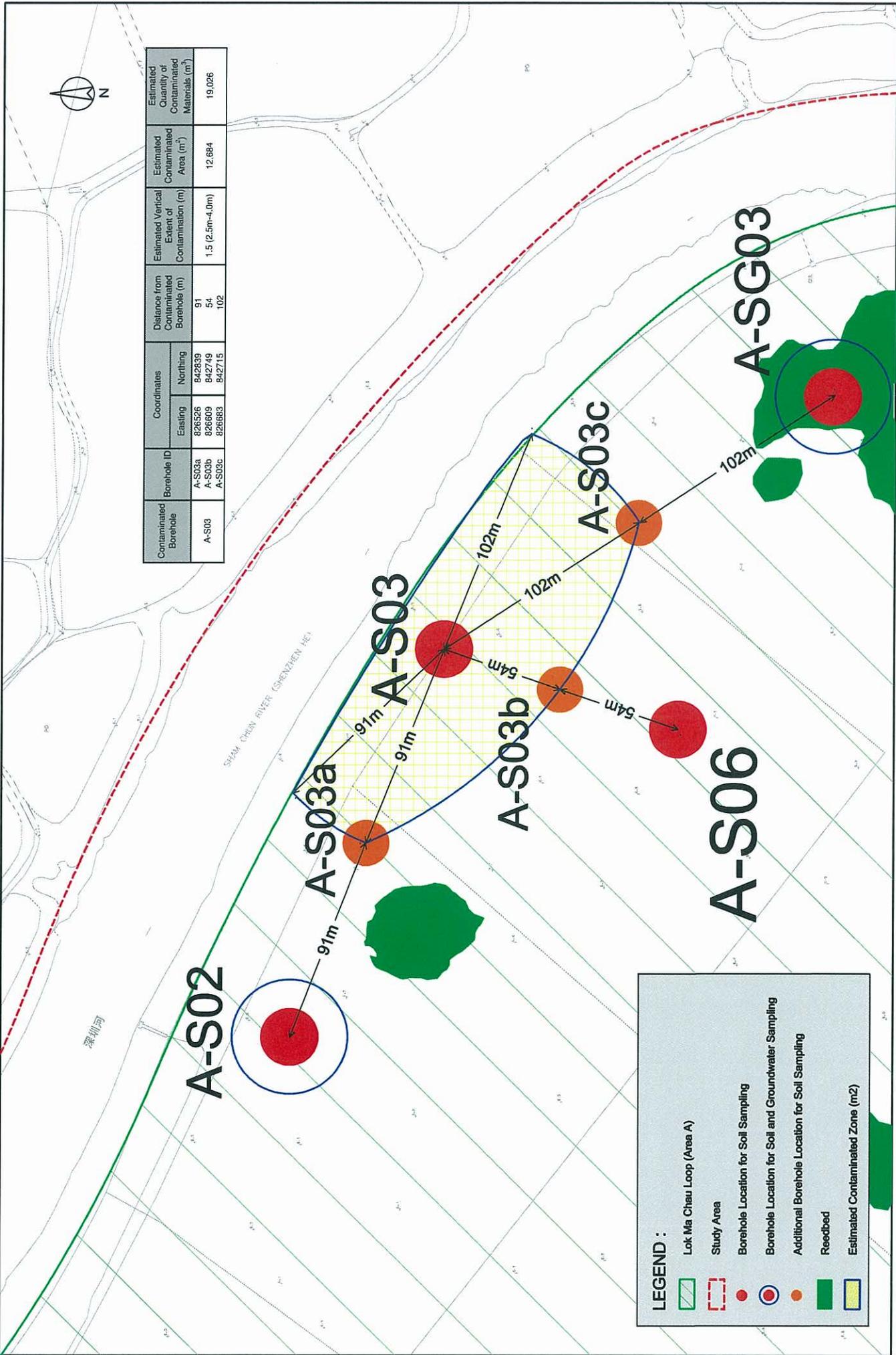
土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	規劃署 PLANNING DEPARTMENT	ARUP Hong Kong & Taiwan Incorporated in Hong Kong Limited	Job Title	Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation	Drawing Title	Locations of Additional Boreholes for A-SG10	Drawn	LK	Date	04/10	Drawing No.	Figure 5.2.5
			Rev	04/10	Scale	1:1500 ON A3	Checked	TC	Approved	ST	Rev.	



Contaminated Borehole	Borehole ID	Coordinates		Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S01	A-S01a	826220	842980	90	3.0 (2.5m-5.5m)	18,519	55,557
	A-S01b	826276	842969	69			
	A-S01c	826377	842900	87			
A-S03	A-S03a	826526	842839	91	1.5 (2.5m-4.0m)	12,684	19,026
	A-S03b	826609	842749	54			
	A-S03c	826683	842715	102			
A-S20	A-S20a	826261	841982	96	1.5 (2.5m-4.0m)	26,131	39,197
	A-S20b	826293	842137	112			
	A-S20c	826399	842092	82			
A-S24	A-S24a	825825	841950	63	1.5 (2.5m-4.0m)	14,361	21,542
	A-S24b	825906	841927	92			
	A-S24c	825883	841856	68			
A-SG10	A-SG10a	826006	841819	62	1.5 (2.5m-4.0m)	12,749	19,124
	A-SG10b	826028	841890	86			
	A-SG10c	826112	841863	67			
Total:						84,444	154,445

Type of Borehole	Boreholes ID	Coordinates	
		Easting	Northing
Soil Sampling Only	A-S01	826297	842935
	A-S03	826627	842800
	A-S04	826089	842857
	A-S05	826256	842804
	A-S06	826592	842698
	A-S08	826370	842583
	A-S10	826706	842476
	A-S11	825981	842522
	A-S12	826162	842481
	A-S13	826479	842379
	A-S15	826245	842238
	A-S17	826551	842192
	A-S18	825891	842177
	A-S19	826042	842133
	A-S20	826341	842035
	A-S21	825696	842043
	A-S22	825989	841966
A-S23	826156	841912	
A-S25	825944	841825	
Soil and Groundwater Sampling	A-SG02	826423	842751
	A-SG04	826035	842690
	A-SG05	826367	842408
	A-SG07	825928	842354
	A-SG09	825827	842012
	A-SG10	826067	841813
	A-S02	826457	842866
	A-S07	826203	842637
	A-S09	826538	842530
	A-S14	846094	842301
A-S16	826454	842214	
A-S24	825822	841887	
A-SG01	826142	843025	
A-SG03	826738	842631	
A-SG06	826622	842323	
A-SG08	826180	842055	

 土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	 規劃署 PLANNING DEPARTMENT	 ARUP One Asia & Pacific Hong Kong Limited	Job Title Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation	Drawing Title Locations of Possible Contaminated Zones	Drawing No. Figure 6.1
			Date 02/10	Approved ST	Scale 1:10000 ON A3
FIRST ISSUE Description		Date 06/09	Checked TC	Drawn LK	Date 02/10

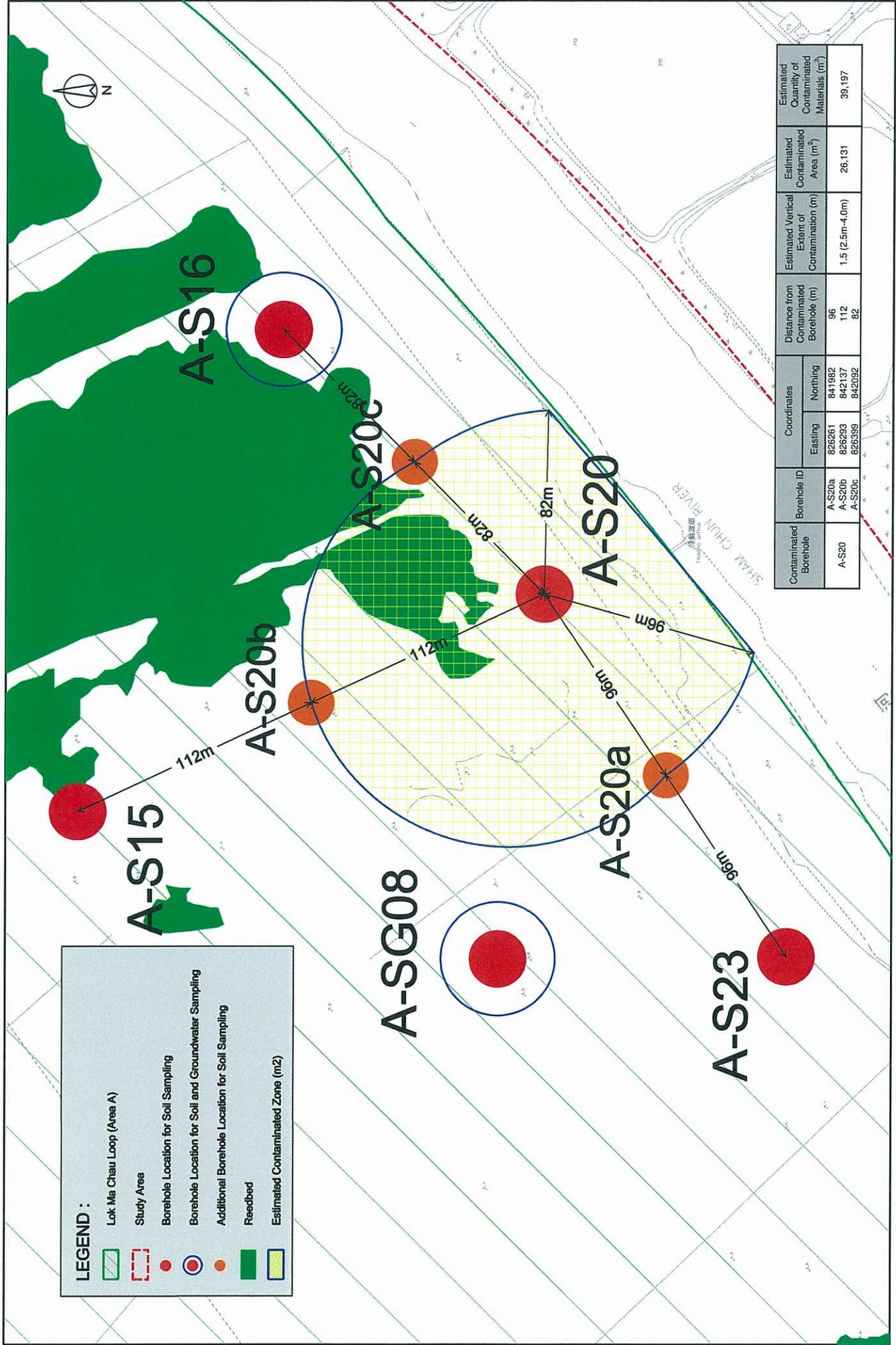


LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Borehole Location for Soil Sampling
- Borehole Location for Soil and Groundwater Sampling
- Additional Borehole Location for Soil Sampling
- Reebbed
- Estimated Contaminated Zone (m2)

土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	規劃署 PLANNING DEPARTMENT	ARUP Hong Kong Limited	Job Title	Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation	Drawing Title	Location of Possible Contaminated Zone A-S03	Rev.	07/10	1:1500 DN A3	1:1500 DN A3	02/10	02/10	02/10	02/10
			Description	Location of Possible Contaminated Zone A-S03	07/10	1:1500 DN A3	02/10	02/10	02/10	02/10				

Figure 6.1.2



LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Borehole Location for Soil Sampling
- Borehole Location for Soil and Groundwater Sampling
- Additional Borehole Location for Soil Sampling
- Reedbed
- Estimated Contaminated Zone (m2)

Contaminated Borehole	Borehole ID	Coordinates		Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S20	A-S20a	826261	841982	96	1.5 (2.5m-4.0m)	26,131	39,197
	A-S20b	826293	842137	112			
	A-S20c	826399	842092	82			

土木工程發展部 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	規劃部 PLANNING DEPARTMENT	ARUP One Asia & Pacific Hong Kong Limited	Job Title Location of Possible Contaminated Zone A-S20		Drawing No. Figure 6.1.3
			Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation		Date 02/10
Legend Lok Ma Chau Loop (Area A) Study Area Borehole Location for Soil Sampling Borehole Location for Soil and Groundwater Sampling Additional Borehole Location for Soil Sampling Reedbed Estimated Contaminated Zone (m2)			Checked TC	Drawn LK	Approved ST
Table Contaminated Borehole, Borehole ID, Coordinates, Distance from Contaminated Borehole, Estimated Vertical Extent of Contamination, Estimated Contaminated Area, Estimated Quantity of Contaminated Materials			Scale 1:1500 ON A3	Date 02/10	Description Location of Possible Contaminated Zone A-S20

Drawn	LK	Checked	TC	Scale	1:1500 ON A3
Date	02/10	Approved	ST	Rev.	

Location of Possible Contaminated Zone A-S24

Job Title
 Agreement No. CE 53/2008 (CE)
 Planning and Engineering Study on
 Development of Lok Ma Chau Loop - Investigation



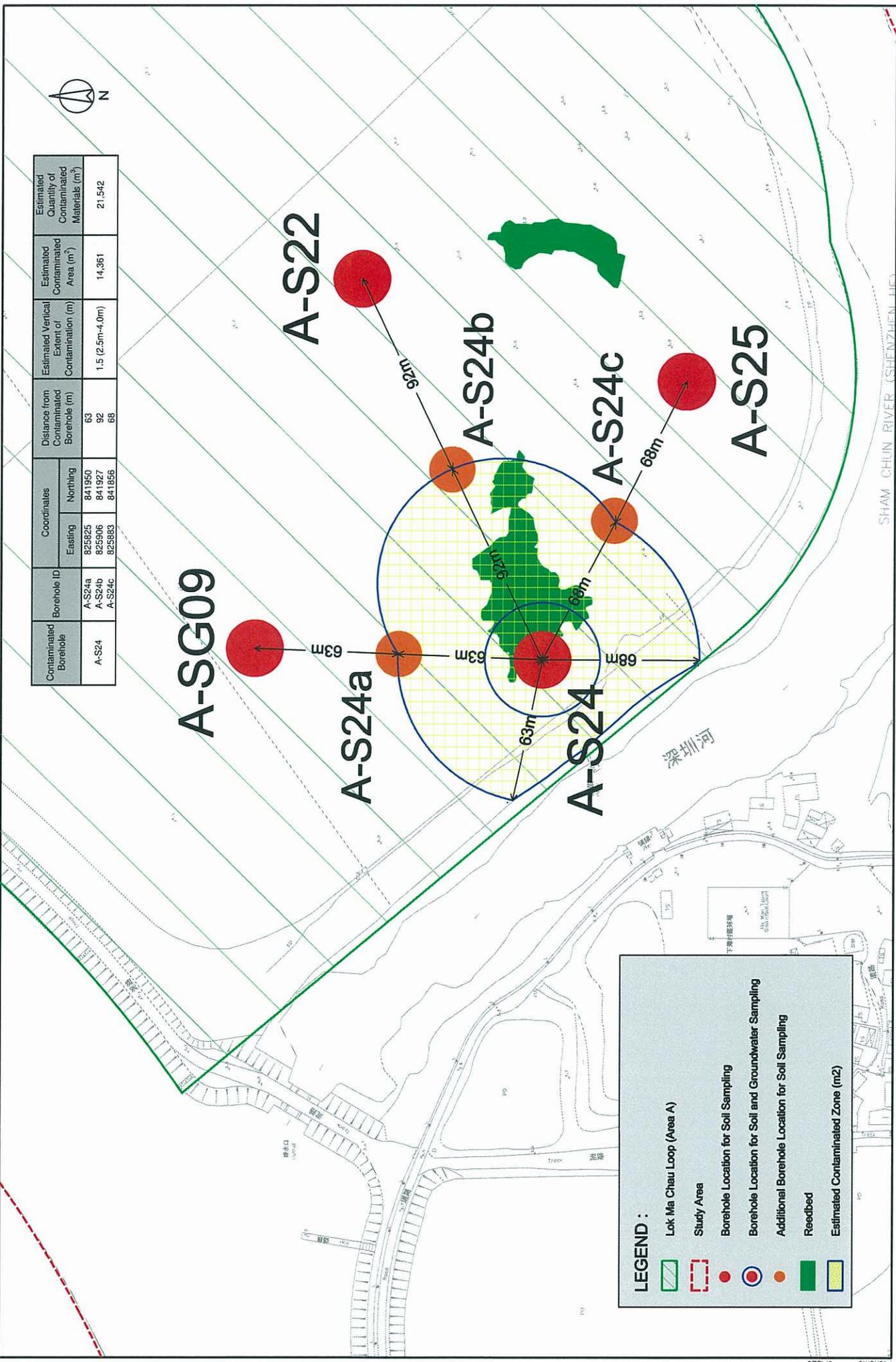
規劃學
 PLANNING
 DEPARTMENT



土木工程拓展署
 CIVIL ENGINEERING
 AND DEVELOPMENT
 DEPARTMENT



Printed by : SDATES
 Filename : SF1E3



Contaminated Borehole	Borehole ID	Coordinates		Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S24	A-S24a	825625	841950	63	1.5 (2.5m-4.0m)	14,361	21,542
	A-S24b	825906	841927	92			
	A-S24c	825983	841856	68			

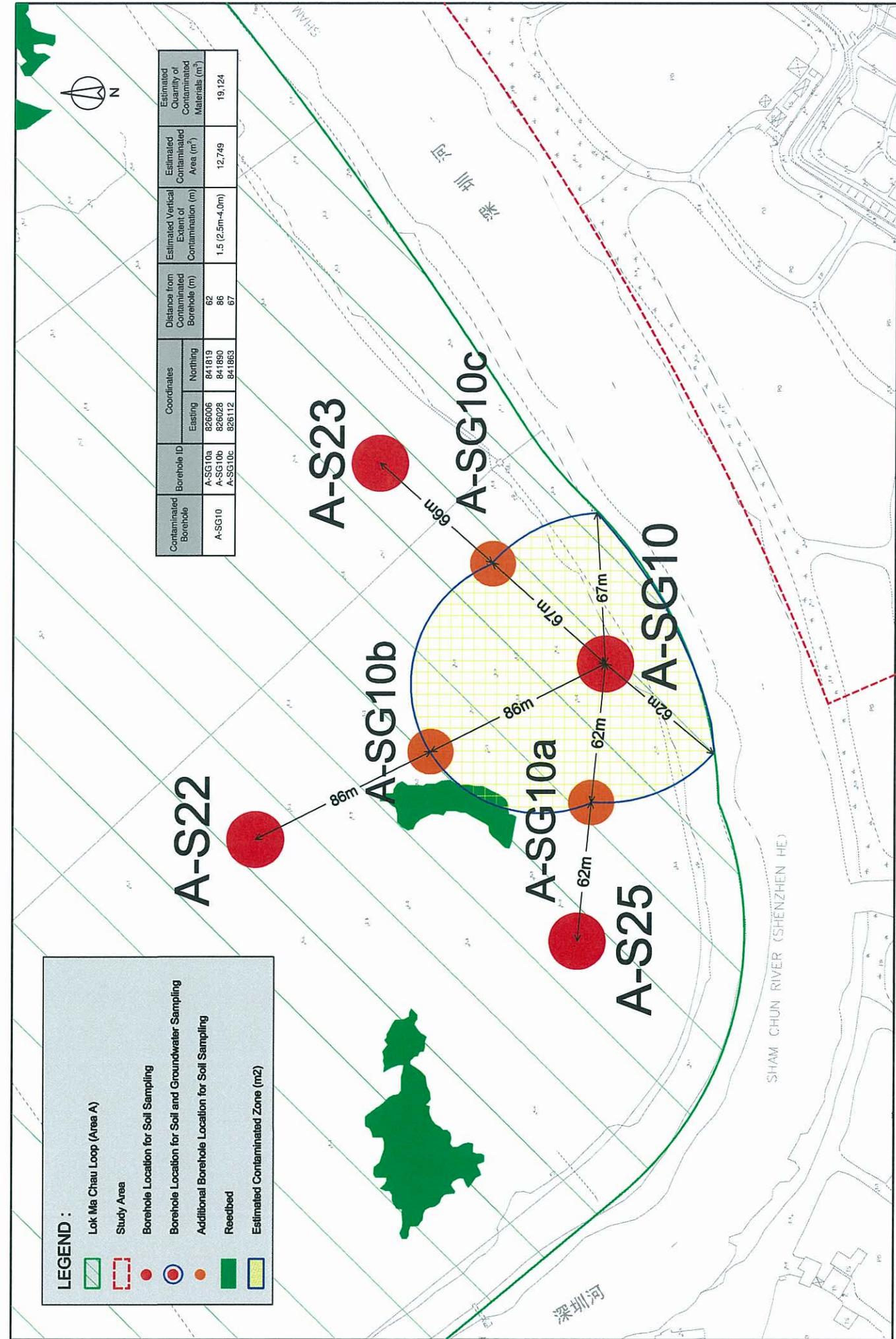
LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Borehole Location for Soil Sampling
- Borehole Location for Soil and Groundwater Sampling
- Additional Borehole Location for Soil Sampling
- Reedbed
- Estimated Contaminated Zone (m2)

LEGEND :

-  Lok Ma Chau Loop (Area A)
-  Study Area
-  Borehole Location for Soil Sampling
-  Borehole Location for Soil and Groundwater Sampling
-  Additional Borehole Location for Soil Sampling
-  Reebbed
-  Estimated Contaminated Zone (m2)

Contaminated Borehole	Borehole ID	Coordinates		Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-SG10	A-SG10a	826006	841819	62	1.5 (2.5m-4.0m)	12,749	19,124
	A-SG10b	826028	841890	86			
	A-SG10c	826112	841863	67			



 土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	 規劃署 PLANNING DEPARTMENT	 ARUP One Step & Partners Hong Kong Limited	Job Title Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation		Drawing Title Location of Possible Contaminated Zone A-SG10
			Drawn LK	Checked TC	Date 02/10
			Scale 1:1500 ON A3	Date 07/10	Rev. 1:1500 ON A3

Appendices

Appendix A

**Strata Log Records of
Boreholes**



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S01**
SHEET **1** of **3**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR08**

E 826,297.03
N 842,935.13

DATE from **14.12.09** to **19.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+5.83 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
14.12.09	PW														Loose, brown and grey, silty fine to coarse SAND with some gravel sized rock and brick fragments. (FILL)
				100					21 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00	+4.33	1.50			Loose, yellowish brown, fine to coarse SAND. (FILL)
				100					35 bits	3 3.00 4 3.45 3.50	+2.83	3.00			Stiff, yellowish brown to yellowish grey, sandy CLAY / SILT. (SWAMP DEPOSIT)
14.12.09 15.12.09		Dry at 18:00 Dry at 08:00		100					12 bits	5 4.50 6 4.95 5.00 7 5.50	+1.33	4.50			Stiff, dark grey, CLAY / SILT. (SWAMP DEPOSIT)
				100					(1, 2, 5, 9, 8, 10) N=30	8 6.50 6.60 6.70 9 7.00 7.05 10 7.50	-0.77	6.60			Medium dense, dark yellowish brown, fine to coarse SAND. (ALLUVIUM)
15.12.09 16.12.09		2.70m at 18:00 3.20m at 08:00		0					45 bits	11 8.50 8.60 8.70 12 9.00 9.05 13 9.10 9.20 14 9.50 9.55 15	-3.27	9.10			Soft, light white, CLAY / SILT. (ALLUVIUM)
				100					(1, 0, 1, 1, 0, 1) N=3		-4.17	10.00			

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- ✱ Water Level
- ▬ SPT Liner Sample
- ▬ Standard Penetration Test
- U76 Undisturbed Sample
- ▬ Permeability Test
- U100 Undisturbed Sample
- ▬ Impression Packer Test
- Mazier Sample
- ▬ Standpipe/Piezometer Tip
- Piston Sample
- ∨ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER **P.T. Fong** LOGGING GEOLOGIST **S.O. CHAN** GEOTECHNICAL ENGINEER **EDWARD CHENG**
 GEOTECHNICAL FIELD TECHNICIAN **K.W. Leung** DATE **27.12.09** DATE **28.12.09**

REMARKS
 1. Inspection pit excavated from 0.00m-1.50m.
 2. A constant head permeability test was carried out at 7.50m-9.00m depth.
 3. Flushing medium for first 5m is air.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S01**
SHEET **2** of **3**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. LY38/DR08

E 826,297.03
N 842,935.13

DATE from 14.12.09 to 19.12.09

FLUSHING MEDIUM AIR / WATER

ORIENTATION Vertical

GROUND LEVEL +5.83 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
16.12.09 17.12.09	2.90m at 18:00 3.40m at 08:00			100					(1, 2, 2, 3, 4, 4) N=13	16 17 18 19	-4.77 -5.67	10.60 11.70			As Sheet 1 of 3. Medium dense, light yellowish brown, fine to coarse SAND with some subrounded gravel sized quartz fragments. (ALLUVIUM) Medium dense, light yellowish brown, very silty fine SAND. (ALLUVIUM)
17.12.09 18.12.09	0.60m at 18:00 3.10m at 08:00			0					(4, 4, 6, 11, 14, 17) N=50	20 21 22 23	-7.67	13.70			Very dense, yellowish brown, fine to coarse SAND with much rounded gravel and cobble sized quartz fragments. (ALLUVIUM)
17.12.09 18.12.09	16.20 PW HW			100					69 bls	24 25 26	-10.37	16.20			Dense, yellowish brown, very silty fine to medium SAND. (ALLUVIUM)
18.12.09 19.12.09	2.20m at 18:00 18.06 HW			50					(2, 4, 6, 7, 12, 13) N=36	27 28 29	-11.17	17.00			Extremely weak, pinkish brown spotted green, completely decomposed coarse grained GRANITE. (Silty fine to coarse SAND)
				100	100	73		5.6		T2101 19.58 T2101	-12.23 -14.17	18.06 20.00		III/II	Moderately strong to strong, brownish pink spotted green, moderately to slightly decomposed coarse grained GRANITE. Joints are closely to medium spaced, rough planar, very narrow to narrow, iron stained, calcite infilled, dipping at 20°-30°, 40°-50° and 70°-75°.

DRILLHOLE LOG: J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25092005.GDT 21.4.10

- 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
- ┆ Impression Packer Test
- ┆ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER P.T. Fong LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 27.12.09 DATE 28.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S01**
SHEET **3** of **3**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. LY38/DR08

E 826,297.03
N 842,935.13

DATE from 14.12.09 to 19.12.09

FLUSHING MEDIUM AIR / WATER

ORIENTATION Vertical

GROUND LEVEL +5.83 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
				100	100	52		5.6		T2101			+		As Sheet 2 of 3.
								21.11					+		
				100	100	85		21.59		T2101			+		
								2.0					+		
19.12.09				100	100	88		23.55		T2101			+		End of drillhole at 23.55m.

DRILLHOLE LOG: J0911S26(TFL) LOK MA CHAU LOOP GPJ TYSAN_25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- ✱ Water Level
- SPT Liner Sample
- Standard Penetration Test
- U76 Undisturbed Sample
- Permeability Test
- U100 Undisturbed Sample
- Impression Packer Test
- Mazier Sample
- ⊠ Standpipe/Piezometer Tip
- Piston Sample
- < In-situ Vane Shear Test
- X Point Load Test

DRILLER
P.T. Fong

LOGGING GEOLOGIST
S.O. CHAN

GEOTECHNICAL ENGINEER
EDWARD CHENG

GEOTECHNICAL FIELD TECHNICIAN
K.W. Leung

DATE
27.12.09

DATE
28.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S01a**
SHEET **1** of **1**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. LY38/DR09

E 826,220.14
N 842,980.13

DATE from 30.01.10 to 30.01.10

FLUSHING MEDIUM AIR

ORIENTATION Vertical

GROUND LEVEL +7.00 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / test	Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
30.01.10	PW															Loose, light brown, fine to medium SAND with occasional angular to subangular fine to medium gravel sized rock fragments. (FILL) Firm, brown locally reddish brown and mottled orange, slightly fine sandy SILT with occasional angular to subangular fine to medium gravel sized rock and brick fragments. (FILL)
				100					27 bls		A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00	+6.50	0.50			
				100					11 bls		3 3.00 4 3.45 3.50					Soft, brownish grey, fine sandy SILT. (FILL)
				100					29 bls		5 4.50 6 4.85 5.00	+2.50	4.50			
30.01.10	5.00 PW	4.50m at 18:00		100								+2.00	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10

- 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
- ┆ Impression Packer Test
- ┆ Standpipe/Piezometer Tip
- ∠ In-situ Vane Shear Test
- × Point Load Test

DRILLER P.S. Tam	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 09.02.10	DATE 10.02.10

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S01b**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-3**

E 826,276.05
N 842,869.07

DATE from **30.01.10** to **30.01.10**

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+5.87 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total Core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I./Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
30.01.10	PW														Firm, brown, slightly sandy SILT with rootlets. (FILL)
				100					16 bls	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00	+5.37	0.50			Firm, reddish brown locally mottled white and brown, slightly sandy SILT. (FILL)
				100					11 bls	3 3.00 4 3.45 3.50					
				100					28 bls	5 4.50	+1.37	4.50			Loose, grey to dark grey, slightly silty fine to coarse SAND. (SWAMP DEPOSIT)
30.01.10	5.00 PW	4.42m at 18:00								6 4.85 5.00	+0.87	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG _J0911S26(TFL)_LOK MA CHAU LOOP.GPJ_TYSAN_25032005.GDT_21.4.10

- 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
- Impression Packer Test
- Standpipe/Piezometer Tip
- ◁ In-situ Vane Shear Test
- × Point Load Test

DRILLER <u>C.L. Chung</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>09.02.10</u>	DATE <u>10.02.10</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S01c**
SHEET 1 of 1

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. XY2B/CCL-1

E 826,377.15
N 842,900.03

DATE from 30.01.10 to 30.01.10

FLUSHING MEDIUM AIR

ORIENTATION Vertical

GROUND LEVEL +5.77 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.L. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
30.01.10	PW														Loose, light brown, fine to medium SAND. (FILL)
				100					19 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00	+5.27	0.50			Firm, reddish brown, slightly sandy CLAY / SILT with occasional angular to subangular fine gravel sized rock fragments. (FILL)
				100					8 bits	3 3.00 4 3.45 3.50					
	5.00	4.66m at 18:00		100					13 bits	5 4.50	+1.27	4.50			Soft, grey, CLAY / SILT with rootlets. (SWAMP DEPOSIT)
30.01.10	PW									6 4.95 5.00	+0.77	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- ┆ Penneability Test
- ┆ Impression Packer Test
- ▬ Standpipe/Piezometer Tip
- ∠ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER T.H. Wong
LOGGING GEOLOGIST S.O. CHAN
GEO TECHNICAL FIELD TECHNICIAN K.W. Leung
GEOTECHNICAL ENGINEER EDWARD CHENG
DATE 09.02.10
DATE 10.02.10

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S02**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR09**

E 826,457.16
N 842,866.08

DATE from **17.12.09** to **18.12.09**

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+6.22 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
17.12.09	PW									A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.85 2 2.00					Loose, yellowish brown to light yellowish brown, fine to coarse SAND. (FILL)
17.12.09 18.12.09				100					53 bits						
				100					45 bits	3 3.00 4 3.45 3.50	+3.22	3.00			Loose, yellowish grey to grey, silty fine to medium SAND. (SWAMP DEPOSIT)
18.12.09	5.00 PW	3.75m at 18:00		100					10 bits	5 4.50 6 4.95 7 5.00	+1.72	4.50			Soft, grey to dark grey. CLAY / SILT. (SWAMP DEPOSIT)
											+1.22	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG: J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- ▼ Water Level
- ▬ SPT Liner Sample
- ⊥ Standard Penetration Test
- ▬ U76 Undisturbed Sample
- ⊥ Permeability Test
- ▬ U100 Undisturbed Sample
- ⊥ Impression Packer Test
- ▬ Mazier Sample
- ⊥ Standpipe/Piezometer Tip
- ▬ Piston Sample
- ⊥ In-situ Vane Shear Test
- ⊥ Point Load Test

DRILLER <u>P.S. Tam</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>KW. Leung</u>	DATE <u>27.12.09</u>	DATE <u>28.12.09</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.
2. A water sample was taken at 5.00m depth.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S03**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR05**

E 826,627.15

DATE from **21.12.09** to **23.12.09**

N 842,800.15

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+3.98 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.O.D.	Fracture Index	F1/F2 Test	Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
21.12.09	PW															Loose, brown and grey, very silty fine to coarse SAND. (FILL)
21.12.09 22.12.09				100					19 bts		A 0.45 0.50 B 0.85 1.00 C 1.45 1.50					
22.12.09 23.12.09				100					8 bts		1 1.95 2 2.00	+0.98	3.00			Firm, grey to dark grey, CLAY / SILT. (SWAMP DEPOSIT)
22.12.09 23.12.09		4.03m at 18:00		100					14 bts		3 3.45 4 3.50					
23.12.09	PW	5.00									5 4.50 6 4.85 5.00	-1.02	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG: J0911S26(TFL) LOK MA CHAU LOOP GPJ TYSAN_25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- ✱ Water Level
- SPT Liner Sample
- ⋮ Standard Penetration Test
- ▤ U76 Undisturbed Sample
- ⋮ Permeability Test
- ▥ U100 Undisturbed Sample
- ⋮ Impression Packer Test
- ▧ Mazier Sample
- ⋮ Standpipe/Piezometer Tip
- ▩ Piston Sample
- ⋮ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER F.K. Yiu	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 20.01.10	DATE 21.01.10

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S03a**
SHEET 1 of 1

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. LY38/DR08

E 826,526.03
N 842,839.09

DATE from 30.01.10 to 30.01.10

FLUSHING MEDIUM AIR

ORIENTATION Vertical

GROUND LEVEL +5.70 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
30.01.10	PW														Soft, brown and grey, slightly clayey SILT with occasional fine gravel sized rock fragments and rootlets. (FILL)
										A	+5.20	0.50			Loose, brownish grey, slightly silty fine to medium SAND. (FILL)
										B					
										C	+4.20	1.50			Soft to firm, grey locally mottled brown, CLAY / SILT. (SWAMP DEPOSIT)
				100					8 bits	1					
										2					
										3					
									10 bits	4					
										5					
				100						6					
	5.00	Dry at 18:00							18 bits	7					
30.01.10	PW									8	+0.70	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- ▬ Large Disturbed Sample
- ▼ Water Level
- SPT Liner Sample
- ┆ Standard Penetration Test
- ▨ U76 Undisturbed Sample
- ┆ Permeability Test
- ▨ U100 Undisturbed Sample
- ┆ Impression Packer Test
- ▨ Maziar Sample
- ▨ Standpipe/Piezometer Tip
- ▨ Piston Sample
- ▨ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER P.T. Fong
 LOGGING GEOLOGIST S.O. CHAN
 GEOTECHNICAL FIELD TECHNICIAN KW. Leung
 DATE 09.02.10
 GEOTECHNICAL ENGINEER EDWARD CHENG
 DATE 10.02.10

REMARKS
 1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S03b**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 826,609.09

DATE from **29.01.10** to **29.01.10**

N 842,749.10

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+6.09 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total Core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mP.D)	Depth (m)	Legend	Grade	Description
29.01.10	PW														Loose, light brown locally mottled brown, fine to medium SAND. (FILL)
				100					6 bis	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.90	+5.09	1.00			Soft to firm, grey locally dark grey, SILT / CLAY. (SWAMP DEPOSIT)
				100					10 bis	3 3.00 4 3.45 3.50					
				100					14 bis	5 4.50					
29.01.10	5.00 PW	4.73m at 18:00								6 4.95 5.00	+1.09	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- ⊥ Impression Packer Test
- ⊥ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER
T.H. Wong

GEOTECHNICAL FIELD TECHNICIAN
K.W. Leung

LOGGING GEOLOGIST
S.O. CHAN

DATE
09.02.10

GEOTECHNICAL ENGINEER
EDWARD CHENG

DATE
10.02.10

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S03c**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 826,683.06

DATE from **29.01.10** to **29.01.10**

N 842,715.06

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+5.27 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
29.01.10	PW														Loose, light brown and brown, slightly silty fine to coarse SAND with occasional angular to subangular fine to coarse gravel sized rock fragments. (FILL)
				100					19 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.85 2 2.00	+3.27	2.00			Very soft, grey, CLAY / SILT. (SWAMP DEPOSIT)
				100					23 bits	3 3.00 4 3.45 3.50					
	5.00	4.80m at 18:00		100					1 bits	6 4.50 7 4.95 8 5.00	+0.27	5.00			End of drillhole at 5.00m.
29.01.10	PW														

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP GP J. TYSAN 25032005 GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- ▲ Large Disturbed Sample
- ▼ Water Level
- SPT Liner Sample
- Standard Penetration Test
- U76 Undisturbed Sample
- Permeability Test
- U100 Undisturbed Sample
- Impression Packer Test
- Mazier Sample
- ▲ Standpipe/Piezometer Tip
- Piston Sample
- ▼ In-situ Vane Shear Test
- × Point Load Test

DRILLER T.H. Wong LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 09.02.10 DATE 10.02.10

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S04**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR06**

E 826,089.12

DATE from **14.12.09** to **15.12.09**

N 842,857.26

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+6.06 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.C.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mP.D)	Depth (m)	Legend	Grade	Description
14.12.09	PW														Loose, brown, silty fine to coarse SAND with some gravel sized rock and brick fragments. (FILL)
14.12.09									25 bls	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00	+5.06	1.00			Firm, yellowish brown mottled grey, sandy SILT. (FILL)
15.12.09	5.00 PW	4.21m at 18:00		100					12 bls	3 3.00 4 3.45 3.50	+3.06	3.00			Firm, grey to dark grey, sandy CLAY / SILT. (SWAMP DEPOSIT)
15.12.09				100					11 bls	5 4.50 6 4.85 5.00	+1.06	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP GPJ_TYSAN_25032005.GDT 21.4.10

- 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
- ▬ Impression Packer Test
- ▬ Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER K.M. Lee LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 17.12.09 DATE 18.12.09

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S05**
SHEET **1** of **1**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. LY38/DR06

E 826,256.07

DATE from 16.12.09 to 17.12.09

N 842,804.20

FLUSHING MEDIUM AIR

ORIENTATION Vertical

GROUND LEVEL +5.40 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
16.12.09	PW														Loose, brown mottled grey and black, silty fine to coarse SAND with some gravel sized rock fragments. (FILL)
16.12.09								11 bits	A 0.45 B 0.50 C 0.95 1 1.00 2 1.45 3 1.50						
17.12.09				100											
17.12.09								13 bits	4 1.95 5 2.00 6 3.00 7 3.45 8 3.50						
17.12.09	5.00 PW	4.55m at 18:00		100					7 bits	9 4.50 10 4.65 11 5.00	-0.90 +0.40	4.50 5.00			Firm, grey to dark grey, CLAY / SILT. (SWAMP DEPOSIT)
															End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ_TYSAN_25032005.GDT 21.4.10

- 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
- Impression Packer Test
- Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- × Point Load Test

DRILLER K.M. Lee LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 27.12.09 DATE 28.12.09

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S06**

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

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR09**

E 826,592.03

DATE from **22.12.09** to **23.12.09**

N 842,698.26

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+5.15 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.i. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
22.12.09	PW														Loose, yellowish brown, fine to coarse SAND with some gravel sized quartz fragments. (FILL)
22.12.09 23.12.09				100					2 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00					
				100					50 bits	3 3.00 4 3.45 3.50	+2.15 3.00				Dense, yellowish grey to grey, silty fine to medium SAND. (SWAMP DEPOSIT)
23.12.09	5.00 PW	3.43m at 18:00		100					69 bits	5 4.50 6 4.95 5.00	+0.15 5.00				End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- ┆ Impression Packer Test
- ┆ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER P.S. Tam LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 20.01.10 DATE 21.01.10

REMARKS
 1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S07**
SHEET 1 of 3

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. XY2B/CCL-3

E 826,203.10
N 842,637.20

DATE from 11.12.09 to 17.12.09

FLUSHING MEDIUM AIR / WATER

ORIENTATION Vertical

GROUND LEVEL +5.14 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
11.12.09	PW														Loose, yellowish grey to yellowish brown, fine to coarse SAND. (FILL)
				100					40 bla	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00					
				100					84 bla	3 3.00 4 3.45 3.50	+2.14	3.00			Very soft, yellowish brown to yellowish grey, CLAY. (SWAMP DEPOSIT)
				100					9 bla	5 4.50 6 4.05 35 5.00	+0.64	4.50			Medium dense, yellowish grey to grey, silty fine to medium SAND with oyster fragments. (SWAMP DEPOSIT)
11.12.09 12.12.09		1.36m at 08:00		85					(1, 1, 2, 3, 5, 5) N=15	7 5.50 8 6.50 6.60 6.70 9 7.00 10 7.05	-1.46	6.60			Stiff, grey to dark grey, CLAY / SILT with oyster fragments. (SWAMP DEPOSIT)
12.12.09 14.12.09		2.10m at 18:00 3.20m at 08:00		85					(1, 1, 0, 1, 0) N=2	11 7.50 12 8.50 8.60 13 9.00 14 9.05	-4.86	10.00			

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- ⊥ Impression Packer Test
- ⊥ Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- ⊗ Point Load Test

DRILLER
C.L. Chung

LOGGING GEOLOGIST
S.O. CHAN

GEOTECHNICAL ENGINEER
EDWARD CHENG

GEOTECHNICAL FIELD TECHNICIAN
K.W. Leung

DATE
27.12.09

DATE
28.12.09

REMARKS

1. Inspection pit excavated from 0.00m-1.50m.
2. Falling head permeability tests were carried out at 7.10m-8.60m, 13.50m-15.00m and 16.50m-18.00m depth.
3. A vane shear test was carried out at 11.55m depth.
4. A water sample was taken at 5.00m depth.
5. Flushing medium for first 5m is air.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S07**
SHEET **2** of **3**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. XY2B/CCL-3

E 826,203.10
N 842,637.20

DATE from 11.12.09 to 17.12.09

FLUSHING MEDIUM AIR / WATER

ORIENTATION Vertical

GROUND LEVEL +5.14 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
				85											As Sheet 1 of 3.
									(1, 1, 0, 1, 1, N=3)	15 16 17 18	-5.46	10.60			Very stiff, yellowish brown mottled red, CLAY / SILT. (ALLUVIUM)
				100						19 20 21 22					
									(1, 1, 1, 2, 1, N=6)	23 24 25 26					
				50						27 28 29 30	-8.36	13.50			Very dense, yellowish brown, fine to coarse SAND with some rounded gravel sized quartz fragments. (ALLUVIUM)
				100						31 32					
	2.30m at 18:00								136 bts	33 34					
	4.80m at 08:00			0					(10, 15, 18, 16, 16, 18) N=58	35 36					
	16.50 PW HW								(2, 4, 5, 4, 11, 13) N=33	37 38 39 40					
										41 42	-11.36	16.50		V	Extremely weak, pinkish brown, completely decomposed coarse grained GRANITE. (Silty fine to coarse SAND)
				100						43 44					
	2.70m at 18:00									45 46					
	18.60 HW								(35, 15/30mm, 10/3/45mm, 100/4/45mm)	47 48 49 50	-13.26	18.40		IV	Weak, brownish pink, highly decomposed coarse grained GRANITE. (subangular GRAVEL sized rock fragments)
	3.60m at 08:00			80	80	20	5.6			51 52	-13.46	18.60		IV/III	Moderately weak to moderately strong, pinkish brown, highly to moderately decomposed coarse grained GRANITE with closely spaced joints.
				82	63	63				53 54	-14.66	20.00			

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ_TYSAN_25052005.GDT_21.4.10

- 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
- ┆ Impression Packer Test
- ┆ Standpipe/Piezometer Tip
- ┆ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER C.L. Chung
GEO TECHNICAL FIELD TECHNICIAN K.W. Leung
LOGGING GEOLOGIST S.O. CHAN
DATE 27.12.09
GEO TECHNICAL ENGINEER EDWARD CHENG
DATE 28.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S07**
SHEET **3** of **3**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. XY2B/CCL-3

E 826,203.10
N 842,637.20

DATE from 11.12.09 to 17.12.09

FLUSHING MEDIUM AIR / WATER

ORIENTATION Vertical

GROUND LEVEL +5.14 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
16.12.09 17.12.09	2.40m at 18:00		82	63	63	5.6	20.20			T2101	-15.06	20.20	+	IV/III	As Sheet 2 of 3.
			100	100	30	>20				T2101		20.47	+	III/II	Moderately strong to strong, pinkish brown, moderately to slightly decomposed coarse grained GRANITE. Joints are closely spaced, rough planar, narrow, iron stained, dipping at 10°-20°, 30°-40° and 50°-60°.
	4.50m at 08:00						21.09			T2101	-15.95	21.09	+		Strong, dark pink, slightly decomposed coarse grained GRANITE. Joints are closely to medium spaced, rough planar, narrow, iron stained, chlorite coated, dipping at 20°-30°, 50°-60° and vertical joint from 24.00-24.60m.
			100	100	86	4.5	22.40			T2101		22.60	+		
			100	100	85					T2101		23.20	+	II	
			100	100	36	5.5				T2101		24.69	+		
	3.50m at 18:00		100	100	20	>20	24.60			T2101		24.69	+		
17.12.09							25.53				-20.39	25.53	+		End of drillhole at 25.53m.

DRILL-HOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- ▼ Water Level
- SPT Liner Sample
- Standard Penetration Test
- ▨ U76 Undisturbed Sample
- Permeability Test
- ▨ U100 Undisturbed Sample
- Impression Packer Test
- ▨ Mazier Sample
- Standpipe/Piezometer Tip
- Piston Sample
- ◁ In-situ Vane Shear Test
- × Point Load Test

DRILLER
C.L. Chung

LOGGING GEOLOGIST
S.O. CHAN

GEOTECHNICAL ENGINEER
EDWARD CHENG

GEOTECHNICAL FIELD TECHNICIAN
K.W. Leung

DATE
27.12.09

DATE
28.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S08**
SHEET **1** of **1**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR06**

E 826,370.15

DATE from **18.12.09** to **19.12.09**

N 842,583.11

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+5.67 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	FL Test	Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
18.12.09	PW															Loose, brown, silty fine to medium SAND. (FILL)
18.12.09											A	+5.17	0.50			Firm, brown and grey, sandy SILT. (FILL)
19.12.09											B	+4.67	1.00			Loose, yellowish brown, fine to coarse SAND. (FILL)
				100						20 bis	C	+4.17	1.50			Very stiff, grey and white, sandy CLAY / SILT. (SWAMP DEPOSIT)
											1					
											2					
				100						11 bis	3	+2.67	3.00			Firm, grey to dark grey. CLAY / SILT. (SWAMP DEPOSIT)
											4					
											5	+1.17	4.50			Loose, black, clayey fine to coarse SAND with some roots. (SWAMP DEPOSIT)
19.12.09	5.00 PW	4.40m at 18:00	100							14 bis	6	+0.67	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG: J0911S26(TFL) LOK MA CHAU LOOP.GPJ_TYSAN_25092005.GDT_21.4.10

- 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
- | Impression Packer Test
- ⊕ Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- × Point Load Test

DRILLER K.M. Lee LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 27.12.09 DATE 28.12.09

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰界地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S09**

SHEET 1 of 1

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. LY38/DR06

E 826,538.05
N 842,530.10

DATE from 21.12.09 to 22.12.09

FLUSHING MEDIUM AIR

ORIENTATION Vertical

GROUND LEVEL +4.22 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
21.12.09	PW														Loose, yellowish brown, fine to coarse SAND. (FILL)
				100					12 bis	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00	+3.22	1.00			Very soft, yellowish brown to black, CLAY / SILT. (FILL)
				100					11 bis	3 3.00 4 3.45 3.50	+1.22	3.00			Loose, yellowish brown, fine to coarse SAND with much gravel sized rock and shell fragments. (FILL)
21.12.09 22.12.09	5.00 PW	Dry at 18:00		100					15 bis	5 4.50 6 4.95 7 5.00	-0.28 -0.78	4.50 5.00			Firm, yellowish brown to black, CLAY / SILT. (SWAMP DEPOSIT)
22.12.09															End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP GP1 TYSAN 25032005 GSDT 21.4.10

- 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
- Impression Packer Test
- ▴ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER
K.M. Lee

LOGGING GEOLOGIST
S.O. CHAN

GEOTECHNICAL FIELD TECHNICIAN
K.W. Leung

DATE
20.01.10

GEOTECHNICAL ENGINEER
EDWARD CHENG

DATE
21.01.10

REMARKS

1. Inspection pit excavated from 0.00m-1.50m.
2. A water sample was taken at 5.00m depth.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S10**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-3**

E 826,706.20
N 842,476.09

DATE from **21.12.09** to **21.12.09**

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+4.63 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery % Total core	Solid core Recovery %	R.Q.D.	Fracture index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
21.02.09	PW								<ul style="list-style-type: none"> • A 0.45 • B 0.50 • C 0.95 • D 1.00 • E 1.45 • F 1.50 • G 1.95 • H 2.00 • I 3.00 • J 3.45 • K 3.50 • L 4.50 • M 4.95 • N 5.00 	+3.13	1.50	[Cross-hatch pattern]		Loose, brown to brownish grey, silty fine to coarse SAND. (FILL)
			100									[Horizontal lines pattern]		Very stiff, yellowish grey to grey, CLAY. (SWAMP DEPOSIT)
			100									[Dotted pattern]		Loose, grey, clayey fine to medium SAND with some roots. (SWAMP DEPOSIT)
		4.10m at 18:00	100							+1.63	3.00	[Vertical lines pattern]		Firm, grey to dark grey, CLAY / SILT. (SWAMP DEPOSIT)
21.12.09	5.00 PW									+0.13	4.50	[Vertical lines pattern]		Firm, grey to dark grey, CLAY / SILT. (SWAMP DEPOSIT)
										-0.37	5.00	[Vertical lines pattern]		End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP GRU, TYSAN_25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- ▼ Water Level
- SPT Liner Sample
- Standard Penetration Test
- U76 Undisturbed Sample
- Permeability Test
- U100 Undisturbed Sample
- Impression Packer Test
- Mazier Sample
- Standpipe/Piezometer Tip
- Piston Sample
- In-situ Vane Shear Test
- Point Load Test

DRILLER <u>C.L. Chung</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>27.12.09</u>	DATE <u>28.12.09</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S11**
SHEET 1 of 3

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. LY38/DR09

E 825,981.23
N 842,522.14

DATE from 08.12.09 to 16.12.09

FLUSHING MEDIUM AIR / WATER

ORIENTATION Vertical

GROUND LEVEL +6.05 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
10.12.09	SW														Loose, brown, silty fine to coarse SAND with some gravel sized rock fragments. (FILL)
				100					18 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50	+5.05	1.00			Stiff, yellowish brown mottled grey, sandy SILT with some gravel sized rock fragments. (FILL)
				100					16 bits	1 1.95 2 2.00					
	5.00 SW PW			100					17 bits	3 3.00 4 3.45 3.50					
		Dry at 18:00		100						5 4.50 6 4.95 5.00					
10.12.09		Dry at 08:00		100						7 5.50	+0.55	5.50			Loose, grey to yellowish grey, clayey fine to medium SAND. (SWAMP DEPOSIT)
11.12.09									(1, 0, 1, 1, 2, 3) N=7	8 6.50 6.60 6.70					
				80						9 7.00 7.05					
									(0, 1, 0, 1, 0) N=2	10 7.50	-1.45	7.50			Firm, grey to dark grey, CLAY / SILT with oyster fragments. (SWAMP DEPOSIT)
				100						11 8.50 8.60 8.70					
										12 9.00 9.05					
										13 9.50					
										14					
											-3.95	10.00			

- 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
- ⊥ Impression Packer Test
- Standpipe/Piezometer Tip
- ∠ In-situ Vane Shear Test
- × Point Load Test

DRILLER P.S. Tam
GEOLOGICAL FIELD TECHNICIAN K.W. Leung
LOGGING GEOLOGIST S.O. CHAN
DATE 17.12.09
GEO TECHNICAL ENGINEER EDWARD CHENG
DATE 18.12.09

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.
2. A piezometer installed at 12.00m depth.
3. A falling head permeability test was carried out at 15.60m-17.10m depth.
4. A vane shear test was carried out at 13.10m depth.
5. Flushing medium for first 5m is air.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S11**
SHEET **2** of **3**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC** CO-ORDINATES **E 825,981.23** JOB No. **J0911S26 (TFL)**
N 842,522.14 DATE from **08.12.09** to **16.12.09**
 FLUSHING MEDIUM **AIR / WATER** ORIENTATION **Vertical** GROUND LEVEL **+6.05 m.P.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	FL / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
				100						15 16 10.50 10.80 17 10.70 18 11.00 11.05					As Sheet 1 of 3.
				100				12.00	(0, 0, 0, 1, 1, 1) N=3	19 20 12.50 12.60	-5.45	11.50			Firm, grey to dark grey, CLAY / SILT. (SWAMP DEPOSIT)
11.12.09 12.12.09		Dry at 18:00 2.60m at 08:00		100				13.10	(0, 1, 2, 2, 1, 1) N=7	21 13.05 13.10 22 13.20 23 13.50 13.55 13.60	-7.05	13.10			Soft, yellowish brown to dark yellowish brown, CLAY / SILT. (ALLUVIUM)
12.12.09 14.12.09		1.10m at 18:00 2.35m at 08:00		100					(1, 1, 1, 1, 2, 2) N=6	24 14.60 14.70 25 14.80 26 15.10 15.15					Firm, black mottled yellowish brown, sandy CLAY / SILT with some rounded gravel and cobble sized quartz fragments. (SWAMP DEPOSIT)
				100					(5, 7, 3, 3, 7, 6) N=21	28 15.60 29 16.60 10.70 16.80 30 17.10 17.15	-9.55	15.60			Medium dense, yellowish brown, clayey fine to coarse SAND with some rounded gravel and cobble sized quartz fragments. (ALLUVIUM)
				0				17.10		31 17.60					
				100					33 bis	32 18.60 18.70 33 19.15 19.20 34 19.30 19.60 19.65	-10.65	16.70			
14.12.09 15.12.09	19.65 PW 4.44m HW	1.40m at 18:00 4.44m at		90					(3, 5, 6, 9, 13, 17) N=45	35 19.60 19.65	-13.15	19.20		V	Extremely weak, brownish pink spotted green, completely decomposed coarse grained GRANITE. (Very silty fine to coarse SAND)
											-13.95	20.00			

DRILLHOLE LOG: J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- Impression Packer Test
- ⊕ Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER **P.S. Tam** LOGGING GEOLOGIST **S.O. CHAN** GEOTECHNICAL ENGINEER **EDWARD CHENG**
 GEOTECHNICAL FIELD TECHNICIAN **K.W. Leung** DATE **17.12.09** DATE **18.12.09**

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S11**
SHEET **3** of **3**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. LY38/DR09

E 825,981.23
N 842,522.14

DATE from 08.12.09 to 16.12.09

FLUSHING MEDIUM AIR / WATER

ORIENTATION Vertical

GROUND LEVEL +6.05 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
		08:00		90						(2, 7, 24, 35, 41/50mm) 100bs/200mm (4, 21, 67, 33/25mm) 100bs/100mm					As Sheet 2 of 3.
	24.10 HW			66	66	0		24.10		T2101	24.10 24.25	-18.05	24.10	V	Strong, dark pink to light reddish brown spotted green, slightly decomposed coarse grained GRANITE. Joints are closely to medium spaced, rough planar, very narrow, iron stained, dipping at 20°-30°, 50°-60° and vertical joint from 28.00-28.57m.
				100	100	100				T2101	25.49				
				100	100	88		3.4		T2101	27.01			H	
		2.10m at 18:00		100	100	78				T2101	28.57				
		4.45m at 08:00		100	100	80				T2101	29.54	-23.49	29.54		End of drillhole at 29.54m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ.TYSAN.25032005.GDT.21.4.10

- 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
- Impression Packer Test
- ▣ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER P.S. Tam
 LOGGING GEOLOGIST S.O. CHAN
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung
 DATE 17.12.09
 GEOTECHNICAL ENGINEER EDWARD CHENG
 DATE 18.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S12**

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

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/SB05**

E 826,162.25

DATE from **08.12.09** to **10.12.09**

N 842,480.92

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+4.42 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
08.12.09	PW														Stiff, yellowish grey, sandy SILT. (FILL)
09.12.09 10.12.09				100					4 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00	+3.42	1.00			Loose, grey and yellowish brown, very silty fine to coarse SAND with some gravel sized rock fragments. (FILL)
				100					8 bits	3 3.00 4 3.45 3.50	+1.42	3.00			Firm, grey to yellowish brown, sandy CLAY / SILT with some roots. (SWAMP DEPOSIT)
	5.00 PW	4.37m at 18:00		100					3 bits	5 4.50 6 4.95 5.00	-0.08	4.50			Soft, grey to dark grey, CLAY / SILT. (SWAMP DEPOSIT)
10.12.09															End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_250932005.GDT 21.4.10

- 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
- ⊥ Impression Packer Test
- ⊥ Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- × Point Load Test

DRILLER M.S. Lee	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 17.12.09	DATE 18.12.09

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S13**

SHEET 1 of 1

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. LY38/SB05

E 826,479.39

DATE from 21.12.09 to 21.12.09

N 842,378.72

FLUSHING MEDIUM AIR

ORIENTATION Vertical

GROUND LEVEL +4.55 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
21.12.09	PW														Firm, grey and brown, sandy SILT. (FILL)
				100					10 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50	+3.05	1.50			Firm, light yellowish brown mottled red, clayey SILT. (FILL)
				100					12 bits	1 1.85 2 2.00 3 3.00 4 3.45 3.50	+1.55	3.00			Stiff, yellowish brown and dark grey, CLAY / SILT. (SWAMP DEPOSIT)
				100					10 bits	5 4.50 4.95 5.00	-0.45	5.00			End of drillhole at 5.00m.
21.12.09	5.00 PW	3.94m at 18:00													

DRILLHOLE LOG: J0911S26(TFL) LOK MA CHAU LOOP GPJ, TYSAN, 25032005 GDT, 21.4.10

- 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
- Impression Packer Test
- Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER M.S. Lee	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 20.01.10	DATE 21.01.10

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S14**

SHEET 1 of 1

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. LY38/SB05

E 826,094.11
N 842,301.20

DATE from 07.12.09 to 07.12.09

FLUSHING MEDIUM AIR

ORIENTATION Vertical

GROUND LEVEL +5.37 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
07.12.09	PW														Stiff, yellowish brown, sandy SILT with some gravel sized rock fragments. (FILL)
				100					39 bts	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00	+4.87	0.50			Loose, yellowish brown to brown, fine to coarse SAND with some gravel sized rock fragments. (FILL)
				100					8 bts	3 3.00 4 3.45 3.50	+2.37	3.00			Very soft, dark grey, CLAY / SILT. (SWAMP DEPOSIT)
07.12.09	5.00 PW	Dry at 18:00		100					3 bts	5 4.50 6 4.95 7 5.00	+0.37	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ_TYSAN_25092005.GDT 21.4.10

- 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
- ┆ Impression Packer Test
- ▲ Standpipe/Piezometer Tip
- ∇ In-situ Vane Shear Test
- × Point Load Test

DRILLER M.S. Lee	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 10.12.09	DATE 11.12.09

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.
2. A water sample was taken at 5.00m depth.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S15**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 826,245.98
N 842,238.57

DATE from **08.12.09** to **09.12.09**

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+4.60 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
08.12.09	PW														Loose, brown, silty fine to coarse SAND with some gravel sized rock and brick fragments. (FILL)
08.12.09 09.12.09		0.50m at 18:00							22 bla	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.85 2 2.00	+3.60	1.00			Loose, yellowish grey to yellowish brown, fine to coarse SAND with some shell fragments. (FILL)
09.12.09		0.55m at 08:00		100											
									19 bla	3 3.45 4 3.50	+1.60	3.00			Firm, grey, sandy CLAY / SILT. (SWAMP DEPOSIT)
09.12.09	5.00 PW	1.20m at 18:00		100					20 bla	5 4.50 6 4.95 5.00	-0.40	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GS.J. TYSAN_25032005.GDT 21.4.10

- 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
- ⊥ Impression Packer Test
- ⊥ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER <u>T.H. Wong</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>17.12.09</u>	DATE <u>17.12.09</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S16**

SHEET **1** of **4**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 826,454.19
N 842,214.12

DATE from **11.12.09** to **23.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.55 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total Core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I./Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
11.12.09	PW														Loose, grey, silty fine to coarse SAND. (FILL)
		Dry at 18:00								A 0.45 0.50					
11.02.09										B 0.95 1.00	+3.55	1.00			Soft, grey, CLAY / SILT. (FILL)
12.12.09		0.98m at 08:00		100					22 bits	C 1.45 1.50	+3.05	1.50			Firm, reddish brown mottled white, sandy CLAY / SILT. (FILL)
										1 1.95 2.00					
12.12.09		1.02m at 18:00													
14.12.09		1.10m at 08:00		100					15 bits		+1.55	3.00			Loose, yellowish grey, very silty fine to medium SAND. (SWAMP DEPOSIT)
										3 3.45 3.50					
14.12.09		3.55m at 18:00													
15.12.09		2.82m at 08:00		100					16 bits		+0.05	4.50			Firm, grey to dark grey, sandy CLAY / SILT. (SWAMP DEPOSIT)
										5 4.95 5.00					
14.12.09		1.21m at 18:00													
15.12.09		0.98m at 08:00		100					6.50		-2.05	6.60			Loose, grey, clayey fine to medium SAND. (SWAMP DEPOSIT)
										6 6.50 6.60 6.70					
15.12.09		1.21m at 18:00		90											
16.12.09		0.98m at 08:00													
										7 7.00 7.05					
										8 7.50					
										9 8.50 8.60 8.70					
										10 9.00 9.05					
										11 9.50					
											-5.45	10.00			

DRILLHOLE LOG J0911S26(TFL) LOKMA CHAU LOOP.GPJ TYSAN_25032005.GBT 21.4.10

- 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
- ┆ Impression Packer Test
- ▲ Standpipe/Piezometer Tip
- ▽ In-situ Vane Shear Test
- × Point Load Test

DRILLER T.H. Wong
 LOGGING GEOLOGIST S.O. CHAN
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung
 DATE 30.12.09
 GEOTECHNICAL ENGINEER EDWARD CHENG
 DATE 31.12.09

REMARKS
 1. Inspection pit excavated from 0.00m-1.50m.
 2. A falling head permeability test was carried out at 5.00m-6.50m depth.
 3. A constant head permeability test was carried out at 18.10m-19.60m depth.
 4. A rising head permeability test was carried out at 11.50m-13.00m depth.
 5. A vane shear test was carried out at 13.55m depth.
 6. A water sample was taken at 5.90m depth.
 7. Flushing medium for first 5m is air.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S16**
SHEET **2** of **4**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 826,454.19
N 842,214.12

DATE from **11.12.09** to **23.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.55 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
				100											As Sheet 1 of 4.
									(1, 1, 1, 2, 2, N=8)	15 16 10.50 10.60 10.70 17 18 11.00 11.05	-6.05	10.60			Loose, yellowish grey, silty fine to coarse SAND. (SWAMP DEPOSIT)
				0						11.50	-6.95	11.50			Firm, dark grey, CLAY / SILT. (SWAMP DEPOSIT)
				100						19 20 21 12.50 12.60 13.05 13.10					
18.12.09		1.35m at 18:00						13.00	15 bbs	22 13.50 13.55 13.60					
17.12.09		2.24m at 08:00		0				13.55		23 14.60 14.70	-10.15	14.70			Firm, grey to dark grey, sandy CLAY / SILT. (SWAMP DEPOSIT)
17.12.09		1.55m at 18:00							6 bbs	24 15.15 15.20					
18.12.09		2.84m at 08:00		100						25 15.90					
				85						26 16.80 16.90 17.00 17.10 17.15	-12.15	16.70			Loose, yellowish grey to grey, very silty fine to medium SAND. (SWAMP DEPOSIT)
				0						27 17.60					
				0						28 18.60 18.70	-14.15	18.70			Medium dense, yellowish brown, coarse SAND with subrounded gravel sized quartz fragments. (ALLUVIUM)
				0						29 19.15 19.20					
				80				19.60	36 bbs (8, 8, 3, 4, 3, N=14)	30 19.55 19.60	-15.05	19.60			Yellowish brown, angular GRAVEL sized highly to moderately decomposed granite fragments.
										31 19.55 19.60					
										32 19.55 19.60	-15.45	20.00			

DRILLHOLE LOG _J0911S26(TFL)_LOK MA CHAU LOOP.GPJ_TYSAN_25032005.GDT_21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- ▲ Large Disturbed Sample
- ▼ Water Level
- SPT Liner Sample
- Standard Penetration Test
- U76 Undisturbed Sample
- Permeability Test
- U100 Undisturbed Sample
- Impression Packer Test
- Mazier Sample
- Standpipe/Piezometer Tip
- Piston Sample
- ◁ In-situ Vane Shear Test
- × Point Load Test

DRILLER
T.H. Wong

GEOTECHNICAL FIELD TECHNICIAN
K.W. Leung

LOGGING GEOLOGIST
S.O. CHAN

DATE
30.12.09

GEOTECHNICAL ENGINEER
EDWARD CHENG

DATE
31.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S16**
SHEET **3** of **4**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 826,454.19
N 842,214.12

DATE from **11.12.09** to **23.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.55 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
18.12.09 19.12.09	2.35m at 18:00 3.32m at 08:00 0.94m at 18:00		80						(3, 6, 5, 5, 5, 5) N=24	33 34 35 36 37	-16.15 20.70 20.80 21.10 21.15	20.70 20.80 21.10 21.15			(ALLUVIUM) As Sheet 2 of 4. Medium dense, yellowish brown, fine to coarse SAND. (ALLUVIUM)
19.12.09 21.12.09	3.15m at 08:00		100						(4, 5, 3, 5, 6, 6) N=22	38 39 40	21.60 22.60 22.70 22.80 23.10 23.15	21.60 22.60 22.70 22.80 23.10 23.15			Extremely weak, yellowish brown, completely decomposed meta-SILTSTONE. (Very stiff, SILT)
	26.50 HW		100							41 42	25.60 26.30 26.40	25.60 26.30 26.40			Weak, yellowish grey, highly decomposed meta-SILTSTONE. (COBBLE sized rock fragments)
			79	79	30	>20	NI			AT3	26.80	26.80		IV/III	Moderately weak to moderately strong, yellowish brown to yellowish grey, highly to moderately decomposed meta-SILTSTONE.
			100	100	0	>20	NI			AT3	27.10 27.30	27.20 27.30		II/III	26.80- 27.20m: Non intact. Recovered as angular gravel. (FAULT ZONE) Moderately strong to strong, light grey, moderately to slightly decomposed meta-SILTSTONE. Joints are closely spaced, rough planar, very narrow, iron stained, dipping at 20°-30° and vertical joint from 28.70-29.40m.
21.12.09 22.12.09	2.91m at 18:00 2.84m at 08:00		100	100	0	>20	NI			AT3	28.74 28.88	28.74 28.88		II	Strong, grey, slightly decomposed meta-SILTSTONE. Joints are closely to medium locally very closely spaced, rough planar, very narrow to narrow, iron
			100	100	68	>20	5.0			AT3	-24.85	29.40			
										AT3	-25.45	30.00			

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- ▬ Large Disturbed Sample
- ▼ Water Level
- SPT Liner Sample
- | Standard Penetration Test
- U76 Undisturbed Sample
- ⊥ Permeability Test
- U100 Undisturbed Sample
- ⊥ Impression Packer Test
- Mazier Sample
- ⊥ Standpipe/Piezometer Tip
- Piston Sample
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER **T.H. Wong** LOGGING GEOLOGIST **S.O. CHAN** GEOTECHNICAL ENGINEER **EDWARD CHENG**
 GEOTECHNICAL FIELD TECHNICIAN **K.W. Leung** DATE **30.12.09** DATE **31.12.09**

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S16**
SHEET **4** of **4**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 826,454.19
N 842,214.12

DATE from **11.12.09** to **23.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.55 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I./Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
			100	100	68					AT3	30.25				stained, dipping at 10°-20° and 30°-40°.
		2.77m at 18:00	100	100	100		5.0			AT3	30.80			II	
22.12.09			100	100	100					AT3	31.20				
23.12.09		2.85m at 08:00						31.55			-27.00	31.55		III	
			100	100	78			31.75		AT3	-27.20	31.75		II	31.55- 31.75m: Moderately decomposed, non intact, recovered as angular gravel and cobble. (FAULT ZONE)
23.12.09		3.19m at 18:00					3.0								
								32.60			-28.05	32.60			End of drillhole at 32.60m.

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- ▼ Water Level
- SPT Liner Sample
- ⊥ Standard Penetration Test
- U76 Undisturbed Sample
- ⊕ Permeability Test
- U100 Undisturbed Sample
- ⊖ Impression Packer Test
- Mazier Sample
- ⊕ Standpipe/Piezometer Tip
- Piston Sample
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER T.H. Wong LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 30.12.09 DATE 31.12.09

REMARKS

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ_TYSAN_25032005.GDT 21.4.10



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S17**
SHEET **1** of **1**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC CO-ORDINATES JOB No. J0911S26 (TFL)
MACHINE / No. LY38/DR05 E 826,551.16 DATE from 17.12.09 to 19.12.09
FLUSHING MEDIUM AIR ORIENTATION Vertical GROUND LEVEL +4.78 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery % Total core	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
17.12.09	PW								A 0.45 0.50					Loose to medium dense, yellowish brown, fine to coarse SAND with some gravel sized quartz fragments. (FILL)
17.12.09 19.12.09			100				30 bls	1 1.45 1.50 2 1.05 2.00						
			100				11 bls	3 3.00 4 3.45 3.50		+1.78	3.00			Firm, grey to dark grey, CLAY / SILT. (SWAMP DEPOSIT)
19.12.09	5.00 PW	3.80m at 18:00	100				4.50 9 bls	5 4.50		-0.22	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP, GPJ, TYSAN, 25032005, GDT, 21.4.10

- 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
- ⊥ Impression Packer Test
- ⊥ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER F.K. Yiu
GEOLOGICAL FIELD TECHNICIAN K.W. Leung
LOGGING GEOLOGIST S.O. CHAN
DATE 27.12.09
GEO TECHNICAL ENGINEER EDWARD CHENG
DATE 28.12.09

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.
2. A standpipe installed to 4.50m depth.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S18**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR09**

E 825,891.29
N 842,176.55

DATE from **04.12.09** to **04.12.09**

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+5.52 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
04.12.09	PW														Loose, brown, fine to coarse SAND with some gravel sized rock fragments. (FILL)
				100					22 bis	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50	+4.52 +4.02	1.00 1.50			Firm, brown, CLAY / SILT with some gravel sized siltstone fragments. (FILL)
										1 2					Loose, brown and yellowish brown, silty fine to coarse SAND with some gravel sized rock fragments. (FILL)
				100					20 bis	3 4	+2.52	3.00			Firm, grey, sandy SILT with locally sand matrix. (FILL)
										5	+1.02	4.50			Firm, dark grey to black, CLAY / SILT with some roots. (SWAMP DEPOSIT)
04.12.09	5.00 PW			100					13 bis	A 4.95 5.00	+0.52	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG (J0911S26(TFL)) LOK MA CHAU LOOP GPJ TYSAN 25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- ▼ Water Level
- SPT Liner Sample
- Standard Penetration Test
- ▨ U76 Undisturbed Sample
- ⊥ Permeability Test
- ▩ U100 Undisturbed Sample
- ⊥ Impression Packer Test
- ⊥ Mazier Sample
- ⊥ Standpipe/Piezometer Tip
- ⊥ Piston Sample
- ⊥ In-situ Vane Shear Test
- ⊥ Point Load Test

DRILLER P.S. Tam	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 10.12.09	DATE 11.12.09

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S19**
SHEET 1 of 3

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC CO-ORDINATES E 826,042.20 N 842,133.06 JOB No. J0911S26 (TFL)
MACHINE / No. XY2B/CCL-3 DATE from 30.11.09 to 05.12.09
FLUSHING MEDIUM AIR / WATER ORIENTATION Vertical GROUND LEVEL +5.77 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.L. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
30.11.09	PW														Loose, yellowish brown, fine to coarse SAND with some gravel sized quartz fragments. (FILL)
30.11.09 01.12.09		Dry at 18:00 1.44m at 08:00		100						A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00 3 3.00 4 3.45 3.50					
				100					21 bls	5 4.50 6 4.95 5.00 7 5.50	+1.27 4.50				Loose, yellowish grey, very silty fine to medium SAND. (SWAMP DEPOSIT)
				100					11 bls	8 5.50 5.60 6.70 9 7.00 10 7.05					
				100					(1, 1, 1, 1, 2, 2) N=7	11 7.50 12 8.50 8.60 8.70 13 9.00 9.05 14 9.50	-1.73 7.50				Firm, dark grey, CLAY / SILT. (SWAMP DEPOSIT)
01.12.09 02.12.09		1.00m at 18:00 1.70m at 08:00		90					(1, 1, 1, 2, 2, 2) N=7						
				100							-4.23 10.00				

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10

- ◆ 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
- ┆ Impression Packer Test
- ┆ Standpipe/Piezometer Tip
- ∠ In-situ Vane Shear Test
- × Point Load Test

DRILLER C.L. Chung
GEO TECHNICAL FIELD TECHNICIAN K.W. Leung
LOGGING GEOLOGIST S.O. CHAN
DATE 17.12.09
GEO TECHNICAL ENGINEER EDWARD CHENG
DATE 18.12.09

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.
2. A falling head permeability test was carried out at 9.00m-10.50m depth.
3. Flushing medium for first 5m is air.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S19**
SHEET 3 of 3

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC

CO-ORDINATES

JOB No. J0911S26 (TFL)

MACHINE / No. XY2B/CCL-3

E 826,042.20
N 842,133.06

DATE from 30.11.09 to 05.12.09

FLUSHING MEDIUM AIR / WATER

ORIENTATION Vertical

GROUND LEVEL +5.77 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test	Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
03.12.09 04.12.09	21.17 HW	1.82m at 18:00 5.40m at 08:00	90								(18, 34, 37, 42, 2100mm) 1000fs/100mm					sized rock fragments)
			100	100	0	>20			21.17		T2101	-15.40	21.17	V/IV		Moderately strong to strong, light grey, moderately to slightly decomposed meta-SILTSTONE.
			89	89	30	6.0			21.70		T2101	-15.93	21.70	III/II		Strong, light grey to grey, slightly decomposed meta-SILTSTONE. Joints are closely to medium spaced, rough planar, very narrow, iron stained, chlorite coated, dipping at 10°-20°, 30°-40° and 50°-60°.
			100	100	20				22.44		T2101		22.44			
			100	100	0						T2101		22.97			
											T2101		23.27			
			100	100	20						T2101	-16.18	23.95			23.95- 24.40m: With interlamination of quartz
											T2101	-18.63	24.40			
									24.74		T2101		24.74	II		
			100	100	50						T2101		26.22			
									9.7							
			100	100	53						T2101		27.70			
									27.70			-21.93	27.70			End of drillhole at 27.70m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- ▼ Water Level
- SPT Liner Sample
- Standard Penetration Test
- U76 Undisturbed Sample
- Permeability Test
- U100 Undisturbed Sample
- Impression Packer Test
- Mazier Sample
- Standpipe/Piezometer Tip
- Piston Sample
- In-situ Vane Shear Test
- Point Load Test

DRILLER C.L. Chung	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 17.12.09	DATE 18.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S20**

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

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 826,341.07

DATE from **10.12.09** to **11.12.09**

N 842,035.11

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+4.57 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.i. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
10.12.09	PW														Loose, grey and yellowish brown, very silty fine to coarse SAND. (FILL)
									2 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50	+3.57 +3.07	1.00 1.50			Very soft, dark grey to yellowish brown, CLAY. (FILL?)
				100						1 2					Soft, grey to dark grey. CLAY / SILT. (SWAMP DEPOSIT)
									4 bits	3 4		3.00 3.45 3.50			
		2.32m at 18:00													
10.12.09															
11.12.09	5.00	0.62m at 08:00		100					11 bits	5 6		4.50			
11.12.09	PW											4.05 5.00	-0.43	5.00	End of drillhole at 5.00m.

DRILL-HOLE LOG _J0911S26(TFL)_LOK MA CHAU LOOP.GPJ_TYSAN_25032005.GDT_21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- ▬ Large Disturbed Sample
- ▼ Water Level
- ▬ SPT Liner Sample
- ▬ Standard Penetration Test
- ▬ U76 Undisturbed Sample
- ▬ Permeability Test
- ▬ U100 Undisturbed Sample
- ▬ Impression Packer Test
- ▬ Mazier Sample
- ▬ Standpipe/Piezometer Tip
- ▬ Piston Sample
- ▬ In-situ Vane Shear Test
- ▬ Point Load Test

DRILLER T.H. Wong	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 17.12.09	DATE 18.12.09

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S20a**

SHEET **1 of 1**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 826,261.21
N 841,982.05

DATE from **28.01.10 to 28.01.10**

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+4.88 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
28.01.10	PW														Loose, brown, slightly silty fine to medium SAND. (FILL)
				100					3 bits	A 0.45 B 0.50 C 1.45 1 1.50 2 1.95 2.00	+3.88	1.00			Very soft, grey, CLAY / SILT. (SWAMP DEPOSIT)
				100					3 bits	3 3.00 4 3.45 3.50					
		2.97m at 18:00		100					11 bits	5 4.50					
28.01.10	5.00 PW									6 4.95 5.00	-0.12	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ_TYSAN_25032005.GST_21.4.10

- 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
- | Impression Packer Test
- Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- × Point Load Test

DRILLER T.H. Wong LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 09.02.10 DATE 10.02.10

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S20b**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 826,293.09

DATE from **27.01.10** to **27.01.10**

N 842,137.15

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+4.89 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
27.01.10	PW														Soft, brown, slightly sandy SILT. (FILL)
															Soft, grey, CLAY / SILT. (SWAMP DEPOSIT)
				100					14 bits	1 2	+4.39 +3.39	0.50 1.50			Loose, grey, silty fine to coarse SAND with occasional oyster fragments. (SWAMP DEPOSIT)
				100					8 bits	3 4		3.00 3.45 3.50			
				100					15 bits	5	+0.39	4.50			Soft, grey, CLAY / SILT. (SWAMP DEPOSIT)
27.01.10	5.00 PW	3.05m at 18:00		100								4.95 5.00	-0.11	5.00	End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- ▼ Water Level
- SPT Liner Sample
- Standard Penetration Test
- U76 Undisturbed Sample
- Penneability Test
- U100 Undisturbed Sample
- Impression Packer Test
- Mazier Sample
- Standpipe/Piezometer Tip
- Piston Sample
- In-situ Vane Shear Test
- Point Load Test

DRILLER <u>T.H. Wong</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>09.02.10</u>	DATE <u>10.02.10</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S20c**
SHEET **1 of 1**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC	CO-ORDINATES	JOB No. J0911S26 (TFL)
MACHINE / No. XY2B/CCL-1	E 826,399.08 N 842,092.09	DATE from 26.01.10 to 26.01.10
FLUSHING MEDIUM AIR	ORIENTATION Vertical	GROUND LEVEL +5.35 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
26.01.10	PW														Loose, brown, fine to coarse SAND. (FILL)
				100					3 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50	+3.85	1.50			Soft, grey to dark grey, CLAY / SILT. (SWAMP DEPOSIT)
				100					9 bits	1 1.95 2 2.00 3 3.00 4 3.45 3.50					
	5.00	3.32m at 18:00		100					9 bits	5 4.50 6 4.95 5.00	+0.35	5.00			End of drillhole at 5.00m.
26.01.10	PW														

DRILLHOLE LOG J0911S26(TFL) LOKMA CHAU LOOP.GPJ_TYSAN_26032005.GDT_21.4.10

- 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
- Impression Packer Test
- Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER T.H. Wong	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 09.02.10	DATE 10.02.10

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S21**

SHEET **1** of **4**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR09**

E 825,696.03

DATE from **25.11.09** to **01.12.09**

N 842,042.10

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.55 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
25.11.09	SW														Loose, yellowish brown to brown, silty fine to coarse SAND with some gravel sized rock fragments. (FILL)
25.11.09		Dry at 18:00								A 0.45 0.50	+3.55	1.00			Very loose to loose, grey and brown, silty clayey fine to coarse SAND with occasional gravel sized rock and brick fragments. (FILL)
27.11.09		Dry at 08:00		100					B 0.95 1.00						
									C 1.45 1.50						
									1 1.95 2.00						
27.11.09				78						3 3.00					
27.11.09										4 3.45 3.50					
27.11.09										5 4.50	+0.05	4.50			Firm, grey to dark grey, CLAY / SILT with some oyster fragments. (SWAMP DEPOSIT)
28.11.09		2.81m at 08:00		100						6 4.95 5.00					
										7 5.50					
				90						8 6.50 6.60 6.70					
									(0, 0, 1, 2, 1, 2) N=6	9 7.00 7.05					
	7.50 SW PW									10 7.50					
										11 8.50 8.60 8.70					
										12 9.00 9.05					
										13 9.50					
										14 9.50					
				100							-5.45	10.00			

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10

- 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
- Impression Packer Test
- Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- × Point Load Test

DRILLER
P.S. Tam

GEOTECHNICAL FIELD TECHNICIAN
K.W. Leung

LOGGING GEOLOGIST
S.O. CHAN

DATE
03.12.09

GEOTECHNICAL ENGINEER
EDWARD CHENG

DATE
04.12.09

REMARKS
1. Inspection pit excavated from 0.00m-2.00m.
2. Flushing medium for first 5m is air.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S21**

SHEET **2** of **4**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR09**

E 825,696.03

DATE from **25.11.09** to **01.12.09**

N 842,042.10

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.55 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
				100											As Sheet 1 of 4.
									(0, 0, 0, 1, 1) N=3	15 10.50 10.60 10.70 17 11.00 11.05 11.50	-6.05	10.60			Firm, yellowish grey to grey, sandy CLAY / SILT with some oyster fragments. (SWAMP DEPOSIT)
				100					(0, 1, 0, 1, 1) N=3	19 20 21 22 13.50					
		Dry at 18:00													
		0.60m at 08:00		100					(2, 2, 2, 2, 2) N=8	23 24 25 26 15.50	-10.05	14.60			Loose, yellowish grey, very silty fine to coarse SAND. (SWAMP DEPOSIT)
				0											
				0					42 bis (1, 2, 2, 3, 2) N=13	27 28 29 17.50 17.55	-11.95	16.50			Medium dense, yellowish brown and yellowish grey, fine to coarse SAND with much angular to subangular gravel sized quartz fragments. (ALLUVIUM)
									(3, 13, 17, 15, 19, 20) N=77	30 31 18.80 18.70 19.00 19.05	-14.05	18.60			Very dense, yellowish brown, silty fine to coarse SAND with some fine gravel sized quartz fragments. (ALLUVIUM)
											-15.45	20.00			

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- ┆ Large Disturbed Sample
- ✱ Water Level
- SPT Liner Sample
- ┆ Standard Penetration Test
- U76 Undisturbed Sample
- ┆ Permeability Test
- U100 Undisturbed Sample
- ┆ Impression Packer Test
- Mazier Sample
- ┆ Standpipe/Piezometer Tip
- Piston Sample
- < In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER P.S. Tam LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 03.12.09 DATE 04.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S21**
SHEET **3** of **4**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR09**

E 825,696.03
N 842,042.10

DATE from **25.11.09** to **01.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.55 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPPD)	Depth (m)	Legend	Grade	Description
															As Sheet 2 of 4.
				90					(7, 10, 18, 27, 55/70mm) 100%a/220mm	32 20.80 33 20.82 34 20.92 35 20.97	-16.05	20.60			Extremely weak, yellowish brown, completely decomposed meta-SILTSTONE. (Stiff, sandy SILT)
									(4, 10, 18, 14, 22, 37) N=01	36 21.50 37 22.50 38 22.80 39 22.70 40 23.00 41 23.05			V		
	25.50 PW HW			95						42 25.50	-20.95	25.50			Extremely weak to very weak, yellowish brown mottled grey, completely to highly decomposed meta-SILTSTONE. (Very stiff, sandy SILT with some gravel and cobble sized rock fragments)
		Dry at 18:00 2.61m at 08:00							(11, 20, 59, 41/25mm) 100%a/100mm	43 26.50 44 26.80 45 26.80 46 26.85			V/IV		
	29.90 HW			100						47 29.50 48 29.80 49 29.90	-25.35	29.90			

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ, TYSAN_25032005.GDT_21.4.10

- 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
- ┆ Impression Packer Test
- ┆ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER P.S. Tam LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 03.12.09 DATE 04.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S21**
SHEET **4** of **4**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR09**

E 825,696.03

DATE from **25.11.09** to **01.12.09**

N 842,042.10

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.55 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
			100	100	82	7.5				T2101				II	Strong, light grey to grey, slightly decomposed meta-SILTSTONE. Joints are closely to medium locally very closely spaced, rough planar, very narrow to narrow, chlorite coated, dipping at 20°-30°, 40°-50° and subvertical from 33.80-34.10m.
			100	100	82						31.24				
			100	100	70	7.5				T2101				II	
			100	100	71					T2101		32.73			
											34.20				
			100	100	80	6.0				T2101					34.30- 34.50m: Quartz veins infilling.
01.12.09															End of drillhole at 35.22m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- ✱ Water Level
- SPT Liner Sample
- | Standard Penetration Test
- U76 Undisturbed Sample
- | Permeability Test
- U100 Undisturbed Sample
- | Impression Packer Test
- Mazier Sample
- ⊕ Standpipe/Piezometer Tip
- Piston Sample
- < In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER P.S. Tam LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 03.12.09 DATE 04.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S22**

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

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 825,989.01
N 841,966.22

DATE from **24.11.09** to **25.11.09**

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+4.08 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description	
24.11.09	PW									A 0.45 0.50			[Cross-hatch pattern]	Very loose to loose, brown and grey, SAND with some angular gravel and cobble sized rock fragments. (FILL)		
24.11.09									B 0.95 1.00							
25.11.09				100					C 1.45 1.50							
									1 1.95 2.00							
									2 3.00	+1.08	3.00					
				100					3 3.45 3.50				[Vertical line pattern]	Soft, dark grey to black, CLAY / SILT with some roots. (SWAMP DEPOSIT)		
									4 4.50							
25.11.09	5.00 PW	1.45m at 18:00		100						5 4.95 5.00	-0.92	5.00			End of drillhole at 5.00m.	

DRILLHOLE LOG (J0911S26(TFL)) LOK MA CHAU LOOP.GPJ_TYSAN_25032005.GDT 21.4.10

- 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
- ▬ Impression Packer Test
- ▬ Standpipe/Piezometer Tip
- ▬ In-situ Vane Shear Test
- × Point Load Test

DRILLER <u>T.H. Wong</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>10.12.09</u>	DATE <u>11.12.09</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S23**

SHEET **1** of **5**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 826,156.16
N 841,912.01

DATE from **26.11.09** to **04.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+5.33 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	FI / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
26.11.09	PW									A 0.45 0.50					Loose, brown, fine to coarse SAND with some gravel sized rock fragments. (FILL)
				100						B 0.95 1.00	+4.33	1.00			Firm, grey and brown, CLAY / SILT with sand matrix. (FILL)
										C 1.45 1.50	+3.83	1.50			Loose, brown, fine to coarse SAND. (FILL)
										1 1.95 2.00					
26.11.09 27.11.09				100						3 3.00 4 3.45 3.50					
										5 4.50 6 4.95 5.00					
				100						7 5.50	-0.17	5.50			Soft to firm, dark grey, CLAY / SILT with oyster and shell fragments. (SWAMP DEPOSIT)
					85				(1, 0, 0, 1, 0) N=2	8 6.50 6.60 6.70					
										9 7.00 7.05					
										10 7.50					
				100						11 8.50 8.60	-3.27	8.60			Loose, yellowish grey, silty fine to medium SAND. (SWAMP DEPOSIT)
										12 9.00 9.05					
										13 9.50	-4.17	9.50			Firm, dark grey, CLAY / SILT with decayed roots. (SWAMP DEPOSIT)
				100						14 9.50	-4.67	10.00			

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25092005.GDT_21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- * Water Level
- SPT Liner Sample
- | Standard Penetration Test
- U76 Undisturbed Sample
- | Permeability Test
- U100 Undisturbed Sample
- | Impression Packer Test
- Mazier Sample
- Standpipe/Piezometer Tip
- Piston Sample
- < In-situ Vane Shear Test
- X Point Load Test

DRILLER T.H. Wong LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 10.12.09 DATE 11.12.09

REMARKS
 1. Inspection pit excavated from 0.00m-1.50m.
 2. Flushing medium for first 5m is air.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S23**
SHEET **2** of **5**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC	CO-ORDINATES	JOB No. J0911S26 (TFL)
MACHINE / No. XY2B/CCL-1	E 826,156.16 N 841,912.01	DATE from 26.11.09 to 04.12.09
FLUSHING MEDIUM AIR / WATER	ORIENTATION Vertical	GROUND LEVEL +5.33 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
			100						(1, 1, 1, 1, 2) N=6	14 15 10.50 16 10.60 17 10.70 18 11.00 19 11.05					As Sheet 1 of 5.
			85						(7, 6, 5, 4, 4) N=17	20 11.50 21 12.50 22 12.60 23 12.70 24 13.00 25 13.05	-7.27	12.60			Medium dense, yellowish brown, silty fine to coarse SAND with some gravel sized quartz fragments. (ALLUVIUM)
		3.12m at 18:00	0						35 bls	26 13.50 27 14.50 28 14.60					
		2.30m at 08:00	0						(4, 5, 5, 4, 4) N=19	29 15.05 30 15.10 31 15.20 32 15.50 33 15.55					
									(5, 0, 0, 7, 0) N=34	34 16.60 35 16.70 36 17.00 37 17.05	-11.27	16.60			Dense, yellowish brown, fine to coarse SAND with some gravel and cobble sized quartz fragments. (ALLUVIUM)
									(6, 10, 10, 50mm) 100bls/50mm	38 18.60 39 18.75 40 18.80 41 19.00	-13.27	18.60			Extremely weak to very weak, light yellowish pink, completely to highly decomposed meta-SILTSTONE. (Very stiff, SILT with some gravel and cobble sized rock fragments)
	19.00 PW HW	1.22m at	95							42 18.60 43 18.75 44 18.80 45 19.00	-14.67	20.00	VII/V		

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ_TYSAN_25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- * Water Level
- SPT Liner Sample
- ⊥ Standard Penetration Test
- ▭ U76 Undisturbed Sample
- ⊥ Permeability Test
- ⊥ U100 Undisturbed Sample
- ⊥ Impression Packer Test
- ▭ Mazier Sample
- ▭ Standpipe/Piezometer Tip
- ▭ Piston Sample
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER T.H. Wang	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 10.12.09	DATE 11.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S23**
SHEET 3 of 5

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC CO-ORDINATES JOB No. J0911S26 (TFL)
MACHINE / No. XY2B/CCL-1 E 826,156.16 N 841,912.01 DATE from 26.11.09 to 04.12.09
FLUSHING MEDIUM AIR / WATER ORIENTATION Vertical GROUND LEVEL +5.33 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	FL / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
28.11.09 30.11.09		18.00 3.65m at 08:00						20.10		T2101	-14.77	20.10			As Sheet 2 of 5.
			100	10	0		NI			T2101	-15.27	20.60			Moderately weak to moderately strong, light yellowish brown to yellowish brown, highly to moderately decomposed meta-SILTSTONE. (FAULT ZONE)
			100	20	0					T2101	-15.67	21.00			20.10- 20.60m: Non intact, recovered as angular gravel.
			63	50	0	>20		21.55		T2101	-15.97	21.30		IV/III	21.00- 21.30m: Non intact, recovered as angular gravel.
								22.35	(5, 8, 12, 15, 10, 20) N=65		-17.02	22.35			
			100								22.50			IV/IV	Extremely weak to very weak, yellowish brown, completely to highly decomposed meta-SILTSTONE. (Very stiff, SILT with some gravel sized rock fragments)
								23.60			22.85				
			100	30	0	NI				T2101	-18.27	23.60			Moderately strong, yellowish brown to yellowish grey, moderately decomposed meta-SILTSTONE. Joints are closely to very closely spaced, rough planar, very narrow to narrow, iron stained, dipping at 20°-30°. (FAULT ZONE)
								24.20			-18.67	24.00			23.60- 24.00m: Non Intact, recovered as angular gravel and cobble.
			100	100	0	>20				T2101	-19.47	24.80		III	24.80- 25.92m: Highly fractured.
		1.42m at 18:00						25.02			-20.59	25.92			
			62	62	0		NR				23.60				
		3.52m at 08:00						26.32			-20.99	26.32		IV/IV	Extremely weak to very weak, yellowish brown, completely decomposed meta-SILTSTONE. (Very stiff, SILT with some gravel sized rock fragments)
								27.60	(50/20mm 100/30mm) 100/40/30mm		25.92				25.92- 26.32m: No core recovered, assumed to be completely to highly decomposed.
								28.00			-22.27	27.60			
			72	20	0		NI			T2101	-22.67	28.00			Moderately weak to moderately strong, yellowish brown, highly to moderately decomposed meta-SILTSTONE. (FAULT ZONE)
								28.57			-23.24	28.57		IV/III	28.00- 28.57m: Non intact, recovered as angular gravel and cobble.
			74	74	0	>20				T2101	-23.87	29.20			
								29.20			-24.27	29.60			29.20- 29.60m: Non intact, recovered as angular gravel and cobble.
			85					29.60			-24.67	30.00		IV/IV	Extremely weak to very weak, yellowish brown,

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- ▼ Water Level
- SPT Liner Sample
- | Standard Penetration Test
- U76 Undisturbed Sample
- | Permeability Test
- U100 Undisturbed Sample
- | Impression Packer Test
- Mazier Sample
- Standpipe/Piezometer Tip
- Piston Sample
- ∨ In-situ Vane Shear Test
- X Point Load Test

DRILLER T.H. Wong
LOGGING GEOLOGIST S.O. CHAN
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung
GEOTECHNICAL ENGINEER EDWARD CHENG
DATE 10.12.09
DATE 11.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S23**
SHEET **4** of **5**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC	CO-ORDINATES	JOB No. J0911S26 (TFL)
MACHINE / No. XY2B/CCL-1	E 826,156.16 N 841,912.01	DATE from 26.11.09 to 04.12.09
FLUSHING MEDIUM AIR / WATER	ORIENTATION Vertical	GROUND LEVEL +5.33 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
01.12.09 02.12.09	32.65 HW	1.07m at 18:00	85							38 40 30.60 41 30.70 42 30.97 31.02					completely decomposed meta-SILTSTONE. (Very stiff, SILT with some gravel sized rock fragments)
		3.48m at 08:00		99	99	70		>20	72101	32.60	-27.27	32.60	V/IV	III	Moderately strong, yellowish grey, moderately decomposed meta-SILTSTONE. Joints are closely to medium spaced, rough planar, narrow, iron stained, dipping at 20°-30° and 40°-50°.
				100	100	72		4.6	72101		-29.67	35.00		II	Strong, light white, slightly decomposed QUARTZITE. Joints are closely to medium spaced, rough planar, narrow, iron stained, dipping at 10°-20° and 30°-40°.
				91	91	33		>20	72101		-30.37	35.70		III	35.70- 36.00m: Moderately decomposed.
				100	100	0		>20	72101		-30.67	36.00		II	
								10.0	72101		-31.67	37.20		V/IV	Extremely weak to very weak, yellowish brown, completely decomposed meta-SILTSTONE. (Very stiff, SILT with some gravel sized rock fragments) (FAULT ZONE)
		2.12m at 18:00		100					72101		-32.76	38.09		IV	Weak, yellowish grey, moderately decomposed meta-SILTSTONE. (COBBLE sized rock fragments)
02.12.09 03.12.09	3.54m at 08:00			100	80	0		>20	72101		-33.42	38.75		III	Moderately strong, yellowish grey, moderately decomposed meta-SILTSTONE with very closely spaced joints.
								NI	72101		-34.07	39.40		V	Extremely weak, yellowish brown, completely decomposed meta-SILTSTONE. (SILT) (FAULT ZONE)
								12.5	72101		-34.27	39.60		II	
									72101		-34.67	40.00			

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP GPJ TYSAN 25032005.GDT 21.4.10

- 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
- Impression Packer Test
- Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER T.H. Wong	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 10.12.09	DATE 11.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S23**
SHEET **5** of **5**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 826,156.16
N 841,912.01

DATE from **26.11.09** to **04.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+5.33 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.L. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
			100	100	50										Strong, light grey to grey, slightly decomposed meta-SILTSTONE. Joints are closely to medium spaced, rough planar, very narrow, iron stained, dipping at 10°-20° and 30°-40°.
			100	100	50	12.5				T2101					
			100	100	0	>20	41.28 41.48			T2101	41.28 41.48				
			100	100	69	6.6				T2101					
							43.10 43.18	>20		T2101	42.93				
			100	100	73	4.0	43.95	>20		T2101	44.25				
03.12.09 04.12.09		2.26m at 18:00					44.25								
		3.15m at 08:00													
04.12.09		2.53m at 18:00	100	100	75	9.0				T2101					
							45.39				45.39	40.06	45.39		End of drillhole at 45.39m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- ┆ Impression Packer Test
- ┆ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER T.H. Wong
 LOGGING GEOLOGIST S.O. CHAN
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung
 DATE 10.12.09
 GEOTECHNICAL ENGINEER EDWARD CHENG
 DATE 11.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S24**
SHEET **1** of **3**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD RC	CO-ORDINATES	JOB No. J0911S26 (TFL)
MACHINE / No. LY38/DR08	E 825,822.22 N 841,887.09	DATE from 30.11.09 to 07.12.09
FLUSHING MEDIUM AIR / WATER	ORIENTATION Vertical	GROUND LEVEL +3.55 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test	Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
30.11.09 01.12.09	PW															Very soft, grey to dark grey, CLAY. (FILL)
30.11.09 01.12.09		1.08m at 18:00		100						0 bits	A 0.45 B 0.50 C 0.95 1 1.45 2 1.50					
		1.08m at 08:00		100						2 bits	3 1.95 4 2.00					
		2.70m at 18:00		100						4 bits	5 3.00 6 3.45 7 3.50					Dense, yellowish grey to yellowish brown, fine to coarse SAND with fine gravel sized quartz fragments. (FILL)
01.12.09 03.12.09		1.68m at 08:00		0						47 bits	8 4.50 9 4.95 10 5.00 11 5.50					
				100							(3, 4, 4, 7, 12, 13) N=38					
											(1, 2, 1, 1, 2) N=5					Firm, grey to dark grey, CLAY / SILT with oyster fragments and rubbish. (SWAMP DEPOSIT)
				90												

DRILLHOLE LOG _J0911S26(TFL)_LOK MA CHAU LOOP GPJ_TYSAN_25032005.GDT 21.4.10

- 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
- ▬ Impression Packer Test
- ▬ Standpipe/Piezometer Tip
- ▬ In-situ Vane Shear Test
- × Point Load Test

DRILLER <u>P.T. Fong</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>17.12.09</u>	DATE <u>18.12.09</u>

REMARKS
 1. Inspection pit excavated from 0.00m-1.50m.
 2. A vane shear test was carried out at 11.55m depth.
 3. A water sample was taken at 5.00m depth.
 4. Flushing medium for first 5m is air.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S24**
SHEET **2** of **3**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC** CO-ORDINATES **E 825,822.22** JOB No. **J0911S26 (TFL)**
N 841,887.09 DATE from **30.11.09** to **07.12.09**
 FLUSHING MEDIUM **AIR / WATER** ORIENTATION **Vertical** GROUND LEVEL **+3.55 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	FI / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
03.12.09 04.12.09	0.50m at 18:00 1.51m at 08:00		90						(0, 0, 1, 0, 0) N=1	14 15 10.50 16 10.60 17 11.00 18 11.05				As Sheet 1 of 3.	
				100				11.55 ✓		18 11.51 19 11.58 20 11.60	-9.05	11.60		Stiff, grey to dark grey, CLAY / SILT. (SWAMP DEPOSIT)	
04.12.09 05.12.09	2.90m at 18:00 1.60m at 08:00								(1, 0, 1, 1, 0) N=3	21 12.60 22 12.70 23 12.80 24 13.10 25 13.15					
				100					(1, 1, 2, 1, 1) N=5	26 13.60 27 14.60 28 14.70 29 14.80	-11.15	14.70		Extremely weak, greenish grey and white, completely decomposed meta-SILTSTONE. (Stiff, SILT)	
	15.60 PW HW									30 15.10 31 15.15 32 15.60			V		
				100					(7, 8, 11, 13, 17, 19) N=60	33 16.60 34 16.70 35 16.80	-13.15	16.70		Extremely weak, yellowish brown, completely decomposed meta-SILTSTONE. (Very stiff, SILT)	
									(17, 33/45mm 100/70mm) 100/60/70mm	36 17.60 37 18.60 38 18.70 39 18.82 40 18.87			V		
				95						41 19.60	-16.45	20.00			

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- ┆ Impression Packer Test
- ⊕ Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- ⊗ Point Load Test

DRILLER P.T. Fong LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 17.12.09 DATE 18.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S24**
SHEET **3** of **3**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR08**

E 825,822.22
N 841,887.09

DATE from **30.11.09** to **07.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+3.55 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test	Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
05.12.09 07.12.09	21.01 HW	1.70m at 18:00 1.59m at 08:00		93	63	10	NI	21.01 21.20		(50/30mm 100/40mm 1000s/40mm)	34 35 36	-17.15 -17.46 -17.65	20.70 21.01 21.20		V IV	As Sheet 2 of 3. Weak, grey and white, highly decomposed meta-SILTSTONE. (Angular GRAVEL sized siltstone and quartz fragments)
				100	100	30	9.4			T2101		-18.35 -18.75 -18.90	21.90 22.30 22.45		II/III	21.01- 21.20m: Non intact, recovered as angular gravel. Moderately strong to strong, grey to greenish grey, moderately to slightly decomposed meta-SILTSTONE. Joints are closely to medium spaced, rough planar, very narrow, iron stained, quartz vein infilled, dipping at 10°-20° and 30°-40°.
				100	100	0		23.00		T2101		-19.45 -19.65	23.00 23.20		III/IV	21.90- 22.30m: With interlamination of quartz.
				100	100	0	>20			T2101		-20.20 -20.25	23.75 23.80		III	22.45- 23.00m: Moderately weak, moderately to highly decomposed.
				100	100	0		26.31		T2101		-22.90	26.45		II	23.20- 23.75m: Locally highly fractured. Strong, grey, slightly decomposed meta-SILTSTONE. Joints are closely to medium spaced, rough planar, very narrow, iron stained, quartz vein infilled, dipping at 10°-20°, 30°-40° and 50°-60°.
		2.00m at 18:00		100	100	50	15.0	27.18		T2101		-23.63	27.18			23.80- 26.45m: With interlamination of quartz.
07.12.09								27.18								End of drillhole at 27.18m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- ┆ Impression Packer Test
- ┆ Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- × Point Load Test

DRILLER
P.T. Fong
GEOTECHNICAL FIELD TECHNICIAN
K.W. Leung

LOGGING GEOLOGIST
S.O. CHAN
DATE
17.12.09

GEOTECHNICAL ENGINEER
EDWARD CHENG
DATE
18.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S24a**
SHEET **1** of **1**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD RC	CO-ORDINATES	JOB No. J0911S26 (TFL)
MACHINE / No. XY2B/CCL-3	E 825,825.11 N 841,950.13	DATE from 27.01.10 to 27.01.10
FLUSHING MEDIUM AIR	ORIENTATION Vertical	GROUND LEVEL +3.88 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	FL / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
27.01.10	PW														Firm, grey mottled brown, slightly sandy SILT with rootlets. (FILL)
				100					12 bla	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50	+2.88 +2.38	1.00 1.50			Loose, grey, slightly silty fine to coarse SAND with occasional oyster fragments. (FILL)
				100					1 bla	1 1.05 2 2.00 3 3.00 4 3.45 3.50					Very soft, grey, CLAY / SILT. (FILL)
				88						T2101	+0.08	3.80			CONCRETE.
										4.23	-0.35	4.23			Very soft, grey, CLAY / SILT. (SWAMP DEPOSIT)
27.01.10	5.00 PW	4.06m at 18:00		100					10 bla	4.50 4.95 5.00					End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- ┆ Impression Packer Test
- ┆ Standpipe/Piezometer Tip
- ┆ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER <u>C.L. Chung</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>09.02.10</u>	DATE <u>10.02.10</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
 FOUNDATION LIMITED
 泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S24b**

SHEET **1 of 1**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR09**

E 825,906.11
N 841,927.20

DATE from **26.01.10 to 27.01.10**

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+3.43 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I./Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
26.01.10	PW									A 0.45 0.50					Firm, greyish brown, CLAY / SILT. (SWAMP DEPOSIT)
26.01.10				100					6 bits	B 0.95 1.00					Very soft, grey, CLAY / SILT. (SWAMP DEPOSIT)
27.01.10										C 1.45 1.50	+1.93	1.50			
				100					1 bits	D 1.95 2.00					
				100					1 bits	E 3.00 3.45 3.50					
27.01.10	5.00 PW	2.83m at 18:00		100					1 bits	F 4.50 4.95 5.00	-1.57	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP GPJ_TYSAN_25032005.GDT 21.4.10

- 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
- ┆ Impression Packer Test
- ┆ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- X Point Load Test

DRILLER P.S. Tam LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 09.02.10 DATE 10.02.10

REMARKS
 1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S24c**

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

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-3**

E 825,883.05

DATE from **25.01.10** to **26.01.10**

N 841,856.13

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+3.43 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery % Total core	Water Recovery % Solid core	Water Recovery % R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
25.01.10	PW													Loose, brown, fine to coarse SAND. (FILL)
25.01.10									A	+2.93	0.50			Firm, dark grey, CLAY / SILT with much roots. (SWAMP DEPOSIT)
25.01.10									a					
26.01.10			100					10 bits	c	+1.93	1.50			Soft, grey to dark grey. CLAY / SILT. (SWAMP DEPOSIT)
26.01.10									1					
26.01.10									2					
26.01.10			100					0 bits	3					
26.01.10									4					
26.01.10	5.00 PW	2.40m at 18:00	100					11 bits	5					
26.01.10									a	-1.57	5.00			End of drillhole at 5.00m.
26.01.10														

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- ┆ Impression Packer Test
- ▭ Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- × Point Load Test

DRILLER C.L. Chung LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 09.02.10 DATE 10.02.10

REMARKS
 1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-S25**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-3**

E 825,944.13
N 841,825.13

DATE from **07.12.09** to **08.12.09**

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+4.29 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
07.12.09	PW														Loose, brown, silty fine to coarse SAND with some gravel sized rock fragments. (FILL)
				100					6 bits	A 0.45 0.50 B 0.85 1.00 C 1.45 1.50 1 1.95 2 2.80	+3.29	1.00			Loose to medium dense, yellowish brown, fine to coarse SAND with some gravel sized rock fragments. (FILL)
07.12.09 08.12.09				100					13 bits	3 4 3.45 3.50	+1.29	3.00			Firm, grey to dark grey, sandy CLAY / SILT. (SWAMP DEPOSIT)
08.12.09	5.00 PW	4.13m at 18:00		100					14 bits	5 4.50 6 4.85 7 5.00	-0.71	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG: J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- Impression Packer Test
- ⊕ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER <u>C.L. Chung</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>17.12.09</u>	DATE <u>18.12.09</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.
2. A water sample was taken at 5.00m depth.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG01**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR08**

E 826,142.10
N 843,025.32

DATE from **10.12.09** to **11.12.09**

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+6.12 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
10.12.09	PW														Loose, yellowish brown, fine to medium SAND. (FILL)
				100					18 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.05 2 2.00	+5.12	1.00			Stiff, dark brown to yellowish brown, very sandy SILT with gravel sized rock and brick fragments. (FILL)
10.12.09 11.12.09				100					17 bits	3 3.00 4 3.45 3.50	+3.12	3.00			Firm, grey to yellowish brown, sandy SILT. (SWAMP DEPOSIT)
	5.00 PW	Dry at 18:00		100					53 bits	5 4.50 6 4.95 7 5.00	+1.62	4.50			Dense, light grey, silty fine to medium SAND. (SWAMP DEPOSIT)
11.12.09											+1.12	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- ⊥ Impression Packer Test
- ⊥ Standpipe/Piezometer Tip
- ∠ In-situ Vane Shear Test
- × Point Load Test

DRILLER <u>P.T. Feng</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>17.12.09</u>	DATE <u>18.12.09</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.
2. A water sample was taken at 5.00m depth.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG02**

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

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR09**

E 826,423.14

DATE from **21.12.09** to **21.12.09**

N 842,751.05

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+6.64 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery % Total core	Water Recovery % Solid core	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mP.D)	Depth (m)	Legend	Grade	Description
21.12.09	PW													Loose, yellowish brown, fine to coarse SAND with some gravel sized rock and brick fragments. (FILL)
			100				11 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00						
			100				28 bits	3 3.00 4 3.45 3.50						
			100				28 bits	5 4.50 6 4.95 5.00	+2.14	4.50			Firm, brown and grey, sandy CLAY / SILT with some gravel sized rock fragments. (FILL)	
21.12.09	5.00 PW	Dry at 18:00	100							+1.64	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP GPJ TYSAN 25032005 GDT 21.4.10

- 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
- ⊥ Impression Packer Test
- ⊥ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER P.S. Tam	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 27.12.09	DATE 28.12.09

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG03**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR08**

E 826,738.11
N 842,631.07

DATE from **22.12.09** to **22.12.09**

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+3.16 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.i. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
22.12.09	PW														Firm, brown, sandy SILT with some gravel sized rock fragments. (FILL)
															Very soft, grey to yellowish brown, CLAY. (SWAMP DEPOSIT)
				100					1 bls						Firm, yellowish grey to grey, CLAY / SILT. (SWAMP DEPOSIT)
				100					6 bls						
				100											
		2.43m at 18:00						4.50							
22.12.09	PW								47 bls						Loose, yellowish brown, fine to coarse SAND. (ALLUVIUM)
															End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10

- 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
- ┆ Impression Packer Test
- ▲ Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- × Point Load Test

DRILLER <u>P.T. Fong</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>27.12.09</u>	DATE <u>28.12.09</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.
2. A standpipe installed to 4.50m depth.
3. A water sample was taken at 5.00m depth.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG04**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR06**

E 826,035.06
N 842,690.19

DATE from **10.12.09** to **12.12.09**

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+5.74 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.C.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
10.12.09	PW														Stiff, brown to brownish grey, sandy SILT with some gravel sized rock and brick fragments. (FILL)
10.12.09 11.12.09				100					25 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00					
11.12.09 12.12.09				100					13 bits	3 3.00 4 3.45 3.50	+2.74	3.00			Firm, grey to dark grey, sandy SILT. (SWAMP DEPOSIT)
12.12.09	5.00 PW	4.77m at 18:00		100					8 bits	5 4.50 4.95 5.00	+1.24	4.50			Loose, yellowish grey, clayey fine to medium SAND. (SWAMP DEPOSIT)
											+0.74	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10

- 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
- ⊥ Impression Packer Test
- ⊥ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER <u>K.M. Lee</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>17.12.09</u>	DATE <u>18.12.09</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG05**
SHEET 1 of 4

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD RC	CO-ORDINATES	JOB No. J0911S26 (TFL)
MACHINE / No. LY38/SB05	E 826,367.93 N 842,408.08	DATE from 12.12.09 to 18.12.09
FLUSHING MEDIUM AIR / WATER	ORIENTATION Vertical	GROUND LEVEL +4.05 mP.D.

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
12.12.09	SW														Firm, grey and yellowish brown, sandy SILT with some gravel sized brick fragments. (FILL)
				100					77 bls	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00 3 3.00 4 3.45 3.50					
		4.25m at 18:00		100				4.60	26 bls	5 4.50 6 4.95 5.00	-0.45	4.50			Very soft, grey to black, CLAY / SILT with some gravel and cobble sized granite fragments. (FILL)
12.12.09		3.80m at 08:00							17 bls	7 5.50					
14.12.09				0						8 6.50 8.60					
		2.70m at 08:00		0					102 bls	9 7.05 7.10	-3.05	7.10			Medium dense, light grey to grey, clayey fine to medium SAND with some gravel sized rock and shell fragments. (SWAMP DEPOSIT)
14.12.09									(2, 4, 6, 6, 7, 7) N=26	10 7.50 7.55 7.60					
15.12.09	7.60 SW PW									11 8.60 8.70					
				47					15 bls	12 9.15 9.20 9.30					
									(2, 2, 2, 4, 2, 3) N=11	13 9.60 9.65 9.70	-5.65	9.70			
				92						14 9.65 9.70	-5.95	10.00			Firm, grey to dark grey, CLAY / SILT. (SWAMP)

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10

- 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
- ⊥ Impression Packer Test
- ⊥ Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- × Point Load Test

DRILLER M.S. Lee	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 21.12.09	DATE 22.12.09

REMARKS

1. Inspection pit excavated from 0.00m-1.50m.
2. A falling head permeability test was carried out at 3.10m-4.60m depth.
3. A constant head permeability test was carried out at 13.50m-15.00m depth.
4. A vane shear test was carried out at 11.80m depth.
5. Flushing medium for first 5m is air.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG05**

SHEET **2** of **4**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/SB05**

E 826,367.93
N 842,408.08

DATE from **12.12.09** to **18.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.05 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recover %	Total core Recover %	Solid core Recover %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
				92						15					DEPOSIT)
									(1, 1, 1, 2, 2, 2) N=7	16 10.70 10.80 10.90	-6.75	10.80			Firm, dark yellowish brown, CLAY / SILT. (ALLUVIUM)
										17 11.20 11.25					
				93						18 12.00	-7.95	12.00			Medium dense, yellowish brown, fine to coarse SAND with some rounded gravel sized quartz fragments. (ALLUVIUM)
									(1, 2, 3, 4, 6) N=10	19 13.00 13.10 13.20					
				0						20 13.50 13.55					
15.12.09										21 14.00	-9.95	14.00			Grey and greyish brown, subrounded GRAVEL and COBBLE sized quartz fragments. (ALLUVIUM)
16.12.09	2.73m at 08:00			0						22 15.00 15.10					
				0						23 15.60 15.70					
16.12.09									139 lbs	24 16.00 16.05 16.10	-11.55	15.60			Very stiff, yellowish brown to dark yellowish brown, CLAY / SILT. (ALLUVIUM)
17.12.09	2.69m at 08:00								(7, 10, 6, 4, 3) N=16	25 17.10 17.20 17.30					
				93						26 17.60 17.65					
									(1, 1, 2, 3, 3, 3) N=13	27 18.10					
										28 19.10 19.20 19.30					
				96						29 19.60 19.65					
									(1, 1, 3, 3, 3, 3) N=14	30 18.10	-14.05	18.10			Extremely weak to very weak, grey, completely to highly decomposed meta-SILTSTONE. (Very stiff, SILT with some gravel sized rock fragments)
										31 19.10 19.20 19.30					
										32 19.60 19.65					
	20.10									33 -15.95					
										34 20.00					

DRILLHOLE LOG (J0911S26(TFL)) LOK MA CHAU LOOP GPJ TYSAN 25032005 GDT 21.4.10

- 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
- ▬ Impression Packer Test
- ▬ Standpipe/Piezometer Tip
- ▬ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER M.S. Lee	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 21.12.09	DATE 22.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG05**
SHEET **3** of **4**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/SB05**

E 826,367.93
N 842,408.08

DATE from **12.12.09** to **18.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.05 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total Core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F1 / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
	HW			100					(4, 13, 8, 9, 9, 12) N=38	35 36 37 38	20.10 16.65 21.10 21.20 21.30 21.60 21.65	20.10		V	As Sheet 2 of 4. Extremely weak, yellowish brown, completely decomposed meta-SILTSTONE. (Very stiff, SILT)
				100					(7, 43, 100/20mm) 100/120mm	39 40 41	24.10 20.05 25.10 25.20 25.32 25.37	24.10		V/IV	Extremely weak to very weak, yellowish brown and grey, completely to highly decomposed meta-SILTSTONE. (Very stiff, SILT with some gravel sized rock fragments)
	28.60 HW			100	100	20	NI		28.60	T2101	28.60	-24.55		IV/III	Moderately weak to moderately strong, yellowish brown, highly to moderately decomposed meta-SILTSTONE. (Recovered as angular gravel)
				98	98	98	7.2		29.00	T2101	29.07	-24.95		II	Strong, grey to dark grey, slightly decomposed meta-SILTSTONE. Joints are closely to medium spaced, rough planar, very narrow, iron stained, quartz vein infilled, dipping at 20°-30°.
				100	100	85				AT3	29.55	-25.95			

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP GPJ TYSAN_25032005.GDT 21.4.10

- 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
- ┆ Impression Packer Test
- ┆ Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER M.S. Lee LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 21.12.09 DATE 22.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG05**

SHEET **4** of **4**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/SB05**

E 826,367.93
N 842,408.08

DATE from **12.12.09** to **18.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.05 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
				100	100	85				AT3					As Sheet 3 of 4.
				100	100	80				AT3	30.06				
				100	100	70		7.2		AT3	32.16				
				100	100	75				AT3	33.06				
				100	100	85				AT3	33.81				
18.12.09								34.68		AT3	34.80	-30.55	34.60		

DRILLHOLE LOG (J0911S26(TFL)) LOK MA CHAU LOOP GPJ TYSAN 25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- ┆ Large Disturbed Sample
- ▼ Water Level
- ┆ SPT Liner Sample
- ┆ Standard Penetration Test
- ┆ U76 Undisturbed Sample
- ┆ Permeability Test
- ┆ U100 Undisturbed Sample
- ┆ Impression Packer Test
- ┆ Mazier Sample
- ┆ Standpipe/Piezometer Tip
- ┆ Piston Sample
- ┆ In-situ Vane Shear Test
- ┆ Point Load Test

DRILLER <u>M.S. Lee</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>21.12.09</u>	DATE <u>22.12.09</u>

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG06**
SHEET **1** of **1**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-3**

E 826,622.15

DATE from **19.12.09** to **21.12.09**

N 842,323.03

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+4.82 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
19.12.09	PW														Firm, grey, SILT with some roots. (FILL)
				100					45 bts	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00	+4.32	0.50			Loose, yellowish brown, fine to coarse SAND. (FILL)
				100					22 bts	3 3.00 4 3.45 3.50	+1.82	3.00			Firm, yellowish grey, CLAY / SILT with some roots. (SWAMP DEPOSIT)
19.12.09 21.12.09	5.00 PW	3.18m at 18:00		100					9 bts	5 4.50 6 4.85 7 5.00	+0.32	4.50			Firm, dark grey, CLAY / SILT. (SWAMP DEPOSIT)
21.12.09	PW										-0.18	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- ⋮ Impression Packer Test
- ⋮ Standpipe/Piezometer Tip
- ⋮ In-situ Vane Shear Test
- × Point Load Test

DRILLER <u>C.L. Chung</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>27.12.09</u>	DATE <u>28.12.09</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.
2. A water sample was taken at 5.00m depth.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG07**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR09**

E 825,928.05

DATE from **07.12.09** to **07.12.09**

N 842,354.10

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+5.84 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery % Total core	Recovery % Solid core	Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
07.12.09	PW								26 bs	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00					Loose, brown, silty fine to coarse SAND with some gravel and cobble sized quartz and brick fragments. (FILL)
			100						18 bs	3 3.00 4 3.45 3.50	+2.84	3.00			Firm, reddish brown mottled white and grey, clayey SILT with completely decomposed siltstone fragments. (FILL)
		4.89m at 18:00	100						18 bs	5 4.50	+1.34	4.50			Firm, grey to dark grey, sandy CLAY / SILT with some roots. (SWAMP DEPOSIT)
07.12.09	5.00 PW									6 4.95 5.00	+0.84	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10

- 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
- ⊥ Impression Packer Test
- ⊥ Standpipe/Piezometer Tip
- ∠ In-situ Vane Shear Test
- × Point Load Test

DRILLER <u>P.S. Tam</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>10.12.09</u>	DATE <u>11.12.09</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG08**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-1**

E 826,180.17

DATE from **05.12.09** to **07.12.09**

N 842,055.22

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+5.79 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
05.12.09	PW														Loose, yellowish brown, fine to medium SAND. (FILL)
				100					15 bls	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00	+4.79	1.00			Medium dense, yellowish grey to yellowish brown, clayey fine to coarse SAND with some shell fragments. (FILL)
				100					44 bls	3 3.00 4 3.45 3.50	+2.79	3.00			Firm, grey mottled reddish brown, sandy CLAY / SILT. (FILL)
05.12.09 07.12.09		1.45m at 18:00													
07.12.09	5.00 PW	1.45m at 08:00		100					15 bls	5 4.50 6 4.95 7 5.00	+1.29	4.50			Stiff, grey to yellowish grey, CLAY / SILT. (SWAMP DEPOSIT)
07.12.09	PW										+0.79	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP GPJ_TYSAN_25092005.GDT 21.4.10

- 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
- | Impression Packer Test
- △ Standpipe/Piezometer Tip
- In-situ Vane Shear Test
- X Point Load Test

DRILLER T.H. Wong	LOGGING GEOLOGIST S.O. CHAN	GEOTECHNICAL ENGINEER EDWARD CHENG
GEOTECHNICAL FIELD TECHNICIAN K.W. Leung	DATE 17.12.09	DATE 17.12.09

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.
2. A water sample was taken at 5.00m depth.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG09**
SHEET **2** of **5**

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/SB05**

E 825,826.50
N 842,012.38

DATE from **26.11.09** to **04.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.94 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I./Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
				70											As Sheet 1 of 5.
				100					(1, 4, 3, 4, 4, N=16)	15 16 17 18 19 20	-6.76	11.70			Medium dense, grey to dark grey, clayey fine to medium SAND. (SWAMP DEPOSIT)
				100					(2, 4, 4, 6, 8, N=26)	21 22 23 24					
				0						25 26	-10.76	15.70			Very dense, yellowish brown to yellowish grey, subangular GRAVEL sized quartz fragments. (ALLUVIUM)
				0					(2, 4, 5, 6, 8, N=29)	27 28	-11.26	16.20			Medium dense, yellowish brown to yellowish grey, silty fine to coarse SAND. (ALLUVIUM)
									(3, 3, 5, 5, 3, N=18)	29		17.70 18.10 18.15			
									(5, 18, 25, 26, 18, 25, N=85)	30	-14.76 -15.06	19.70 20.00		V	Extremely weak, yellowish brown, completely

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ_TYSAN_25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- ✱ Water Level
- SPT Liner Sample
- ⊥ Standard Penetration Test
- U76 Undisturbed Sample
- ⊥ Permeability Test
- U100 Undisturbed Sample
- ⊥ Impression Packer Test
- Mazier Sample
- ⊕ Standpipe/Piezometer Tip
- Piston Sample
- ∨ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER M.S. Lee LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 10.12.09 DATE 11.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG09**

SHEET **3** of **5**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/SB05**

E 825,826.50
N 842,012.38

DATE from **26.11.09** to **04.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.94 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery % Total core	Recovery % Solid core	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
	20.60 PW 20.60 HW								31 20.10 20.15 20.60				V	decomposed meta-SILTSTONE. (Very stiff, SILT) As Sheet 2 of 5.
			91					(50/70mm 100/70mm 100/5/70mm)	32 33 21.60 21.70 21.79 21.84	-16.76	21.70			Extremely weak to very weak, yellowish brown to yellowish grey, completely to highly decomposed meta-SILTSTONE. (Very stiff, sandy SILT with some gravel and cobble sized rock fragments)
			88					(4, 17, 16, 16, 24, 40 N=93)	34 35 24.60 36 25.60 25.70 25.80 37 26.10 26.15	-20.76	25.70	VIV		Extremely weak, yellowish brown, completely decomposed meta-SILTSTONE. (Very stiff, SILT)
			40				27.75	(50/70mm 100/10mm 100/5/10mm)	38 39 28.60 40 29.60 29.70 29.73 41	-25.06	30.00		V	

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25092005.GDT 21.4.10

- 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
- ┆ Impression Packer Test
- ┆ Standpipe/Piezometer Tip
- ┆ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER <u>M.S. Lee</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>10.12.09</u>	DATE <u>11.12.09</u>

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG09**

SHEET **4** of **5**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/SB05**

E 825,826.50

DATE from **26.11.09** to **04.12.09**

N 842,012.38

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.94 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
				75						29.78					As Sheet 3 of 5.
									(24, 13, 11, 10, 16, 16) N=53	32.60				V	
				100						33.60 33.70 33.80 34.10 34.15					
	37.55 HW									35.60	-31.66	35.60		IV	Weak, yellowish grey, highly decomposed meta-SILTSTONE. (Subangular GRAVEL and COBBLE sized rock fragments)
				78	0	0	NI		37.56 37.79	37.43 37.53 37.56 37.79	-32.85	37.79			
				100	100	20				T2101					
				100	100	40	8.0			T2101				II	Strong, light grey to grey, slightly decomposed meta-SILTSTONE. Joints are closely to medium locally very closely spaced, rough planar, very narrow, calcite and quartz vein infilled, dipping at 10°-20°, 30°-40° and 50°-60°.
				100	100	68				T2101	-35.06	40.00			

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25092005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- Large Disturbed Sample
- * Water Level
- SPT Liner Sample
- | Standard Penetration Test
- U76 Undisturbed Sample
- | Permeability Test
- U100 Undisturbed Sample
- | Impression Packer Test
- Mazier Sample
- Standpipe/Piezometer Tip
- Piston Sample
- < In-situ Vane Shear Test
- X Point Load Test

DRILLER M.S. Lee LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 10.12.09 DATE 11.12.09

REMARKS



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG09**

SHEET **5** of **5**

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/SB05**

E 825,826.50
N 842,012.38

DATE from **26.11.09** to **04.12.09**

FLUSHING MEDIUM **AIR / WATER**

ORIENTATION **Vertical**

GROUND LEVEL **+4.94 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
			100	100	68					T2101	40.26				As Sheet 4 of 5.
			100	100	82	8.0				T2101					
			97	97	0	>20		41.11		T2101	41.11				
			95	95	20			41.90		T2101	41.76				
								9.3		T2101	42.34				
			100	100	70					T2101	43.32				
04.12.09								43.32			-38.38	43.32			End of drillhole at 43.32m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP G.P.I. TYSAN 25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- ◆ Large Disturbed Sample
- ✱ Water Level
- SPT Liner Sample
- Standard Penetration Test
- ▨ U76 Undisturbed Sample
- ⊥ Permeability Test
- ▨ U100 Undisturbed Sample
- ⊥ Impression Packer Test
- ▨ Mazier Sample
- ⊥ Standpipe/Piezometer Tip
- ▨ Piston Sample
- ⊥ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER M.S. Lee LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 10.12.09 DATE 11.12.09

REMARKS



TYSAN
 FOUNDATION LIMITED
 泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG10**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-3**

E 826,067.23

DATE from **09.12.09** to **09.12.09**

N 841,813.16

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+5.14 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I./Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
09.12.09	PW														Loose, reddish brown, silty fine to coarse SAND with some gravel sized rock and brick fragments. (FILL)
				100					19 bts	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.85 2 2.00					
				100					12 bts	3 3.00 4 3.45 3.50	+2.14	3.00			
				100					18 bts	5 4.50 6 4.85 5.00	+0.14	5.00			
09.12.09	5.00 PW	3.42m at 18:00													End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- Small Disturbed Sample
- ▲ Water Sample
- ▬ Large Disturbed Sample
- ✱ Water Level
- ▬ SPT Liner Sample
- ▬ Standard Penetration Test
- ▬ U76 Undisturbed Sample
- ▬ Permeability Test
- ▬ U100 Undisturbed Sample
- ▬ Impression Packer Test
- ▬ Mazier Sample
- ▬ Standpipe/Piezometer Tip
- ▬ Pison Sample
- ▬ In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER <u>C.L. Chung</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>17.12.09</u>	DATE <u>18.12.09</u>

REMARKS
 1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG10a**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **LY38/DR09**

E 826,006.09

DATE from **27.01.10** to **29.01.10**

N 841,819.07

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+3.30 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
27.01.10	PW														Firm, grey mottled brown, slightly sandy SILT with occasional rootlets. (FILL)
27.01.10 29.01.10				100					2 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50	+1.80	1.50			Very soft, grey, CLAY / SILT. (SWAMP DEPOSIT)
				100					4 bits	1 1.95 2 2.00 3 3.00 4 3.45 3.50					
29.01.10	5.00 PW	1.90m at 18:00		100					2 bits	5 4.50 6 4.85 5.00	-1.20	4.50			Loose, brownish grey, slightly silty fine to coarse SAND. (SWAMP DEPOSIT)
											-1.70	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25022005.GDT 21.4.10

- 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
- ⊥ Impression Packer Test
- ⊥ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- × Point Load Test

DRILLER P.S. Tam LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 09.02.10 DATE 10.02.10

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG10b**

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

PROJECT **Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A**

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-3**

E 826,028.17

DATE from **28.01.10** to **28.01.10**

N 841,890.05

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+3.18 mP.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	FI / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
28.01.10	PW														Firm, greyish brown, CLAY / SILT. (SWAMP DEPOSIT)
				100					6 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 2 1.95 2.00	+2.18	1.00			Very soft, grey to dark grey, CLAY / SILT. (SWAMP DEPOSIT)
				100					8 bits	3 3.00 4 3.45 3.50					
28.01.10	5.00 PW	1.86m at 18:00		100					13 bits	5 4.50 6 4.85 5.00	-1.32	4.50			Loose, grey, slightly silty fine to coarse SAND. (SWAMP DEPOSIT)
											-1.82	5.00			End of drillhole at 5.00m.

DRILLHOLE LOG: J0911S26(TFL) LOK MA CHAU LOOP.GPJ TYSAN_25032005.GDT 21.4.10

- 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
- ▬ Impression Packer Test
- ▬ Standpipe/Piezometer Tip
- ∨ In-situ Vane Shear Test
- × Point Load Test

DRILLER C.L. Chung LOGGING GEOLOGIST S.O. CHAN GEOTECHNICAL ENGINEER EDWARD CHENG
 GEOTECHNICAL FIELD TECHNICIAN K.W. Leung DATE 09.02.10 DATE 10.02.10

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.



TYSAN
FOUNDATION LIMITED
泰昇地基工程有限公司

DRILLHOLE RECORD

HOLE No. **A-SG10c**

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

PROJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A

METHOD **RC**

CO-ORDINATES

JOB No. **J0911S26 (TFL)**

MACHINE / No. **XY2B/CCL-3**

E 826,112.08

DATE from **29.01.10** to **29.01.10**

N 841,863.10

FLUSHING MEDIUM **AIR**

ORIENTATION **Vertical**

GROUND LEVEL **+5.21 m.P.D.**

Drilling Progress	Casing depth/size	Water level (m) Shift start/end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
29.01.10	PW														Soft, greyish brown, slightly fine sandy SILT with occasional angular to subangular fine to coarse gravel sized rock fragments. (FILL)
				100				24 bits	A 0.45 0.50 B 0.95 1.00 C 1.45 1.50 1 1.95 2 2.00						
				100				13 bits	3 3.00 4 3.45 3.50						
		2.34m at 18:00		100				19 bits	5 4.50 6 4.95 5.00	+0.71 +0.21	4.50 5.00			Soft, grey mottled brown, CLAY / SILT. (SWAMP DEPOSIT)	
29.01.10	5.00 PW													End of drillhole at 5.00m.	

DRILLHOLE LOG: J0911S26(TFL) LOK MA CHAU LOOP GRU TYSAN_25032005.GDT_21.4.10

- 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
- ┆ Impression Packer Test
- ┆ Standpipe/Piezometer Tip
- < In-situ Vane Shear Test
- ✕ Point Load Test

DRILLER <u>C.L. Chung</u>	LOGGING GEOLOGIST <u>S.O. CHAN</u>	GEOTECHNICAL ENGINEER <u>EDWARD CHENG</u>
GEOTECHNICAL FIELD TECHNICIAN <u>K.W. Leung</u>	DATE <u>09.02.10</u>	DATE <u>10.02.10</u>

REMARKS
1. Inspection pit excavated from 0.00m-1.50m.

Appendix B

RBRGs Criteria

Risk-Based Remediation Goals (RBRGs) for Soil & Soil Saturation Limit

Chemical	Risk-Based Remediation Goals (RBRGs) for Soil				Soil Saturation Limit (C _{sat}) (mg/kg)
	Urban Residential	Rural Residential	Industrial	Public Park	
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
VOCs					
Acetone	9,590	4,260	10,000	10,000	***
Benzene	0.704	0.279	9.21	42.2	336
Bromodichloromethane	0.317	0.129	2.85	13.40	1,030
2-Butanone	10,000	10,000	10,000	10,000	***
Chloroform	0.132	0.0529	1.54	253	1,100
Ethylbenzene	709	298	8,240	10,000	138
Methyl tert-Butyl Ether	6.88	2.80	70.1	505	2,380
Methylene Chloride	1.30	0.529	13.9	128	921
Styrene	3,220	1,540	10,000	10,000	497
Tetrachloroethene	0.101	0.0444	0.78	1.84	97.1
Toluene	1,440	705	10,000	10,000	235
Trichloroethene	0.523	0.211	5.68	69.4	488
Xylenes (Total)	95.0	36.8	1,230	10,000	150
SVOCs					
Acenaphthene	3,510	3,280	10,000	10,000	60.2
Acenaphthylene	2,340	1,510	10,000	10,000	19.8
Anthracene	10,000	10,000	10,000	10,000	2.56
Benzo(a)anthracene	12.0	11.4	91.8	38.3	
Benzo(a)pyrene	1.20	1.14	9.18	3.83	
Benzo(b)fluoranthene	9.88	10.1	17.8	20.4	
Benzo(g,h,i)perylene	1,800	1,710	10,000	5,740	
Benzo(k)fluoranthene	120	114	918	383	
Bis-(2-Ethylhexyl)phthalate	30.0	28.0	91.8	94.2	
Chrysene	871	919	1,140	1,540	
Dibenzo(a,h)anthracene	1.20	1.14	9.18	3.83	
Fluoranthene	2,400	2,270	10,000	7,620	
Fluorene	2,380	2,250	10,000	7,450	54.7
Hexachlorobenzene	0.243	0.220	0.582	0.713	
Indeno(1,2,3-cd)pyrene	12.0	11.4	91.8	38.3	
Naphthalene	182	85.6	453	914	125
Phenanthrene	10,000	10,000	10,000	10,000	28.0
Phenol	10,000	10,000	10,000	10,000	7,260
Pyrene	1,800	1,710	10,000	5,720	
Metals					
Antimony	29.5	29.1	261	97.9	
Arsenic	22.1	21.8	196	73.5	
Barium	10,000	10,000	10,000	10,000	
Cadmium	73.8	72.8	653	245	
Chromium III	10,000	10,000	10,000	10,000	
Chromium VI	221	218	1,960	735	
Cobalt	1,480	1,460	10,000	4,900	
Copper	2,950	2,910	10,000	9,790	
Lead	258	255	2,290	857	
Manganese	10,000	10,000	10,000	10,000	
Mercury	11.0	6.52	38.4	45.6	
Molybdenum	369	364	3,260	1,220	
Nickel	1,480	1,460	10,000	4,900	
Tin	10,000	10,000	10,000	10,000	
Zinc	10,000	10,000	10,000	10,000	
Dioxins / PCBs					
Dioxins (I-TEQ)	0.001	0.001	0.005	0.001	
PCBs	0.236	0.223	0.748	0.756	
Petroleum Carbon Ranges					
C6 - C8	1,410	545	10,000	10,000	1,000
C9 - C16	2,240	1,330	10,000	10,000	3,000
C17 - C35	10,000	10,000	10,000	10,000	5,000
Other Inorganic Compounds					
Cyanide, free	1,480	1,460	10,000	4,900	
Organometallics					
TBTO	22.1	21.8	196	73.5	

Notes:

- (1) For Dioxins, the cleanup levels in USEPA Office of Solid Waste and Emergency Response (OSWER) Directive of 1998 have been adopted. The OSWER Directive value of 1 ppb for residential use has been applied to the scenarios of "Urban Residential", "Rural Residential", and "Public Parks", while the low end of the range of values for industrial, 5 ppb, has been applied to the scenario of "industrial".
- (2) Soil saturation limits for petroleum carbon ranges taken from the Canada-Wide Standards for Petroleum Hydrocarbons in Soil, CCME 2000.
- (3) * indicates a 'ceiling limit' concentration.
- (4) *** indicates that the C_{sat} value exceeds the 'ceiling limit' therefore the RBRG applies.

Risk-Based Remediation Goals (RBRGs) for Groundwater and Solubility Limit

Chemical	Risk-Based Remediation Goals (RBRGs) for Groundwater			Solubility Limit (mg/L)
	Urban Residential (mg/L)	Rural Residential (mg/L)	Industrial (mg/L)	
VOCs				
Acetone	9,590	4,260	10,000	***
Benzene	0.704	0.279	9.21	336
Bromodichloromethane	0.317	0.129	2.85	1,030
2-Butanone	10,000	10,000	10,000	***
Chloroform	0.132	0.0529	1.54	1,100
Ethylbenzene	709	298	8,240	138
Methyl tert-Butyl Ether	6.88	2.80	70.1	2,380
Methylene Chloride	1.30	0.529	13.9	921
Styrene	3,220	1,540	10,000	497
Tetrachloroethene	0.101	0.0444	0.78	97.1
Toluene	1,440	705	10,000	235
Trichloroethene	0.523	0.211	5.68	488
Xylenes (Total)	95.0	36.8	1,230	150
SVOCs				
Acenaphthene	10,000	7,090	10,000	4.24
Acenaphthylene	1,410	542	10,000	3.93
Anthracene	10,000	10,000	10,000	0.0434
Benzo(a)anthracene				
Benzo(a)pyrene				
Benzo(b)fluoranthene	0.539	0.203	7.53	0.0015
Benzo(g,h,i)perylene				
Benzo(k)fluoranthene				
Bis-(2-Ethylhexyl)phthalate				
Chrysene	58.1	21.9	812	0.0016
Dibenzo(a,h)anthracene				
Fluoranthene	10,000	10,000	10,000	0.206
Fluorene	10,000	10,000	10,000	1.98
Hexachlorobenzene	0.0589	0.0234	0.695	6.20
Indeno(1,2,3-cd)pyrene				
Naphthalene	61.7	23.7	862	31.0
Phenanthrene	10,000	10,000	10,000	1.00
Phenol				
Pyrene	10,000	10,000	10,000	0.135
Metals				
Antimony				
Arsenic				
Barium				
Cadmium				
Chromium III				
Chromium VI				
Cobalt				
Copper				
Lead				
Manganese				
Mercury	0.486	0.184	6.79	
Molybdenum				
Nickel				
Tin				
Zinc				
PCBs				
Dioxins (I-TEQ)				
PCBs	0.433	0.171	5.11	0.031
Petroleum Carbon Ranges				
C6 - C8	1,410	545	10,000	1,000
C9 - C16	2,240	1,330	10,000	3,000
C17 - C35	10,000	10,000	10,000	5,000
Other Inorganic Compounds				
Cyanide, free				
Organometallics				
TBTO				

Notes:

- (1) Blank indicates that RBRG could not be calculated because the toxicity or physical/chemical values were unavailable, or the condition of Henry's Law Constant > 0.00005 was not met for the inhalation pathway.
- (2) Where solubilities for Petroleum Carbon Range aliphatic C9-C16 and greater than C16 generally are considered to be effectively zero and therefore the aromatic solubility for C9-C16 is used.
- (3) * indicates a 'ceiling limit' concentration.
- (4) *** indicates that the solubility limit exceeds the 'ceiling limit' therefore the RBRG applies.

Appendix C

**Intervention Value
downloaded from the
website of Ministry of
Housing, Spatial
Planning and
Environment,
Netherland**

Table 1a: Target values and soil remediation intervention values and background concentrations soil/sediment and groundwater for metals. Values for soil/sediment have been expressed as the concentration in a standard soil (10% organic matter and 25% clay).

	EARTH/SEDIMENT (mg/kg dry matter)			GROUNDWATER (µg/l in solution)			
	national background concentration	target value	Intervention value	target value shallow	national background concentration deep	target value deep	intervention value
	(BC)	(incl. BC)			(BC)	(incl. BC)	
I Metals							
antimony	3	3	15	-	0.09	0.15	20
arsenic	29	29	55	10	7	7.2	60
barium	160	160	625	50	200	200	625
cadmium	0.8	0.8	12	0.4	0.06	0.06	6
chromium	100	100	380	1	2.4	2.5	30
cobalt	9	9	240	20	0.6	0.7	100
copper	36	36	190	15	1.3	1.3	75
mercury	0.3	0.3	10	0.05	-	0.01	0.3
lead	85	85	530	15	1.6	1.7	75
molybdenum	0.5	3	200	5	0.7	3.6	300
nickel	35	35	210	15	2.1	2.1	75
zinc	140	140	720	65	24	24	800

Table 1b: Target values and intervention values for soil remediation soil/sediment and groundwater for inorganic compounds, aromatic compounds, PAH, chlorinated hydrocarbons, pesticides and other contaminants. Values for soil/sediment have been expressed as the concentration in a standard soil (10% organic matter and 25% clay).

	EARTH/SEDIMENT (mg/kg dry matter)		GROUNDWATER (µg/l in solution)	
	target value	intervention value	target value	intervention value
II Inorganic compounds				
cyanides-free	1	20	5	1500
cyanides-complex (pH<5) ¹	5	650	10	1500
cyanides-complex (pH ≥5)	5	50	10	1500
thiocyanates (sum)	1	20	-	1500
bromide (mg Br/l)	20	-	0.3 mg/l ²	-
chloride (mg Cl/l)	-	-	100 mg/l ²	-
fluoride (mg F/l)	500 ³	-	0.5 mg/l ²	-
III Aromatic compounds				
benzene	0.01	1	0.2	30
ethyl benzene	0.03	50	4	150
toluene	0.01	130	7	1000
xylenes	0.1	25	0.2	70
styrene (vinyl benzene)	0.3	100	6	300
phenol	0.05	40	0.2	2000
cresols (sum)	0.05	5	0.2	200
catechol(o-dihydroxybenzene)	0.05	20	0.2	1250
resorcinol(m-dihydroxybenzene)	0.05	10	0.2	600
hydroquinone(p-dihydroxybenzene)	0.05	10	0.2	800
IV Polycyclic aromatic hydrocarbons (PAH)				
PAH (sum 10) ^{4,14}	1	40	-	-
naphthalene			0.01	70
anthracene			0.0007*	5
phenatrene			0.003*	5
fluoranthene			0.003	1
benzo(a)anthracene			0.0001*	0.5
chrysene			0.003*	0.2
benzo(a)pyrene			0.0005*	0.05
benzo(ghi)perylene			0.0003	0.05
benzo(k)fluoranthene			0.0004*	0.05
indeno(1,2,3-cd)pyrene			0.0004*	0.05

Table 1b(continued): Target values and intervention values for soil remediation soil/sediment and groundwater for inorganic compounds, aromatic compounds, PAH, chlorinated hydrocarbons, pesticides and other contaminants. Values for soil/sediment have been expressed as the concentration in a standard soil (10% organic matter and 25% clay).

	EARTH/SEDIMENT (mg/kg dry matter)		GROUNDWATER (µg/l in solution)	
	target value	intervention value	target value	intervention value
V Chlorinated hydrocarbons				
vinyl chloride	0.01	0.1	0.01	5
dichloromethane	0.4	10	0.01	1000
1,1-dichloroethane	0.02	15	7	900
1,2-dichloroethane	0.02	4	7	400
1,1-dichloroethene	0.1	0.3	0.01	10
1,2-dichloroethene (cis and trans)??	0.2	1	0.01	20
dichloropropane	0.002#	2	0.8	80
trichloromethane (chloroform)	0.02	10	6	400
1,1,1-trichloroethane	0.07	15	0.01	300
1,1,2-trichloroethane	0.4	10	0.01	130
trichloroethene (Tri)	0.1	60	24	500
tetrachloromethane (Tetra)	0.4	1	0.01	10
tetrachloroethene (Per)	0.002	4	0.01	40
chlorobenzenes (sum) ^{5,14}	0.03	30	-	-
monochlorobenzene			7	180
dichlorobenzenes			3	50
trichlorobenzenes			0.01	10
tetrachlorobenzenes			0.01	2.5
pentachlorobenzene			0.003	1
hexachlorobenzene			0.00009*	0.5
chlorophenols (sum) ^{6,14}	0.01	10	-	-
monochlorophenols (sum)			0.3	100
dichlorophenols			0.2	30
trichlorophenols			0.03*	10
tetrachlorophenols			0.01*	10
pentachlorophenol			0.04*	3
chloronaphthalene	-	10	-	6
monochloroaniline	0.005	50	-	30
polychlorobiphenyls (sum 7) ⁷	0.02	1	0.01*	0.01
EOX	0.3		-	

Table 1b(continued): Target values and intervention values for soil remediation soil/sediment and groundwater for inorganic compounds, aromatic compounds, PAH, chlorinated hydrocarbons, pesticides and other contaminants. Values for soil/sediment have been expressed as the concentration in a standard soil (10% organic matter and 25% clay).

	EARTH/SEDIMENT (mg/kg dry matter)		GROUNDWATER (µg/l in solution)	
	target value	intervention value	target value	intervention value
VI Pesticides				
DDT/DDE/DDD ⁸	0.01	4	0.004 ng/l *	0.01
drins ⁹	0.005	4	-	0.1
aldrin	0.00006		0.009 ng/l*	
dieldrin	0.0005		0.1 ng/l	
endrin	0.00004		0.04 ng/l	
HCH-compounds ¹⁰	0.01 ^A	2	0.05 ^A	1
α-HCH	0.003		33 ng/l	
β-HCH	0.009		8 ng/l	
γ-HCH	0.00005		9 ng/l	
atrazine	0.0002	6	29 ng/l	150
carbaryl	0.00003	5	2 ng/l*	50
carbofuran	0.00002	2	9 ng/l	100
chlorodane	0.00003	4	0.02 ng/l*	0.2
endosulfan	0.00001	4	0.2 ng/l*	5
heptachloro	0.0007	4	0.005 ng/l*	0.3
heptachloro-epoxide	0.0000002	4	0.005 ng/l*	3
maneb	0.002	35	0.05 ng/l*	0.1
MCPA	0.00005#	4	0.02	50
organotin compounds ¹¹	0.001	2.5	0.05*-16 ng/l	0.7
VII Other contaminants				
cyclohexanone	0.1	45	0.5	15000
phthalates (sum) ¹²	0.1	60	0.5	5
mineral oil ¹³	50	5000	50	600
pyridine	0.1	0.5	0.5	30
tetrahydrofuran	0.1	2	0.5	300
tetrahydrothiophene	0.1	90	0.5	5000
tribromomethane	-	75	-	630

Notes to table 1:

1. Acidity: pH (0.01 M CaCl₂). In order to determine whether pH is greater than or equal to 5, or less than 5, the 90 percentile of the measured values is taken.
2. In areas subject to marine influence higher values occur naturally (salt and brackish water).
3. Differentiation by clay content: (F) = 175 = 13L (L = % clay).
4. PAH (sum of 10) here means the total of anthracene, benzo(a)anthracene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, phenantrene, fluoroanthene, indeno(1,2,3-cd)pyrene, naphthalene and benzo(ghi)perylene.
5. 'Chlorobenzenes (sum)' here means the total of all chlorobenzenes (mono-, di-, tri-, tetra-, penta- and hexachlorobenzene).
6. 'Chlorophenols (sum)' here means the total of all chlorophenols (mono-, di-, tri-, tetra- and pentachlorophenol).
7. In the case of the intervention value, 'polychlorobiphenyls (sum)' means the total of PCB 28, 52, 101, 118, 138, 153 and 180. For the target value it refers to the total excluding PCB 118.

8. 'DDT/DDD/DDE' above means the sum of DDT, DDD and DDE.
9. 'Drins' above means the sum of aldrin, dieldrin and endrin.
10. 'HCH compounds' above means the sum of α -HCH, β -HCH, γ -HCH and δ -HCH.
11. The intervention value applies to the sum of the concentrations of organotin compounds encountered.
12. 'Phthalates (sum)' above means the total of all phthalates.
13. 'Mineral oil' is defined in the analysis standard. Where the contamination is due to mixtures (e.g. gasoline or domestic heating oil), then not only the alkane content but also the content of aromatic and/or polycyclic aromatic hydrocarbons must be determined. This aggregate parameter has been adopted for practical reasons. Further toxicological and chemical disaggregation is under study.
14. The values for the sum of polycyclic aromatic hydrocarbons, the sum of chlorophenols and the sum of chlorobenzenes in earth/sediment apply to the total concentration of the compounds belonging to the relevant category. If the contamination is due to only one compound of a category, the value used is the value for that compound. Where there are two or more compounds the value for the total of these compounds applies, etc. For earth/sediment, effects are directly additive (i.e. 1 mg of substance A has the same effect as 1 mg of substance B) and can be tested against an aggregate standard by summing the concentrations of the substances involved. In the case of groundwater, effects are indirectly additive and are expressed as a fraction of the individual intervention values (i.e. 0.5 of the intervention value of substance A has the same effect as 0.5 of the intervention value of substance B). This means that an addition formula must be used to determine whether an intervention value is exceeded. The intervention value for the sum of a group of substances is exceeded if:

$$\sum (C_i / I_i) \geq 1,$$

where: C_i = measured concentration of a substance in the group of substances in question
 I_i = intervention value for the group.

*numeric value below the detection level/quantification level or measurement method is lacking

These target values have not been tested in HANS. All the other values have been tested in HANS.

^ The individual standards in INS are given in the Fourth Policy Document on Water Management along with the sum standards marked ^.

Table 2a: Target values , indicative levels for serious soil contamination and background concentrations soil/sediment and groundwater for metals. . Values for soil/sediment have been expressed as the concentration in a standard soil (10% organic matter and 25% clay).

	EARTH/SEDIMENT (mg/kg dry matter)			GROUNDWATER (μ g/l in solution)			
	national background concentration (BC)	target values (incl. BC)	indicative level serious contamination	target values shallow	national background concentration deep (BC)	target values deep (incl. BC)	indicative level serious contamination
I Metals							
beryllium	1.1	1.1	30	-	0.05*	0.05*	15
selenium	0.7	0.7	100	-	0.02	0.07	160
tellurium	-	-	600	-	-	-	70
thallium	1	1	15	-	<2*	2*	7
tin	19	-	900	-	<2*	2.2*	50
vanadium	42	42	250	-	1.2	1.2	70
silver	-	-	15	-	-	-	40

Appendix D

**Analytical Results of
Soil Samples**

Soil Samples : Boreholes A-S01 to A-S05

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil					Drillhole No.														
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Soil Saturation Limit (C _{sat}) (mg/kg)	A-S01			A-S02			A-S03			A-S04			A-S05		
							Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)		
							14-Dec-09	14-Dec-09	15-Dec-09	18-Dec-09	18-Dec-09	18-Dec-09	22-Dec-09	22-Dec-09	23-Dec-09	15-Dec-09	15-Dec-09	15-Dec-09	17-Dec-09	17-Dec-09	17-Dec-09
1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95				
SVOCs																					
Acenaphthene	0.5	3,510	3,280	10,000	10,000	60.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Acenaphthylene	0.5	2,340	1,510	10,000	10,000	19.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Anthracene	0.5	10,000	10,000	10,000	2.56	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(a)pyrene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(b)fluoranthene	0.5	9.88	10.1	17.8	20.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(g,h,i)perylene	0.5	1,800	1,710	10,000	5,740		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(k)fluoranthene	0.5	120	114	918	383		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	91.8	94.2		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0		
Chrysene	0.5	871	919	1,140	1,540		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Dibenzo(a,h)anthracene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Fluoranthene	0.5	2,400	2,270	10,000	7,620		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Fluorene	0.5	2,380	2,250	10,000	7,450	54.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Hexachlorobenzene	0.05	0.243	0.220	0.582	0.713		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Indeno(1,2,3-cd)pyrene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Naphthalene	0.5	182	85.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Phenanthrene	0.5	10,000	10,000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Phenol	0.5	10,000	10,000	10,000	10,000	7,260	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Pyrene	0.5	1,800	1,710	10,000	5,720		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Metals																					
Antimony	0.05	29.5	29.1	261	97.9		0.28	0.72	0.81	<0.05	<0.05	<0.05	0.36	0.89	0.62	0.46	0.41	0.29	0.25		
Arsenic	0.5	22.1	21.8	196	73.5		4.3	22.2	24.0	1.0	0.8	8.4	5.4	26.8	17.0	11.0	7.0	16.0	7.9		
Barium	0.05	10,000	10,000	10,000	10,000		28.7	55.0	67.1	<0.05	<0.05	<0.05	46.7	77.3	57.8	51.5	45.8	43.1	26.3		
Cadmium	0.02	73.8	72.8	653	245		0.11	0.11	0.21	<0.02	0.02	0.4	0.05	0.18	0.12	0.07	0.06	0.04	0.07		
Chromium III	0.5	10,000	10,000	10,000	10,000		13.9	42.4	43.9	<0.5	<0.5	27.0	16.5	33.1	41.3	25.6	23.7	28.0	17.0		
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Cobalt	0.5	1,480	1,460	10,000	4,900		3.6	14.5	13.7	<0.5	<0.5	<0.5	2.8	9.3	13.7	5.0	5.6	3.6	2.1		
Copper	0.05	2,950	2,910	10,000	9,790		9.93	21.2	22.9	1.93	3.35	38.4	11.1	40.3	19.3	10.8	11.5	10.6	7.09		
Lead	0.05	258	255	2,290	857		24.8	50.9	62.1	4	4	62	25.8	57.3	53.6	25.8	27.0	32.1	23.1		
Manganese	0.5	10,000	10,000	10,000	10,000		136	446	693	<0.5	<0.5	<0.5	118	617	1250	201	164	92.0	46.4		
Mercury	0.02	11.0	6.52	38.4	45.6		0.02	0.08	0.11	<0.02	<0.02	0.10	0.06	0.06	0.09	0.06	0.03	0.03	0.06		
Molybdenum	0.05	369	364	3,260	1,220		0.74	3.61	2.31	<0.05	<0.05	<0.05	1.10	1.93	1.95	1.62	2.48	2.47	1.40		
Nickel	0.05	1,480	1,460	10,000	4,900		7.27	20.8	20.8	2	3	23.5	5.72	18.9	23.5	9.34	10.7	10.4	4.87		
Tin	0.05	10,000	10,000	10,000	10,000		1.66	4.57	4.8	<0.05	<0.05	<0.05	2.65	7.87	4.97	2.37	2.41	2.25	2.07		
Zinc	1	10,000	10,000	10,000	10,000		392	358	106	39	17.4	1980	45.2	148	95.5	45.1	52.3	520	74.3		
Dioxins / PCBs																					
Dioxins (I-TEQ) *	5.01 pp/g	0.001	0.001	0.005	0.001		6.73	10.99	14.32	5.84	6.40	10.37	8.17	15.05	13.57	6.77	9.34	9.21	7.35		
PCBs	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		
Other Inorganic Compounds																					
Cyanide, free	1	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
Chlorinated Pesticides																					
alpha-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
beta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
gamma-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
delta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
p,p'-DDE	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
p,p'-DDD	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
p,p'-DDT	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		
Total Organic Carbon																					
TOC	0.05%						<0.05	0.88	1.11	<0.05	<0.05	0.39	0.14	0.57	0.75	0.34	0.62	0.66	0.20		
Grain Size																					
Clay (%)	1%						21	17	47	3	2	39	23	29	58	20	21	28	29		
Silt (%)	1%						24	15	49	2	3	58	28	57	41	29	34	55	25		
Sand (%)	1%						43	49	4	89	68	3	38	14	1	39	42	15	43		
Gravel (%)	1%						12	19	0	26	27	0	11	0	0	12	3	2	3		
Mositure Content																					
Moisture Content (%)	0.1%						14.8	30.9	34.5	12.0	8.9	32.1	17.5	30.6	38.5	16.5	17.0	24.6	15.3		

* 1 pp/g = 0.000001 mg/kg

The reporting limit of Dioxins (I-TEQ) was computed by "Summation of (Reporting Limits of each dioxin/furan compound (i.e. the column of "LOR" in the laboratory reports) times their respective International Toxic Equivalency Factor (i.e. the column of "I-TEF" in the laboratory report)) or $\sum(LOR \times I-TEF)$

The reporting limits of each dioxin/furan compound could be found in the laboratory report (i.e. the column of "LOR" in the laboratory report).

The total I-TEQ was computed by "Summation of (Concentration of each dioxin/furan compound (i.e. the column of "Conc" in laboratory report) times their respective International Toxic Equivalency Factor (i.e. the column of "I-TEF" in laboratory report)) or $\sum(Conc \times I-TEF)$

The footnote explanation "I-TEQ(LOR) calculated treating <LOR as LOR concentration (pp/g)" in the laboratory report means if the concentration of the dioxin/furan compounds was below the reporting limit, the value of Reporting Limit (LOR) of the respective dioxin/furan compound would be used for the computation of the I-TEQ₃. However, multiplication of the LOR with their respective I-TEF is still required during the computation of "I-TEQ₃"

** Assessment Criteria extracted from "Intervention Value for Soil Remediation, Netherlands"

22.2 Result exceed the RBRG of "Rural & Urban Residential"

Soil Samples : Boreholes A-S06 to A-S010

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil					Drillhole No.															
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Soil Saturation Limit (C _{sat}) (mg/kg)	A-S06			A-S07			A-S08			A-S09			A-S10			
							Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			
							23-Dec-09	23-Dec-09	23-Dec-09	11-Dec-09	11-Dec-09	11-Dec-09	19-Dec-09	19-Dec-09	19-Dec-09	21-Dec-09	21-Dec-09	22-Dec-09	21-Dec-09	21-Dec-09	21-Dec-09	
1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95								
SVOCs																						
Acenaphthene	0.5	3,510	3,280	10,000	10,000	60.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthylene	0.5	2,340	1,510	10,000	10,000	19.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Anthracene	0.5	10,000	10,000	10,000	2.56	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(a)pyrene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(b)fluoranthene	0.5	9.88	10.1	17.8	20.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(g,h,i)perylene	0.5	1,800	1,710	10,000	5,740		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(k)fluoranthene	0.5	120	114	918	383		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	91.8	94.2		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chrysene	0.5	871	919	1,140	1,540		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Dibenzo(a,h)anthracene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluoranthene	0.5	2,400	2,270	10,000	7,620		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluorene	0.5	2,380	2,250	10,000	7,450	54.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Hexachlorobenzene	0.05	0.243	0.220	0.582	0.713		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Indeno(1,2,3-cd)pyrene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Naphthalene	0.5	182	85.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenanthrene	0.5	10,000	10,000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenol	0.5	10,000	10,000	10,000	10,000	7,260	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Pyrene	0.5	1,800	1,710	10,000	5,720		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Metals																						
Antimony	0.05	29.5	29.1	261	97.9		0.15	0.14	1.41	0.06	0.33	0.36	0.28	0.49	0.50	2.46	0.76	0.54	0.36	0.18	0.19	
Arsenic	0.5	22.1	21.8	196	73.5		0.7	0.9	14.0	<0.5	7.0	13.4	7.0	9.1	9.2	19.7	18.9	9.3	15.4	3.0	3.0	
Barium	0.05	10,000	10,000	10,000	10,000		12.5	9.16	132	6.06	22.3	52.2	36.3	71.4	42.6	163	68.0	58.6	34.1	13.0	9.71	
Cadmium	0.02	73.8	72.8	653	245		<0.02	0.06	0.44	<0.02	0.05	0.04	0.35	0.04	0.11	0.67	0.11	0.03	0.11	0.03	0.02	
Chromium III	0.5	10,000	10,000	10,000	10,000		1.7	3.3	53.0	1.7	15.3	28.0	21.2	28.9	28.0	76.0	38.9	34.8	23.0	5.4	7.2	
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Cobalt	0.5	1,480	1,460	10,000	4,900		0.6	0.9	9.6	<0.5	4.1	5.4	6.6	8.6	9.8	12.9	9.5	5.7	9.5	1.8	1.5	
Copper	0.05	2,950	2,910	10,000	9,790		1.93	7.96	108	2.20	14.4	23.9	11.2	24.1	14.6	142	22.1	15.0	11.6	5.99	4.37	
Lead	0.05	258	255	2,290	857		4.92	5.94	61.3	4.49	22.2	43.2	38.0	32.1	32.8	86.1	104	47.8	39.4	9.89	8.54	
Manganese	0.5	10,000	10,000	10,000	10,000		22.5	22.3	311	7.9	79.1	122	156	221	178	340	160	118	386	56.9	61.9	
Mercury	0.02	11.0	6.52	38.4	45.6		<0.02	<0.02	0.23	<0.02	0.02	0.04	0.07	0.04	0.03	0.25	0.05	0.10	0.04	0.02	<0.02	
Molybdenum	0.05	369	364	3,260	1,220		0.10	0.17	2.15	0.24	0.92	3.61	1.48	2.76	2.69	3.11	3.34	2.48	1.18	0.31	0.35	
Nickel	0.05	1,480	1,460	10,000	4,900		1.05	2.74	36.0	0.90	6.81	12.5	9.78	13.4	16.2	43.8	16.3	13.9	11.4	3.11	2.52	
Tin	0.05	10,000	10,000	10,000	10,000		0.43	0.68	6.68	0.28	1.58	3.4	2.51	2.99	2.30	10.4	4.73	4.68	2.83	0.98	0.84	
Zinc	1	10,000	10,000	10,000	10,000		10.1	21.7	342	49.8	473	826	167	120	443	578	170	62.5	116	44.2	97.4	
Dioxins / PCBs																						
Dioxins (I-TEQ) *	5.01 ppb	0.001	0.001	0.005	0.001		6.55	8.42	5.51	7.79	5.96	11.84	10.82	9.41	7.67	23.65	11.48	12.41	10.68	6.26	5.87	
PCBs	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
Other Inorganic Compounds																						
Cyanide, free	1	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Chlorinated Pesticides																						
alpha-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
beta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
gamma-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
delta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
p,p'-DDE	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
p,p'-DDD	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
p,p'-DDT	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Total Organic Carbon																						
TOC	0.05%						<0.05	0.12	0.76	<0.05	0.07	1.33	0.42	0.59	0.72	1.99	1.19	1.04	0.61	0.06	0.06	
Grain Size																						
Clay (%)	1%						2	3	18	2	22	34	26	13	39	50	41	40	19	5	15	
Silt (%)	1%						1	3	22	3	33	28	30	44	49	51	56	37	6	13		
Sand (%)	1%						87	87	56	71	36	33	38	30	6	1	5	4	40	80	65	
Gravel (%)	1%						10	7	4	24	9	5	6	13	1	0	3	0	4	9	7	
Mositure Content																						
Moisture Content (%)	0.1%						9.7	11.9	33.1	14.4	22.0	32.9	14.7	20.								

Soil Samples : Boreholes A-S11 to A-S15

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil					Drillhole No.														
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Soil Saturation Limit (C _{sat}) (mg/kg)	A-S11			A-S12			A-S13			A-S14			A-S15		
							Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)		
							10-Dec-09	10-Dec-09	10-Dec-09	10-Dec-09	10-Dec-09	10-Dec-09	10-Dec-09	21-Dec-09	21-Dec-09	21-Dec-09	07-Dec-09	07-Dec-09	07-Dec-09	09-Dec-09	09-Dec-09
1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95				
SVOCs																					
Acenaphthene	0.5	3,510	3,280	10,000	10,000	60.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Acenaphthylene	0.5	2,340	1,510	10,000	10,000	19.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Anthracene	0.5	10,000	10,000	10,000	2.56	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(a)pyrene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(b)fluoranthene	0.5	9.88	10.1	17.8	20.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(g,h,i)perylene	0.5	1,800	1,710	10,000	5,740		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(k)fluoranthene	0.5	120	114	918	383		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	91.8	94.2		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0		
Chrysene	0.5	871	919	1,140	1,540		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Dibenzo(a,h)anthracene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Fluoranthene	0.5	2,400	2,270	10,000	7,620		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Fluorene	0.5	2,380	2,250	10,000	7,450	54.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Hexachlorobenzene	0.05	0.243	0.220	0.582	0.713		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Indeno(1,2,3-cd)pyrene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Naphthalene	0.5	182	85.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Phenanthrene	0.5	10,000	10,000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Phenol	0.5	10,000	10,000	10,000	10,000	7,260	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Pyrene	0.5	1,800	1,710	10,000	5,720		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Metals																					
Antimony	0.05	29.5	29.1	261	97.9		1.01	0.31	0.26	0.32	0.43	0.64	0.38	0.38	0.36	0.13	0.48	0.75	0.26		
Arsenic	0.5	22.1	21.8	196	73.5		9.9	8.3	5.5	8.7	6.3	13.0	16.2	9.3	8.1	1.3	14.7	16.5	7.4		
Barium	0.05	10,000	10,000	10,000	10,000		48.6	45.0	41.2	48.5	33.1	67.1	34.5	33.2	47.6	15.8	48.20	57.80	27.8		
Cadmium	0.02	73.8	72.8	653	245		0.08	0.06	<0.02	0.03	0.03	0.35	0.06	0.05	0.05	0.03	0.15	0.19	0.12		
Chromium III	0.5	10,000	10,000	10,000	10,000		21.5	21.1	22.9	22.1	19.4	35.6	27.5	17.0	30.3	6.2	33.8	36.8	9.1		
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Cobalt	0.5	1,480	1,460	10,000	4,900		3.4	6.4	2.6	4.1	4.0	7.8	2.6	4.7	8.8	1.1	11.6	9.9	4.3		
Copper	0.05	2,950	2,910	10,000	9,790		44.6	12.3	6.48	13.7	8.38	13.4	15.5	30.6	13.4	5.76	17.2	23.3	6.76		
Lead	0.05	258	255	2,290	857		18.5	26.4	13.2	25.9	21.0	47.1	30.9	27.8	45.6	9.03	43.9	56.5	18.9		
Manganese	0.5	10,000	10,000	10,000	10,000		141	161	106	111	106	113	134	131	178	33.9	427	142	175		
Mercury	0.02	11.0	6.52	38.4	45.6		0.03	0.07	0.07	0.04	0.03	0.05	0.07	0.07	0.03	<0.02	0.04	0.08	<0.02		
Molybdenum	0.05	369	364	3,260	1,220		1.21	0.89	1.15	2.97	2.20	4.50	1.88	1.34	2.76	0.31	2.75	4.78	1.03		
Nickel	0.05	1,480	1,460	10,000	4,900		7.46	11.0	7.86	9.50	9.07	18.2	5.75	7.26	19.1	1.89	19.1	18.8	5.47		
Tin	0.05	10,000	10,000	10,000	10,000		4.60	2.30	2.44	2.51	1.74	4.74	2.98	2.67	3.89	0.58	3.11	4.32	1.45		
Zinc	1	10,000	10,000	10,000	10,000		101	52.8	68.4	304	318	251	36.4	52.5	76.4	55.0	155	358	464		
Dioxins / PCBs																					
Dioxins (I-TEQ) *	5.01 ppb/g	0.001	0.001	0.005	0.001		7.49	10.03	6.97	10.86	22.97	93.14	7.34	7.64	12.53	16.75	11.87	13.22	6.70		
PCBs	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		
Other Inorganic Compounds																					
Cyanide, free	1	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
Chlorinated Pesticides																					
alpha-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
beta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
gamma-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
delta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
p,p'-DDE	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
p,p'-DDD	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
p,p'-DDT	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		
Total Organic Carbon																					
TOC	0.05%						0.14	0.06	<0.05	0.23	0.50	0.99	0.31	0.35	0.77	0.06	0.98	1.93	0.13		
Grain Size																					
Clay (%)	1%						14	37	28	21	23	21	31	24	39	3	30	35	3		
Silt (%)	1%						26	45	11	32	35	28	24	29	56	5	41	38	5		
Sand (%)	1%						46	14	60	41	39	45	37	33	5	84	29	7	84		
Gravel (%)	1%						14	4	1	6	3	6	8	14	0	8	0	0	8		
Moisture Content																					
Moisture Content (%)	0.1%						12.9	18.7	32.3	24.4	23.9	27.7	17.0	16.3	31.2	12.1	35.5	35.6	21.8		

* 1 ppb/g = 0.000001 mg/kg

The reporting limit of Dioxins (I-TEQ) was computed by "Summation of (Reporting Limits of each dioxin/furan compound (i.e. the column of "LOR" in the laboratory reports) times their respective International Toxic Equivalency Factor (i.e. the column of "I-TEF" in the laboratory report))" or $\sum(LOR \times I-TEF)$

The reporting limits of each dioxin/furan compound could be found in the laboratory report (i.e. the column of "LOR" in the laboratory report).

The total I-TEQ was computed by "Summation of (Concentration of each dioxin/furan compound (i.e. the column of "Conc" in laboratory report) times their respective International Toxic Equivalency Factor (i.e. the column of "I-TEF" in laboratory report))" or $\sum(Conc \times I-TEF)$

The footnote explanation "I-TEQ(LOR) calculated treating <LOR as LOR concentration (ppb/g)" in the laboratory report means if the concentration of the dioxin/furan compounds was below the reporting limit, the value of Reporting Limit (LOR) of the respective dioxin/furan compound would be used for the computation of the I-TEQ_s. However, multiplication of the LOR with their respective I-TEF is still required during the computation of "I-TEQ_s".

** Assessment Criteria extracted from "Intervention Value for Soil Remediation, Netherlands"

Soil Samples : Boreholes A-S16 to A-S20

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil					Drillhole No.														
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Soil Saturation Limit (C _{sat}) (mg/kg)	A-S16			A-S17			A-S18			A-S19			A-S20		
							Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)		
							12-Dec-09	14-Dec-09	14-Dec-09	19-Dec-09	19-Dec-09	19-Dec-09	04-Dec-09	04-Dec-09	04-Dec-09	01-Dec-09	01-Dec-09	01-Dec-09	10-Dec-09	10-Dec-09	11-Dec-09
1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95							
SVOCs																					
Acenaphthene	0.5	3,510	3,280	10,000	10,000	60.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthylene	0.5	2,340	1,510	10,000	10,000	19.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Anthracene	0.5	10,000	10,000	10,000	2.56	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(a)pyrene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(b)fluoranthene	0.5	9.88	10.1	17.8	20.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(g,h,i)perylene	0.5	1,800	1,710	10,000	5,740		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(k)fluoranthene	0.5	120	114	918	383		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	91.8	94.2		<2.0	<2.0	7.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.4	<2.0	
Chrysene	0.5	871	919	1,140	1,540		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Dibenzo(a,h)anthracene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluoranthene	0.5	2,400	2,270	10,000	7,620		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluorene	0.5	2,380	2,250	10,000	7,450	54.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Hexachlorobenzene	0.05	0.243	0.220	0.582	0.713		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Indeno(1,2,3-cd)pyrene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Naphthalene	0.5	182	85.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenanthrene	0.5	10,000	10,000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenol	0.5	10,000	10,000	10,000	10,000	7,260	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Pyrene	0.5	1,800	1,710	10,000	5,720		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Metals																					
Antimony	0.05	29.5	29.1	261	97.9		0.53	0.66	3.39	0.19	0.22	0.54	0.36	0.52	0.57	0.07	0.08	0.09	0.53	1.26	0.52
Arsenic	0.5	22.1	21.8	196	73.5		18.4	1.3	8.4	1.4	8.3	19.0	8.7	18.6	14.2	1.1	2.0	2.5	13.9	23.0	20.1
Barium	0.05	10,000	10,000	10,000	10,000		46.5	72.0	366	12.5	28.8	60.8	42.9	52.3	7.75	6.89	9.26	37.2	49.9	61.0	61.0
Cadmium	0.02	73.8	72.8	653	245		0.16	0.25	2.52	0.04	0.08	0.12	0.03	<0.02	0.09	<0.02	<0.02	0.02	0.14	0.25	0.16
Chromium III	0.5	10,000	10,000	10,000	10,000		32.3	64.3	64.7	5.1	17.7	39.9	20.5	32.6	30.2	2.5	2.9	5.1	24.9	67.5	39.7
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	0.5	1,480	1,460	10,000	4,900		10.7	3.6	15.5	2.7	6.3	14.6	3.7	3.7	7.4	0.5	0.8	1.3	6.6	13.9	13.8
Copper	0.05	2,950	2,910	10,000	9,790		20.8	47.6	436	3.36	10.9	19.1	11.40	13.4	8.01	3.48	5.03	15.9	57.9	19.0	19.0
Lead	0.05	258	255	2,290	857		48.3	17.4	90.0	8.01	25.4	53.9	28.1	35.0	36.2	5.45	28.4	6.82	33.9	67.3	59.9
Manganese	0.5	10,000	10,000	10,000	10,000		458	154	474	43.6	186	251	94.7	77.4	154	15.4	19.7	51.6	370	494	325
Mercury	0.02	11.0	6.52	38.4	45.6		0.06	0.05	0.25	<0.02	0.04	0.04	0.02	<0.02	0.05	<0.02	<0.02	<0.02	0.05	0.08	0.06
Molybdenum	0.05	369	364	3,260	1,220		1.4	1.01	3.31	0.32	1.55	1.73	1.08	1.33	3.29	0.33	0.36	0.45	1.16	2.37	1.69
Nickel	0.05	1,480	1,460	10,000	4,900		18.6	28.4	44.8	2.81	9.73	24	8.21	10.3	10.3	0.83	1.05	2.17	11.0	18.8	22.7
Tin	0.05	10,000	10,000	10,000	10,000		3.59	5.28	44.3	0.40	1.59	4.90	2.27	2.84	3.99	0.43	0.31	0.43	2.51	6.79	4.39
Zinc	1	10,000	10,000	10,000	10,000		478	350	611	91.3	59.4	120	59.5	93.0	249	21.4	36.0	315	70.7	278	151
Dioxins / PCBs																					
Dioxins (I-TEQ) *	5.01 pg/g	0.001	0.001	0.005	0.001		24.91	6.37	19.19	5.56	7.48	11.75	8.29	25.13	9.76	6.97	6.42	6.04	8.02	20.19	13.43
PCBs	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Other Inorganic Compounds																					
Cyanide, free	1	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorinated Pesticides																					
alpha-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p,p'-DDE	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p,p'-DDD	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p,p'-DDT	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Organic Carbon																					
TOC	0.05%						0.76	0.25	1.79	<0.05	0.40	0.94	0.16	<0.05	0.83	<0.05	<0.05	<0.05	1.12	0.66	0.94
Grain Size																					
Clay (%)	1%						35	16	43	4	34	50	31	32	34	1	1	6	26	40	45
Silt (%)	1%						28	19	52	5	33	46	41	35	43	4	2	9	58	49	48
Sand (%)	1%						34	62	5	62	32	4	26	30	18	82	82	75	16	11	7
Gravel (%)	1%						3	3	0	29	1	0	2	3	5	13	15	10	0	0	0
Moisture Content																					
Moisture Content (%)	0.1%						41.3	18.0	34.0	17.5	21.3	39.5	13.1	19.2	21.0	5.1	8.1	14.2	30.2	40.4	33.4

* 1 pg/g = 0.000001 mg/kg

The reporting limit of Dioxins (I-TEQ) was computed by "Summation of (Reporting Limits of each dioxin/furan compound (i

Soil Samples : Boreholes A-S21 to A-S25

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil					Drillhole No.														
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Soil Saturation Limit (C _{sat}) (mg/kg)	A-S21			A-S22			A-S23			A-S24			A-S25		
							Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)		
							27-Nov-09	27-Nov-09	28-Nov-09	25-Nov-09	25-Nov-09	25-Nov-09	26-Nov-09	27-Nov-09	27-Nov-09	01-Dec-09	01-Dec-09	01-Dec-09	07-Dec-09	08-Dec-09	08-Dec-09
1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95							
SVOCs																					
Acenaphthene	0.5	3,510	3,280	10,000	10,000	60.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	0.5	2,340	1,510	10,000	10,000	19.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	0.5	10,000	10,000	10,000	2.56	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	0.5	9.88	10.1	17.8	20.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	0.5	1,800	1,710	10,000	5,740		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	0.5	120	114	918	383		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	91.8	94.2		<2.0	<2.0	2.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chrysene	0.5	871	919	1,140	1,540		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzo(a,h)anthracene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	0.5	2,400	2,270	10,000	7,620		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	0.5	2,380	2,250	10,000	7,450	54.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	0.05	0.243	0.220	0.582	0.713		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-cd)pyrene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	0.5	182	85.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	0.5	10,000	10,000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenol	0.5	10,000	10,000	10,000	10,000		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	0.5	1,800	1,710	10,000	5,720		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals																					
Antimony	0.05	29.5	29.1	261	97.9		0.74	0.16	1.44	0.29	0.64	0.45	0.12	0.08	0.12	0.45	1.12	0.18	0.16	0.54	0.33
Arsenic	0.5	22.1	21.8	196	73.5		16.3	3.1	8.1	5.9	16.3	19.3	2.6	1.1	1.4	17.9	27.7	8.4	2.2	14.4	14.8
Barium	0.05	10,000	10,000	10,000	58.4		47.2	9.30	58.4	44.0	74.4	58.7	15.8	22.6	21.2	63.6	72.0	29.8	8.5	51.2	36.8
Cadmium	0.02	73.8	72.8	653	245		0.20	0.04	0.09	0.04	0.17	0.14	0.03	0.03	0.04	0.16	0.22	0.07	0.06	0.18	0.08
Chromium III	0.5	10,000	10,000	10,000	10,000		27.5	4.4	23.2	18.1	40.4	34.7	9.1	12.5	20.2	40.8	58.4	14.3	5.5	33.9	23.0
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	0.5	1,480	1,460	10,000	4,900		8.4	1.3	5.5	3.8	12.5	12.0	2.5	2.7	3.2	12.5	15.3	5.1	1.9	10.5	7.7
Copper	0.05	2,950	2,910	10,000	9,790		16.4	6.51	24.2	9.00	18.0	14.8	12.4	9.00	18.2	18.0	29.4	7.00	3.16	23.6	11.4
Lead	0.05	258	255	2,290	857		45.6	10.2	31.0	25.4	55.2	45.9	9.07	6.63	7.50	50.6	71.8	23.0	12.2	47.6	37.5
Manganese	0.5	10,000	10,000	10,000	10,000		703	38.3	189	111	462	267	69.8	73.6	100	396	658	172	39.7	360	232
Mercury	0.02	11.0	6.62	38.4	45.6		0.07	<0.02	0.05	0.05	0.04	0.04	<0.02	<0.02	<0.02	0.03	0.12	<0.02	<0.02	0.05	0.04
Molybdenum	0.05	369	364	3,260	1,220		1.33	0.41	1.70	1.29	2.53	1.81	0.56	1.50	2.58	1.98	2.09	0.81	0.46	2.02	1.01
Nickel	0.05	1,480	1,460	10,000	4,900		15.7	1.52	10.3	7.74	20.6	19.4	3.58	3.81	5.25	20.8	27.4	7.35	3.44	18.6	12.2
Tin	0.05	10,000	10,000	10,000	10,000		3.43	0.55	3.63	2.82	4.39	3.65	0.61	0.75	0.89	3.88	5.66	1.43	0.43	3.58	2.96
Zinc	1	10,000	10,000	10,000	10,000		79.7	27.0	114	45.0	100	410	25.1	55.9	220	246	479	742	37.8	386	1870
Dioxins / PCBs																					
Dioxins (I-TEQ) *	5.01 pg/g	0.001	0.001	0.005	0.001		9.37	7.58	9.29	9.40	15.23	16.64	7.81	8.27	6.13	26.05	22.72	15.73	9.56	8.89	17.28
PCBs	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Other Inorganic Compounds																					
Cyanide, free	1	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorinated Pesticides																					
alpha-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p,p'-DDE	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p,p'-DDD	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p,p'-DDT	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Organic Carbon																					
TOC	0.05%						0.64	0.10	0.43	0.28	1.04	1.47	<0.05	<0.05	<0.05	1.03	0.94	0.64	<0.05	0.99	0.64
Grain Size																					
Clay (%)	1%						9	7	7	21	51	49	21	3	3	29	49	8	5	44	41
Silt (%)	1%						6	6	7	26	48	44	21	4	5	51	43	10	7	48	37
Sand (%)	1%						86	67	57	32	1	7	37	76	78	20	8	80	70	7	22
Gravel (%)	1%						19	20	29	21	0	0	21	17	14	0	0	2	18	1	0
Mositure Content																					
Moisture Content (%)	0.1%						25.3	16.1	18.4	19.1	44.4	36.2	10.1	9.2							

Soil Samples : Boreholes A-SG01 to A-SG05

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil					Drillhole No.															
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Soil Saturation Limit (C _{sat}) (mg/kg)	A-SG01			A-SG02			A-SG03			A-SG04			A-SG05			
							Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			
							10-Dec-09	11-Dec-09	11-Dec-09	21-Dec-09	21-Dec-09	21-Dec-09	22-Dec-09	22-Dec-09	22-Dec-09	11-Dec-09	12-Dec-09	12-Dec-09	12-Dec-09	12-Dec-09	12-Dec-09	12-Dec-09
1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95					
SVOCs																						
Acenaphthene	0.5	3,510	3,280	10,000	10,000	60.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthylene	0.5	2,340	1,510	10,000	10,000	19.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Anthracene	0.5	10,000	10,000	10,000	2.56	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(a)pyrene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(b)fluoranthene	0.5	9.88	10.1	17.8	20.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(g,h,i)perylene	0.5	1,800	1,710	10,000	5,740		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(k)fluoranthene	0.5	120	114	918	383		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	91.8	94.2		<2.0	<0.5	<0.5	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chrysene	0.5	871	919	1,140	1,540		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Dibenzo(a,h)anthracene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluoranthene	0.5	2,400	2,270	10,000	7,620		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluorene	0.5	2,380	2,250	10,000	7,450	54.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Hexachlorobenzene	0.05	0.243	0.220	0.582	0.713		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Indeno(1,2,3-cd)pyrene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Naphthalene	0.5	182	86.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenanthrene	0.5	10,000	10,000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenol	0.5	10,000	10,000	10,000	10,000	7,260	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Pyrene	0.5	1,800	1,710	10,000	5,720		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Metals																						
Antimony	0.05	29.5	29.1	261	97.9		0.39	0.4	0.29	0.08	0.08	0.10	1.21	0.73	0.12	0.50	0.39	0.15	0.45	0.33	0.62	
Arsenic	0.5	22.1	21.8	196	73.5		10.7	8.8	10.7	1.3	1.9	1.9	16.8	16.2	3.2	8.9	14.1	4.4	5.2	6.2	12.4	
Barium	0.05	10,000	10,000	10,000	10,000		55.8	39.5	52.1	6.08	6.50	8.11	117	59.7	7.31	56.2	47.8	12.4	33.8	37.2	43.1	
Cadmium	0.02	73.8	72.8	653	245		0.29	0.08	0.02	<0.02	<0.02	<0.02	0.64	0.10	<0.02	0.07	0.08	<0.02	0.09	0.04	0.12	
Chromium III	0.5	10,000	10,000	10,000	10,000		30.0	19.1	21.7	2.2	2.1	4.2	61.8	39.5	3.9	27.9	28.8	11.4	12.0	15.3	22.3	
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Cobalt	0.5	1,480	1,460	10,000	4,900		9.0	4.1	4.7	0.7	0.8	0.9	12.4	13.0	1.6	4.1	7.4	1.1	4.4	4.2	15.9	
Copper	0.05	2,950	2,910	10,000	9,790		17.3	17.1	11.2	1.27	1.34	2.99	87.4	22.8	1.71	19.6	13.5	5.12	39.7	16.4	30.4	
Lead	0.05	258	255	2,290	857		83.4	29.4	30.0	3.93	4.81	6.36	76.3	56.1	6.60	25.4	39.0	18.7	16.5	21.9	29.6	
Manganese	0.5	10,000	10,000	10,000	10,000		167	112	73.3	19.0	17.5	25.9	552	283	31.5	220	105	28.1	128	127	469	
Mercury	0.02	11.0	6.52	38.4	45.6		0.06	0.04	0.04	0.02	<0.02	0.04	0.17	0.06	<0.02	0.20	0.05	<0.02	<0.02	0.06	0.03	
Molybdenum	0.05	369	364	3,260	1,220		2.28	1.80	2.28	0.15	0.25	0.26	2.75	2.16	0.41	1.36	3.84	2.96	1.24	1.57	1.65	
Nickel	0.05	1,480	1,460	10,000	4,900		14.1	7.94	10.3	1.19	1.24	2.87	34.4	23.3	1.92	6.36	18.0	3.68	7.67	7.93	17.7	
Tin	0.05	10,000	10,000	10,000	10,000		3.27	2.4	2.64	0.39	0.42	0.66	8.60	5.71	0.65	3.04	3.19	0.88	2.02	2.30	2.36	
Zinc	1	10,000	10,000	10,000	10,000		129	57.4	252	20.7	15.5	59.0	322	135	29.7	78.5	167	113	285	258	685	
Dioxins / PCBs																						
Dioxins (I-TEQ) *	5.01 pg/g	0.001	0.001	0.005	0.001		27.93	29.27	24.45	5.85	6.73	5.64	11.05	13.28	5.72	21.97	24.40	7.56	7.29	39.47	13.54	
PCBs	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
Other Inorganic Compounds																						
Cyanide, free	1	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Chlorinated Pesticides																						
alpha-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
beta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
gamma-BHC	0.05					4 **	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
delta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
p,p'-DDE	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
p,p'-DDD	0.05					2 **	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
p,p'-DDT	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Total Organic Carbon																						
TOC	0.05%						0.32	0.45	0.50	<0.05	<0.05	<0.05	1.13	0.99	0.13	0.58	0.77	0.41	0.26	0.28	2.75	
Grain Size																						
Clay (%)	1%						34	19	21	2	2	11	44	46	36	21	36	20	18	19	13	
Silt (%)	1%						44	24	22	2	2	8	45	51	29	38	48	23	25	18	22	
Sand (%)	1%						21	50	46	75	80	69	1	3	33	30	14	55	53	58	51	
Gravel (%)	1%						1	7	11	21	16	12	0	0	2	11	2	2	4	5	14	
Moisture Content																						
Moisture Content (%)	0.1%																					

Soil Samples : Boreholes A-SG06 to A-SG10

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil					Drillhole No.														
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Soil Saturation Limit (C _{sat}) (mg/kg)	A-SG06			A-SG07			A-SG08			A-SG09			A-SG10		
							Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)		
							19-Dec-09	19-Dec-09	21-Dec-09	07-Dec-09	07-Dec-09	07-Dec-09	05-Dec-09	05-Dec-09	07-Dec-09	28-Nov-09	28-Nov-09	28-Nov-09	09-Dec-09	09-Dec-09	09-Dec-09
		1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95		
SVOCs																					
Acenaphthene	0.5	3,510	3,280	10,000	10,000	60.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthylene	0.5	2,340	1,510	10,000	10,000	19.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Anthracene	0.5	10,000	10,000	10,000	2,56	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(a)pyrene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(b)fluoranthene	0.5	9.88	10.1	17.8	20.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(g,h,i)perylene	0.5	1,800	1,710	10,000	5,740		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(k)fluoranthene	0.5	120	114	918	383		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	91.8	94.2		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Chrysene	0.5	871	919	1,140	1,540		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Dibenzo(a,h)anthracene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluoranthene	0.5	2,400	2,270	10,000	7,620		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluorene	0.5	2,380	2,250	10,000	7,450	54.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Hexachlorobenzene	0.05	0.243	0.220	0.582	0.713		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Indeno(1,2,3-cd)pyrene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Naphthalene	0.5	182	85.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenanthrene	0.5	10,000	10,000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenol	0.5	10,000	10,000	10,000	10,000	7,260	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Pyrene	0.5	1,800	1,710	10,000	5,720		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Metals																					
Antimony	0.05	29.5	29.1	261	97.9		0.09	0.30	0.40	0.67	0.34	0.24	0.15	0.21	0.68	0.39	0.42	0.77	0.29	0.39	0.79
Arsenic	0.5	22.1	21.8	196	73.5		1.4	11.8	19.5	6.6	7.3	12.6	3.6	4.8	21.2	9.7	4.4	13.6	5.4	9.3	27.3
Barium	0.05	10,000	10,000	10,000	10,000		8.3	35.8	52.8	50.1	47.4	44.5	8.39	59.3	32.5	34.5	68.2	67.4	48.8	60.7	
Cadmium	0.02	73.8	72.8	653	245		0.07	0.04	0.11	0.08	0.03	<0.02	0.03	0.05	0.14	0.08	0.04	0.24	0.06	0.08	0.17
Chromium III	0.5	10,000	10,000	10,000	10,000		3.6	23.8	33.0	21.2	19.4	20.2	7.6	4.4	42.7	18.2	13.0	34.6	17.2	21.0	42.1
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	0.5	1,480	1,460	10,000	4,900		3.6	5.2	13.2	5.4	5.2	2.3	1.6	3.7	12.4	5.4	2.7	8.1	6.3	5.4	15.8
Copper	0.05	2,950	2,910	10,000	9,790		4.44	12.3	15.4	18.7	7.73	5.42	2.99	4.65	10.3	15.8	10.3	71.3	10.2	13.0	23.6
Lead	0.05	258	255	2,290	857		12.0	39.3	49.2	26.0	28.1	25.4	7.67	9.38	59.8	22.3	12.9	42.0	17.0	43.6	86.5
Manganese	0.5	10,000	10,000	10,000	10,000		41.3	102	258	240	92.4	41.8	65.4	214	204	151	136	224	241	175	236
Mercury	0.02	11.0	6.52	38.4	45.6		<0.02	0.03	0.05	<0.02	0.03	0.07	<0.02	<0.02	0.09	0.02	0.03	0.09	0.02	0.05	0.09
Molybdenum	0.05	369	364	3,280	1,220		0.29	1.96	1.36	0.87	1.33	0.87	0.46	0.49	2.97	1.15	0.94	1.71	0.71	1.85	3.35
Nickel	0.05	1,480	1,460	10,000	4,900		3.18	11.3	21.4	12.2	9.41	6.03	4.08	2.63	9.82	3.97	18.8	7.31	9.79	25.7	
Tin	0.05	10,000	10,000	10,000	10,000		0.48	2.62	4.12	2.90	2.21	2.08	0.58	0.64	5.56	2.06	2.99	4.76	1.69	3.16	4.90
Zinc	1	10,000	10,000	10,000	10,000		52.3	171	215	49.9	110	498	31.5	159	194	84.4	272	160	58.3	73.4	376
Dioxins / PCBs																					
Dioxins (I-TEQ) *	5.01 pg/g	0.001	0.001	0.005	0.001		5.18	9.89	12.37	10.46	8.87	7.55	6.24	5.79	41.47	8.84	7.64	7.73	8.30	10.46	17.85
PCBs	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Other Inorganic Compounds																					
Cyanide, free	1	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorinated Pesticides																					
alpha-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p,p'-DDE	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p,p'-DDD	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p,p'-DDT	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Organic Carbon																					
TOC	0.05%			Not Applicable			<0.05	0.56	0.99	0.26	0.17	0.08	<0.05	0.06	0.90	0.52	0.29	1.11	0.10	0.46	0.76
Grain Size																					
Clay (%)	1%						2	17	47	21	24	36	5	5	42	23	16	30	19	45	53
Silt (%)	1%						4	22	51	28	31	35	5	5	39	24	18	29	34	43	43
Sand (%)	1%						79	50	2	39	40	28	77	84	17	44	37	39	36	9	4
Gravel (%)	1%						15	11	0	12	5	1	13	6	2	9	29	2	11	3	0
Moisture Content																					
Moisture Content (%)	0.1%			Not Applicable			12.1	20.0	39.0	16.1	17.6	17.1	13.9	11.1	29.5	18.0	15.4	26.5	14.8	16.6	31.3

* 1 pg/g = 0.000001 mg/kg

Appendix E

**Analytical Results of
Soil Samples of 15
Additional Boreholes**

Soil Samples : **Additional 15 Boreholes**

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil					Drillhole No.														
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Soil Saturation Limit (C _{sat}) (mg/kg)	A-S01a			A-S01b			A-S01c			A-S03a			A-S03b		
							Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)		
							30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	01-Feb-10	29-Jan-10
1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95				
Metals																					
Antimony	0.05	29.5	29.1	261	97.9	0.22	0.43	0.34	0.31	0.29	0.23	0.27	0.41	0.41	0.19	2.68	0.56	0.95	0.71	0.46	
Arsenic	0.5	22.1	21.8	196	73.5	4.8	6.8	6.2	9.5	10.5	6.7	10.5	16.4	13.6	2.9	16.1	18.7	16.7	17.0	10.4	
Barium	0.05	10,000	10,000	10,000	10,000	16.4	63.2	37.4	37.4	24.2	30.6	65.2	35.5	37.0	30.0	262	59.1	75.3	75.8	49.6	
Cadmium	0.02	73.8	72.8	653	245	0.04	0.05	0.07	0.02	0.02	0.12	0.03	0.03	0.06	0.10	1.10	0.09	0.30	0.18	0.04	
Chromium III	0.5	10,000	10,000	10,000	10,000	7.9	21.6	21.2	23.4	27.0	21.2	28.4	40.7	36.8	7.7	109	39.4	45.2	39.1	28.1	
Chromium VI	0.5	221	218	1,960	735	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Cobalt	0.5	1,480	1,460	10,000	4,900	1.7	4.6	3.4	1.9	1.3	2.2	1.7	2.1	4.8	6.0	12.0	11.4	10.8	7.8	5.6	
Copper	0.05	2,950	2,910	10,000	9,790	6.32	48.2	30.2	37.9	13.2	14.2	9.13	14.0	14.1	12.9	194	19.3	32.5	42.1	13.4	
Lead	0.05	258	255	2,290	857	13.2	18.7	21.2	19.0	24.2	21.3	24.6	30.8	32.5	13.8	81.2	47.6	86.9	65.4	46.8	
Manganese	0.5	10,000	10,000	10,000	10,000	62.3	154	104	46.6	29.6	29.9	47.2	67.2	274	74.7	352	765	461	166	108	
Mercury	0.02	11.0	6.52	38.4	45.6	0.02	<0.02	0.04	0.05	0.04	0.09	0.05	0.06	0.04	0.03	0.57	0.04	0.11	0.11	0.06	
Molybdenum	0.05	369	364	3,260	1,220	0.92	1.72	1.87	1.82	1.92	1.18	1.46	2.35	1.63	0.54	5.16	1.61	2.43	3.19	3.10	
Nickel	0.05	1,480	1,460	10,000	4,900	3.50	7.7	6.91	4.43	5.64	6.24	5.79	6.48	11.3	9.30	80.9	21.2	20.2	20.4	12.8	
Tin	0.05	10,000	10,000	10,000	10,000	1.58	2.74	2.55	2.71	2.39	2.42	2.25	2.71	3.12	1.02	15.9	4.70	5.00	4.47	3.30	
Zinc	1	10,000	10,000	10,000	10,000	42.8	76.6	89.5	197	249	688	170	45.8	467	151	1460	330	245	252	72.8	
Moisture Content																					
Moisture Content (%)	0.1%	Not Applicable					14.3	14.7	14.9	13.1	17.7	16.1	17.9	19.1	31.0	22.4	44.1	40.0	39.8	27.1	24.0

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil					Drillhole No.														
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Soil Saturation Limit (C _{sat}) (mg/kg)	A-S03c			A-S20a			A-S20b			A-S20c			A-S24a		
							Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)		
							29-Jan-10	29-Jan-10	29-Jan-10	28-Jan-10	28-Jan-10	28-Jan-10	27-Jan-10	27-Jan-10	27-Jan-10	26-Jan-10	26-Jan-10	26-Jan-10	27-Jan-10	27-Jan-10	27-Jan-10
1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95				
Metals																					
Antimony	0.05	29.5	29.1	261	97.9	0.20	1.88	4.22	0.65	1.11	0.46	0.47	0.14	0.72	0.73	0.62	1.43	0.25	0.38	0.72	
Arsenic	0.5	22.1	21.8	196	73.5	1.3	8.3	17.7	18.3	20.4	17.1	16.7	4.3	11.5	20.4	18.2	12.5	10.0	15.7	18.9	
Barium	0.05	10,000	10,000	10,000	10,000	22.7	142	214	32.7	83.6	57.9	44.5	10.4	51.6	68.9	68.9	22.3	26.7	26.7	57.5	
Cadmium	0.02	73.8	72.8	653	245	0.03	0.63	1.33	0.16	0.34	0.17	0.17	0.03	0.19	0.24	0.21	1.05	0.08	0.14	0.15	
Chromium III	0.5	10,000	10,000	10,000	10,000	11.0	53.1	96.3	22.6	60.7	42.1	29.4	6.7	30.0	48.0	42.3	47.0	13.6	17.7	35.7	
Chromium VI	0.5	221	218	1,960	735	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Cobalt	0.5	1,480	1,460	10,000	4,900	2.7	7.0	15.2	6.9	15.7	19.9	8.4	2.3	7.1	12.7	11.5	12.7	4.4	5.8	10.9	
Copper	0.05	2,950	2,910	10,000	9,790	5.90	101	209	16.6	44.6	18.3	18.1	3.63	30.7	31.4	24.9	69.4	6.78	9.67	47.6	
Lead	0.05	258	255	2,290	857	19.6	54.0	90.6	38.7	82.5	51.6	40.3	8.51	40.1	60.5	56.2	61.5	22.7	27.7	49.0	
Manganese	0.5	10,000	10,000	10,000	10,000	67.1	210	343	410	826	321	412	108	330	555	536	342.0	174	223	270	
Mercury	0.02	11.0	6.52	38.4	45.6	<0.02	0.34	0.56	0.05	0.10	0.04	0.06	<0.02	0.07	0.07	0.06	0.12	0.02	0.04	0.06	
Molybdenum	0.05	369	364	3,260	1,220	0.55	2.79	9.71	1.29	2.13	5.43	1.41	0.36	1.32	1.62	1.41	2.74	1.25	2.08	2.43	
Nickel	0.05	1,480	1,460	10,000	4,900	6.84	41.3	88.4	10.4	32.8	27.7	15.0	2.75	15.2	24.9	21.5	22.8	6.83	8.54	19.5	
Tin	0.05	10,000	10,000	10,000	10,000	1.75	8.15	16.8	3.01	6.51	3.88	3.16	0.63	3.24	5.33	10.6	1.33	1.33	1.70	4.02	
Zinc	1	10,000	10,000	10,000	10,000	37	454	892	86.6	213	139	110	47.2	140	158	161	296	99.7	72.8	142	
Moisture Content																					
Moisture Content (%)	0.1%	Not Applicable					13.7	32.0	48.9	32.0	52.6	30.8	40.4	24.3	35.9	44.4	43.2	35.1	21.7	40.4	35.4

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil					Drillhole No.														
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Soil Saturation Limit (C _{sat}) (mg/kg)	A-S24b			A-S24c			A-SG10a			A-SG10b			A-SG10c		
							Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)			Sampling Date and Depth (m)		
							27-Jan-10	27-Jan-10	27-Jan-10	26-Jan-10	26-Jan-10	26-Jan-10	29-Jan-10	29-Jan-10	29-Jan-10	28-Jan-10	28-Jan-10	28-Jan-10	29-Jan-10	29-Jan-10	29-Jan-10
1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95				
Metals																					
Antimony	0.05	29.5	29.1	261	97.9	0.63	0.32	0.44	0.50	0.44	0.40	0.45	0.56	0.35	0.50	0.56	0.10	0.16	0.26	0.86	
Arsenic	0.5	22.1	21.8	196	73.5	18.1	16.0	18.3	18.2	17.1	14.7	14.4	10.7	9.6	17.8	17.6	5.3	3.1	5.3	13.8	
Barium	0.05	10,000	10,000	10,000	10,000	54.7	37.4	61.3	36.7	41.4	59.6	54.0	50.4	37.4	56.3	53.8	13.8	18.8	33.9	77.0	
Cadmium	0.02	73.8	72.8	653	245	0.09	0.07	0.09	0.11	0.12	0.12	0.14	0.06	0.07	0.17	0.16	0.03	0.04	0.06	0.28	
Chromium III	0.5	10,000	10,000	10,000	10,000	33.1	23.5	32.8	39.7	28.5	38.2	37.3	34.6	22.8	41.4	39.0	7.7	9.7	15.6	40.2	
Chromium VI	0.5	221	218	1,960	735	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Cobalt	0.5	1,480	1,460	10,000	4,900	10.4	7.4	10.3	8.4	10.1	11.9	10.5	10.8	6.8	12.3	15.3	2.8	3.2	4.5	9.4	
Copper	0.05	2,950	2,910	10,000	9,790	20.7	11.0	15.4	18.3	13.3	15.8	20.5	16.5	11.0	18.8	21.0	3.57	5.87	11.5	39.5	
Lead	0.05	258	255	2,290	857	47.0	32.8	49.1	53.1	37.7	45.1	51.8	47.2	33.1	49.3	50.2	12.1	12.5	18.1	69.5	
Manganese	0.5	10,000	10,000	10,000	10,000	309	191	298	283	194	424	380	362	546	425	272	47.9	105	146	290	
Mercury	0.02	11.0	6.52	38.4	45.6	0.04	0.03	0.0													

Appendix F

**Analytical Results of
Groundwater Samples**

Groundwater Samples : Boreholes A-SG01 to A-SG10

Chemical	Reporting Limit		Risk-Based Remediation Goals (RBRGs) for Groundwater					Boreholes No. / Sampling Date									
	(µg/L)	(mg/L)	Urban Residential (mg/L)	Rural Residential (mg/L)	Industrial (mg/L)	Solubility Limit (mg/L)	A-S02	A-S07	A-S09	A-S14	A-S16	A-S24	A-SG01	A-SG03	A-SG06	A-SG08	
In-situ measurement							19-Dec-09	12-Dec-09	23-Dec-09	08-Dec-09	15-Dec-09	02-Dec-09	12-Dec-09	23-Dec-09	21-Dec-09	08-Dec-09	
pH							6.32	6.25	6.34	6.79	6.73	7.18	6.91	66.7	6.82	6.78	
Temp (°C)							22.4	23.2	21.7	21.2	22.0	23.8	23.3	22.9	21.2	23.3	
SVOCs							<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Acenaphthene	1.0	0.001	10,000	7,090	10,000	4.24	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Acenaphthylene	1.0	0.001	1,410	542	10,000	3.93	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Anthracene	1.0	0.001	10,000	10,000	10,000	0.0434	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Benzo(b)fluoranthene	1.0	0.001	0.539	0.203	7.53	0.0015	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Chrysene	1.0	0.001	58.1	21.9	812	0.0016	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Fluoranthene	1.0	0.001	10,000	10,000	10,000	0.206	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Fluorene	1.0	0.001	10,000	10,000	10,000	1.98	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Hexachlorobenzene	0.5	0.001	0.0589	0.0234	0.695	6.20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Naphthalene	1.0	0.001	61.7	23.7	893	31.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Phenanthrene	1.0	0.001	10,000	10,000	10,000	7.00	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Pyrene	1.0	0.001	10,000	10,000	10,000	0.735	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Mercury							<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
PCBS							<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Chlorinated Pesticides							<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
alpha-BHC							<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
beta-BHC & gamma-BHC							<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
delta-BHC							<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
p,p'-DDE							<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
p,p'-DDD							<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
p,p'-DDT							<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
Total Organic Carbon							<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
TOC							<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	

The "Reporting Limit" is adopted as preliminary screening goals.

Not Applicable

Appendix G

**Analytical Results of
Elutriate Samples**

Elutriate Samples : Boreholes A-S24, A-SG01, A-SG03, A-SG06 & A-SG08

Chemical	Boreholes No. / Sampling Date														
	A-S24			A-SG01			A-SG03			A-SG06			A-SG08		
	04-Dec-09		11-Dec-09		22-Dec-09		21-Dec-09		07-Dec-09						
Reporting Limit	Blank Test	Elutriate Test	Elutriate Potential (%)	Blank Test	Elutriate Test	Elutriate Potential (%)	Blank Test	Elutriate Test	Elutriate Potential (%)	Blank Test	Elutriate Test	Elutriate Potential (%)	Blank Test	Elutriate Test	Elutriate Potential (%)
In-situ measurement															
pH		6.96	--	--	6.79	--	--	5.92	--	--	6.75	--	--	6.61	--
Temp (°C)		22.9	--	--	24.0	--	--	21.7	--	--	20.4	--	--	22.7	--
SVOCs															
Acenaphthene	1.0	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	<1.0	<1.0	Nil
Acenaphthylene	1.0	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	<1.0	<1.0	Nil
Anthracene	1.0	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	<1.0	<1.0	Nil
Benzo(b)fluoranthene	1.0	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	<1.0	<1.0	Nil
Chrysene	1.0	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	<1.0	<1.0	Nil
Fluoranthene	1.0	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	<1.0	<1.0	Nil
Fluorene	1.0	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	<1.0	<1.0	Nil
Hexachlorobenzene	0.5	<0.5	<0.5	Nil	<0.5	<0.5	Nil	<0.5	<0.5	Nil	<0.5	<0.5	<0.5	<0.5	Nil
Naphthalene	1.0	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	<1.0	<1.0	Nil
Phenanthrene	1.0	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	<1.0	<1.0	Nil
Pyrene	1.0	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	Nil	<1.0	<1.0	<1.0	<1.0	Nil
Metals															
Mercury	0.0005	<0.0005	<0.0005	Nil	<0.0005	<0.0005	Nil	<0.0005	<0.0005	Nil	<0.0005	<0.0005	<0.0005	<0.0005	Nil
PGBs															
PCBs	1	<1	<1	Nil	<1	<1	Nil	<1	<1	Nil	<1	<1	<1	<1	Nil
Chlorinated Pesticides															
alpha-BHC	0.0005	<0.0005	<0.0005	Nil	<0.0005	<0.0005	Nil	<0.0005	<0.0005	Nil	<0.0005	<0.0005	<0.0005	<0.0005	Nil
beta-BHC & gamma-BHC	0.0010	<0.0010	<0.0010	Nil	<0.0010	<0.0010	Nil	<0.0010	<0.0010	Nil	<0.0010	<0.0010	<0.0010	<0.0010	Nil
delta-BHC	0.0005	<0.0005	<0.0005	Nil	<0.0005	<0.0005	Nil	<0.0005	<0.0005	Nil	<0.0005	<0.0005	<0.0005	<0.0005	Nil
p,p'-DDE	0.0005	<0.0005	<0.0005	Nil	<0.0005	<0.0005	Nil	<0.0005	<0.0005	Nil	<0.0005	<0.0005	<0.0005	<0.0005	Nil
p,p'-DDD	0.0005	<0.0005	<0.0005	Nil	<0.0005	<0.0005	Nil	<0.0005	<0.0005	Nil	<0.0005	<0.0005	<0.0005	<0.0005	Nil
p,p'-DDT	0.0020	<0.0020	<0.0020	Nil	<0.0020	<0.0020	Nil	<0.0020	<0.0020	Nil	<0.0020	<0.0020	<0.0020	<0.0020	Nil

Appendix H

**Laboratory Testing
Reports of Soil
Samples, Groundwater
Samples and Elutriate
Samples**

Agreement No. CE 53/2008 (CE)

Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation

Land Contamination Assessment for Area A

Laboratory Testing Report No.

Report No.	Lab Works Order No.
1	HK0925295
2	HK0925301
3	HK0925302
4	HK0925303
5	HK0926115
6	HK0926309
7	HK0926317
8	HK0926336
9	HK0926383
10	HK0926386
11	HK0926533
12	HK0926548
13	HK0926564
14	HK0926566
15	HK0926568
16	HK0926571
17	HK0926669
18	HK0926670
19	HK0926740
20	HK0926774
21	HK0926802
22	HK0926826
23	HK0927313
24	HK0927322
25	HK0927342
26	HK0927346
27	HK0927362
28	HK0927374
29	HK0927379
30	HK0927388
31	HK0927390
32	HK0927397
33	HK0927405
34	HK0927407

Soil Samples : Boreholes A-S01 to A-S15

	Drillhole No.																	
	A-S01			A-S02			A-S03			A-S04			A-S05					
	Sampling Date and Depth (m)																	
Chemical	14-Dec-09 1.50 - 1.95	14-Dec-09 3.00 - 3.95	15-Dec-09 4.50 - 4.95	18-Dec-09 1.50 - 1.95	18-Dec-09 3.00 - 3.95	18-Dec-09 4.50 - 4.95	22-Dec-09 1.50 - 1.95	22-Dec-09 3.00 - 3.95	22-Dec-09 4.50 - 4.95	23-Dec-09 1.50 - 1.95	23-Dec-09 3.00 - 3.95	23-Dec-09 4.50 - 4.95	15-Dec-09 1.50 - 1.95	15-Dec-09 3.00 - 3.95	15-Dec-09 4.50 - 4.95	17-Dec-09 1.50 - 1.95	17-Dec-09 3.00 - 3.95	17-Dec-09 4.50 - 4.95
Metals																		
Cyanide, free																		
Total Organic Carbon																		
Moisture Content																		
Sulphite (SO ₃ ²⁻)																		
Sulphate (SO ₄ ²⁻)																		
Sulphide (S ²⁻)																		
AVS																		
SVOCs																		
PCBs																		
Chlorinated Pesticides																		
Sulphur (Total S)																		
Dioxins																		
Grain Size																		
		Report No. 20 (HK0926774)	Report No. 22 (HK0926806)		Report No. 24 (HK0927322)			Report No. 32 (HK0927397)		Report No. 34 (HK0927407)				Report No. 22 (HK0926826)			Report No. 23 (HK0927313)	

	Drillhole No.																	
	A-S06			A-S07			A-S08			A-S09			A-S10					
	Sampling Date and Depth (m)																	
Chemical	23-Dec-09 1.50 - 1.95	23-Dec-09 3.00 - 3.95	23-Dec-09 4.50 - 4.95	11-Dec-09 1.50 - 1.95	11-Dec-09 3.00 - 3.95	11-Dec-09 4.50 - 4.95	19-Dec-09 1.50 - 1.95	19-Dec-09 3.00 - 3.95	19-Dec-09 4.50 - 4.95	21-Dec-09 1.50 - 1.95	21-Dec-09 3.00 - 3.95	21-Dec-09 4.50 - 4.95	21-Dec-09 1.50 - 1.95	21-Dec-09 3.00 - 3.95	21-Dec-09 4.50 - 4.95			
Metals																		
Cyanide, free																		
Total Organic Carbon																		
Moisture Content																		
Sulphite (SO ₃ ²⁻)																		
Sulphate (SO ₄ ²⁻)																		
Sulphide (S ²⁻)																		
AVS																		
SVOCs																		
PCBs																		
Chlorinated Pesticides																		
Sulphur (Total S)																		
Dioxins																		
Grain Size																		
		Report No. 34 (HK0927407)			Report No. 16 (HK0926571)			Report No. 27 (HK0927362)			Report No. 28 (HK0927374)			Report No. 32 (HK0927397)			Report No. 28 (HK0927374)	

	Drillhole No.																	
	A-S11			A-S12			A-S13			A-S14			A-S15					
	Sampling Date and Depth (m)																	
Chemical	10-Dec-09 1.50 - 1.95	10-Dec-09 3.00 - 3.95	10-Dec-09 4.50 - 4.95	10-Dec-09 1.50 - 1.95	10-Dec-09 3.00 - 3.95	10-Dec-09 4.50 - 4.95	21-Dec-09 1.50 - 1.95	21-Dec-09 3.00 - 3.95	21-Dec-09 4.50 - 4.95	07-Dec-09 1.50 - 1.95	07-Dec-09 3.00 - 3.95	07-Dec-09 4.50 - 4.95	09-Dec-09 1.50 - 1.95	09-Dec-09 3.00 - 3.95	09-Dec-09 4.50 - 4.95			
Metals																		
Cyanide, free																		
Total Organic Carbon																		
Moisture Content																		
Sulphite (SO ₃ ²⁻)																		
Sulphate (SO ₄ ²⁻)																		
Sulphide (S ²⁻)																		
AVS																		
SVOCs																		
PCBs																		
Chlorinated Pesticides																		
Sulphur (Total S)																		
Dioxins																		
Grain Size																		
		Report No. 10 (HK0926386)			Report No. 10 (HK0926386)			Report No. 28 (HK0927374)			Report No. 12 (HK0926548)			Report No. 9 (HK0926383)				

Soil Samples : Boreholes A-S16 to A-S25

	Drillhole No.														
	A-S16			A-S17			A-S18			A-S19			A-S20		
	Sampling Date and Depth (m)														
Chemical	12-Dec-09 1.50 - 1.95	14-Dec-09 3.00 - 3.95	14-Dec-09 4.50 - 4.95	19-Dec-09 1.50 - 1.95	19-Dec-09 3.00 - 3.95	19-Dec-09 4.50 - 4.95	04-Dec-09 1.50 - 1.95	04-Dec-09 3.00 - 3.95	04-Dec-09 4.50 - 4.95	01-Dec-09 1.50 - 1.95	01-Dec-09 3.00 - 3.95	01-Dec-09 4.50 - 4.95	10-Dec-09 1.50 - 1.95	10-Dec-09 3.00 - 3.95	11-Dec-09 4.50 - 4.95
Metals															
Cyanide, free															
Total Organic Carbon															
Moisture Content															
Sulphite (SO ₃ ²⁻)															
Sulphate (SO ₄ ²⁻)															
Sulphide (S ²⁻)															
AVS															
SVOCs															
PCBs															
Chlorinated Pesticides															
Sulphur (Total S)															
Dioxins															
Grain Size															
	Report No.19 (HK0926740)	Report No.20 (HK0926774)	Report No.27 (HK0927362)	Report No.7 (HK0926317)	Report No.11 (HK0926533)	Report No.10 (HK0926386)	Report No.16 (HK0926571)								

	Drillhole No.														
	A-S21			A-S22			A-S23			A-S24			A-S25		
	Sampling Date and Depth (m)														
Chemical	27-Nov-09 1.50 - 1.95	27-Nov-09 3.00 - 3.95	28-Nov-09 4.50 - 4.95	25-Nov-09 1.50 - 1.95	25-Nov-09 3.00 - 3.95	25-Nov-09 4.50 - 4.95	28-Nov-09 1.50 - 1.95	27-Nov-09 3.00 - 3.95	27-Nov-09 4.50 - 4.95	01-Dec-09 1.50 - 1.95	01-Dec-09 3.00 - 3.95	01-Dec-09 4.50 - 4.95	07-Dec-09 1.50 - 1.95	08-Dec-09 3.00 - 3.95	08-Dec-09 4.50 - 4.95
Metals															
Cyanide, free															
Total Organic Carbon															
Moisture Content															
Sulphite (SO ₃ ²⁻)															
Sulphate (SO ₄ ²⁻)															
Sulphide (S ²⁻)															
AVS															
SVOCs															
PCBs															
Chlorinated Pesticides															
Sulphur (Total S)															
Dioxins															
Grain Size															
	Report No.3 (HK0925302)	Report No.4 (HK0925303)	Report No.1 (HK0925295)	Report No.2 (HK0925301)	Report No.3 (HK0925302)	Report No.11 (HK0926533)	Report No.12 (HK0926548)	Report No.14 (HK0926566)							

Soil Samples : Boreholes A-SG01 to A-SG10

	Drillhole No.														
	A-SG01			A-SG02			A-SG03			A-SG04			A-SG05		
	Sampling Date and Depth (m)														
Chemical	10-Dec-09 1.50 - 1.95	11-Dec-09 3.00 - 3.95	11-Dec-09 4.50 - 4.95	21-Dec-09 1.50 - 1.95	21-Dec-09 3.00 - 3.95	21-Dec-09 4.50 - 4.95	22-Dec-09 1.50 - 1.95	22-Dec-09 3.00 - 3.95	22-Dec-09 4.50 - 4.95	11-Dec-09 1.50 - 1.95	12-Dec-09 3.00 - 3.95	12-Dec-09 4.50 - 4.95	12-Dec-09 1.50 - 1.95	12-Dec-09 3.00 - 3.95	12-Dec-09 4.50 - 4.95
Metals															
Cyanide, free															
Total Organic Carbon															
Moisture Content															
Sulphite (SO ₃ ²⁻)															
Sulphate (SO ₄ ²⁻)															
Sulphide (S ²⁻)															
AVS															
SVOCs															
PCBs															
Chlorinated Pesticides															
Sulphur (Total S)															
Dioxins															
Grain Size															
	Report No.10 (HK0926386)	Report No.18 (HK0926571)	Report No.28 (HK0927374)	Report No.30 (HK0927388)	Report No.16 (HK0926571)	Report No.19 (HK0926740)									

	Drillhole No.														
	A-SG06			A-SG07			A-SG08			A-SG09			A-SG10		
	Sampling Date and Depth (m)														
Chemical	19-Dec-09 1.50 - 1.95	19-Dec-09 3.00 - 3.95	21-Dec-09 4.50 - 4.95	07-Dec-09 1.50 - 1.95	07-Dec-09 3.00 - 3.95	07-Dec-09 4.50 - 4.95	05-Dec-09 1.50 - 1.95	05-Dec-09 3.00 - 3.95	07-Dec-09 4.50 - 4.95	28-Nov-09 1.50 - 1.95	28-Nov-09 3.00 - 3.95	28-Nov-09 4.50 - 4.95	09-Dec-09 1.50 - 1.95	09-Dec-09 3.00 - 3.95	09-Dec-09 4.50 - 4.95
Metals															
Cyanide, free															
Total Organic Carbon															
Moisture Content															
Sulphite (SO ₃ ²⁻)															
Sulphate (SO ₄ ²⁻)															
Sulphide (S ²⁻)															
AVS															
SVOCs															
PCBs															
Chlorinated Pesticides															
Sulphur (Total S)															
Dioxins															
Grain Size															
	Report No.26 (HK0927346)	Report No.28 (HK0927374)	Report No.12 (HK0926548)	Report No.8 (HK0926336)	Report No.12 (HK0926548)	Report No.4 (HK0925303)	Report No.12 (HK0926548)	Report No.8 (HK0926336)	Report No.12 (HK0926548)	Report No.16 (HK0926571)	Report No.4 (HK0925303)	Report No.9 (HK0926383)	Report No.9 (HK0926383)	Report No.9 (HK0926383)	Report No.9 (HK0926383)

Groundwater Samples : Boreholes **A-S02, A-S07, A-S09, A-S14, A-S16, A-S24, A-SG01, A-SG03, A-SG06 & A-SG08**

Chemical	Boreholes No. / Sampling Date									
	A-S02 19-Dec-09	A-S07 12-Dec-09	A-S09 23-Dec-09	A-S14 09-Dec-09	A-S16 15-Dec-09	A-S24 02-Dec-09	A-SG01 12-Dec-09	A-SG03 23-Dec-09	A-SG06 21-Dec-09	A-SG08 08-Dec-09
SVOCs		Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.9 (HK0926383)	Report No.22 (HK0926826)	Report No.6 (HK0926309)	Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.28 (HK0927374)	Report No.14 (HK0926566)
Mercury		Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.9 (HK0926383)	Report No.22 (HK0926826)	Report No.6 (HK0926309)	Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.28 (HK0927374)	Report No.14 (HK0926566)
PCBs		Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.9 (HK0926383)	Report No.22 (HK0926826)	Report No.6 (HK0926309)	Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.28 (HK0927374)	Report No.14 (HK0926566)
Chlorinated Pesticides		Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.9 (HK0926383)	Report No.22 (HK0926826)	Report No.6 (HK0926309)	Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.28 (HK0927374)	Report No.14 (HK0926566)
Total Organic Carbon		Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.9 (HK0926383)	Report No.22 (HK0926826)	Report No.6 (HK0926309)	Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.28 (HK0927374)	Report No.14 (HK0926566)
Sulphur (Total S)		Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.9 (HK0926383)	Report No.22 (HK0926826)	Report No.6 (HK0926309)	Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.28 (HK0927374)	Report No.14 (HK0926566)
Sulphite (SO ₃ ²⁻)		Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.9 (HK0926383)	Report No.22 (HK0926826)	Report No.6 (HK0926309)	Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.28 (HK0927374)	Report No.14 (HK0926566)
Sulphate (SO ₄ ²⁻)		Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.9 (HK0926383)	Report No.22 (HK0926826)	Report No.6 (HK0926309)	Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.28 (HK0927374)	Report No.14 (HK0926566)
Sulphide (S ²⁻)		Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.9 (HK0926383)	Report No.22 (HK0926826)	Report No.6 (HK0926309)	Report No.19 (HK0926740)	Report No.34 (HK0927407)	Report No.28 (HK0927374)	Report No.14 (HK0926566)

Appendix I

**Laboratory Testing
Reports of Soil
Samples of 15
Additional Boreholes**

Agreement No. CE 53/2008 (CE)

Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A

Laboratory Testing Report No. (Additional Boreholes)

Report No.	Lab Works Order No.
A	HK1002030
B	HK1002074
C	HK1002122
D	HK1002220
E	HK1002332
F	HK1002333

Soil Samples : 15 Additional Boreholes

	Drillhole No.																	
	A-S01a			A-S01b			A-S01c			A-S03a			A-S03b					
	Sampling Date and Depth (m)																	
Chemical	30-Jan-10 1.50 - 1.95	30-Jan-10 3.00 - 3.95	30-Jan-10 4.50 - 4.95	30-Jan-10 1.50 - 1.95	30-Jan-10 3.00 - 3.95	30-Jan-10 4.50 - 4.95	30-Jan-10 1.50 - 1.95	30-Jan-10 3.00 - 3.95	30-Jan-10 4.50 - 4.95	30-Jan-10 1.50 - 1.95	30-Jan-10 3.00 - 3.95	01-Feb-10 4.50 - 4.95	29-Jan-10 1.50 - 1.95	29-Jan-10 3.00 - 3.95	29-Jan-10 4.50 - 4.95			
Metals	Report No.E (HK1002332)						Report No. E (HK1002332)						Report No.F (HK1002333)			Report No.D (HK1002220)		

	Drillhole No.																				
	A-S20a			A-S20b			A-S20c			A-S24a											
	Sampling Date and Depth (m)																				
Chemical	29-Jan-10 1.50 - 1.95	29-Jan-10 3.00 - 3.95	29-Jan-10 4.50 - 4.95	28-Jan-10 1.50 - 1.95	28-Jan-10 3.00 - 3.95	28-Jan-10 4.50 - 4.95	27-Jan-10 1.50 - 1.95	27-Jan-10 3.00 - 3.95	27-Jan-10 4.50 - 4.95	26-Jan-10 1.50 - 1.95	26-Jan-10 3.00 - 3.95	26-Jan-10 4.50 - 4.95	27-Jan-10 1.50 - 1.95	27-Jan-10 3.00 - 3.95	27-Jan-10 4.50 - 4.95						
Metals	Report No.D (HK1002220)						Report No.C (HK1002122)						Report No.B (HK1002074)			Report No.A (HK1002030)			Report No.B (HK1002074)		

	Drillhole No.																				
	A-S24b			A-S24c			A-SG10a			A-SG10b			A-SG10c								
	Sampling Date and Depth (m)																				
Chemical	27-Jan-10 1.50 - 1.95	27-Jan-10 3.00 - 3.95	27-Jan-10 4.50 - 4.95	26-Jan-10 1.50 - 1.95	26-Jan-10 3.00 - 3.95	26-Jan-10 4.50 - 4.95	29-Jan-10 1.50 - 1.95	29-Jan-10 3.00 - 3.95	29-Jan-10 4.50 - 4.95	28-Jan-10 1.50 - 1.95	28-Jan-10 3.00 - 3.95	28-Jan-10 4.50 - 4.95	28-Jan-10 1.50 - 1.95	28-Jan-10 3.00 - 3.95	28-Jan-10 4.50 - 4.95						
Metals	Report No.B (HK1002074)						Report No.A (HK1002030)						Report No.D (HK1002220)			Report No.C (HK1002122)			Report No.D (HK1002220)		

Agreement No. CE 53/2008 (CE)

PLANNING AND ENGINEERING
STUDY ON DEVELOPMENT OF
LOK MA CHAU LOOP
- INVESTIGATION

**Supplementary
Contamination Assessment Report
and Remediation Action Plan for Area A
October 2011**



土木工程拓展署
Civil Engineering and
Development Department



規劃署
Planning Department

ARUP

Planning Department and Civil
Engineering and Development
Department

**Agreement No. CE 53/2008 (CE)
Planning and Engineering Study
on Development of Lok Ma Chau
Loop - Investigation**

Supplementary Contamination
Assessment Report and Remediation
Action Plan for Area A

209840

Draft 2 | October 2011

Document Verification

ARUP

Job title		Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation		Job number		209840	
Document title		Supplementary Contamination Assessment Report and Remediation Action Plan for Area A		File reference			
Document ref							
Revision	Date	Filename	Loop_Draft Supp CAR_Area A_v0.docx				
Draft 1	18/08/11	Description	First draft				
			Prepared by	Checked by	Approved by		
		Name	Louisa Cheung	Thomas Chan	Sam Tsoi		
		Signature					
Draft 2	07/10/11	Filename	Loop_Draft Supp CAR_Area A_v1.docx				
		Description	Second draft				
			Prepared by	Checked by	Approved by		
		Name	Louisa Cheung	Thomas Chan	Sam Tsoi		
		Signature	<i>Louisa Cheung</i>	<i>Thomas Chan</i>	<i>Sam Tsoi</i>		
		Filename					
		Description					
			Prepared by	Checked by	Approved by		
		Name					
		Signature					
		Filename					
		Description					
			Prepared by	Checked by	Approved by		
		Name					
		Signature					
Issue Document Verification with Document <input checked="" type="checkbox"/>							

Contents

	Page
1 Introduction	1
1.1 Background	1
1.2 Contamination Assessment Report and Remediation Action Plan for Area A	1
1.3 Objective	3
1.4 Statutory Legislation and Evaluation Criteria	3
2 Site Investigation Works	4
2.1 Further Investigation into the Extent of Contamination	4
2.2 Soil Sampling	4
2.3 Analytical Parameters & Assessment Criteria	5
2.4 HOKLAS Accredited Laboratory	6
2.5 Strata Logging	6
3 Interpretation of Laboratory Testing Results	7
3.1 Soil Contamination	7
4 Possible Soil Contamination Extent	8
4.1 Update on the Possible Soil Contamination Extent	8
4.2 Remediation Method	10
5 Conclusion and Recommendation	11

Figures

- Figure 2.1 Locations of As-built Sampling Boreholes in Area A
- Figure 4.1 Locations of Contaminated Zones
- Figure 4.1.1 Location of Contaminated Zone at A-S01
- Figure 4.1.2 Location of Contaminated Zone at A-S03
- Figure 4.1.2a Location of Contaminated Zone at A-S03a1
- Figure 4.1.2b Location of Contaminated Zone at A-S03c1
- Figure 4.1.3 Location of Contaminated Zone at A-S20
- Figure 4.1.4 Location of Contaminated Zone at A-S24
- Figure 4.1.5 Location of Contaminated Zone at A-SG10

Appendices

Appendix A Figures Extracted from Contamination Assessment Report and
Remediation Action Plan for Area A July 2010

Appendix B Strata Log Records

Appendix C Laboratory Analytical Results

Appendix D Laboratory Testing Reports

Appendix E Responses to Comments

1 Introduction

1.1 Background

On 26 May 2009, Planning Department (PlanD) in association with Civil Engineering and Development Department (CEDD) commissioned Ove Arup & Partners Hong Kong Limited (Arup) as the Consultant for undertaking the “Planning and Engineering Study on Development of Lok Ma Chau Loop – Investigation” (the Study).

Section 3.4.9.4 of the EIA Study Brief No.: ESB-201/2008 for the LMC Loop Development project dated January 2009 issued by the EPD specified that a land contamination assessment shall be undertaken and that a Contamination Assessment Plan (CAP) shall be submitted to the EPD prior to conducting the assessment.

The CAP for Area A has been prepared and submitted to EPD in July 2009. EPD indicated no further comments on the CAP for Area A in October 2009. Environmental site investigation (SI) works were carried out between 25 November 2009 and 1 February 2010.

1.2 Contamination Assessment Report and Remediation Action Plan for Area A

A Contamination Assessment Report (CAR) and Remediation Action Plan (RAP) for Area A was submitted to and endorsed by EPD in July 2010 summarising the analytical results of the SI works and providing recommendations on the appropriate remediation actions for the contaminated areas found.

According to the testing results, out of the 105 soil samples collected, 6 soil samples from 5 of the boreholes (A-S01, A-S03, A-S20, A-S24, and A-SG10 as shown in **Figure 5.1** in **Appendix A**) contain concentrations of Arsenic that marginally exceeded the RBRGs of Rural Residential and Urban Residential land uses. The laboratory results exceeding the RBRGs are given in **Table 1.1**.

Table 1.1 Summary of soil samples exceeding RBRGs

Borehole No.	Depth of Soil Sampling (mbgl)	Contaminant	Concentration (mg/kg dry soil)	RBRGs of Arsenic (mg/kg dry soil)
A-S01	3.0 – 3.45	Arsenic	22.2	Rural Residential RBRG : 21.8 Urban Residential RBRG : 22.1 Public Parks RBRG : 73.5 Industrial RBRG : 196
	4.5 – 4.95	Arsenic	24.0	
A-S03	3.0 – 3.45	Arsenic	26.8	
A-S20	3.0 – 3.45	Arsenic	23.0	
A-S24	3.0 – 3.45	Arsenic	27.7	
A-SG10	4.5 – 4.95	Arsenic	27.3	

In order to further ascertain the extent of contamination at these 5 locations, 3 additional boreholes near each of the 5 contaminated boreholes were drilled (i.e. a total of 15 additional boreholes were drilled) for additional soil sampling and testing. The locations of the additional boreholes were roughly mid-way between the contaminated boreholes and their respective adjacent boreholes, as shown in **Figure 5.2** and **Figures 5.2.1 to 5.2.5** in **Appendix A**. The laboratory testing results of the additional soil samples show compliance with the RBRG for Rural Residential (i.e. the most stringent set of RBRGs).

Based on the results from the SI works, an estimate of the quantity order of contaminated soil is summarised in **Table 1.2**. The extents of 5 estimated plan areas in which the contaminated zones lie are depicted in **Figure 6.1** and **Figures 6.1.1 to 6.1.5** in **Appendix A**.

Table 1.2 Estimation of the order of quantity of contaminated soil by conservative approach

Contaminated Borehole (Contaminated Zone ID)	Additional Borehole ID	Distance from Contaminated Borehole to the Additional Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Plan Area in which Contaminated Area Lies (m ²) ⁽¹⁾	Estimated of Order of Quantity of Contaminated Materials (m ³)
A-S01	A-S01a	90	3.0 (2.5m-5.5m)	18,519	55,557
	A-S01b	69			
	A-S01c	87			
A-S03	A-S03a	91	1.5 (2.5m-4.0m)	12,684	19,026
	A-S03b	54			
	A-S03c	102			
A-S20	A-S20a	96	1.5 (2.5m-4.0m)	26,131	39,197
	A-S20b	112			
	A-S20c	82			
A-S24	A-S24a	63	1.5 (2.5m-4.0m)	14,361	21,542
	A-S24b	92			
	A-S24c	68			
A-SG10	A-SG10a	62	1.5 (4.0m-5.5m)	12,749	19,124
	A-SG10b	86			
	A-SG10c	67			
Total ⁽²⁾ :				84,444	154,446

Note:

- (1) The “Estimated Plan Area in which the Horizontal Contaminated Area (m²) Lies” was computed by a software call “MicroStation”. (i.e. common graphical software similar to “AutoCad”)
- (2) The data presented based on the conservative approach are subject to variation after the completion of further investigation to confirm the actual horizontal extent of contamination.

Since the 5 contaminated boreholes only marginally exceeded the RBRG, the estimation of the horizontal extent of contamination is considered conservative. As the estimated quantity of contaminated soil is highly sensitive to how the plan area (in which the actual horizontal extent of contaminated lies) is estimated,

further SI is carried out to further ascertain the horizontal extent of contamination prior to the commencement of remediation works on site in order to avoid over-remediation.

For easy reference, the initial SI work conducted between 25 November 2009 and 1 February 2010 will be referred as “Stage 1 SI”; whereas the further SI work will be referred as “Stage 2 SI”.

1.3 Objective

This Supplementary Contamination Assessment Report (CAR) for Area A is prepared to present findings of the investigation and provide an update on the estimation of the quantity of contaminated soil based on the results of the Stage 2 SI to seek approval/agreement by EPD prior to the commencement of remediation work. This Supplementary CAR shall be read in conjunction with the endorsed CAR/RAP for Area A.

1.4 Statutory Legislation and Evaluation Criteria

This Supplementary CAR is prepared in accordance with the following Technical Memorandum and Guidance Notes:

- Annex 19 of the Technical Memorandum on Environmental Impact Assessment Process (TM-EIA), Guidelines for Assessment of Impact On Sites of Cultural Heritage and Other Impacts (Section 3 : Potential Contaminated Land Issues);
- Guidance Notes for Investigation Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repairing/Dismantling Workshops, EPD, 1999;
- Guidance Notes for Contaminated Land Assessment and Remediation; and
- Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management, EPD, 2007.

2 Site Investigation Works

2.1 Further Investigation into the Extent of Contamination

According to **Section 6.2.2** of the endorsed CAR/RAP for Area A, the Stage 2 SI should include the drilling of new boreholes at such locations between the contaminated boreholes and their respective adjacent additional uncontaminated boreholes within the possible plan area conservatively estimated (as shown in **Figures 6.1.1 to 6.1.5** in **Appendix A**) so as to confirm the horizontal extent of contamination. In the endorsed CAR/RAP for Area A, it was recommended that soil samples should be collected in the new boreholes at the respective depths of contamination detected in the 5 contaminated boreholes (as summarised in **Table 1.1**), and tested for Arsenic. But in order to also confirm the vertical extent of Arsenic contamination, it was later decided that soil samples should be collected at the same depth intervals as in Stage 1 SI i.e. 1.5-1.95mbgl, 3.0-3.45mbgl and 4.5-4.95mbgl.

2.2 Soil Sampling

2.2.1 Borehole locations

The Stage 2 SI was conducted strictly in compliance with the technical procedures in the approved CAP/RAP for Area A such as dry drilling of boreholes, decontamination requirements, soil sampling procedures and the analytical methodologies etc.

The Stage 2 SI works were carried out by Fugro Geotechnical Services (HK) Ltd. between 27 May and 2 July 2011. 15 boreholes were drilled for the soil sampling. The borehole locations and depth for soil sampling are summarised in **Table 2.1** and are shown in **Figure 2.1**. The entire SI programme was supervised by the on-site Land Contamination Specialist.

Table 2.1 Sampling locations and drilling depths

Borehole ID	Proposed Borehole Locations		Actual Borehole Locations		Termination Level of Sampling (mbgl)	Ground Level (mPD)
	Easting	Northing	Easting	Northing		
A-S01a1	826258	842958	826258	842957	5	+6.23
A-S01b1	826287	842902	826287	842902		+5.97
A-S01c1	826337	842918	826338	842918		+5.68
A-S03a1	826585	842816	826587	842815		+5.94
A-S03b1	826618	842775	826618	842774		+5.59
A-S03c1	826655	842757	826655	842757		+4.86
A-S20a1	826301	842008	826321	842024		+5.26
A-S20b1	826295	842067	826304	842069		+4.90
A-S20c1	826370	842064	826370	842064		+4.63
A-S24a1	825798	841907	825798	841907		+3.91

Borehole ID	Proposed Borehole Locations		Actual Borehole Locations		Termination Level of Sampling (mbgl)	Ground Level (mPD)
	Easting	Northing	Easting	Northing		
A-S24b1	825851	841923	825851	841923	5	+3.62
A-S24c1	825841	841858	825841	841857		+4.44
A-SG10a1	826036	841816	826037	841813		+3.75
A-SG10b1	825048	841851	825048	841852		+3.46
A-SG10c1	826089	841838	826088	841837		3.64

Boreholes A-S20b1 and A-S20c1 have been shifted from the original proposed locations due to the actual site situation and constrain e.g. to avoid damage of reedbed. Deviation from the original proposed boreholes locations are summarised in **Table 2.2**.

Table 2.2 Change of borehole locations due to site constraints

Borehole ID	Deviation from Original Location	Justification
A-S20a1	26m north-east of the original location	To avoid damage of vegetation owned by a villager
A-S20b1	10m north-east of the original location	Avoid damage to reedbed

2.2.1 Soil Sampling

Inspection pits from ground surface to 1.5 meter below ground level (mbgl) were excavated at each borehole location before drilling in order to determine the thickness of the top soil (i.e. Area A was capped by a layer of clean top soil after the disposal of dredged mud from Shenzhen River). Three U-100 undisturbed soil samples were then collected from each borehole at the depths of 1.5m (1.5-1.95mbgl), 3.0m (3.0-3.45mbgl) and 4.5m (4.5-4.95mbgl).

2.2.2 Decontamination procedures

Before drilling / excavation, the sampler and all equipment in contact with the ground were thoroughly decontaminated by phosphate-free detergent between each sampling event to minimize potential cross contamination. All drilling machines were decontaminated by phosphate-free detergent and high pressure hot water jet before mobilization to site. During sampling and decontamination activities, disposable latex gloves were worn to prevent the transfer of contaminants from other sources.

Moreover, dry drilling method was adopted for the entire environmental SI in order to prevent any influence of flushing medium to the soil testing results.

2.3 Analytical Parameters & Assessment Criteria

The soil samples collected were analysed for Arsenic. The RBRGs for Arsenic found in soil are given in **Table 2.3**. Similar to the endorsed CAR/RAP for Area A, “Rural Residential” RBRG was adopted for the interpretation of the soil testing results.

Table 2.3 Risk-Based Remediation Goals (RBRGs) of Arsenic

Chemical	Risk-Based Remediation Goals (RBRGs) for soil			
	Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)
Arsenic	22.1	21.8	196	73.5

2.4 HOKLAS Accredited Laboratory

A testing laboratory “ALS Technichem (HK) Pty Ltd”, accredited under Hong Kong Laboratory Accreditation Scheme (HOKLAS) was appointed to conduct chemical testing for the soil samples. The laboratory testing method was accredited by the HOKLAS.

2.5 Strata Logging

Strata logging for boreholes was undertaken during the course of drilling and sampling by qualified geologist. The logs included the general stratigraphic descriptions, depth of soil sampling, and sample notation etc. The strata logs of boreholes are given in **Appendix B**.

3 Interpretation of Laboratory Testing Results

3.1 Soil Contamination

A total of 45 soil samples were collected from the 15 boreholes between 27 May 2011 and 2 July 2011. At the sampling depths where Arsenic contamination was detected previously in Stage I SI (refer to **Table 1.1**), no Arsenic exceedances were found according to the laboratory testing results. However, among the depths where Arsenic contamination were not previously detected, marginal exceedances of the RBRG (Rural Residential) Arsenic limit were found in the samples collected at A-S03a1 (4.5-4.95 mbgl) and A-S03c1 (1.5-1.95 mbgl). The laboratory testing results exceeding the RBRGs are given in **Table 3.1**. All the laboratory testing results are summarised in **Appendix C**. The laboratory testing reports are given in **Appendix D**.

Table 3.1 Summary of soil samples exceeding RBRGs

Borehole No.	Depth of Soil Sampling (mbgl)	Contaminant	Concentration (mg/kg dry soil)	RBRGs (Rural Residential) for Arsenic (mg/kg dry soil)
A-S03a1	4.50-4.95	Arsenic	23	21.8
A-S03c1	1.50-1.95		24	

4 Possible Soil Contamination Extent

4.1 Update on the Possible Soil Contamination Extent

Based on the results from the Stage 2 SI works, the possible vertical and horizontal extents of soil contamination present within Area A has been estimated using the same method as stipulated in Section 6.1.1 and 6.1.2 in the endorsed CAR/RAP for Area A which is summarised in **Sections 4.1.1** and **4.1.2** below.

4.1.1 Estimation of Horizontal Extent of Contamination

The horizontal contamination extent is estimated by the curvilinear area formed by taking the contaminated borehole at the centre and the boundary joining the adjacent additional boreholes (i.e. which reveal no contamination), or along site boundary (i.e. Shenzhen meander). A software called “MicroStation” (i.e. common graphical software similar to “AutoCad”) was used to draw the curvilinear plan area in which the horizontal extent of contamination lies.

4.1.2 Estimation of Vertical Extent of Contamination

For such sample with contaminated laboratory testing results, the full depth of soil sampling is taken as contaminated. Besides, a depth of 0.5m above and below that sampling depth respectively will be taken as contaminated as a conservative estimate. For example, for the sampling depth of 3.0–3.5mgbl with contaminated laboratory testing finding, the vertical extent of contamination will be estimated from 2.5mgbl (i.e. 3mgbl - 0.5m) to 4mgbl (i.e. 3.5mgbl + 0.5m), and the vertical extent of contamination is therefore estimated as 1.5m.

4.1.3 Possible Soil Contamination Extent

Based on the methodology described in **Section 4.1.1**, the updated extents of the 5 plan areas in which the contaminated zones lie are shown in **Figure 4.1** and **Figures 4.1.1** to **4.1.5**.

According to the testing results, no updates on the vertical extents of soil contamination will be required except for boreholes A-S03a1 and A-S03c1 where Arsenic exceedances were detected at 4.5-4.95 mbgl and 1.5-1.95 mbgl respectively. The vertical extents of the soil contamination at these two boreholes have been estimated to be 4.0-5.5m at A-S03a1 and 1.0-2.5m at A-S03c1 with reference to the method described in **Section 4.1.2**. A-S03a1 and A-S03c1 have been considered as two additional contaminated boreholes and their respective estimated plan areas are shown in **Figures 4.1.2a** and **4.1.2b**.

Based on the soil contamination extent estimated, the updated order of quantity of contaminated soil, including those from A-S03a1 (4.5-4.95 mbgl) and A-S03c1 (1.5-1.95 mbgl) is summarised in **Table 4.1**.

Table 4.1 Estimation of the order of quantity of contaminated soil based on Stage 2 SI results

Contaminated Borehole/ Concerned Area ID	Borehole ID (Stage 2 SI)	Coordinates		Estimated Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m) ^[1]	Estimated Contaminated Area (m ²) ^[2]	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S01	A-S01a1	826258	842957	45	3.0 (2.5m-5.5m)	5,576	16,728
	A-S01b1	826287	842902	35			
	A-S01c1	826338	842918	44			
A-S03	A-S03a1	826587	842815	43	1.5 (2.5m-4.0m)	4,580	6,870
	A-S03b1	826618	842774	27			
	A-S03c1	826655	842757	51			
A-S20	A-S20a1	826321	842024	23	1.5 (2.5m-4.0m)	4,989	7,484
	A-S20b1	826304	842069	50			
	A-S20c1	826370	842064	41			
A-S24	A-S24a1	825798	841907	32	1.5 (2.5m-4.0m)	4,001	6,002
	A-S24b1	825851	841923	46			
	A-S24c1	825841	841857	34			
A-SG10	A-SG10a1	826037	841813	31	1.5 (4.0m-5.5m)	3,520	5,280
	A-SG10b1	825048	841852	43			
	A-SG10c1	826088	841837	34			
Sub-Total:						22,666	42,364
Estimated Quantity of Contaminated Materials at A-S03a1 & A-S03c1							
Contaminated Borehole/ Concerned Area ID	Borehole ID (Stage 1/2 SI)	Coordinates		Estimated Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²) ^[1]	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S03a1	A-S03a	526526	542839	48	1.5 (4.0-5.5m)	4,452	6,678
	A-S03b1	826618	842774	51			
	A-S03	826627	842800	43			
A-S03c1	A-S03c	826683	842715	50	1.5 (1.0-2.5m)	5,601	8,402
	A-S03b1	826618	842774	41			
	A-S03	826627	842800	51			
Sub-Total:						10,053	15,080
Total:							57,444

Note:

[1] For such sample with contamination detected, the full depth of soil sampling is taken as contaminated. Besides, a depth of 0.5m above and below that sampling depth respectively will be taken as contaminated as a conservative estimate. For example, for the sampling depth of 3.0–3.5mgbl with contaminated laboratory testing finding, the vertical extent of contamination will be estimated from 2.5mgbl (i.e. 3mgbl - 0.5m) to 4mgbl (i.e. 3.5mgbl + 0.5m), and the vertical extent of contamination is therefore estimated as 1.5m.

[2] The “Estimated Plan Area in which the Horizontal Contaminated Area (m²) Lies” was computed by a software call “MicroStation”. (i.e. common graphical software similar to “AutoCad”) as described in Section 6.1.1 in the endorsed CAR/RAP for Area A

4.2 Remediation Method

For the detailed remediation method for treating arsenic contaminated soil, please refer to Section 7 in the endorsed CAR/RAP for Area A.

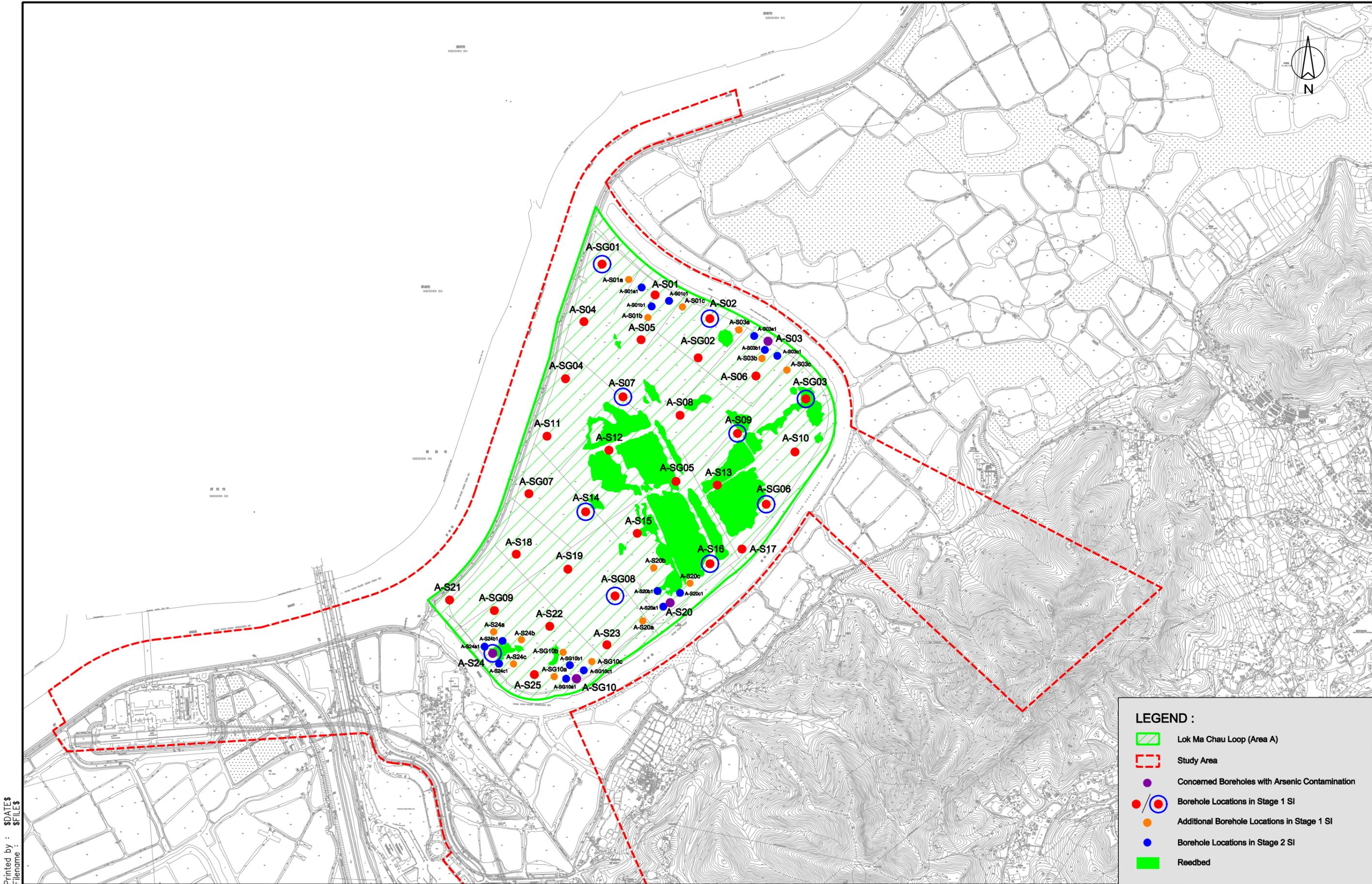
5 Conclusion and Recommendation

To confirm the possible soil contamination extent within Area A, a Stage 2 SI were conducted between 27 May 2011 and 2 July 2011 which involved sampling and testing of soil samples from 15 boreholes at the same sampling depth intervals (i.e. 1.5m, 3.0m, and 4.5m) as in Stage 1 SI.

According to the testing results, no further Arsenic exceedances were found at the sampling depths where such contamination was detected previously in Stage I SI. However, Arsenic concentrations in the soil samples collected from A-S03a1 at 4.5-4.95 mgbl and from A-S03c1 at 1.5-1.95 mgbl have marginally exceeded the RBRGs of Rural Residential land uses. These two boreholes were considered as two additional contaminated boreholes and their respective possible contamination zones have been estimated.

Based on the Stage 2 SI results, the possible soil contamination extent within Area A have been updated and the quantity of contaminated soil was estimated to be 57,443 m³ (including those from A-S03a1 and A-S03c1). Remediation of the contaminated soil will be conducted as stipulated in the endorsed CAR/RAP for Area A.

Figures



Printed by : \$DATE\$
 Filename : \$FILE\$

LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Boreholes with Arsenic Contamination
- Borehole Locations in Stage 1 SI
- Additional Borehole Locations in Stage 1 SI
- Borehole Locations in Stage 2 SI
- Reebed



Job Title
Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation

Drawing Title
Locations of As-built Sampling Boreholes in Area A

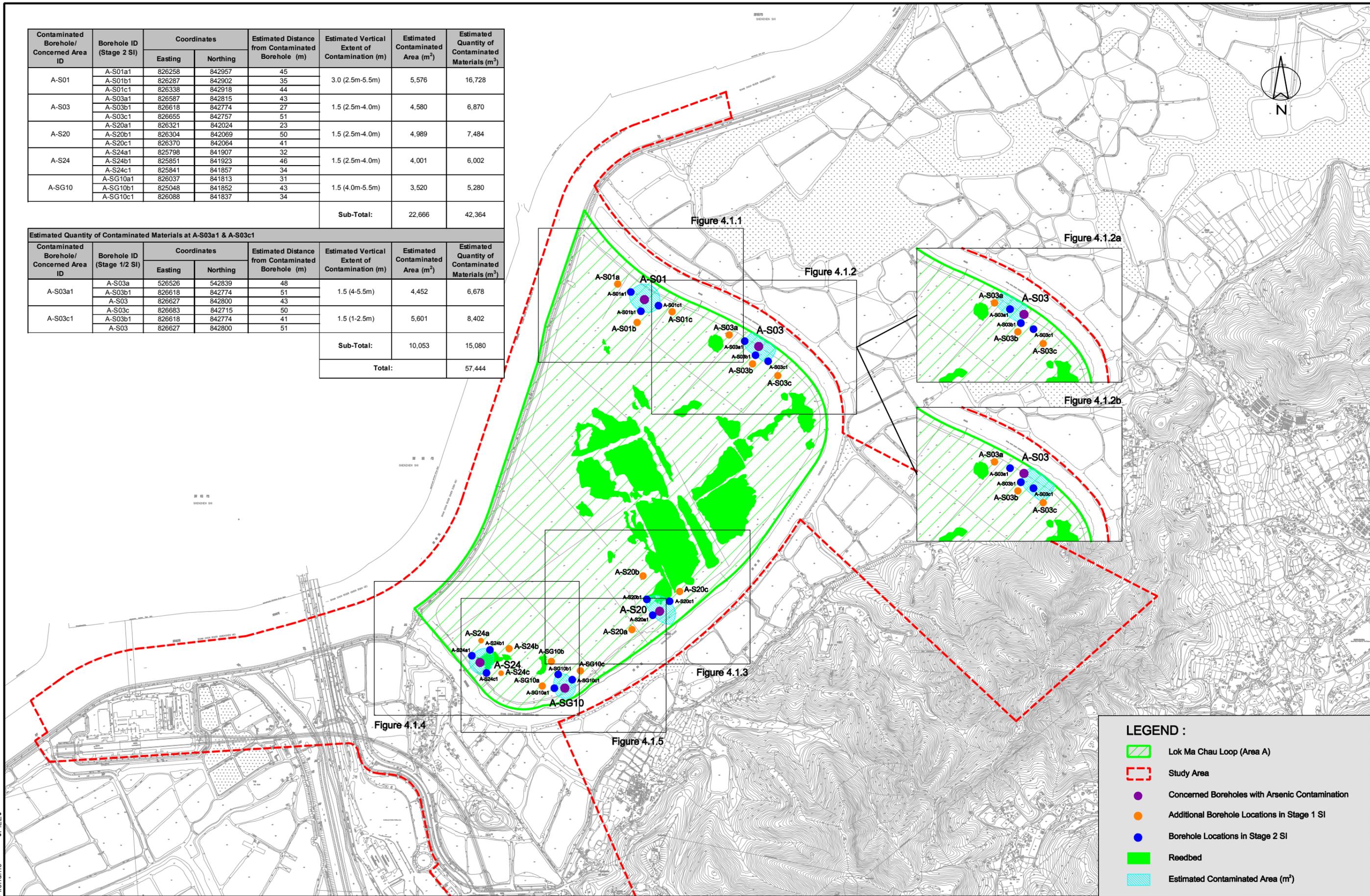
Rev	Description	Date
	FIRST ISSUE	07/11

Drawn	AC	Date	07/11
Checked	TC	Approved	ST
Scale	1:10000 ON A3		

Drawing No.
Figure 2.1
 Rev.

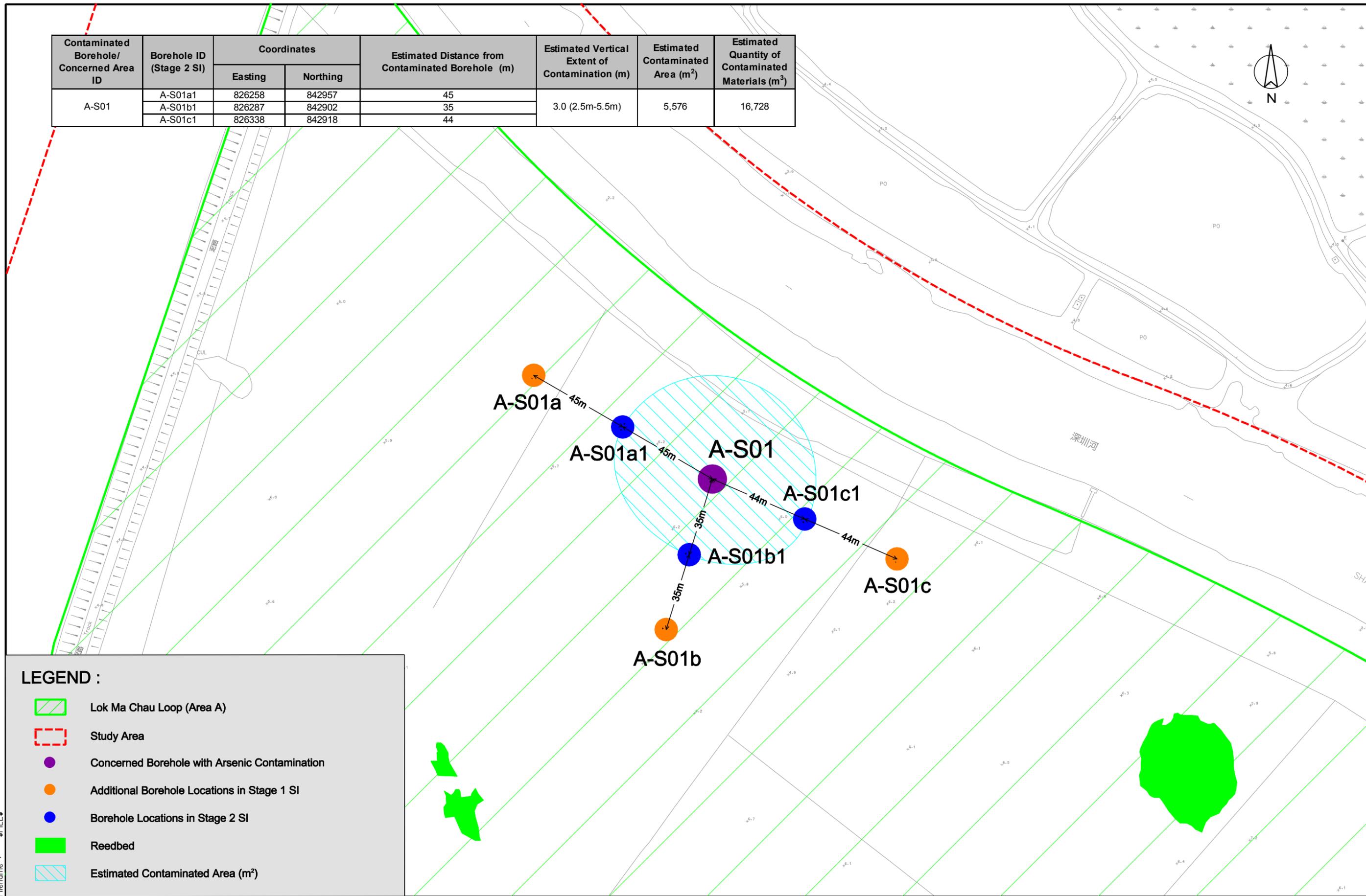
Contaminated Borehole/ Concerned Area ID	Borehole ID (Stage 2 SI)	Coordinates		Estimated Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S01	A-S01a1	826258	842957	45	3.0 (2.5m-5.5m)	5,576	16,728
	A-S01b1	826287	842902	35			
	A-S01c1	826338	842918	44			
A-S03	A-S03a1	826587	842815	43	1.5 (2.5m-4.0m)	4,580	6,870
	A-S03b1	826618	842774	27			
	A-S03c1	826655	842757	51			
A-S20	A-S20a1	826321	842024	23	1.5 (2.5m-4.0m)	4,989	7,484
	A-S20b1	826304	842069	50			
	A-S20c1	826370	842064	41			
A-S24	A-S24a1	825798	841907	32	1.5 (2.5m-4.0m)	4,001	6,002
	A-S24b1	825851	841923	46			
	A-S24c1	825841	841857	34			
A-SG10	A-SG10a1	826037	841813	31	1.5 (4.0m-5.5m)	3,520	5,280
	A-SG10b1	825048	841852	43			
	A-SG10c1	826088	841837	34			
Sub-Total:						22,666	42,364

Estimated Quantity of Contaminated Materials at A-S03a1 & A-S03c1							
Contaminated Borehole/ Concerned Area ID	Borehole ID (Stage 1/2 SI)	Coordinates		Estimated Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S03a1	A-S03a	526526	542839	48	1.5 (4-5.5m)	4,452	6,678
	A-S03b1	826618	842774	51			
	A-S03	826627	842800	43			
A-S03c1	A-S03c	826683	842715	50	1.5 (1-2.5m)	5,601	8,402
	A-S03b1	826618	842774	41			
	A-S03	826627	842800	51			
Sub-Total:						10,053	15,080
Total:							57,444



Printed by : \$DATES\$
Filename : \$FILE\$

Contaminated Borehole/ Concerned Area ID	Borehole ID (Stage 2 SI)	Coordinates		Estimated Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S01	A-S01a1	826258	842957	45	3.0 (2.5m-5.5m)	5,576	16,728
	A-S01b1	826287	842902	35			
	A-S01c1	826338	842918	44			

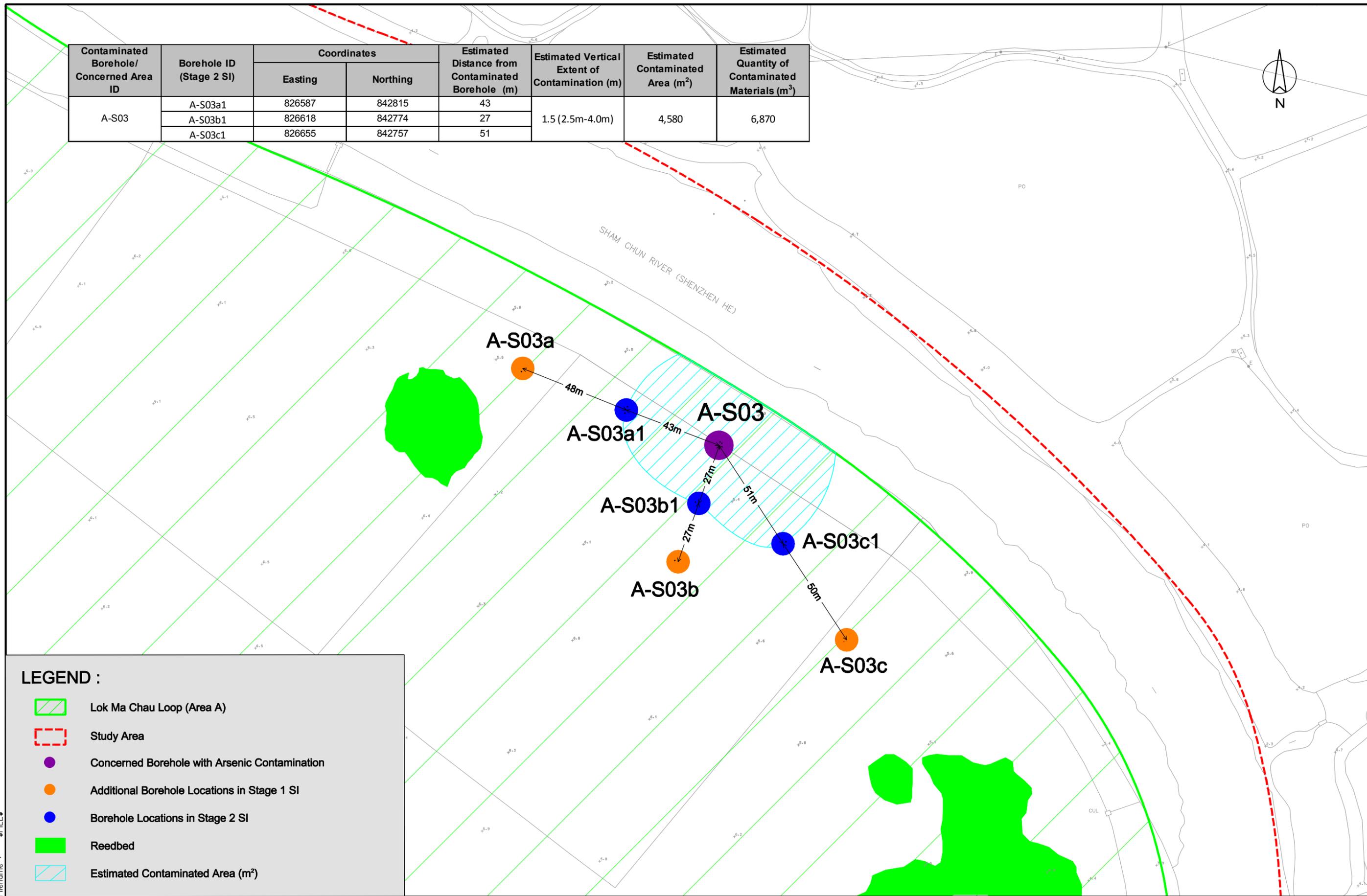


LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Borehole with Arsenic Contamination
- Additional Borehole Locations in Stage 1 SI
- Borehole Locations in Stage 2 SI
- Reedbed
- Estimated Contaminated Area (m²)

Printed by : \$DATE\$
Filename : \$FILE\$

Contaminated Borehole/ Concerned Area ID	Borehole ID (Stage 2 SI)	Coordinates		Estimated Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S03	A-S03a1	826587	842815	43	1.5 (2.5m-4.0m)	4,580	6,870
	A-S03b1	826618	842774	27			
	A-S03c1	826655	842757	51			

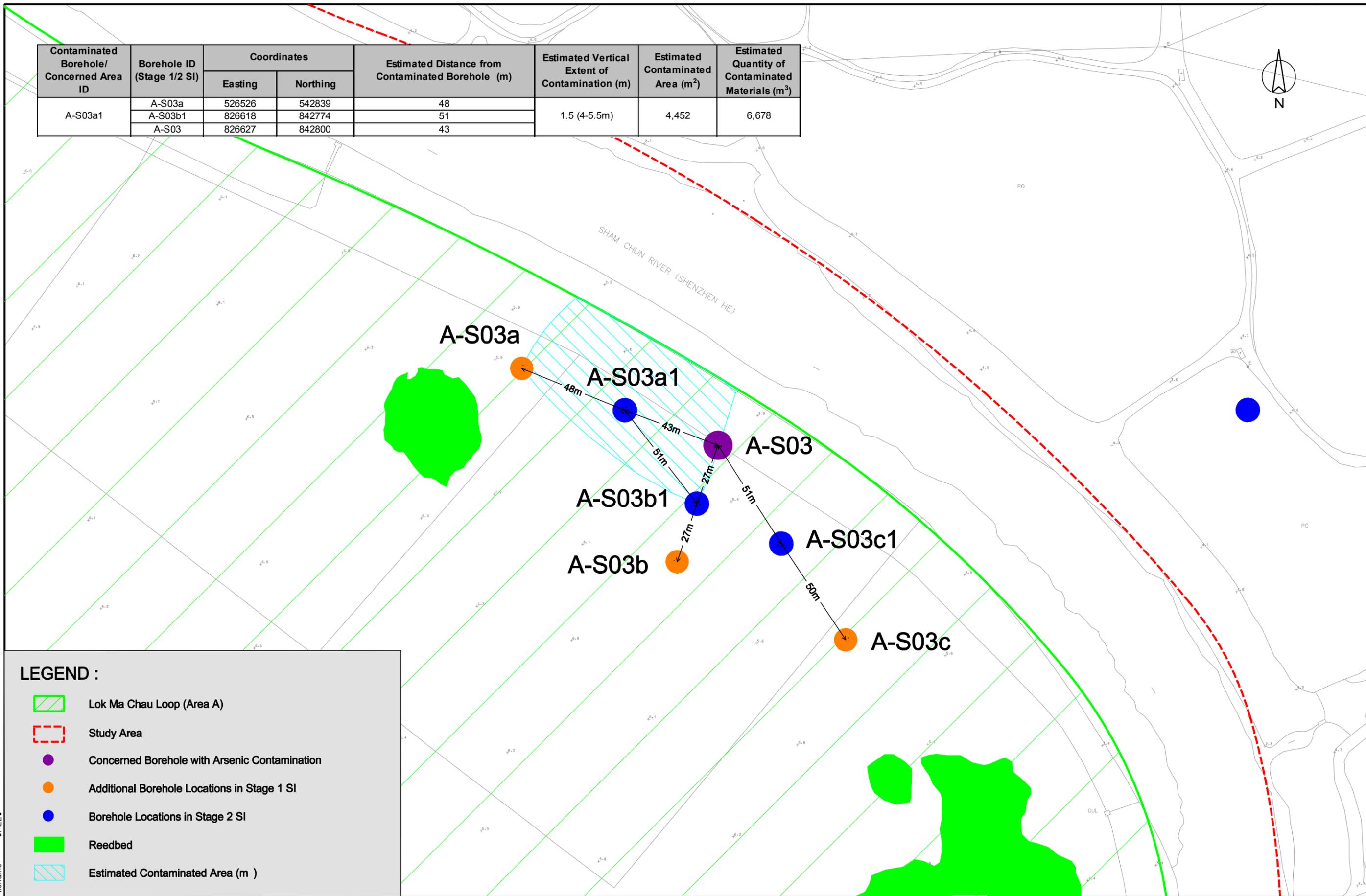


LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Borehole with Arsenic Contamination
- Additional Borehole Locations in Stage 1 SI
- Borehole Locations in Stage 2 SI
- Reedbed
- Estimated Contaminated Area (m²)

Printed by : \$DATES\$
Filename : \$FILE\$

Contaminated Borehole/ Concerned Area ID	Borehole ID (Stage 1/2 SI)	Coordinates		Estimated Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S03a1	A-S03a	526526	542839	48	1.5 (4-5.5m)	4,452	6,678
	A-S03b1	826618	842774	51			
	A-S03	826627	842800	43			

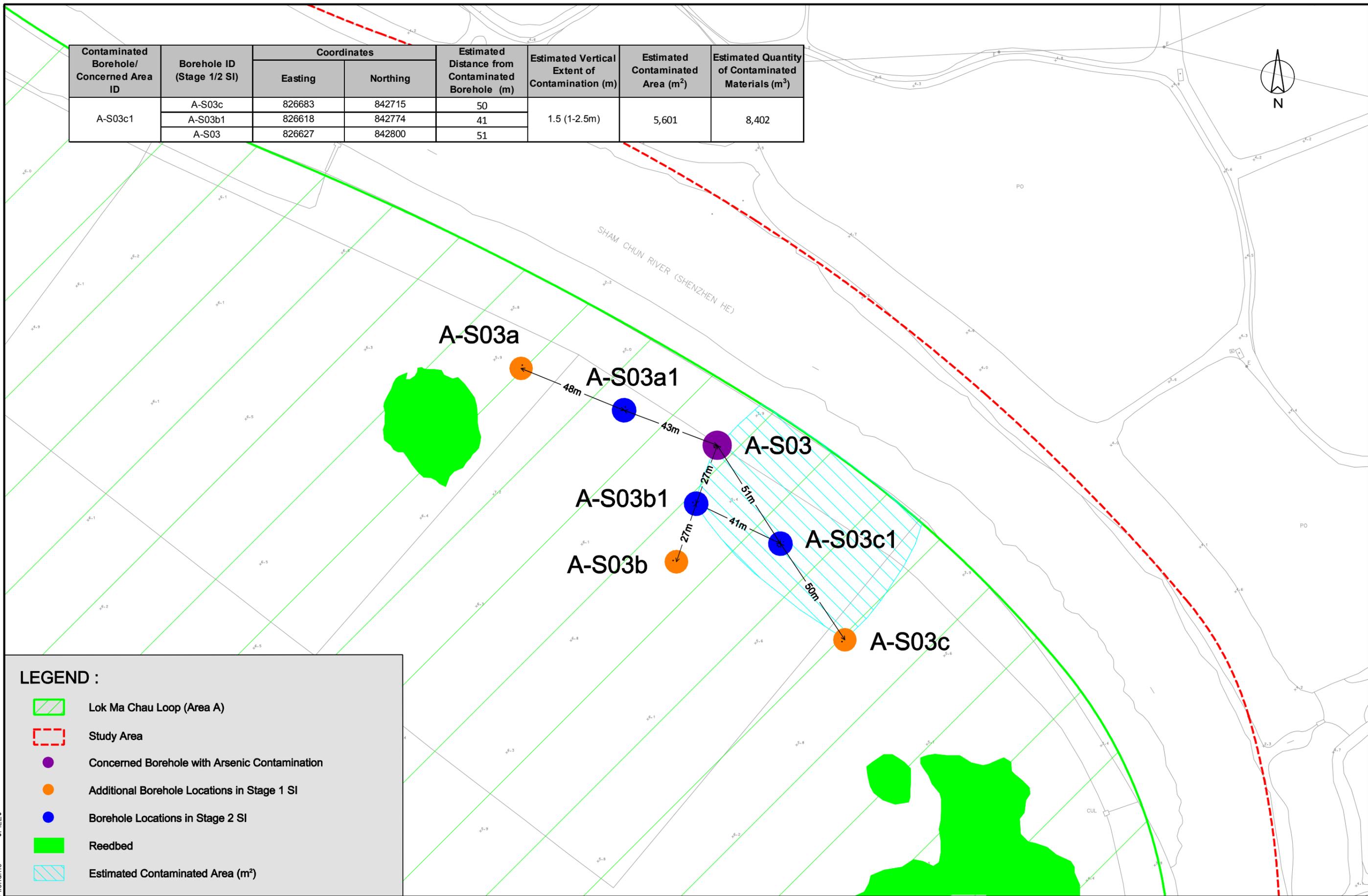


LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Borehole with Arsenic Contamination
- Additional Borehole Locations in Stage 1 SI
- Borehole Locations in Stage 2 SI
- Reedbed
- Estimated Contaminated Area (m)

Printed by : \$DATE\$
Filename : \$FILE\$

Contaminated Borehole/ Concerned Area ID	Borehole ID (Stage 1/2 SI)	Coordinates		Estimated Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S03c1	A-S03c	826683	842715	50	1.5 (1-2.5m)	5,601	8,402
	A-S03b1	826618	842774	41			
	A-S03	826627	842800	51			



LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Borehole with Arsenic Contamination
- Additional Borehole Locations in Stage 1 SI
- Borehole Locations in Stage 2 SI
- Reedbed
- Estimated Contaminated Area (m²)

Printed by : \$DATES\$
Filename : \$FILE\$



Job Title
Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation

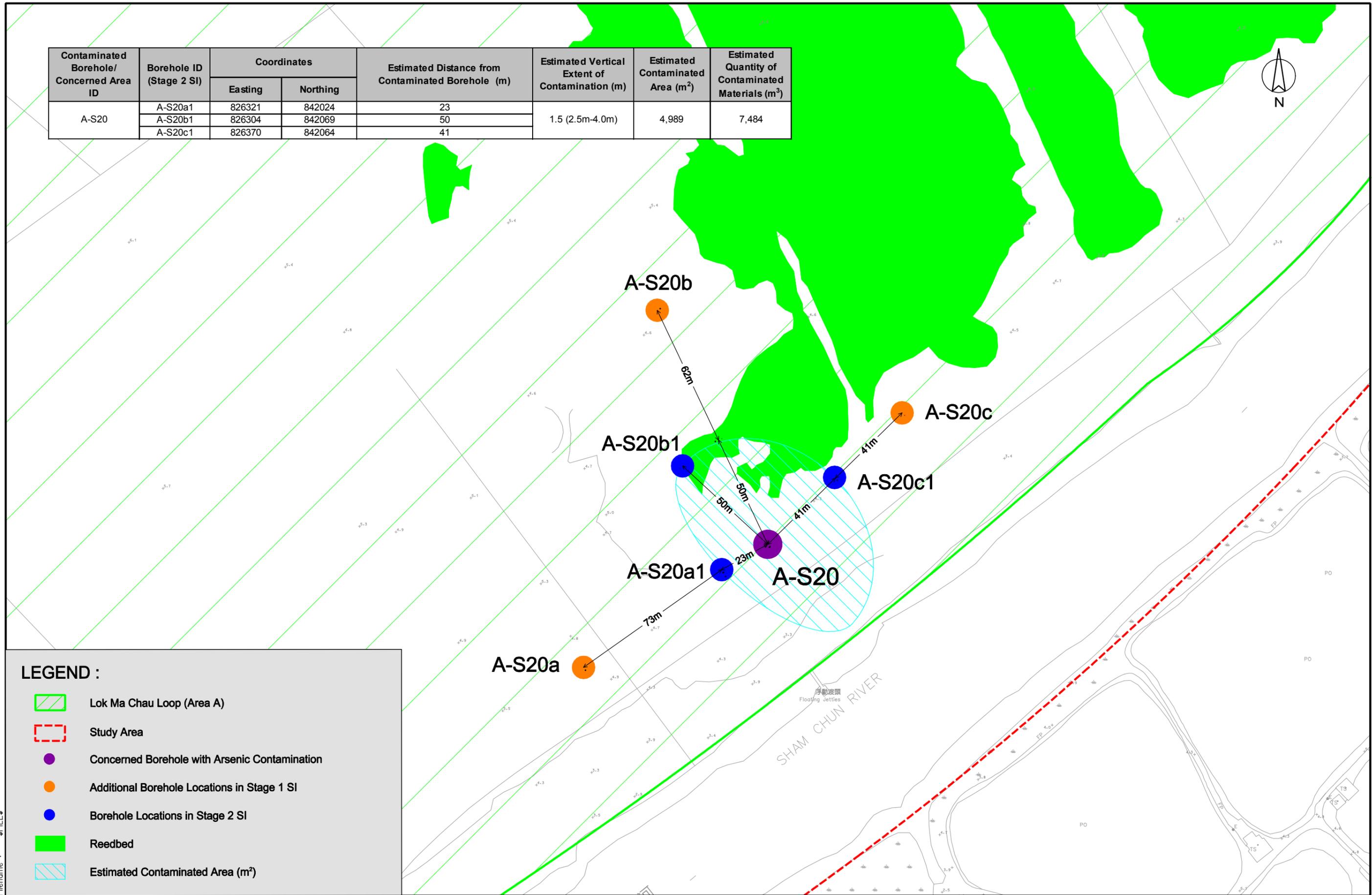
Drawing Title
Location of Contaminated Zone at A-S03c1

Rev	Description	Date

Drawn	LK	Date	07/11
Checked	TC	Approved	ST
Scale	1:1500 ON A3		

Drawing No.	Figure 4.1.2b
Rev.	

Contaminated Borehole/ Concerned Area ID	Borehole ID (Stage 2 SI)	Coordinates		Estimated Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S20	A-S20a1	826321	842024	23	1.5 (2.5m-4.0m)	4,989	7,484
	A-S20b1	826304	842069	50			
	A-S20c1	826370	842064	41			

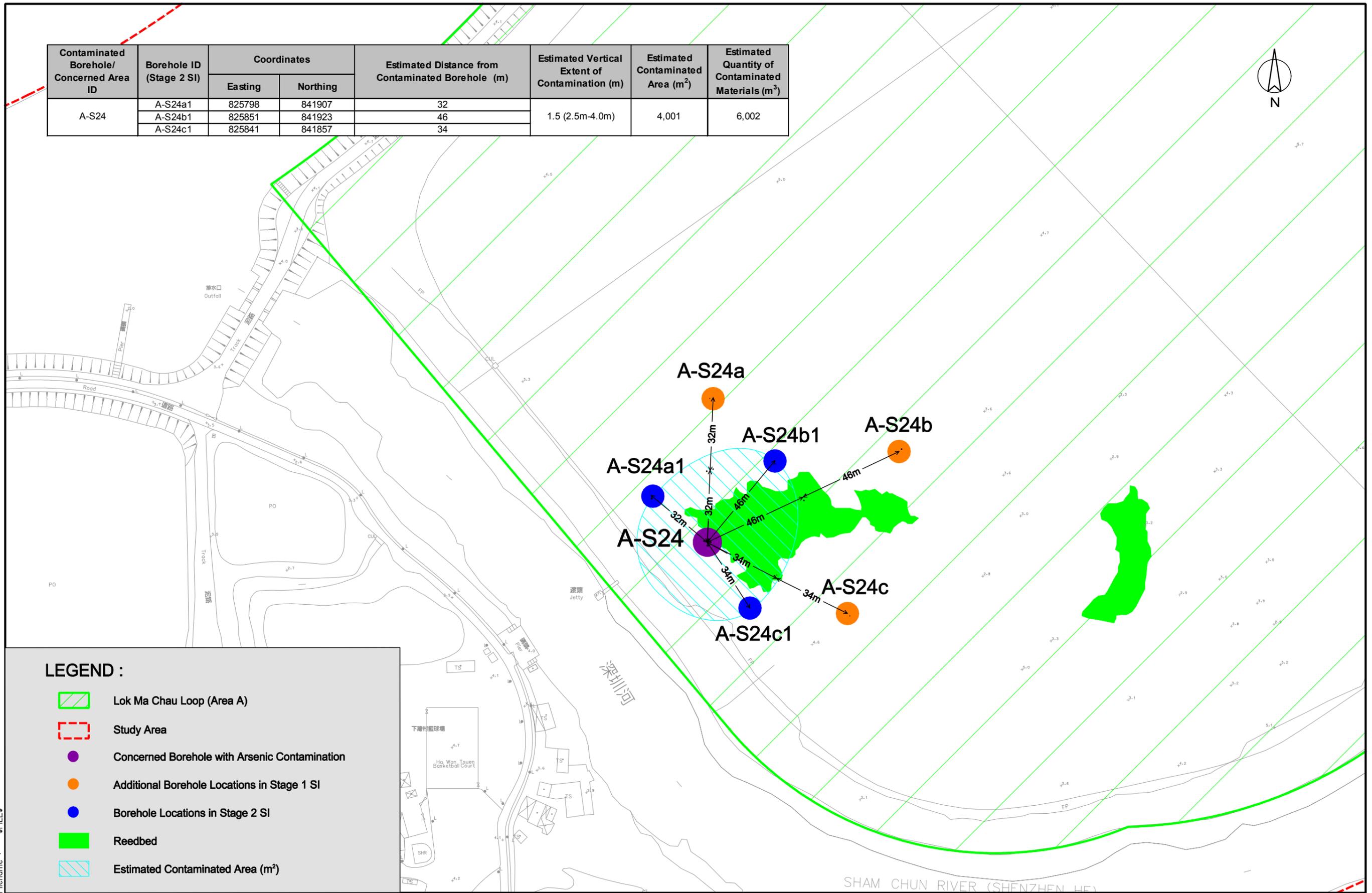


LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Borehole with Arsenic Contamination
- Additional Borehole Locations in Stage 1 SI
- Borehole Locations in Stage 2 SI
- Reedbed
- Estimated Contaminated Area (m²)

Printed by : \$DATE\$
Filename : \$FILE\$

Contaminated Borehole/ Concerned Area ID	Borehole ID (Stage 2 SI)	Coordinates		Estimated Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S24	A-S24a1	825798	841907	32	1.5 (2.5m-4.0m)	4,001	6,002
	A-S24b1	825851	841923	46			
	A-S24c1	825841	841857	34			



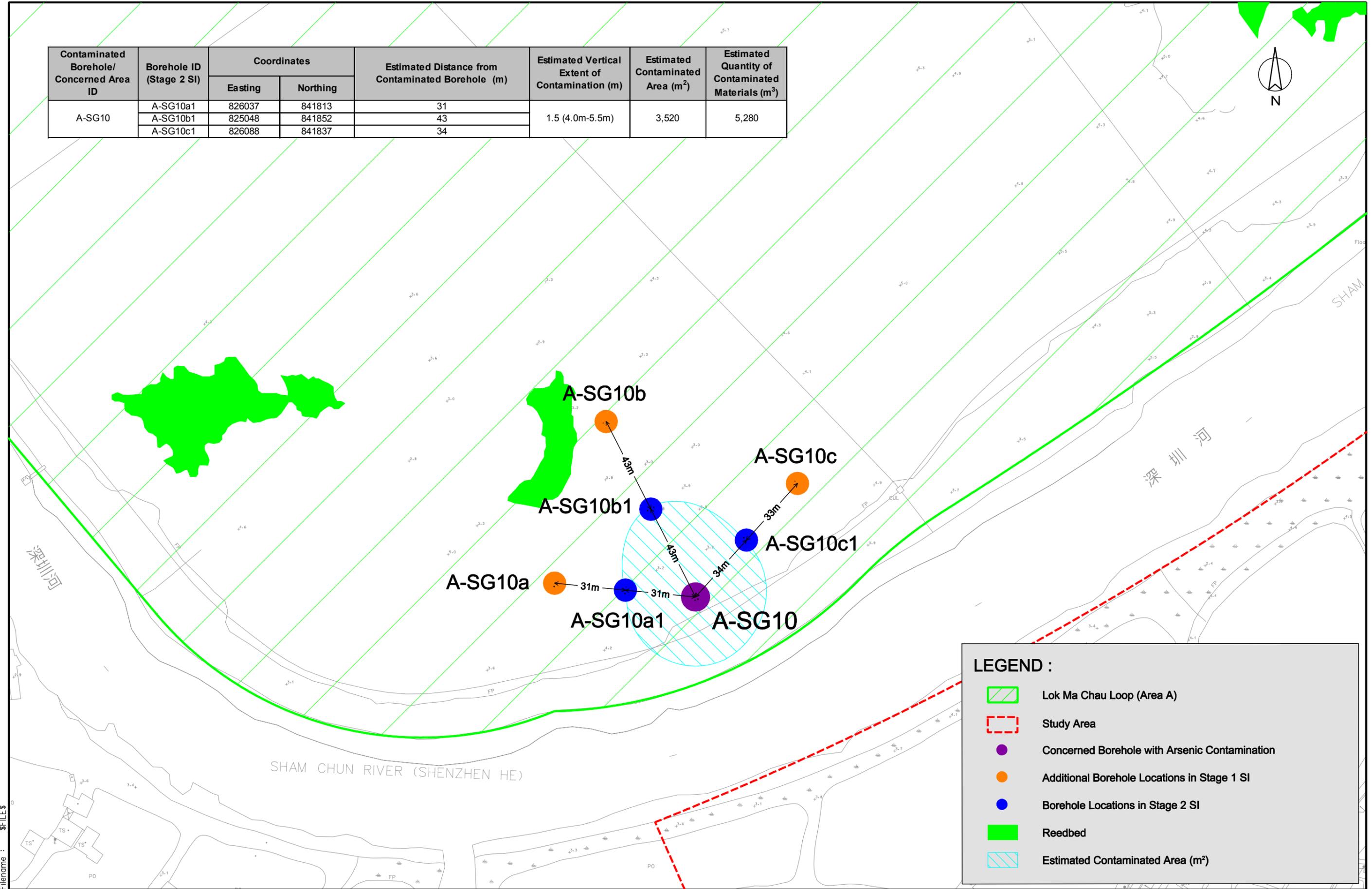
LEGEND :

-  Lok Ma Chau Loop (Area A)
-  Study Area
-  Concerned Borehole with Arsenic Contamination
-  Additional Borehole Locations in Stage 1 SI
-  Borehole Locations in Stage 2 SI
-  Reedbed
-  Estimated Contaminated Area (m²)

Printed by : \$DATE\$
Filename : \$FILE\$

 土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	 規劃署 PLANNING DEPARTMENT	 Ove Arup & Partners Hong Kong Limited	Job Title Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation	Drawing Title Location of Contaminated Zone at A-S24	Drawn LK Date 07/11	Drawing No. Figure 4.1.4
					Checked TC Approved ST	
FIRST ISSUE 07/11 Scale 1:1500 ON A3					Date	Rev.

Contaminated Borehole/ Concerned Area ID	Borehole ID (Stage 2 SI)	Coordinates		Estimated Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-SG10	A-SG10a1	826037	841813	31	1.5 (4.0m-5.5m)	3,520	5,280
	A-SG10b1	825048	841852	43			
	A-SG10c1	826088	841837	34			



LEGEND :

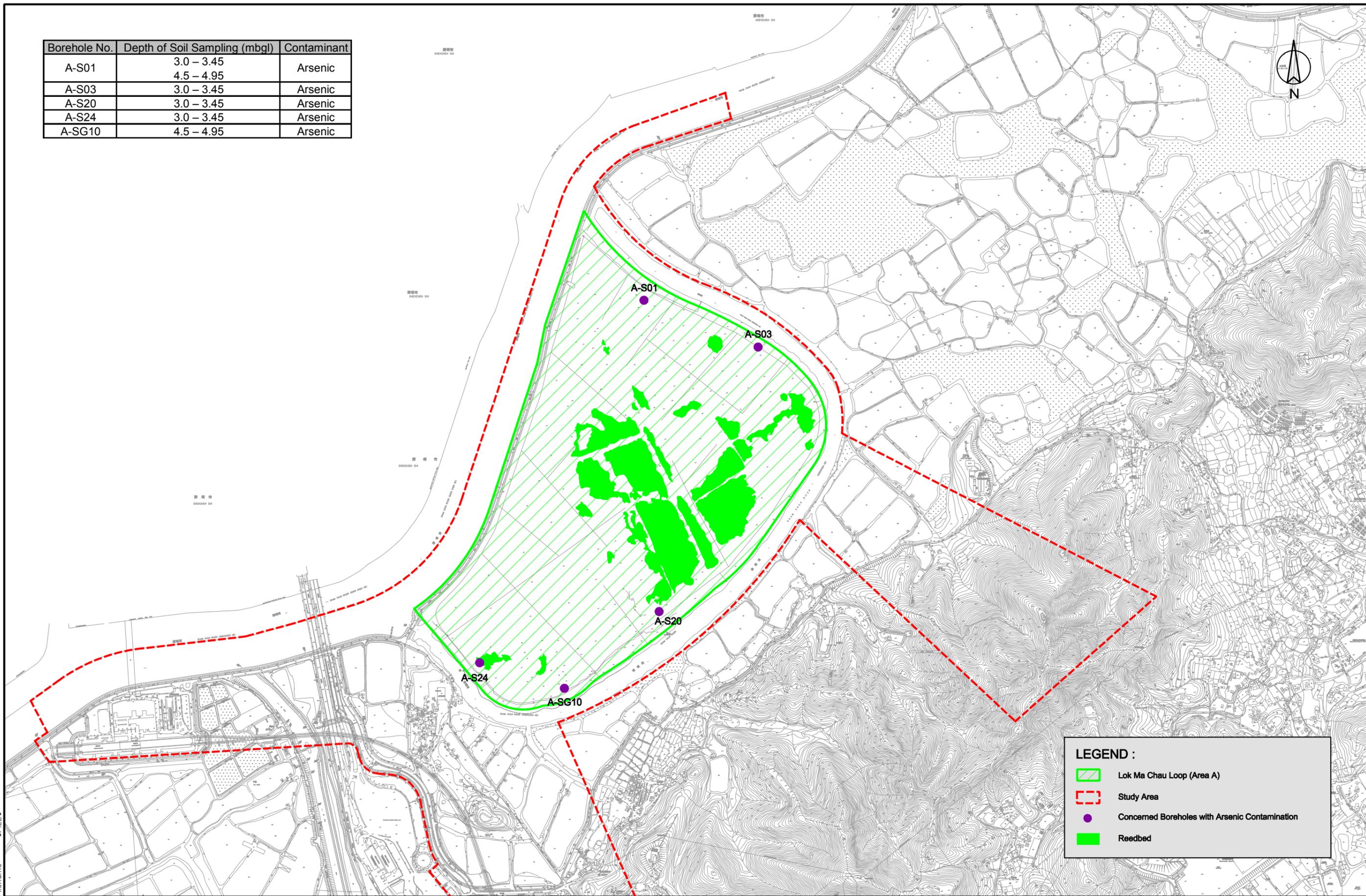
- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Borehole with Arsenic Contamination
- Additional Borehole Locations in Stage 1 SI
- Borehole Locations in Stage 2 SI
- Reedbed
- Estimated Contaminated Area (m²)

Printed by : \$DATES\$
Filename : \$FILE\$

Appendix A

Figures Extracted from
Contamination Assessment
Report and Remediation Action
Plan for Area A July 2010

Borehole No.	Depth of Soil Sampling (mbgl)	Contaminant
A-S01	3.0 – 3.45 4.5 – 4.95	Arsenic
A-S03	3.0 – 3.45	Arsenic
A-S20	3.0 – 3.45	Arsenic
A-S24	3.0 – 3.45	Arsenic
A-SG10	4.5 – 4.95	Arsenic

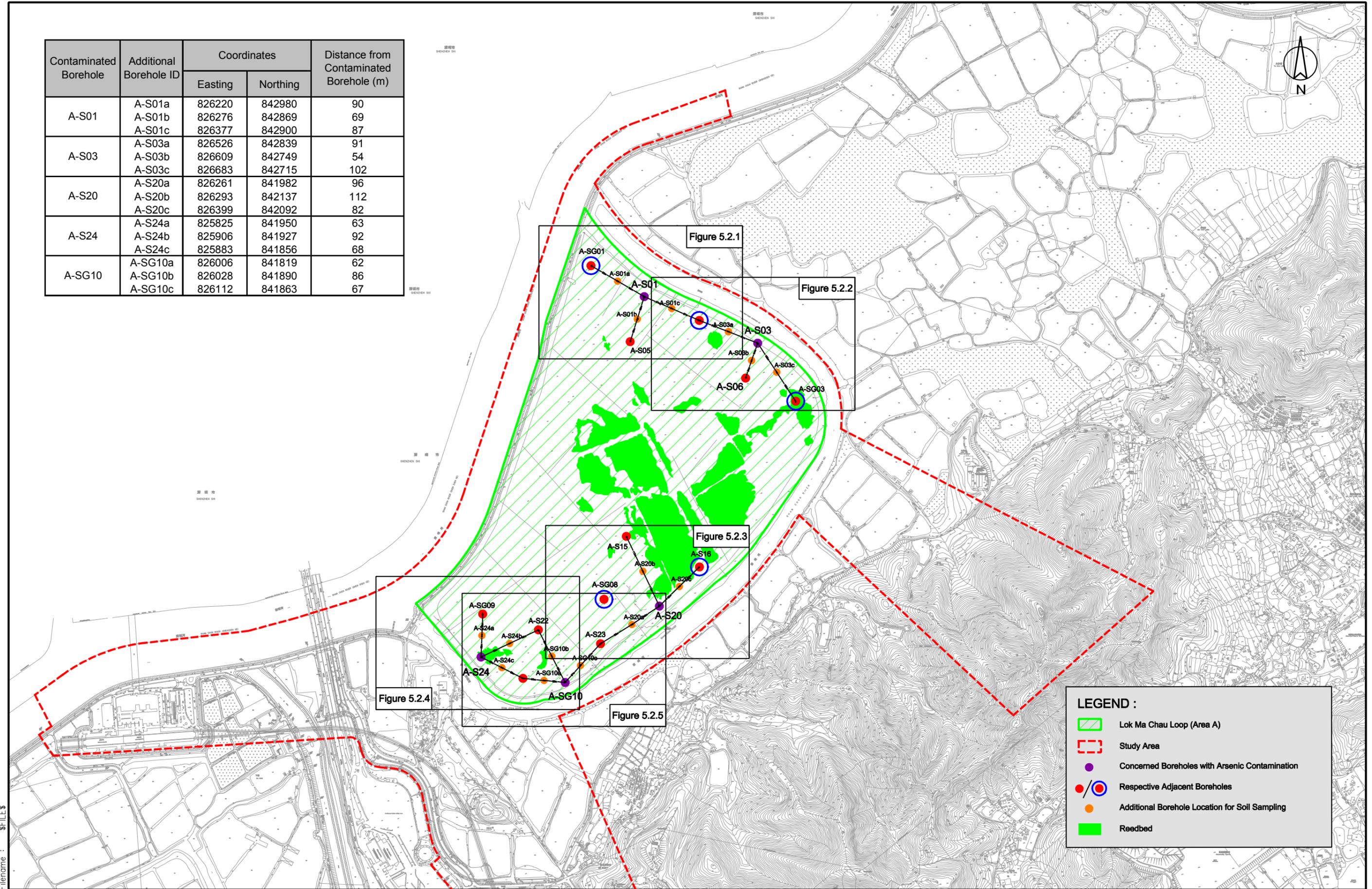


LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Boreholes with Arsenic Contamination
- Reedbed

Printed by : \$DATES\$
Filename : \$FILE\$

Contaminated Borehole	Additional Borehole ID	Coordinates		Distance from Contaminated Borehole (m)
		Easting	Northing	
A-S01	A-S01a	826220	842980	90
	A-S01b	826276	842869	69
	A-S01c	826377	842900	87
A-S03	A-S03a	826526	842839	91
	A-S03b	826609	842749	54
	A-S03c	826683	842715	102
A-S20	A-S20a	826261	841982	96
	A-S20b	826293	842137	112
	A-S20c	826399	842092	82
A-S24	A-S24a	825825	841950	63
	A-S24b	825906	841927	92
	A-S24c	825883	841856	68
A-SG10	A-SG10a	826006	841819	62
	A-SG10b	826028	841890	86
	A-SG10c	826112	841863	67

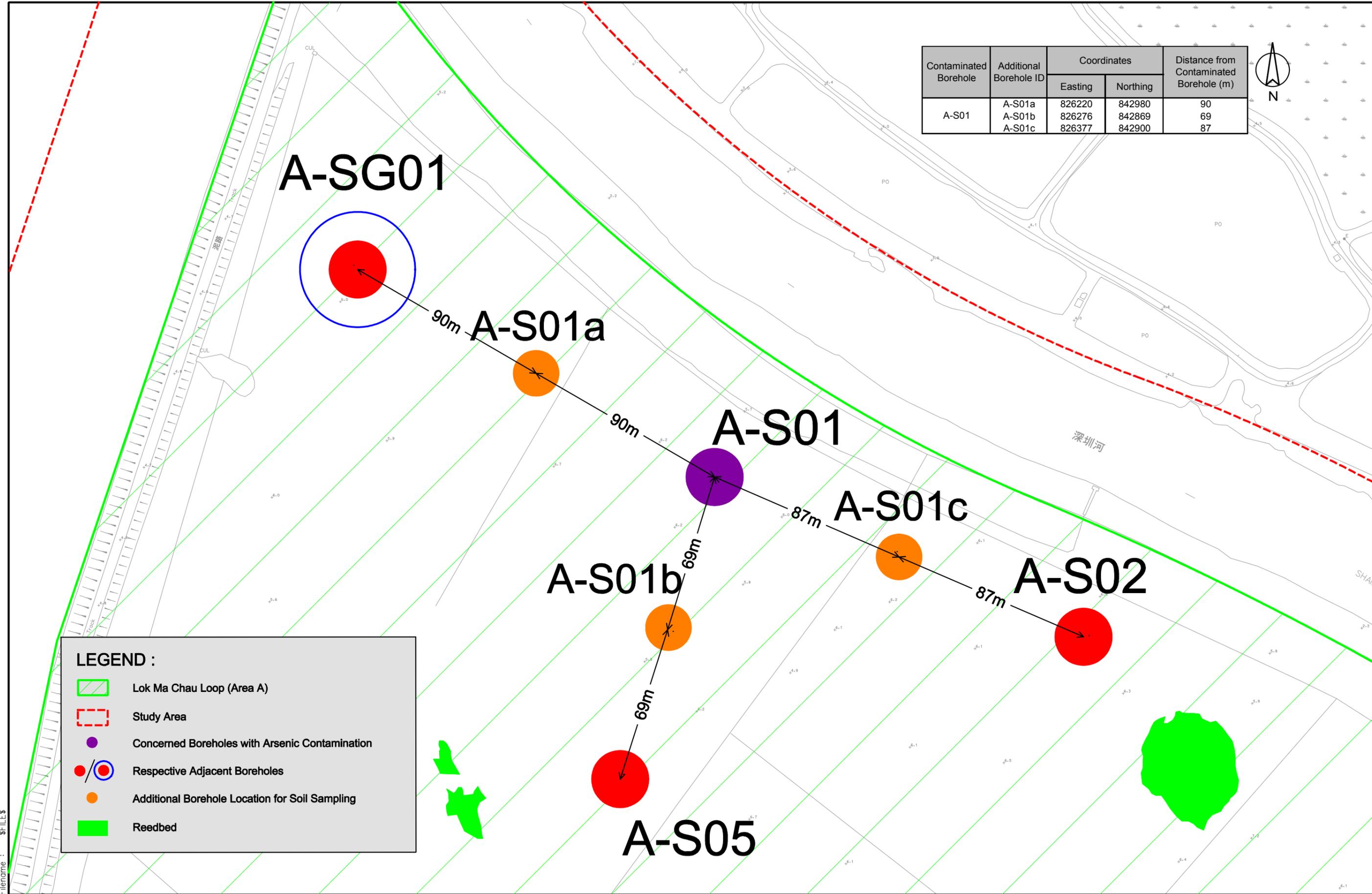


LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Boreholes with Arsenic Contamination
- Respective Adjacent Boreholes
- Additional Borehole Location for Soil Sampling
- Reedbed

Printed by : \$DATES\$
 Filename : \$FILE\$

Contaminated Borehole	Additional Borehole ID	Coordinates		Distance from Contaminated Borehole (m)
		Easting	Northing	
A-S01	A-S01a	826220	842980	90
	A-S01b	826276	842869	69
	A-S01c	826377	842900	87

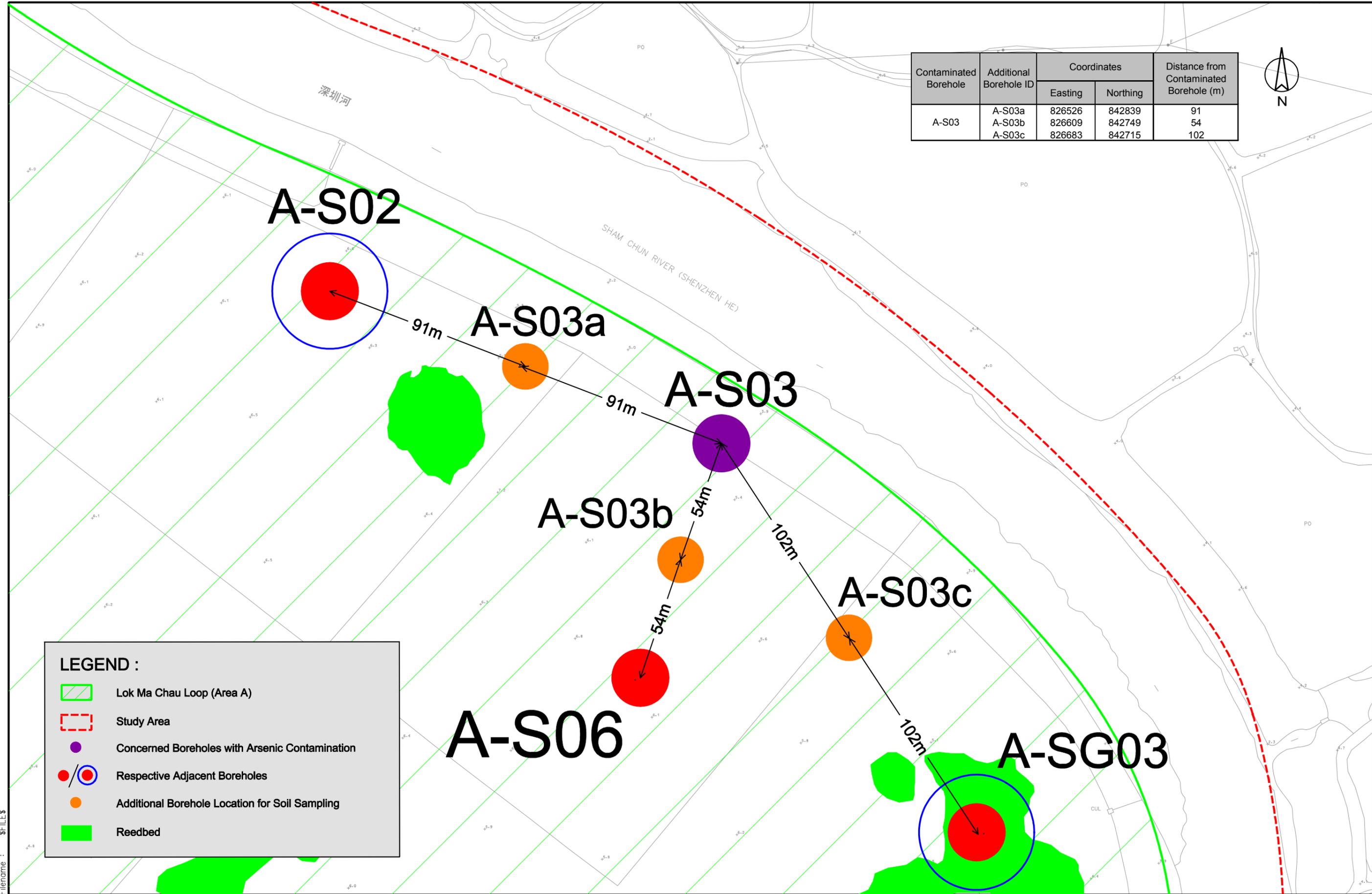


LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Boreholes with Arsenic Contamination
- Respective Adjacent Boreholes
- Additional Borehole Location for Soil Sampling
- Reedbed

Printed by : \$DATES\$
Filename : \$FILE\$

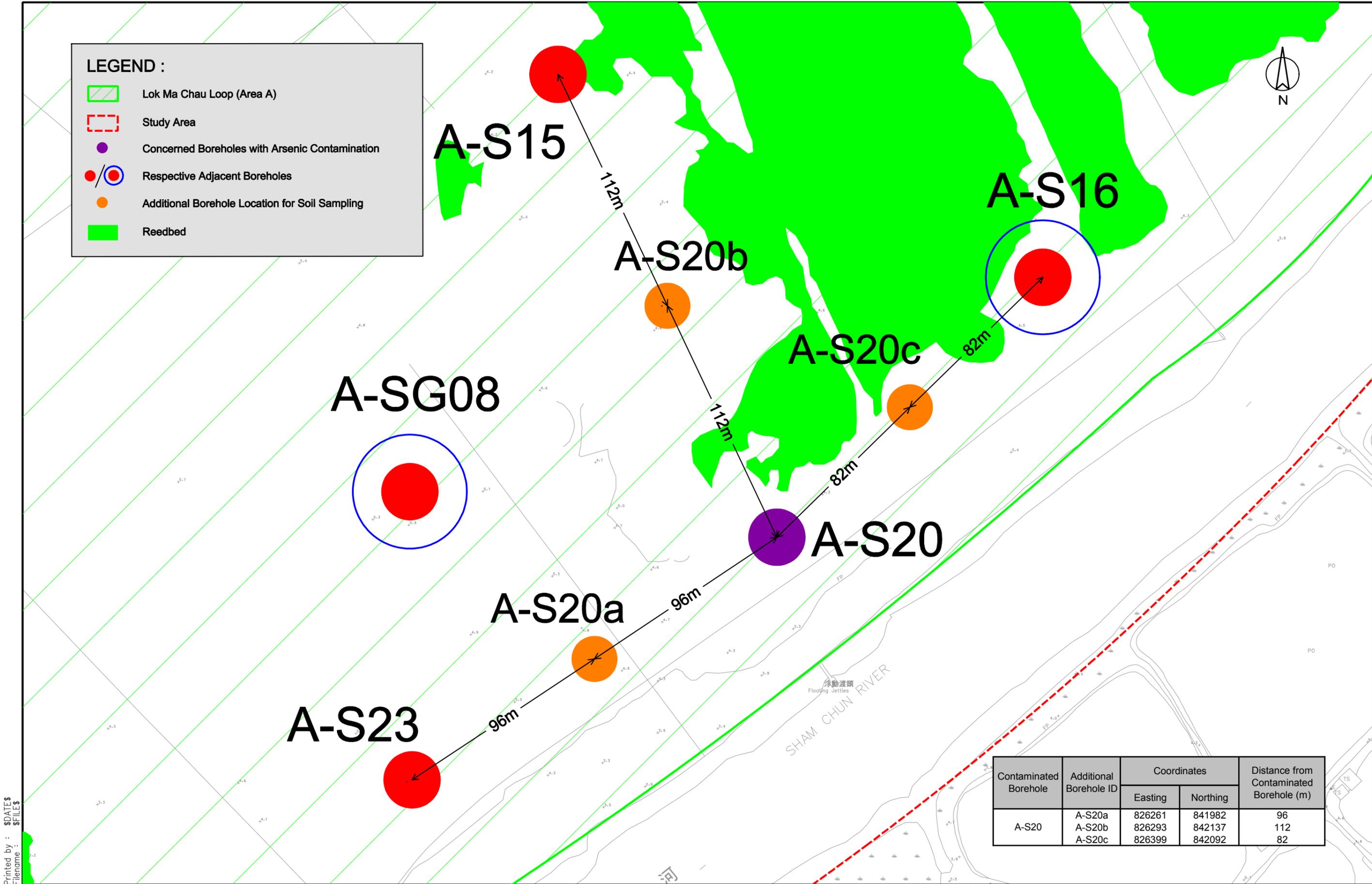
Contaminated Borehole	Additional Borehole ID	Coordinates		Distance from Contaminated Borehole (m)
		Easting	Northing	
A-S03	A-S03a	826526	842839	91
	A-S03b	826609	842749	54
	A-S03c	826683	842715	102



LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Boreholes with Arsenic Contamination
- Respective Adjacent Boreholes
- Additional Borehole Location for Soil Sampling
- Reedbed

Printed by : \$DATES\$
 Filename : \$FILE\$



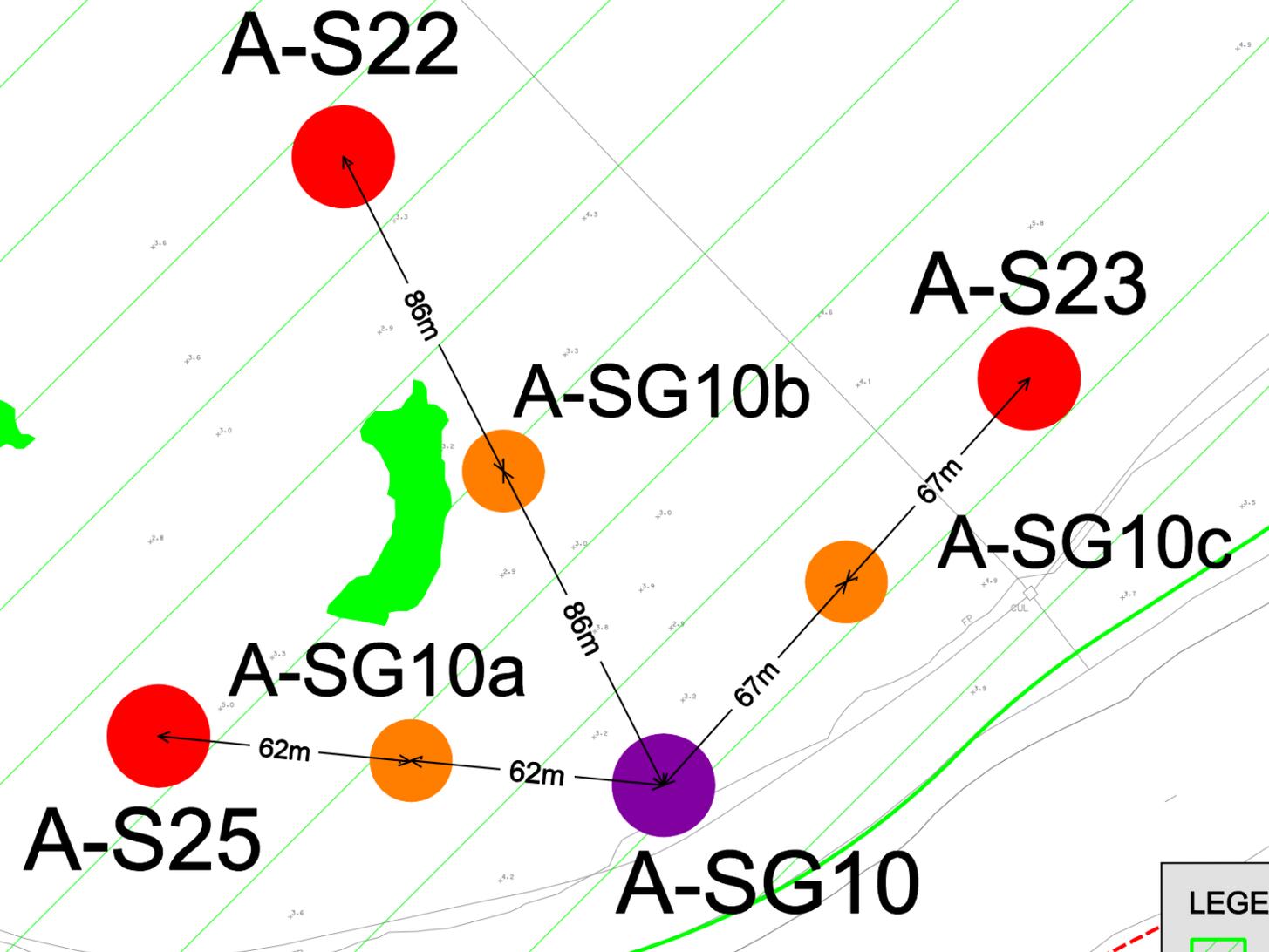
LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Boreholes with Arsenic Contamination
- / ● Respective Adjacent Boreholes
- Additional Borehole Location for Soil Sampling
- Reedbed

Contaminated Borehole	Additional Borehole ID	Coordinates		Distance from Contaminated Borehole (m)
		Easting	Northing	
A-S20	A-S20a	826261	841982	96
	A-S20b	826293	842137	112
	A-S20c	826399	842092	82

Printed by : \$DATES\$
Filename : \$FILE\$

Contaminated Borehole	Additional Borehole ID	Coordinates		Distance from Contaminated Borehole (m)
		Easting	Northing	
A-SG10	A-SG10a	826006	841819	62
	A-SG10b	826028	841890	86
	A-SG10c	826112	841863	67



LEGEND :

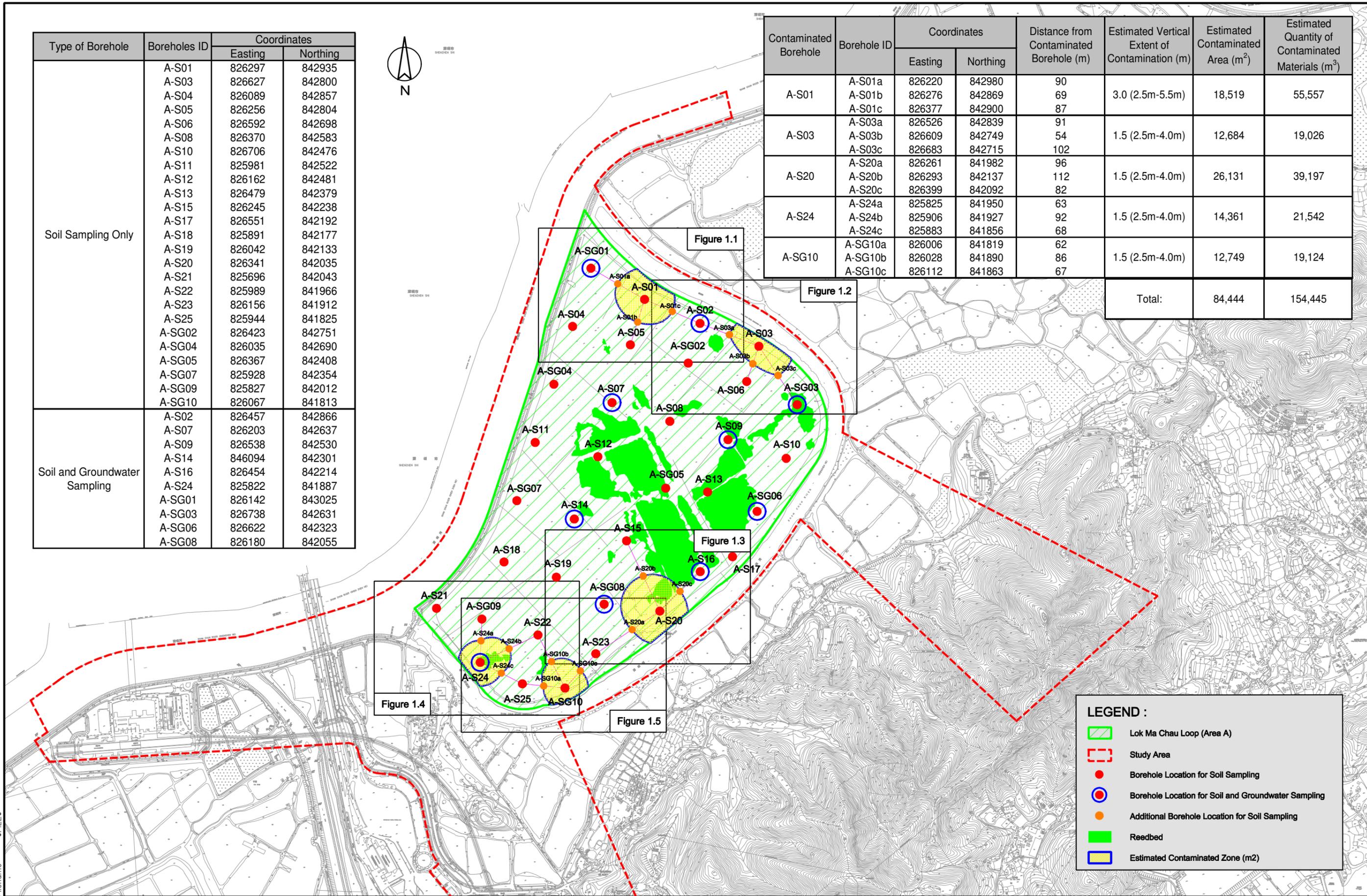
- Lok Ma Chau Loop (Area A)
- Study Area
- Concerned Boreholes with Arsenic Contamination
- Respective Adjacent Boreholes
- Additional Borehole Location for Soil Sampling
- Reedbed

Printed by : \$DATES\$
Filename : \$FILE\$

Type of Borehole	Boreholes ID	Coordinates	
		Easting	Northing
Soil Sampling Only	A-S01	826297	842935
	A-S03	826627	842800
	A-S04	826089	842857
	A-S05	826256	842804
	A-S06	826592	842698
	A-S08	826370	842583
	A-S10	826706	842476
	A-S11	825981	842522
	A-S12	826162	842481
	A-S13	826479	842379
	A-S15	826245	842238
	A-S17	826551	842192
	A-S18	825891	842177
	A-S19	826042	842133
	A-S20	826341	842035
	A-S21	825696	842043
	A-S22	825989	841966
	A-S23	826156	841912
	A-S25	825944	841825
	A-SG02	826423	842751
	A-SG04	826035	842690
	A-SG05	826367	842408
	A-SG07	825928	842354
	A-SG09	825827	842012
	A-SG10	826067	841813
Soil and Groundwater Sampling	A-S02	826457	842866
	A-S07	826203	842637
	A-S09	826538	842530
	A-S14	846094	842301
	A-S16	826454	842214
	A-S24	825822	841887
	A-SG01	826142	843025
	A-SG03	826738	842631
	A-SG06	826622	842323
	A-SG08	826180	842055



Contaminated Borehole	Borehole ID	Coordinates		Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S01	A-S01a	826220	842980	90	3.0 (2.5m-5.5m)	18,519	55,557
	A-S01b	826276	842869	69			
	A-S01c	826377	842900	87			
A-S03	A-S03a	826526	842839	91	1.5 (2.5m-4.0m)	12,684	19,026
	A-S03b	826609	842749	54			
	A-S03c	826683	842715	102			
A-S20	A-S20a	826261	841982	96	1.5 (2.5m-4.0m)	26,131	39,197
	A-S20b	826293	842137	112			
	A-S20c	826399	842092	82			
A-S24	A-S24a	825825	841950	63	1.5 (2.5m-4.0m)	14,361	21,542
	A-S24b	825906	841927	92			
	A-S24c	825883	841856	68			
A-SG10	A-SG10a	826006	841819	62	1.5 (2.5m-4.0m)	12,749	19,124
	A-SG10b	826028	841890	86			
	A-SG10c	826112	841863	67			
Total:						84,444	154,445



LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Borehole Location for Soil Sampling
- Borehole Location for Soil and Groundwater Sampling
- Additional Borehole Location for Soil Sampling
- Reebed
- Estimated Contaminated Zone (m2)

Printed by : \$DATES\$
Filename : \$FILES\$



Contaminated Borehole	Borehole ID	Coordinates		Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S01	A-S01a	826220	842980	90	3.0 (2.5m-5.5m)	18,519	55,557
	A-S01b	826276	842869	69			
	A-S01c	826377	842900	87			

A-SG01

90m **A-S01a**

A-S01

A-S01c

A-S02

A-S01b

A-S05

LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Borehole Location for Soil Sampling
- Borehole Location for Soil and Groundwater Sampling
- Additional Borehole Location for Soil Sampling
- Reedbed
- Estimated Contaminated Zone (m2)

Printed by : \$DATES\$
Filename : \$FILE\$



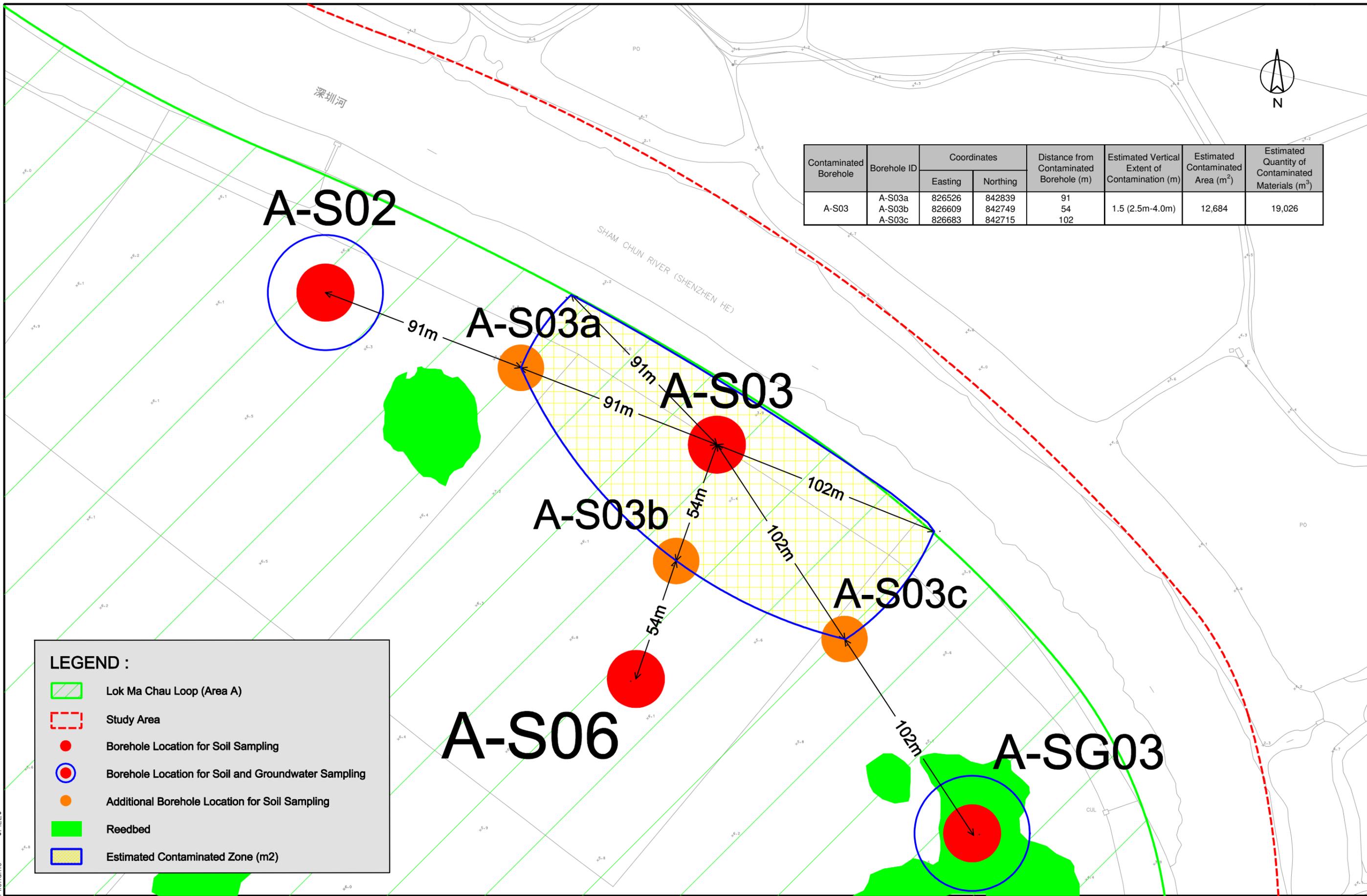
Job Title
Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on
Development of Lok Ma Chau Loop - Investigation

Drawing Title
Location of Possible
Contaminated Zone A-S01

Rev	Description	Date

Drawn	LK	Date	02/10
Checked	TC	Approved	ST
Scale	1:1500 ON A3		

Drawing No.
Figure 6.1.1
Rev.



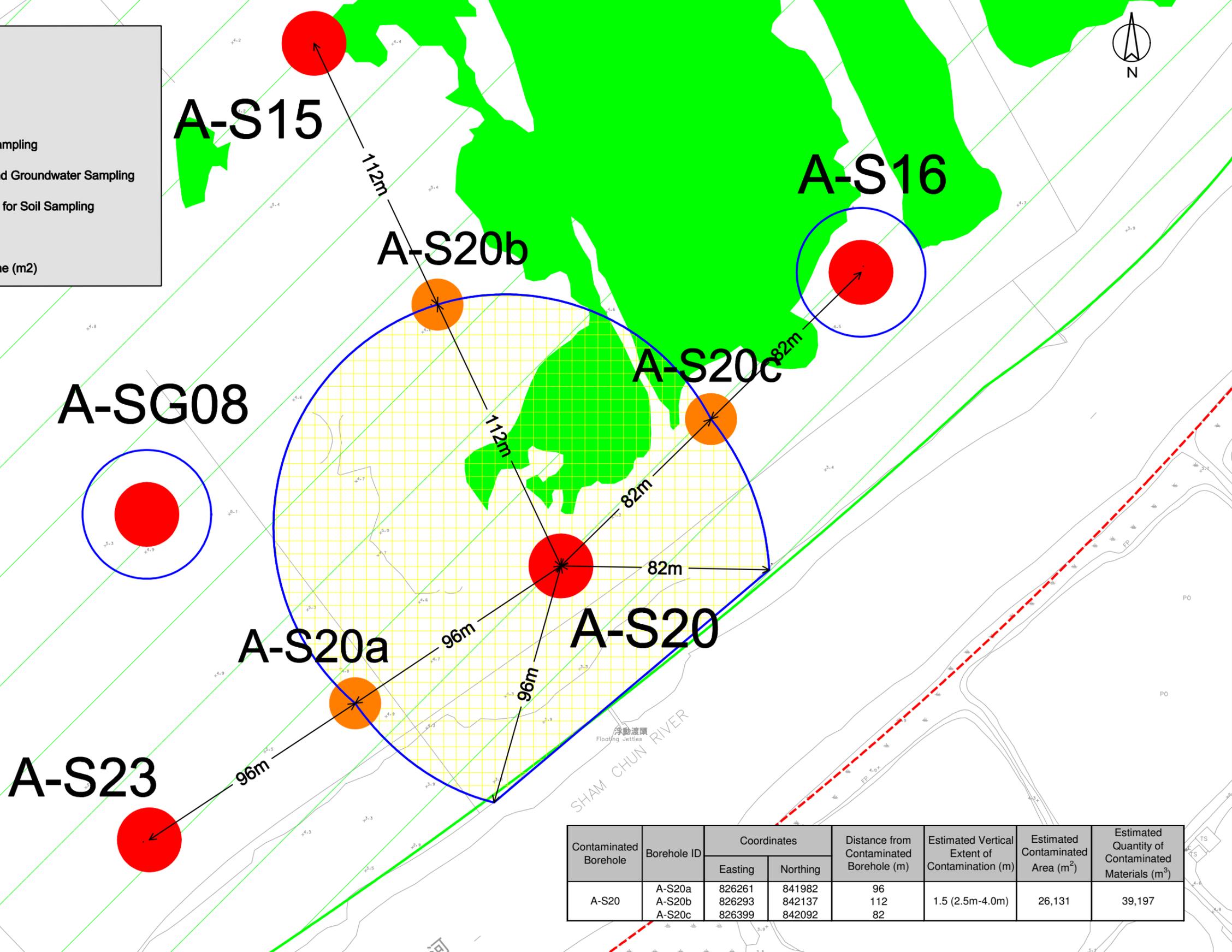
Printed by : \$DATES\$
 Filename : \$FILES\$

LEGEND :

-  Lok Ma Chau Loop (Area A)
-  Study Area
-  Borehole Location for Soil Sampling
-  Borehole Location for Soil and Groundwater Sampling
-  Additional Borehole Location for Soil Sampling
-  Reedbed
-  Estimated Contaminated Zone (m2)

LEGEND :

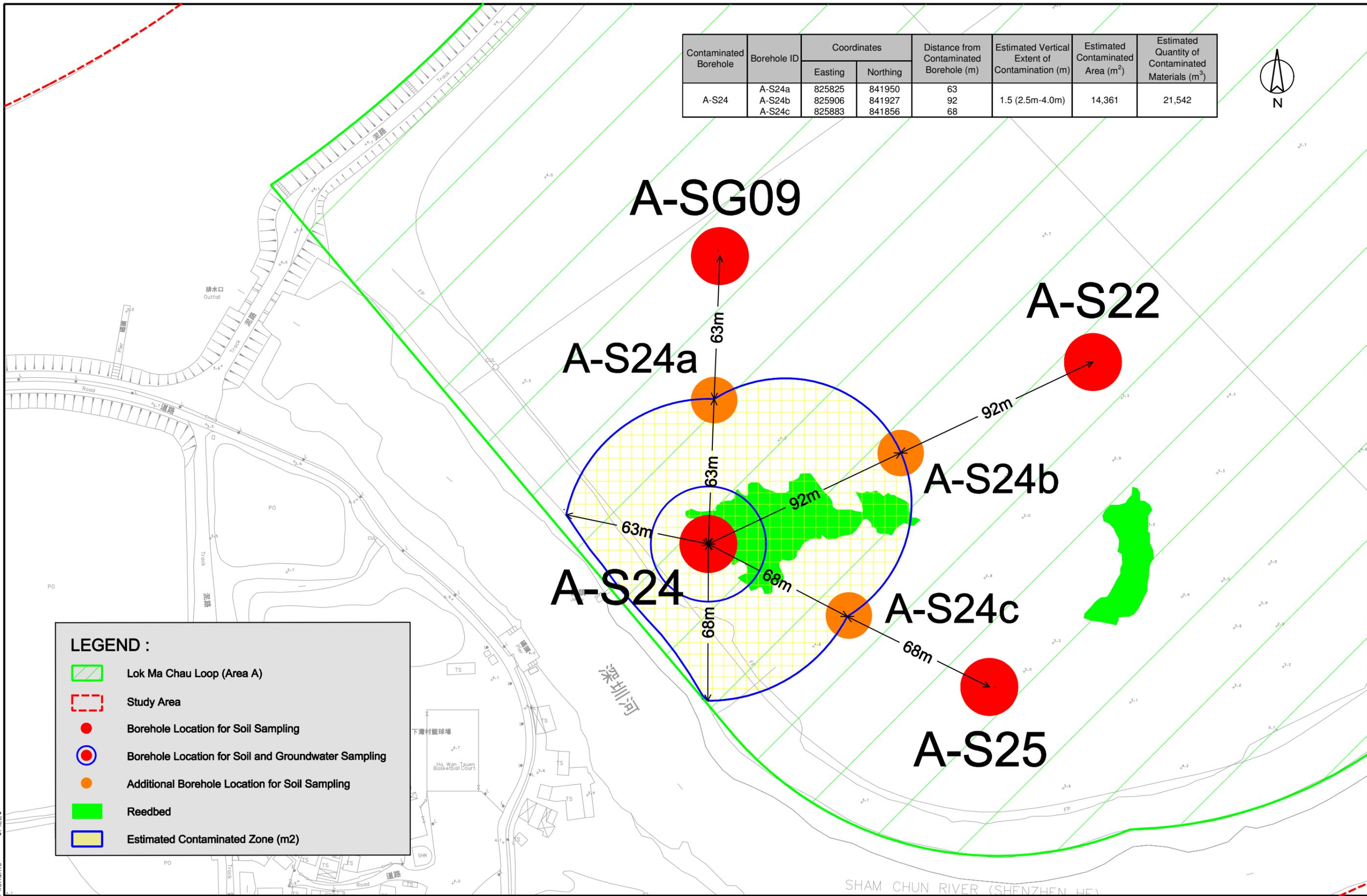
-  Lok Ma Chau Loop (Area A)
-  Study Area
-  Borehole Location for Soil Sampling
-  Borehole Location for Soil and Groundwater Sampling
-  Additional Borehole Location for Soil Sampling
-  Reedbed
-  Estimated Contaminated Zone (m2)



Contaminated Borehole	Borehole ID	Coordinates		Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S20	A-S20a	826261	841982	96	1.5 (2.5m-4.0m)	26,131	39,197
	A-S20b	826293	842137	112			
	A-S20c	826399	842092	82			

Printed by : \$DATES\$
Filename : \$FILE\$

Contaminated Borehole	Borehole ID	Coordinates		Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-S24	A-S24a	825825	841950	63	1.5 (2.5m-4.0m)	14,361	21,542
	A-S24b	825906	841927	92			
	A-S24c	825883	841856	68			



LEGEND :

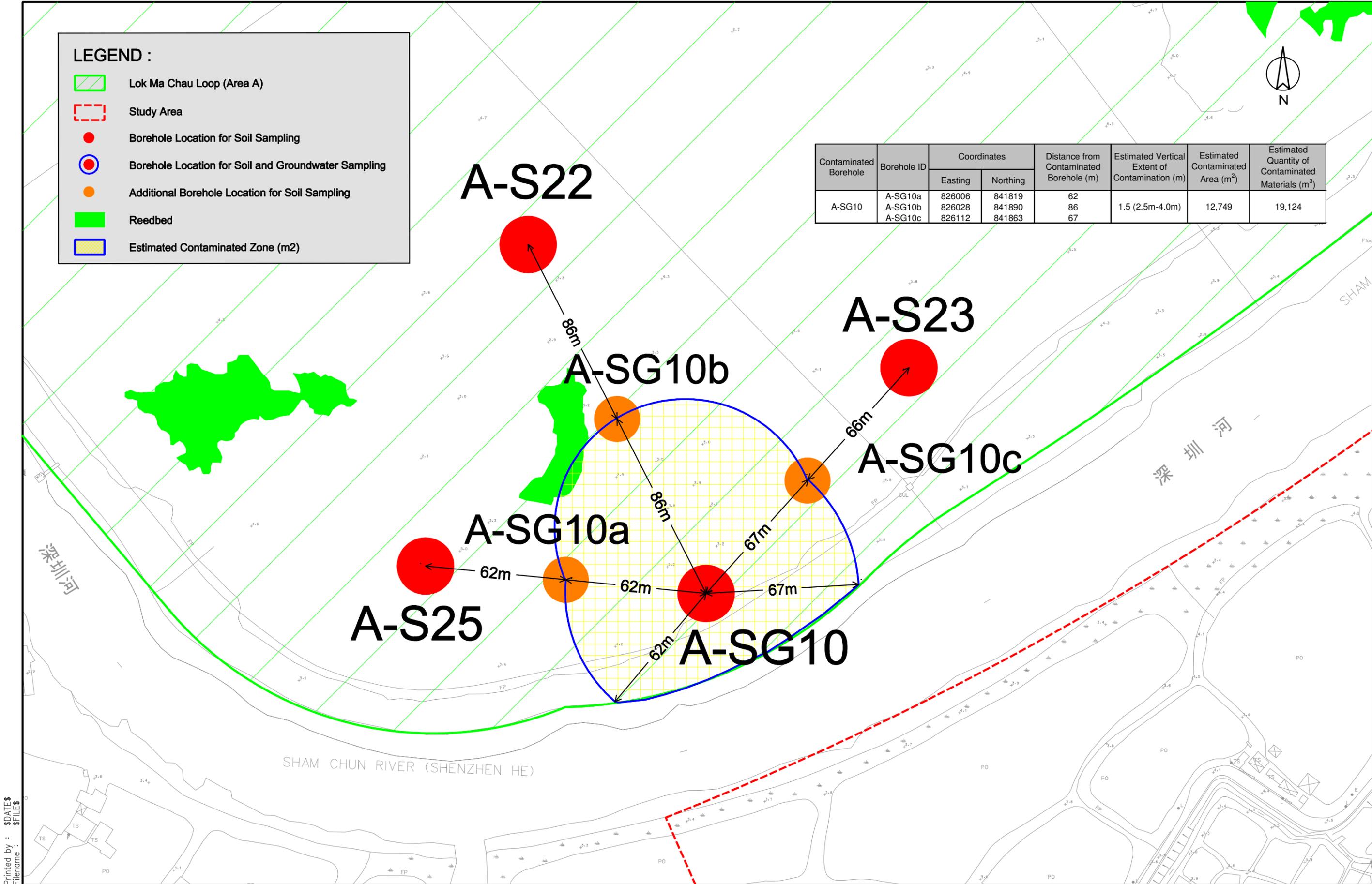
- Lok Ma Chau Loop (Area A)
- Study Area
- Borehole Location for Soil Sampling
- Borehole Location for Soil and Groundwater Sampling
- Additional Borehole Location for Soil Sampling
- Reedbed
- Estimated Contaminated Zone (m2)

Printed by : \$DATES\$
Filename : \$FILE\$

LEGEND :

- Lok Ma Chau Loop (Area A)
- Study Area
- Borehole Location for Soil Sampling
- Borehole Location for Soil and Groundwater Sampling
- Additional Borehole Location for Soil Sampling
- Reedbed
- Estimated Contaminated Zone (m2)

Contaminated Borehole	Borehole ID	Coordinates		Distance from Contaminated Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Contaminated Area (m ²)	Estimated Quantity of Contaminated Materials (m ³)
		Easting	Northing				
A-SG10	A-SG10a	826006	841819	62	1.5 (2.5m-4.0m)	12,749	19,124
	A-SG10b	826028	841890	86			
	A-SG10c	826112	841863	67			



Printed by : \$DATES\$
Filename : \$FILE\$

 土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	 規劃署 PLANNING DEPARTMENT	 Ove Arup & Partners Hong Kong Limited	Job Title Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation	Drawing Title Location of Possible Contaminated Zone A-SG10	Drawn LK	Date 02/10	Drawing No. Figure 6.1.5						
					Checked TC	Approved ST		Scale 1:1500 ON A3	Rev.				
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">Rev.</th> <th style="width: 65%;">Description</th> <th style="width: 30%;">Date</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>FIRST ISSUE</td> <td style="text-align: center;">02/10</td> </tr> </tbody> </table>					Rev.	Description	Date	1	FIRST ISSUE	02/10	Date 02/10		
Rev.	Description	Date											
1	FIRST ISSUE	02/10											

Appendix B

Strata Log Records



**FUGRO
GEOTECHNICAL
SERVICES LTD**

DRILLHOLE RECORD

HOLE No. **A-S01a1**

CONTRACT No.: **GE/2010/01**

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

PROJECT: **Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

WORKS ORDER No. **GE/2010/01.18A**

MACHINE & No.: **FDR-05**

E **826257.84**
N **842956.97**

DATE from: **03/06/2011** to **08/06/2011**

FLUSHING MEDIUM: **Dry drilling**

ORIENTATION: **Vertical**

GROUND LEVEL **+ 6.23** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/end	Water Return %	TCR %	SCR %	ROD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
1	PW								1	INSPECTION PIT	0.65	6.23	0.00			Soft to firm, reddish brown (5YR/4/3), sandy clayey SILT with occasional angular coarse gravel of concrete. (FILL)
2		Dry at 18:00		100				18 bls	2	INSPECTION PIT	1.65					
3		Dry at 08:00							3		1.45	4.73	1.50			Soft, red (10R/5/8), sandy clayey SILT. (FILL)
4								12 bls	4		1.50					
5	PW 4.50								5		1.55					
6		4.80m at 18:00		100					6		3.00	3.23	3.00			Soft to firm, dark greenish grey (10GY/4/1), sandy silty CLAY. (ALLUVIUM)
7									7		3.45					
8									8		3.50					
9								32 bls	9		4.50	1.73	4.50			Dark grey (5YR/4/1), slightly clayey silty coarse SAND. (ALLUVIUM)
10									10		4.95	1.23	5.00			End of investigation hole at 5.00m.

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

LOGGED W.P. Yip
DATE 10/06/2011
CHECKED A.B. Hollinshead
DATE 10/06/2011

REMARKS
1. An inspection pit was excavated to a depth of 1.50m.
2. U100 samples were sent to the analytical laboratory from 1.50m to 1.95m, 3.00m to 3.45m and 4.50m to 4.95m.



**FUGRO
GEOTECHNICAL
SERVICES LTD**

DRILLHOLE RECORD

HOLE No. **A-S01b1**

CONTRACT No.: **GE/2010/01**

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

PROJECT: **Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

WORKS ORDER No. **GE/2010/01.18A**

MACHINE & No.: **FDR-18**

E **826286.89**
N **842901.51**

DATE from: **03/06/2011** to **07/06/2011**

FLUSHING MEDIUM: **Dry drilling**

ORIENTATION: **Vertical**

GROUND LEVEL **+ 5.97** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
04/06/2011	PW										5.97	0.00				
1																
04/02/2011 07/09/2011		0.90m at 18:00 0.90m at 08:00		95				17 bls								Soft to firm, yellowish brown (10YR/5/6), sandy clayey SILT. (FILL)
2																
3								17 bls								Soft to firm, dark greenish grey (10GY/4/1), slightly sandy, silty CLAY. (ALLUVIUM)
4																
07/09/2011	PW 4.50	4.20m at 18:00		100				24 bls								Dark grey (5YR/4/1), slightly clayey silty coarse SAND. (ALLUVIUM)
5																End of investigation hole at 5.00m.
6																
7																
8																
9																
10																

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

LOGGED W.P. Yiu
DATE 10/06/2011
CHECKED A.B. Hollinshead
DATE 10/06/2011

REMARKS
1. An inspection pit was excavated to a depth of 1.50m.
2. U100 samples were sent to the analytical laboratory from 1.50m to 1.95m, 3.00m to 3.45m and 4.50m to 4.95m.



FUGRO
GEOTECHNICAL
SERVICES LTD

DRILLHOLE RECORD

HOLE No. **A-S01c1**

CONTRACT No.: **GE/2010/01**

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

PROJECT: **Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

WORKS ORDER No. **GE/2010/01.18A**

MACHINE & No.: **FDR-18**

E 826337.81
N 842917.64

DATE from: **31/05/2011** to **02/06/2011**

FLUSHING MEDIUM: **Dry drilling**

ORIENTATION: **Vertical**

GROUND LEVEL **+ 5.68** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
01/06/2011	PW										5.68	0.00				
1									1	INSPECTION PIT	0.50					Soft to firm, reddish brown (5YR/4/3), sandy clayey SILT with some angular fine to coarse gravel of strong tuff. (FILL)
2				89				16 bls	2		0.50					
3									3		1.45	4.18	1.50			Soft to firm, yellowish red (5YR/5/6), sandy, very clayey SILT. (FILL)
4		Dry at 18:00 at 08:00		100				8 bls	4		1.50					
01/06/2011 02/06/2011									5		1.95					
5	PW 4.50			100				19 bls	6		3.00					
6		Dry at 18:00							7		3.45					Soft, black (5R/2.5/1), silty CLAY with organic odour. (POND DEPOSIT)
7									8		4.50	1.18	4.50			
8									9		4.95	0.68	5.00			End of Investigation hole at 5.00m.
9																
10																

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

LOGGED W.P. Yiu
 DATE 10/06/2011
 CHECKED A.B. Hollinshead
 DATE 10/06/2011

REMARKS
 1. An inspection pit was excavated to a depth of 1.50m.
 2. U100 samples were sent to the analytical laboratory from 1.50m to 1.95m, 3.00m to 3.45m and 4.50m to 4.95m.



**FUGRO
GEOTECHNICAL
SERVICES LTD**

DRILLHOLE RECORD

HOLE No. **A-S03c1**

CONTRACT No.: **GE/2010/01**

SHEET: **1 of 1**

PROJECT: **Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

WORKS ORDER No. **GE/2010/01.18A**

MACHINE & No.: **FDR-18**

E **826654.62**
N **842757.05**

DATE from: **25/05/2011** to **30/05/2011**

FLUSHING MEDIUM: **Dry drilling**

ORIENTATION: **Vertical**

GROUND LEVEL **+ 4.86** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description	
									No.	Type	Depth						
27/05/2011	HW										4.86	0.00				Soft to firm, yellowish brown (10YR/5/6), dappled grey, slightly sandy, very clayey SILT. (FILL)	
1									1	INSPECTION PIT	0.55						
									2	INSPECTION PIT	0.65	3.86	1.00				Soft, black (5R/2.5/1), silty CLAY with organic odour. (POND DEPOSIT)
2				89				29 bls	3		1.45						
									4		1.50						
									5		1.95						
									6		2.00						
3	HW 3.00 PW			89				44 bls	7		3.00	1.86	3.00			Black (5R/2.5/1), slightly silty, fine to coarse SAND with occasional subangular coarse gravel of moderately strong tuff. (POND DEPOSIT)	
		2.80m at 18:00							8		3.45						
27/05/2011 28/05/2011		2.20m at 08:00							9		3.50						
									10		4.50	0.36	4.50			Very soft to soft, dark greenish grey (10GY/4/1), silty CLAY. (ALLUVIUM)	
28/05/2011 30/05/2011	PW 4.50	3.30m at 18:00		100				12 bls	11		4.55						
		3.80m at 08:00							12		4.95						
30/05/2011		2.20m at 18:00							13		5.00	-0.14	5.00			End of investigation hole at 5.00m.	
6																	
7																	
8																	
9																	
10																	

- Small Disturbed Sample
- Piston sample
- U78 Undisturbed Sample
- U100 Undisturbed Sample
- Mazler Sample
- 76mm Vibrocore Sample
- 100mm Vibrocore Sample
- Vibrocore Sub-sample
- SPT Liner Sample
- Standard Penetration Test
- In-situ Vane Shear Test
- Permeability Test
- Pressuremeter Test
- Televiwer Survey
- Packer Test
- Impression Packer Test
- Water Sample
- Standpipe
- Piezometer Tip

LOGGED W.P. Yiu
DATE 10/06/2011
CHECKED A.B. Hollinshead
DATE 10/06/2011

REMARKS

1. An inspection pit was excavated to a depth of 1.50m.
2. U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m.



**FUGRO
GEOTECHNICAL
SERVICES LTD**

DRILLHOLE RECORD

HOLE No. **A-S20a1**

CONTRACT No.: **GE/2010/01**

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

PROJECT: **Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

WORKS ORDER No. **GE/2010/01.18A**

MACHINE & No.: **FDR-05**

E **826320.99**
N **842023.64**

DATE from: **28/06/2011** to **02/07/2011**

FLUSHING MEDIUM: **Dry drilling**

ORIENTATION: **Vertical**

GROUND LEVEL **+ 5.26** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
30/06/2011	PW										5.26	0.00				
1									1	INSPECTION PIT	0.55					Light yellowish brown (2.5Y/6/4), fine to coarse SAND with some angular and rounded fine to medium gravel of moderately quartz and occasional shell fragments. (FILL)
									2	INSPECTION PIT	0.88					
2				100				40 bls	3		1.45	3.76	1.50			Black (5R/2.5/1), slightly silty fine to coarse SAND with occasional shell fragments. (FILL)
									4		1.60					
									5		1.85					
									6		2.00					
3				100				41 bls	6		3.00	2.26	3.00			Light yellowish brown (2.5Y/6/4), fine to coarse SAND with some angular and rounded fine to medium gravel of moderately strong quartz and occasional shell fragments. (FILL)
									7		3.45					
									8		3.50					
30/06/2011 02/07/2011									9		4.50					
	PW 4.50			100				21 bls	8		4.60					
									9		4.85	0.26	5.00			End of investigation hole at 5.00m.
											5.00					
6																
7																
8																
9																
10																

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

LOGGED W.P. Yiu
DATE 04/07/2011
CHECKED A.B. Hollinshead
DATE 04/07/2011

REMARKS

1. An inspection pit was excavated to a depth of 1.50m.
2. U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m.



FUGRO
GEOTECHNICAL
SERVICES LTD

DRILLHOLE RECORD

HOLE No. **A-S20b1**

CONTRACT No.: **GE/2010/01**

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

PROJECT: **Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

Works Order No.: **GE/2010/01.18A**

MACHINE & No.: **FDR-05**

E **826304.01**
 N **842069.18**

DATE from: **28/06/2011** to **02/07/2011**

FLUSHING MEDIUM: **Dry drilling**

ORIENTATION: **Vertical**

GROUND LEVEL **+ 4.90** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
30/06/2011	PW										4.90	0.00				
1									1	INSPECTION PIT	0.55					Soft to firm, dark grey (5YR/4/1) and yellowish brown (10YR/5/6), sandy silty CLAY. (FILL)
2									2	INSPECTION PIT	0.95					
3				100				12 bis	3		1.45	3.40	1.50			Firm to stiff, red (10R/5/8), mottled light grey, sandy silty CLAY. (FILL)
4									4		1.50					
5									5		1.55					
6									6		3.00	1.90	3.00			Soft to firm, grey (7.5YR/6/1), slightly sandy, silty CLAY with some plant fragments. (ALLUVIUM)
30/06/2011 02/07/2011				100				9 bis	7		3.45		3.50			
4									8		4.50					
5	PW 4.50			100				10 bis	9		4.95	-0.10	5.00			End of investigation hole at 5.00m.
02/07/2011																
6																
7																
8																
9																
10																

- Small Disturbed Sample
- Piston sample
- U78 Undisturbed Sample
- U100 Undisturbed Sample
- Mazier Sample
- 76mm Vibrocore Sample
- 100mm Vibrocore Sample
- Vibrocore Sub-sample
- SPT Liner Sample
- Standard Penetration Test
- in-situ Vane Shear Test
- Permeability Test
- Pressuremeter Test
- Televiwer Survey
- Packer Test
- Impression Packer Test
- Water Sample
- Standpipe
- Piezometer Tip

LOGGED W.P. Yiu
 DATE 04/07/2011
 CHECKED A.B. Hollinshead
 DATE 04/07/2011

REMARKS
 1. An inspection pit was excavated to a depth of 1.50m.
 2. U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m.



**FUGRO
GEOTECHNICAL
SERVICES LTD**

DRILLHOLE RECORD

HOLE No. **A-S20c1**

CONTRACT No.: **GE/2010/01**

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

PROJECT: **Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

Works Order No.: **GE/2010/01.18A**

MACHINE & No.: **FDR-05**

E **826369.97**
N **842063.97**

DATE from: **28/06/2011** to **02/07/2011**

FLUSHING MEDIUM: **Dry drilling**

ORIENTATION: **Vertical**

GROUND LEVEL **+ 4.63** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
30/06/2011	PW										4.63	0.00				
1									1	INSPECTION PIT	0.85					Soft to firm, light yellowish brown (2.5Y/6/4), slightly sandy, silty CLAY. (ALLUVIUM)
									2	INSPECTION PIT	0.85					
2				100				10 bls	3		1.45	3.13	1.50			Soft, dark grey (5YR/4/1), silty CLAY with some plant fragments. (ALLUVIUM)
									4		1.60					
									5		1.95					
									6		2.00					
3				100				12 bls	7		3.00					
									8		3.45					
									9		3.50					
30/06/2011 02/07/2011									10		4.60	0.13	4.60			Soft, grey (7.5YR/6/1), silty CLAY. (ALLUVIUM)
	PW 4.50			100				12 bls	11		4.80					
									12		4.95	-0.37	5.00			End of investigation hole at 5.00m.
02/07/2011									13		5.00					
6																
7																
8																
9																
10																

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

LOGGED W.P. Yiu
DATE 04/07/2011
CHECKED A.B. Hollinshead
DATE 04/07/2011

REMARKS
1. An inspection pit was excavated to a depth of 1.50m.
2. U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m.



FUGRO
GEOTECHNICAL
SERVICES LTD

DRILLHOLE RECORD

HOLE No. **A-S24a1**

CONTRACT No.: **GE/2010/01**

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

PROJECT: **Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

WORKS ORDER No. **GE/2010/01.18A**

MACHINE & No.: **FDR-18**

E **825798.27**
 N **841906.52**

DATE from: **10/06/2011** to **14/06/2011**

FLUSHING MEDIUM: **Dry drilling**

ORIENTATION: **Vertical**

GROUND LEVEL **+ 3.91** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
11/06/2011	PW															
1																
11/06/2011		0.50m at 18:00														
13/06/2011		0.60m at 08:00						41 bls								Grey (7.5YR/6/1) and red (10R/5/8), angular coarse GRAVEL and COBBLES of strong tuff and brick fragments. (FILL)
2																
3								68 bls								Light yellowish brown (2.5Y/6/4), fine to coarse SAND. (FILL)
13/06/2011		0.30m at 18:00														
14/06/2011		0.70m at 08:00														
4																
	PW															
	4.50							28 bls								Grey (7.5YR/6/1), slightly silty, fine to medium SAND. (ALLUVIUM)
14/06/2011		0.92m at 18:00														
5																End of investigation hole at 5.00m.
6																
7																
8																
9																
10																

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

LOGGED W.P. Yiu
 DATE 17/06/2011
 CHECKED A.B. Hollinshead
 DATE 18/06/2011

REMARKS

1. An Inspection pit was excavated to a depth of 1.30m.
2. U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m.



**FUGRO
GEOTECHNICAL
SERVICES LTD**

DRILLHOLE RECORD

HOLE No. **A-S24b1**

CONTRACT No.: **GE/2010/01**

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

PROJECT: **Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

WORKS ORDER No. **GE/2010/01.18A**

MACHINE & No.: **FDR-18**

E **825850.74**
N **841923.09**

DATE from: **15/06/2011** to **20/06/2011**

FLUSHING MEDIUM: **Dry drilling**

ORIENTATION: **Vertical**

GROUND LEVEL **+ 3.62** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
18/06/2011	PW															
1									1	INSPECTION PIT	0.65					Soft, yellowish brown (10YR/5/6), sandy, very clayey SILT. (FILL)
									2	INSPECTION PIT	0.65	2.62	1.00			Soft, greyish brown (10YR/5/2), sandy clayey SILT with some shell fragments. (FILL)
2								6 bis	3		1.45	2.12	1.50			Soft, dark grey (5YR/4/1), silty CLAY. (ALLUVIUM)
									4		1.50					
3		0.00m at 18:00							6 bis	5		1.95				
										6		3.00				
18/06/2011		0.10m at 08:00								7		3.45	3.50			
4									7 bis	8		4.50	-0.88	4.50		Soft, dark grey (5YR/4/1), sandy silty CLAY. (ALLUVIUM)
										9		4.95	-1.38	5.00		
20/06/2011	PW 4.50															End of investigation hole at 5.00m.
6																
7																
8																
9																
10																

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

LOGGED W.P. Yiu
DATE 23/06/2011
CHECKED A.B. Hollinshead
DATE 23/06/2011

REMARKS
1. An inspection pit was excavated to a depth of 1.50m.
2. U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m.



FUGRO
GEOTECHNICAL
SERVICES LTD

DRILLHOLE RECORD

HOLE No. **A-S24c1**

CONTRACT No.: **GE/2010/01**

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

PROJECT: **Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

WORKS ORDER No. **GE/2010/01.18A**

MACHINE & No.: **FDR-05**

E **825840.65**
 N **841856.91**

DATE from: **10/06/2011** to **14/06/2011**

FLUSHING MEDIUM: **Dry drilling**

ORIENTATION: **Vertical**

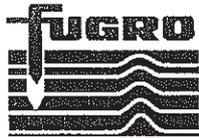
GROUND LEVEL **+ 4.44** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
11/06/2011	PW															
1																
11/06/2011 13/06/2011		0.75m at 18:00 0.70m at 08:00		100				21 bls	1	INSPECTION PIT	0.85					Soft to firm, reddish brown (5YR/4/3), sandy clayey SILT with some angular fine to coarse gravel of moderately strong tuff. (FILL)
2									2		0.88					
3								21 bls	3		1.45	2.94	1.50			
13/06/2011 14/06/2011		0.80m at 18:00 0.65m at 08:00		85					4		1.93					Soft, black (5R/2.5/1), mottled red, sandy silty CLAY with occasional angular fine to coarse gravel of strong tuff and shell fragments. (FILL)
4									5		1.95					
5	PW 4.50			100				32 bls	6		3.00					
14/06/2011									7		3.45					
6									8		4.50	-0.06	4.50			Very soft to soft, dark grey (5YR/4/1), silty CLAY. (ALLUVIUM)
7									9		4.95	-0.56	5.00			End of investigation hole at 5.00m.
8																
9																
10																

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

LOGGED W.P. Yiu
 DATE 17/06/2011
 CHECKED A.B. Hollinshead
 DATE 18/06/2011

REMARKS
 1. An inspection pit was excavated to a depth of 1.50m.
 2. U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m.



FUGRO
GEOTECHNICAL
SERVICES LTD

DRILLHOLE RECORD

HOLE No. **A-SG10a1**

CONTRACT No.: **GE/2010/01**

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

PROJECT: **Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

WORKS ORDER No. **GE/2010/01.18A**

MACHINE & No.: **FDR-05**

E **826036.89**
 N **841812.57**

DATE from: **21/06/2011** to **23/06/2011**

FLUSHING MEDIUM: **Dry drilling**

ORIENTATION: **Vertical**

GROUND LEVEL **+ 3.75** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
21/05/2011	PW										3.75	0.00				Soft to firm, red (10R/5/8), sandy clayey SILT. (FILL)
1									1	INSPECTION PIT	0.85					
									2	INSPECTION PIT	0.85	2.75	1.00			Soft to firm, light greyish brown (2.5Y/6/2), slightly sandy, very clayey SILT. (ALLUVIUM)
								30 bls	3		1.65	2.25	1.50			Soft, dark grey (5YR/4/1), silty CLAY. (ALLUVIUM)
									4		1.88					
21/06/2011 22/06/2011									5		1.95					
											2.00					
3								10 bls	6		3.00	0.75	3.00			Soft, dark grey (5YR/4/1), sandy silty CLAY. (ALLUVIUM)
									7		3.45					
4											3.50					
	PW 4.50							13 bls	8		4.50					
5											4.85	-1.25	5.00			End of investigation hole at 5.00m.
22/06/2011									9		5.00					
6																
7																
8																
9																
10																

- Small Disturbed Sample
- Piston sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
- Mazier Sample
- 78mm Vibrocore Sample
- 100mm Vibrocore Sample
- Vibrocore Sub-sample
- SPT Liner Sample
- Standard Penetration Test
- In-situ Vane Shear Test
- Permeability Test
- Pressuremeter Test
- Televiwer Survey
- Packer Test
- Impression Packer Test
- Water Sample
- Standpipe
- Piezometer Tip

LOGGED **W.P. Yiu**
 DATE **23/06/2011**
 CHECKED **A.B. Hollinshead**
 DATE **23/06/2011**

REMARKS
 1. An inspection pit was excavated to a depth of 1.50m.
 2. U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m.



**FUGRO
GEOTECHNICAL
SERVICES LTD**

DRILLHOLE RECORD

HOLE No. **A-SG10b1**

CONTRACT No.: **GE/2010/01**

SHEET: **1 of 1**

PROJECT: **Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

WORKS ORDER No. **GE/2010/01.18A**

MACHINE & No.: **FDR-18**

E **825047.77**
N **841852.43**

DATE from: **21/06/2011** to **23/06/2011**

FLUSHING MEDIUM: **Dry drilling**

ORIENTATION: **Vertical**

GROUND LEVEL **+ 3.46** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/end	Water Return %	TCR %	SCR %	RQD %	F.I.	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
21/06/2011	PW											3.46	0.00			
1																Firm, light brown (7.5YR/6/3), slightly sandy, very clayey SILT. (ALLUVIUM)
21/06/2011								12 bls								Firm, grey (7.5YR/6/1), dappled yellowish brown, slightly sandy, very clayey SILT. (ALLUVIUM)
22/06/2011																
3								12 bls								Soft, dark grey (5YR/4/1), silty CLAY. (ALLUVIUM)
4																
	PW 4.50							13 bls								Soft, dark grey (5YR/4/1), sandy silty CLAY. (ALLUVIUM)
22/06/2011																End of investigation hole at 5.00m.
6																
7																
8																
9																
10																

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

LOGGED W.P. Yiu
DATE 23/06/2011
CHECKED A.B. Hollinshead
DATE 23/06/2011

REMARKS
1. An inspection pit was excavated to a depth of 1.50m.
2. U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m.



FUGRO
GEOTECHNICAL
SERVICES LTD

DRILLHOLE RECORD

HOLE No. **A-SG10c1**

CONTRACT No.: **GE/2010/01**

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

PROJECT: **Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)**

METHOD: **Rotary Drilling**

CO-ORDINATES:

WORKS ORDER No. **GE/2010/01.18A**

MACHINE & No.: **FDR-05**

E **826088.48**
 N **841837.26**

DATE from: **15/06/2011** to **18/06/2011**

FLUSHING MEDIUM: **Dry drilling**

ORIENTATION: **Vertical**

GROUND LEVEL **+ 3.64** mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/end	Water Return %	TCR %	SCR %	RQD %	FI	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type					
18/06/2011	PW														Soft to firm, light brown (7.5YR/6/3), slightly sandy, very clayey SILT. (ALLUVIUM)
1															
2				100				11 bls			2.14	1.50			Soft, dark grey (5YR/4/1), silty CLAY. (ALLUVIUM)
3															
4		0.20m at 18:00 0.10m at 08:00		100				12 bls							
18/06/2011 20/06/2011															
5	PW 4.50							9 bls			-0.86	4.50			Soft, dark grey (5YR/4/1), sandy, silty CLAY. (ALLUVIUM)
21/06/2011				100							-1.38	5.00			End of investigation hole at 5.00m.
6															
7															
8															
9															
10															

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

LOGGED W.P. Yiu
 DATE 23/06/2011
 CHECKED A.B. Ho/Inshead
 DATE 23/06/2011

REMARKS
 1. An inspection pit was excavated to a depth of 1.50m.
 2. U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m.

Appendix C

Laboratory Testing Results

Soil Samples: Stage 2 SI Works (45 soil samples)

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil				Drillhole No.								
						A-S01a1			A-S01b1			A-S01c1		
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Sampling Date and Depth (m)								
						04-Jun-11 1.50 - 1.95	07-Jun-11 3.00 - 3.45	07-Jun-11 4.50 - 4.95	04-Jun-11 1.50 - 1.95	07-Jun-11 3.00 - 3.45	07-Jun-11 4.50 - 4.95	01-Jun-11 1.50 - 1.95	01-Jun-11 3.00 - 3.45	02-Jun-11 4.50 - 4.95
Metals														
Arsenic	1.0	22.1	21.8	196	73.5	5	14	2	11	8	4	6	8	16
Mositure Content														
Moisture Content (%)	0.1%	Not Applicable				15.2	17.1	14.6	18.9	18.1	16.7	14.6	19	31.8

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil				Drillhole No.								
						A-S03a1			A-S03b1			A-S03c1		
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Sampling Date and Depth (m)								
						01-Jun-11 1.50 - 1.95	02-Jun-11 3.00 - 3.45	02-Jun-11 4.50 - 4.95	27-May-11 1.50 - 1.95	27-May-11 3.00 - 3.45	30-May-11 4.50 - 4.95	27-May-11 1.50 - 1.95	27-May-11 3.00 - 3.45	30-May-11 4.50 - 4.95
Metals														
Arsenic	1.0	22.1	21.8	196	73.5	4	1	23	8	2	3	24	2	18
Mositure Content														
Moisture Content (%)	0.1%	Not Applicable				17.8	14.5	36.8	25.0	14.0	12.0	45.4	9.5	40.6

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil				Drillhole No.								
						A-S20a1			A-S20b1			A-S20c1		
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Sampling Date and Depth (m)								
						30-Jun-11 1.50 - 1.95	01-Jul-11 3.00 - 3.45	02-Jul-11 4.50 - 4.95	30-Jun-11 1.50 - 1.95	01-Jul-11 3.00 - 3.45	02-Jul-11 4.50 - 4.95	30-Jun-11 1.50 - 1.95	01-Jul-11 3.00 - 3.45	02-Jul-11 4.50 - 4.95
Metals														
Arsenic	1.0	22.1	21.8	196	73.5	4.0	3.0	3	7	17	16.0	21	12	13.0
Mositure Content														
Moisture Content (%)	0.1%	Not Applicable				17.7	14.4	18.6	19.6	27.2	28.6	36.9	30.1	40.9

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil				Drillhole No.								
						A-S24a1			A-S24b1			A-S24c1		
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Sampling Date and Depth (m)								
						13-Jun-11 1.50 - 1.95	13-Jun-11 3.00 - 3.45	14-Jun-11 4.50 - 4.95	18-Jun-11 1.50 - 1.95	20-Jun-11 3.00 - 3.45	20-Jun-11 4.50 - 4.95	13-Jun-11 1.50 - 1.95	13-Jun-11 3.00 - 3.45	14-Jun-11 4.50 - 4.95
Metals														
Arsenic	1.0	22.1	21.8	196	73.5	16	4	18	15	15	11	6	6	8
Mositure Content														
Moisture Content (%)	0.1%	Not Applicable				27.0	14.7	33.9	41.7	44.5	36.0	11.8	17.2	21.4

Chemical	Reporting Limit (mg/kg)	Risk-Based Remediation Goals (RBRGs) for Soil				Drillhole No.								
						A-SG10a1			A-SG10b1			A-SG10c1		
		Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Sampling Date and Depth (m)								
						21-Jun-11 1.50 - 1.95	22-Jun-11 3.00 - 3.45	22-Jun-11 4.50 - 4.95	21-Jun-11 1.50 - 1.95	22-Jun-11 3.00 - 3.45	22-Jun-11 4.50 - 4.95	18-Jun-11 1.50 - 1.95	18-Jun-11 3.00 - 3.45	20-Jun-11 4.50 - 4.95
Metals														
Arsenic	1.0	22.1	21.8	196	73.5	18	9	14	12	17	13	15	16	17
Mositure Content														
Moisture Content (%)	0.1%	Not Applicable				38.2	34.2	38.9	31.6	37.9	36.7	39.0	30.0	35.6

Note:
 Red indicates depth of soil with Arsenic contamination detected in Stage 1 SI
 indicates Result exceed the RBRG of "Rural Residential"

Appendix D

Laboratory Testing Reports



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR SAMMY C Y WONG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112124
Address	: GEOTECHNICAL PROJECTS DIVISION, GEOTECHNICAL ENGINEERING OFFICE, 23/F., KWUN TONG VIEW, 410 KWUN TONG ROAD, KOWLOON, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: chiyuenwong@cedd.gov.hk	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: +852 2158 5611	Telephone	: +852 2610 1044		
Facsimile	: +852 2693 2918	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 27-MAY-2011
Order number	: GE/2009/16.15			Issue Date	: 03-JUN-2011
C-O-C number	: H016751			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 31-MAY-2011

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: **HK1112124**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S03C1
 1.50M-1.95M**

Client sampling date / time

27-MAY-2011 10:30

Compound	CAS Number	LOR	Unit	HK1112124-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	45.4				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	24				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1811262)								
HK1112112-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	11.6	11.7	1.4
EG: Metals and Major Cations (QC Lot: 1813135)								
HK1112112-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	22	18	17.2
HK1112183-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	18	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1813135)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	92.8	----	85	115	----	----

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1813135)										
HK1112112-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR SAMMY C Y WONG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112139
Address	: GEOTECHNICAL PROJECTS DIVISION, GEOTECHNICAL ENGINEERING OFFICE, 23/F., KWUN TONG VIEW, 410 KWUN TONG ROAD, KOWLOON, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: chiyuenwong@cedd.gov.hk	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: +852 2158 5611	Telephone	: +852 2610 1044		
Facsimile	: +852 2693 2918	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 27-MAY-2011
Order number	: GE/2009/16.15			Issue Date	: 03-JUN-2011
C-O-C number	: H016752			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 02-JUN-2011

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: **HK1112139**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S03B1
 1.50M-1.95M**

Client sampling date / time

27-MAY-2011 10:40

Compound	CAS Number	LOR	Unit	HK1112139-001				
----------	------------	-----	------	---------------	--	--	--	--

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	25.0				
---	------	-----	---	------	--	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	8				
----------------	-----------	---	-------	---	--	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1813132)								
HK1112062-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	7.3	7.2	1.6
HK1112063-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	9.2	9.0	1.8
EG: Metals and Major Cations (QC Lot: 1813135)								
HK1112112-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	22	18	17.2
HK1112183-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	18	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1813135)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	92.8	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1813135)										
HK1112112-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR SAMMY C Y WONG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112141
Address	: GEOTECHNICAL PROJECTS DIVISION, GEOTECHNICAL ENGINEERING OFFICE, 23/F., KWUN TONG VIEW, 410 KWUN TONG ROAD, KOWLOON, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: chiyuenwong@cedd.gov.hk	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: +852 2158 5611	Telephone	: +852 2610 1044		
Facsimile	: +852 2693 2918	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 27-MAY-2011
Order number	: GE/2009/16.15			Issue Date	: 03-JUN-2011
C-O-C number	: H016754			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 02-JUN-2011

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: **HK1112141**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S03C1
 3.00M-3.45M**

Client sampling date / time

27-MAY-2011 16:15

Compound	CAS Number	LOR	Unit	HK1112141-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	9.5				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	2				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1813132)								
HK1112062-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	7.3	7.2	1.6
HK1112063-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	9.2	9.0	1.8
EG: Metals and Major Cations (QC Lot: 1813135)								
HK1112112-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	22	18	17.2
HK1112183-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	18	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1813135)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	92.8	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1813135)										
HK1112112-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 6
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112142
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 27-MAY-2011
Order number	: GE/2009/16.15			Issue Date	: 04-JUN-2011
C-O-C number	: H016753			No. of samples received	: 4
Site	: LMC LOOP AREA A			No. of samples analysed	: 4

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

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.

<i>Signatories</i>	<i>Position</i>	<i>Authorised results for</i>
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: 02-JUN-2011

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: **HK1112142**

Sample(s) were received in a chilled condition.

Water sample(s) analysed and reported on an as received basis.

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

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.



Analytical Results

Sub-Matrix: SOIL

Client sample ID

				A-S03B1 3.00M-3.45M	A-S03B1 3.00M-3.45M DUPLICATE			
				27-MAY-2011 16:00	27-MAY-2011 16:00			
Compound	CAS Number	LOR	Unit	HK1112142-001	HK1112142-002			
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	---	0.1	%	14.0	14.8			
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	2	2			



Sub-Matrix: WATER				Client sample ID					
				Client sampling date / time					
Compound	CAS Number	LOR	Unit	A-S03B1 EQUIPMENT BLANK	A-S03B1 FIELD BLANK				
				27-MAY-2011 16:00	27-MAY-2011 16:00				
				HK1112142-003	HK1112142-004				
EG: Metals and Major Cations - Filtered									
EG020: Arsenic	7440-38-2	10	µg/L	<10	<10				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1813132)								
HK1112062-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	7.3	7.2	1.6
HK1112063-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	9.2	9.0	1.8
EG: Metals and Major Cations (QC Lot: 1813135)								
HK1112112-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	22	18	17.2
HK1112183-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	18	0.0
Matrix: WATER				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 - Filtered (QC Lot: 1813442)								
HK1112142-004	A-S03B1 FIELD BLANK	EG020: Arsenic	7440-38-2	10	µg/L	<10	<10	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)					
						LCS	DCS	Low	High	Value	Control Limit				
EG: Metals and Major Cations (QC Lot: 1813135)															
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	92.8	----	85	115	----	----				
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				
EG: Metals and Major Cations - Filtered (QC Lot: 1813442)															
EG020: Arsenic	7440-38-2	10	µg/L	<10	100 µg/L	89.5	----	85	115	----	----				

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1813135)										
HK1112112-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----
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
EG: Metals and Major Cations - Filtered (QC Lot: 1813442)										
HK1112142-003	A-S03B1 EQUIPMENT BLANK	EG020: Arsenic	7440-38-2	100 µg/L	88.4	----	75	125	----	----





CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR SAMMY C Y WONG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112183
Address	: GEOTECHNICAL PROJECTS DIVISION, GEOTECHNICAL ENGINEERING OFFICE, 23/F., KWUN TONG VIEW, 410 KWUN TONG ROAD, KOWLOON, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: chiyuenwong@cedd.gov.hk	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: +852 2158 5611	Telephone	: +852 2610 1044		
Facsimile	: +852 2693 2918	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 30-MAY-2011
Order number	: GE/2009/16.15			Issue Date	: 03-JUN-2011
C-O-C number	: H016756			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 02-JUN-2011

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: **HK1112183**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S03C1
 4.50M-4.95M**

Client sampling date / time

30-MAY-2011 14:30

Compound	CAS Number	LOR	Unit	HK1112183-001				
----------	------------	-----	------	---------------	--	--	--	--

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	40.6				
---	------	-----	---	------	--	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	18				
----------------	-----------	---	-------	----	--	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1813132)								
HK1112062-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	7.3	7.2	1.6
HK1112063-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	9.2	9.0	1.8
EG: Metals and Major Cations (QC Lot: 1813135)								
HK1112112-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	22	18	17.2
HK1112183-001	A-S03C1 4.50M-4.95M	EG020: Arsenic	7440-38-2	1	mg/kg	18	18	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1813135)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	92.8	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1813135)										
HK1112112-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR SAMMY C Y WONG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112184
Address	: GEOTECHNICAL PROJECTS DIVISION, GEOTECHNICAL ENGINEERING OFFICE, 23/F., KWUN TONG VIEW, 410 KWUN TONG ROAD, KOWLOON, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: chiyuenwong@cedd.gov.hk	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: +852 2158 5611	Telephone	: +852 2610 1044		
Facsimile	: +852 2693 2918	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 30-MAY-2011
Order number	: GE/2009/16.15			Issue Date	: 03-JUN-2011
C-O-C number	: H016757			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 02-JUN-2011

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: **HK1112184**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S03B1
 4.50M-4.95M**

Client sampling date / time

30-MAY-2011 14:40

Compound	CAS Number	LOR	Unit	HK1112184-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	12.0				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	3				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1813132)								
HK1112062-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	7.3	7.2	1.6
HK1112063-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	9.2	9.0	1.8
EG: Metals and Major Cations (QC Lot: 1813135)								
HK1112112-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	22	18	17.2
HK1112183-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	18	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1813135)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	92.8	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1813135)										
HK1112112-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112456
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 01-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 13-JUN-2011
C-O-C number	: H016758			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 11-JUN-2011

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: **HK1112456**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S03A1
 1.50M-1.95M**

Client sampling date / time

[01-JUN-2011]

Compound	CAS Number	LOR	Unit	HK1112456-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	17.8				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	4				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1816152)								
HK1112218-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	20.5	20.2	1.4
EG: Metals and Major Cations (QC Lot: 1819699)								
HK1112316-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	42	42	0.0
HK1112556-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	34	39	14.1

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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1819699)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	107	----	85	115	----	----

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1819699)										
HK1112316-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112460
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 01-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 13-JUN-2011
C-O-C number	: H016759			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 11-JUN-2011

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: **HK1112460**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S01C1
 1.50M-1.95M**

Client sampling date / time

[01-JUN-2011]

Compound	CAS Number	LOR	Unit	HK1112460-001				
----------	------------	-----	------	---------------	--	--	--	--

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	14.6				
---	------	-----	---	------	--	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	6				
----------------	-----------	---	-------	---	--	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1816152)								
HK1112218-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	20.5	20.2	1.4
EG: Metals and Major Cations (QC Lot: 1819699)								
HK1112316-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	42	42	0.0
HK1112556-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	34	39	14.1

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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1819699)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	107	----	85	115	----	----

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1819699)										
HK1112316-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112461
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 01-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 13-JUN-2011
C-O-C number	: H016760			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 11-JUN-2011

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: **HK1112461**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S01C1
 3.00M-3.45M**

Client sampling date / time

[01-JUN-2011]

Compound	CAS Number	LOR	Unit	HK1112461-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	19.0				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	8				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1816152)								
HK1112218-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	20.5	20.2	1.4
EG: Metals and Major Cations (QC Lot: 1819699)								
HK1112316-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	42	42	0.0
HK1112556-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	34	39	14.1

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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1819699)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	107	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1819699)										
HK1112316-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112560
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 02-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 13-JUN-2011
C-O-C number	: H016761			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 11-JUN-2011

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: **HK1112560**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S01C1
 4.50M-4.95M**

Client sampling date / time

02-JUN-2011 10:15

Compound	CAS Number	LOR	Unit	HK1112560-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	31.8				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	16				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1819722)								
HK1112387-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	14.1	13.4	4.9
HK1112562-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	36.8	36.1	1.7
EG: Metals and Major Cations (QC Lot: 1819699)								
HK1112316-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	42	42	0.0
HK1112556-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	34	39	14.1

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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1819699)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	107	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1819699)										
HK1112316-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112561
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 02-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 13-JUN-2011
C-O-C number	: H016762			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 11-JUN-2011

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: **HK1112561**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S03A1
3.00M-3.45M**

Client sampling date / time

02-JUN-2011 10:45

Compound	CAS Number	LOR	Unit	HK1112561-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	14.5				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	1				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1819722)								
HK1112387-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	14.1	13.4	4.9
HK1112562-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	36.8	36.1	1.7
EG: Metals and Major Cations (QC Lot: 1819699)								
HK1112316-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	42	42	0.0
HK1112556-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	34	39	14.1

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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1819699)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	107	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1819699)										
HK1112316-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112562
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 02-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 13-JUN-2011
C-O-C number	: H016763			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 11-JUN-2011

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: **HK1112562**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S03A1
 4.50M-4.95M**

Client sampling date / time

02-JUN-2011 14:45

Compound	CAS Number	LOR	Unit	HK1112562-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	36.8				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	23				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1819722)								
HK1112387-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	14.1	13.4	4.9
HK1112562-001	A-S03A1 4.50M-4.95M	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	36.8	36.1	1.7
EG: Metals and Major Cations (QC Lot: 1819699)								
HK1112316-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	42	42	0.0
HK1112556-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	34	39	14.1

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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1819699)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	107	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1819699)										
HK1112316-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112692
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 04-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 15-JUN-2011
C-O-C number	: H016764			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 13-JUN-2011

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: **HK1112692**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S01A1
 1.50M-1.95M**

Client sampling date / time

04-JUN-2011 10:40

Compound	CAS Number	LOR	Unit	HK1112692-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	15.2				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	5				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1821747)								
HK1112620-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	43.4	43.3	0.0
HK1112692-001	A-S01A1 1.50M-1.95M	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	15.2	16.4	7.6
EG: Metals and Major Cations (QC Lot: 1825671)								
HK1112687-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	19	0.0
HK1112831-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	8	9	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1825671)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.5	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1825671)										
HK1112687-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	81.0	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112693
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 04-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 15-JUN-2011
C-O-C number	: H016765			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 13-JUN-2011

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: **HK1112693**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S01B1
 1.50M-1.95M**

Client sampling date / time

04-JUN-2011 10:50

Compound	CAS Number	LOR	Unit	HK1112693-001				
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	11				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1821747)								
HK1112620-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	43.4	43.3	0.0
HK1112692-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	15.2	16.4	7.6
EG: Metals and Major Cations (QC Lot: 1825671)								
HK1112687-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	19	0.0
HK1112831-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	8	9	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1825671)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.5	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1825671)										
HK1112687-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	81.0	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112828
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 07-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 15-JUN-2011
C-O-C number	: H016769			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 13-JUN-2011

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: **HK1112828**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S01A1
 4.50M-4.95M**

Client sampling date / time

07-JUN-2011 14:50

Compound	CAS Number	LOR	Unit	HK1112828-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	14.6				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	2				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1825687)								
HK1112820-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	16.4	17.2	4.8
HK1112903-006	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	18.0	18.8	4.2
EG: Metals and Major Cations (QC Lot: 1825671)								
HK1112687-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	19	0.0
HK1112831-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	8	9	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1825671)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.5	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1825671)										
HK1112687-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	81.0	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112829
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 07-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 15-JUN-2011
C-O-C number	: H016768			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 13-JUN-2011

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: **HK1112829**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S01B1
 4.50M-4.95M**

Client sampling date / time

07-JUN-2011 14:30

Compound	CAS Number	LOR	Unit	HK1112829-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	16.7				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	4				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1825687)								
HK1112820-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	16.4	17.2	4.8
HK1112903-006	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	18.0	18.8	4.2
EG: Metals and Major Cations (QC Lot: 1825671)								
HK1112687-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	19	0.0
HK1112831-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	8	9	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1825671)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.5	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1825671)										
HK1112687-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	81.0	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112830
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 07-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 15-JUN-2011
C-O-C number	: H016767			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 13-JUN-2011

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: **HK1112830**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S01A1
 3.00M-3.45M**

Client sampling date / time

07-JUN-2011 13:40

Compound	CAS Number	LOR	Unit	HK1112830-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	17.1				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	14				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1825687)								
HK1112820-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	16.4	17.2	4.8
HK1112903-006	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	18.0	18.8	4.2
EG: Metals and Major Cations (QC Lot: 1825671)								
HK1112687-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	19	0.0
HK1112831-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	8	9	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1825671)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.5	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1825671)										
HK1112687-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	81.0	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1112831
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 07-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 15-JUN-2011
C-O-C number	: H016766			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 13-JUN-2011

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: **HK1112831**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S01B1
 3.00M-3.45M**

Client sampling date / time

07-JUN-2011 13:30

Compound	CAS Number	LOR	Unit	HK1112831-001				
----------	------------	-----	------	---------------	--	--	--	--

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	18.1				
---	------	-----	---	------	--	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	8				
----------------	-----------	---	-------	---	--	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1825687)								
HK1112820-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	16.4	17.2	4.8
HK1112903-006	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	18.0	18.8	4.2
EG: Metals and Major Cations (QC Lot: 1825671)								
HK1112687-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	19	0.0
HK1112831-001	A-S01B1 3.00M-3.45M	EG020: Arsenic	7440-38-2	1	mg/kg	8	9	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1825671)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.5	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1825671)										
HK1112687-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	81.0	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1113338
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 13-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 21-JUN-2011
C-O-C number	: H016770			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 16-JUN-2011

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: **HK1113338**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S24A1
 1.50M-1.95M**

Client sampling date / time

13-JUN-2011 10:40

Compound	CAS Number	LOR	Unit	HK1113338-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	27.0				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	16				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1830343)								
HK1113078-003	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	14.3	13.7	4.8
HK1113339-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	11.8	12.9	8.7
EG: Metals and Major Cations (QC Lot: 1831156)								
HK1113206-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	50	58	14.3
HK1113338-001	A-S24A1 1.50M-1.95M	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1831156)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	93.8	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1831156)										
HK1113206-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1113339
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 13-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 21-JUN-2011
C-O-C number	: H016771			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 16-JUN-2011

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: **HK1113339**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S24C1
 1.50M-1.95M**

Client sampling date / time

13-JUN-2011 10:50

Compound	CAS Number	LOR	Unit	HK1113339-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	11.8				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	6				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1830343)								
HK1113078-003	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	14.3	13.7	4.8
HK1113339-001	A-S24C1 1.50M-1.95M	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	11.8	12.9	8.7
EG: Metals and Major Cations (QC Lot: 1831156)								
HK1113206-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	50	58	14.3
HK1113338-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1831156)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	93.8	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1831156)										
HK1113206-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1113340
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 13-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 21-JUN-2011
C-O-C number	: H016772			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 16-JUN-2011

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: **HK1113340**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S24C1
 3.00M-3.45M**

Client sampling date / time

13-JUN-2011 14:55

Compound	CAS Number	LOR	Unit	HK1113340-001				
----------	------------	-----	------	---------------	--	--	--	--

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	17.2				
---	------	-----	---	------	--	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	6				
----------------	-----------	---	-------	---	--	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1830343)								
HK1113078-003	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	14.3	13.7	4.8
HK1113339-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	11.8	12.9	8.7
EG: Metals and Major Cations (QC Lot: 1831156)								
HK1113206-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	50	58	14.3
HK1113338-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1831156)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	93.8	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1831156)										
HK1113206-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1113341
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 13-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 21-JUN-2011
C-O-C number	: H016773			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 16-JUN-2011

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: **HK1113341**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S24A1
 3.00M-3.45M**

Client sampling date / time

13-JUN-2011 15:10

Compound	CAS Number	LOR	Unit	HK1113341-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	14.7				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	4				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1830343)								
HK1113078-003	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	14.3	13.7	4.8
HK1113339-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	11.8	12.9	8.7
EG: Metals and Major Cations (QC Lot: 1831156)								
HK1113206-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	50	58	14.3
HK1113338-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1831156)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	93.8	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1831156)										
HK1113206-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not Determined	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1113430
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 14-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 24-JUN-2011
C-O-C number	: H016774			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 22-JUN-2011

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: **HK1113430**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

A-S24A1
4.50M-4.95M
 [14-JUN-2011]
HK1113430-001

Client sampling date / time

Compound	CAS Number	LOR	Unit				
EA/ED: Physical and Aggregate Properties							
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	33.9			
EG: Metals and Major Cations							
EG020: Arsenic	7440-38-2	1	mg/kg	18			



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1834060)								
HK1113552-003	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	15.1	16.1	6.6
HK1113437-002	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	49.5	49.5	0.0
EG: Metals and Major Cations (QC Lot: 1834034)								
HK1113379-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	6	7	0.0
HK1113436-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	6	5	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1834034)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	88.9	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1834034)										
HK1113379-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.3	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1113432
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 14-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 24-JUN-2011
C-O-C number	: H016775			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 22-JUN-2011

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: **HK1113432**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S24C1
 4.50M-4.95M**

Client sampling date / time

[14-JUN-2011]

Compound	CAS Number	LOR	Unit	HK1113432-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	21.4				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	8				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1834060)								
HK1113552-003	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	15.1	16.1	6.6
HK1113437-002	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	49.5	49.5	0.0
EG: Metals and Major Cations (QC Lot: 1834034)								
HK1113379-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	6	7	0.0
HK1113436-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	6	5	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1834034)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	88.9	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1834034)										
HK1113379-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.3	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1113967
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 18-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 29-JUN-2011
C-O-C number	: H016776			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 28-JUN-2011

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: **HK1113967**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-SG10C1
 1.50M-1.95M**

Client sampling date / time

[18-JUN-2011]

Compound	CAS Number	LOR	Unit	HK1113967-001				
----------	------------	-----	------	---------------	--	--	--	--

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	39.0				
---	------	-----	---	------	--	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	15				
----------------	-----------	---	-------	----	--	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1842625)								
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	23.0	20.7	10.6
HK1113967-001	A-SG10C1 1.50M-1.95M	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	39.0	39.6	1.3
EG: Metals and Major Cations (QC Lot: 1844617)								
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9
HK1113971-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1844617)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1844617)										
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1113968
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 18-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 29-JUN-2011
C-O-C number	: H016778			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 28-JUN-2011

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: **HK1113968**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S24B1
 1.50M-1.95M**

Client sampling date / time

[18-JUN-2011]

Compound	CAS Number	LOR	Unit	HK1113968-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	41.7				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	15				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1842625)								
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	23.0	20.7	10.6
HK1113967-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	39.0	39.6	1.3
EG: Metals and Major Cations (QC Lot: 1844617)								
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9
HK1113971-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1844617)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1844617)										
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 6
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1113969
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 18-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 30-JUN-2011
C-O-C number	: H016777			No. of samples received	: 4
Site	: LMC LOOP AREA A			No. of samples analysed	: 4

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

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.

<i>Signatories</i>	<i>Position</i>	<i>Authorised results for</i>
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: 28-JUN-2011

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: **HK1113969**

Sample(s) were received in a chilled condition.

Water sample(s) analysed and reported on an as received basis.

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

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.



Analytical Results

Sub-Matrix: SOIL

Client sample ID

				A-SG10C1 3.00M-3.45M	A-SG10C1 3.00M-3.45M DUPLICATE			
				18-JUN-2011 15:00	18-JUN-2011 15:00			
Compound	CAS Number	LOR	Unit	HK1113969-001	HK1113969-002			
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	30.0	34.7			
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	16	18			



Sub-Matrix: WATER				Client sample ID		Client sampling date / time			
				A-SG10C1 EQUIPMENT BLANK	A-SG10C1 FIELD BLANK				
				18-JUN-2011 15:00	18-JUN-2011 15:00				
Compound	CAS Number	LOR	Unit	HK1113969-003	HK1113969-004				
EG: Metals and Major Cations - Filtered									
EG020: Arsenic	7440-38-2	10	µg/L	<10	<10				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1842625)								
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	23.0	20.7	10.6
HK1113967-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	39.0	39.6	1.3
EG: Metals and Major Cations (QC Lot: 1844617)								
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9
HK1113971-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	0.0
Matrix: WATER				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 - Filtered (QC Lot: 1842734)								
HK1113969-003	A-SG10C1 EQUIPMENT BLANK	EG020: Arsenic	7440-38-2	10	µg/L	<10	<10	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1844617)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4	----	85	115	----	----
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
EG: Metals and Major Cations - Filtered (QC Lot: 1842734)											
EG020: Arsenic	7440-38-2	10	µg/L	<10	100 µg/L	90.5	----	85	115	----	----

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1844617)										
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4	----	75	125	----	----
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
EG: Metals and Major Cations - Filtered (QC Lot: 1842734)										
HK1113786-004	Anonymous	EG020: Arsenic	7440-38-2	100 µg/L	92.4	----	75	125	----	----





CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1113971
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 20-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 29-JUN-2011
C-O-C number	: H016781			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 28-JUN-2011

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: **HK1113971**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S24B1
 4.50M-4.95M**

Client sampling date / time

20-JUN-2011 11:45

Compound	CAS Number	LOR	Unit	HK1113971-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	36.0				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	11				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1842625)								
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	23.0	20.7	10.6
HK1113967-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	39.0	39.6	1.3
EG: Metals and Major Cations (QC Lot: 1844617)								
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9
HK1113971-001	A-S24B1 4.50M-4.95M	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1844617)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1844617)										
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1113973
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 20-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 29-JUN-2011
C-O-C number	: H016780			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 28-JUN-2011

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: **HK1113973**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-SG10C1
 4.50M-4.95M**

Client sampling date / time

20-JUN-2011 11:00

Compound	CAS Number	LOR	Unit	HK1113973-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	35.6				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	17				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1842625)								
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	23.0	20.7	10.6
HK1113967-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	39.0	39.6	1.3
EG: Metals and Major Cations (QC Lot: 1844617)								
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9
HK1113971-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1844617)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1844617)										
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1113976
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 20-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 29-JUN-2011
C-O-C number	: H016779			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 28-JUN-2011

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: **HK1113976**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S24B1
 3.00M-3.45M**

Client sampling date / time

20-JUN-2011 10:30

Compound	CAS Number	LOR	Unit	HK1113976-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	44.5				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	15				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1842625)								
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	23.0	20.7	10.6
HK1113967-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	39.0	39.6	1.3
EG: Metals and Major Cations (QC Lot: 1844617)								
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9
HK1113971-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1844617)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1844617)										
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114027
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 21-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 29-JUN-2011
C-O-C number	: H016782			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 28-JUN-2011

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: **HK1114027**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-SG10A1
1.50M-1.95M**

Client sampling date / time

21-JUN-2011 14:55

Compound	CAS Number	LOR	Unit	HK1114027-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	38.2				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	18				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1842625)								
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	23.0	20.7	10.6
HK1113967-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	39.0	39.6	1.3
EG: Metals and Major Cations (QC Lot: 1844617)								
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9
HK1113971-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1844617)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1844617)										
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MR THOMAS CHAN	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114028
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: thomas.chan@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 21-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 29-JUN-2011
C-O-C number	: H016783			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 28-JUN-2011

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: **HK1114028**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-SG10B1
 1.50M-1.95M**

Client sampling date / time

21-JUN-2011 15:00

Compound	CAS Number	LOR	Unit	HK1114028-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	31.6				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	12				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1842625)								
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	23.0	20.7	10.6
HK1113967-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	39.0	39.6	1.3
EG: Metals and Major Cations (QC Lot: 1844617)								
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9
HK1113971-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1844617)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1844617)										
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114170
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 22-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 04-JUL-2011
C-O-C number	: H010647			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 30-JUN-2011

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: **HK1114170**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-SG10A1
4.50M-4.95M**

Client sampling date / time

22-JUN-2011 11:40

Compound	CAS Number	LOR	Unit	HK1114170-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	38.9				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	14				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1846857)								
HK1114167-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	22.8	23.3	2.2
HK1114174-004	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	19.8	21.1	6.5
EG: Metals and Major Cations (QC Lot: 1850829)								
HK1114171-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	13	12	0.0
HK1114550-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	3	3	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1850829)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.1	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1850829)										
HK1114170-001	A-SG10A1 4.50M-4.95M	EG020: Arsenic	7440-38-2	5 mg/kg	83.8	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114171
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 22-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 04-JUL-2011
C-O-C number	: H020437			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 30-JUN-2011

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: **HK1114171**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-SG10B1
 4.50M-4.95M**

Client sampling date / time

22-JUN-2011 11:55

Compound	CAS Number	LOR	Unit	HK1114171-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	36.7				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	13				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1846857)								
HK1114167-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	22.8	23.3	2.2
HK1114174-004	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	19.8	21.1	6.5
EG: Metals and Major Cations (QC Lot: 1850829)								
HK1114171-001	A-SG10B1 4.50M-4.95M	EG020: Arsenic	7440-38-2	1	mg/kg	13	12	0.0
HK1114550-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	3	3	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1850829)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.1	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1850829)										
HK1114170-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	83.8	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114172
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 22-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 04-JUL-2011
C-O-C number	: H015189			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 30-JUN-2011

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: **HK1114172**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-SG10A1
 3.00M-3.45M**

Client sampling date / time

22-JUN-2011 10:30

Compound	CAS Number	LOR	Unit	HK1114172-001				
----------	------------	-----	------	---------------	--	--	--	--

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	34.2				
---	------	-----	---	------	--	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	9				
----------------	-----------	---	-------	---	--	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1846857)								
HK1114167-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	22.8	23.3	2.2
HK1114174-004	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	19.8	21.1	6.5
EG: Metals and Major Cations (QC Lot: 1850829)								
HK1114171-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	13	12	0.0
HK1114550-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	3	3	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1850829)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.1	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1850829)										
HK1114170-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	83.8	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114173
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 22-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 04-JUL-2011
C-O-C number	: H010648			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 30-JUN-2011

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: **HK1114173**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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

Fung Lim Chee, Richard

Position

General Manager

Authorised results for

Inorganics



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-SG10B1
 3.00M-3.45M**

Client sampling date / time

22-JUN-2011 10:40

Compound	CAS Number	LOR	Unit	HK1114173-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	37.9				
EG: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	17				



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1846857)								
HK1114167-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	22.8	23.3	2.2
HK1114174-004	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	19.8	21.1	6.5
EG: Metals and Major Cations (QC Lot: 1850829)								
HK1114171-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	13	12	0.0
HK1114550-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	3	3	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1850829)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.1	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1850829)										
HK1114170-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	83.8	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114853
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 30-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 12-JUL-2011
C-O-C number	: H016784			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 08-JUL-2011

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: **HK1114853**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S20A1
 1.50M-1.95M**

Client sampling date / time

30-JUN-2011 11:00

Compound	CAS Number	LOR	Unit				
				HK1114853-001			

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	17.7			
--	------	-----	---	-------------	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	4			
-----------------------	-----------	---	-------	----------	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1858718)								
HK1114853-001	A-S20A1 1.50M-1.95M	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	17.7	17.5	1.1
HK1114929-008	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	12.2	11.0	10.1
EG: Metals and Major Cations (QC Lot: 1862040)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
								LCS	DCS	Low	High	Value	Control Limit		
EG: Metals and Major Cations (QC Lot: 1862040)															
EG020: Arsenic				7440-38-2	1	mg/kg	<1	5 mg/kg	89.8	----	85	115	----	----	

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1862040)													
HK1114853-001				A-S20A1 1.50M-1.95M	EG020: Arsenic	7440-38-2	5 mg/kg	77.6	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114984
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 30-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 12-JUL-2011
C-O-C number	: H016785			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 08-JUL-2011

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: **HK1114984**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S20B1
 1.50M-1.95M**

Client sampling date / time

30-JUN-2011 11:15

Compound	CAS Number	LOR	Unit				
				HK1114984-001			

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	19.6			
--	------	-----	---	-------------	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	7			
-----------------------	-----------	---	-------	----------	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1858718)								
HK1114853-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	17.7	17.5	1.1
HK1114929-008	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	12.2	11.0	10.1
EG: Metals and Major Cations (QC Lot: 1862040)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
								LCS	DCS	Low	High	Value	Control Limit		
EG: Metals and Major Cations (QC Lot: 1862040)															
EG020: Arsenic				7440-38-2	1	mg/kg	<1	5 mg/kg	89.8	----	85	115	----	----	

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

Matrix: SOIL				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	
EG: Metals and Major Cations (QC Lot: 1862040)													
HK1114853-001				Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114985
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 30-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 12-JUL-2011
C-O-C number	: H016786			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 08-JUL-2011

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: **HK1114985**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S20C1
 1.50M-1.95M**

Client sampling date / time

30-JUN-2011 11:20

Compound	CAS Number	LOR	Unit				
				HK1114985-001			

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	36.9			
--	------	-----	---	-------------	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	21			
-----------------------	-----------	---	-------	-----------	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1858718)								
HK1114853-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	17.7	17.5	1.1
HK1114929-008	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	12.2	11.0	10.1
EG: Metals and Major Cations (QC Lot: 1862040)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
								LCS	DCS	Low	High	Value	Control Limit		
EG: Metals and Major Cations (QC Lot: 1862040)															
EG020: Arsenic				7440-38-2	1	mg/kg	<1	5 mg/kg	89.8	----	85	115	----	----	

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

Matrix: SOIL				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	
EG: Metals and Major Cations (QC Lot: 1862040)													
HK1114853-001				Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 5
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114986
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louis.cheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 30-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 12-JUL-2011
C-O-C number	: H016787			No. of samples received	: 4
Site	: LMC LOOP AREA A			No. of samples analysed	: 4

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

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.

<i>Signatories</i>	<i>Position</i>	<i>Authorised results for</i>
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: 08-JUL-2011

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: **HK1114986**

Sample(s) were received in a chilled condition.

Water sample(s) analysed and reported on an as received basis.

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

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.



Analytical Results

Sub-Matrix: SOIL

Client sample ID

				A-S20A1 3.00M-3.45M	A-S20A1 3.00M-3.45M DUPLICATE			
				30-JUN-2011 14:00	30-JUN-2011 14:00			
				HK1114986-001	HK1114986-002			

Client sampling date / time

<i>Compound</i>	<i>CAS Number</i>	<i>LOR</i>	<i>Unit</i>					
-----------------	-------------------	------------	-------------	--	--	--	--	--

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	12.8	14.4			
--	------	-----	---	-------------	-------------	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	2	3			
-----------------------	-----------	---	-------	----------	----------	--	--	--



Sub-Matrix: WATER				Client sample ID	A-S20A1 EQUIPMANT BLANK	A-S20A1 FIELD BLANK			
				Client sampling date / time	30-JUN-2011 14:00	30-JUN-2011 14:00			
Compound	CAS Number	LOR	Unit		HK1114986-003	HK1114986-004			
EG: Metals and Major Cations - Filtered									
EG020: Arsenic	7440-38-2	10	µg/L		<10	<10			



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1858719)								
HK1114986-001	A-S20A1 3.00M-3.45M	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	12.8	14.2	10.6
EG: Metals and Major Cations (QC Lot: 1862040)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0

Matrix: WATER				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 - Filtered (QC Lot: 1858880)								
HK1114986-004	A-S20A1 FIELD BLANK	EG020: Arsenic	7440-38-2	10	µg/L	<10	<10	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1862040)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8	----	85	115	----	----

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
EG: Metals and Major Cations - Filtered (QC Lot: 1858880)											
EG020: Arsenic	7440-38-2	10	µg/L	<10	100 µg/L	90.5	----	85	115	----	----

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1862040)										
HK1114853-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6	----	75	125	----	----

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
EG: Metals and Major Cations - Filtered (QC Lot: 1858880)										
HK1114986-003	A-S20A1 EQUIPMANT BLANK	EG020: Arsenic	7440-38-2	100 µg/L	87.9	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114988
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 30-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 12-JUL-2011
C-O-C number	: H016788			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 08-JUL-2011

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: **HK1114988**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S20B1
 3.00M-3.45M**

Client sampling date / time

30-JUN-2011 14:20

Compound	CAS Number	LOR	Unit				
				HK1114988-001			

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	27.2			
--	------	-----	---	-------------	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	17			
-----------------------	-----------	---	-------	-----------	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1858719)								
HK1114986-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	12.8	14.2	10.6
EG: Metals and Major Cations (QC Lot: 1862040)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1862040)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8	----	85	115	----	----

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1862040)										
HK1114853-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114989
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louis.cheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 30-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 12-JUL-2011
C-O-C number	: H016789			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 08-JUL-2011

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: **HK1114989**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S20C1
 3.00M-3.45M**

Client sampling date / time

30-JUN-2011 14:40

Compound	CAS Number	LOR	Unit				
				HK1114989-001			

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	30.1			
--	------	-----	---	-------------	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	12			
-----------------------	-----------	---	-------	-----------	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1858719)								
HK1114986-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	12.8	14.2	10.6
EG: Metals and Major Cations (QC Lot: 1862040)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1862040)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8	----	85	115	----	----

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1862040)										
HK1114853-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114991
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 02-JUL-2011
Order number	: GE/2009/16.15			Issue Date	: 12-JUL-2011
C-O-C number	: H016790			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 08-JUL-2011

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: **HK1114991**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S20A1
 4.50M-4.95M**

Client sampling date / time

02-JUL-2011 10:40

Compound	CAS Number	LOR	Unit				
				HK1114991-001			

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	18.6			
--	------	-----	---	-------------	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	3			
-----------------------	-----------	---	-------	----------	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1858719)								
HK1114986-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	12.8	14.2	10.6
EG: Metals and Major Cations (QC Lot: 1862040)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1862040)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8	----	85	115	----	----

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1862040)										
HK1114853-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114994
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 02-JUL-2011
Order number	: GE/2009/16.15			Issue Date	: 12-JUL-2011
C-O-C number	: H016791			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 08-JUL-2011

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: **HK1114994**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S20B1
 4.50M-4.95M**

Client sampling date / time

02-JUL-2011 10:50

Compound	CAS Number	LOR	Unit				
				HK1114994-001			

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	28.6			
--	------	-----	---	-------------	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	16			
-----------------------	-----------	---	-------	-----------	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1858719)								
HK1114986-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	12.8	14.2	10.6
EG: Metals and Major Cations (QC Lot: 1862040)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0
HK1114994-001	A-S20B1 4.50M-4.95M	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1862040)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8	----	85	115	----	----

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1862040)										
HK1114853-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6	----	75	125	----	----



CERTIFICATE OF ANALYSIS

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	: HK1114997
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisacheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	: ----	Telephone	: +852 2610 1044		
Facsimile	: ----	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	: ----	Date Samples Received	: 02-JUL-2011
Order number	: GE/2009/16.15			Issue Date	: 12-JUL-2011
C-O-C number	: H016792			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 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: 08-JUL-2011

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: **HK1114997**

Sample(s) were received in a chilled condition.

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

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.

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

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



Analytical Results

Sub-Matrix: SOIL

Client sample ID

**A-S20C1
 4.50M-4.95M**

Client sampling date / time

02-JUL-2011 10:59

Compound	CAS Number	LOR	Unit				
				HK1114997-001			

EA/ED: Physical and Aggregate Properties

EA055: Moisture Content (dried @ 103°C)	----	0.1	%	40.9			
--	------	-----	---	-------------	--	--	--

EG: Metals and Major Cations

EG020: Arsenic	7440-38-2	1	mg/kg	13			
-----------------------	-----------	---	-------	-----------	--	--	--



Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 1858719)								
HK1114986-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	12.8	14.2	10.6
EG: Metals and Major Cations (QC Lot: 1862040)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	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	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1862040)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8	----	85	115	----	----

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

Matrix: SOIL				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
EG: Metals and Major Cations (QC Lot: 1862040)										
HK1114853-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6	----	75	125	----	----

Appendix E

Responses to Comments

Comments from Related Departments/Parties

Page No.

Civil Engineering and Development Department, New Territories North and West Development Office	2
Environmental Protection Department, Environmental Assessment Division, Strategic Assessment Group	2

COMMENTS FROM RELATED DEPARTMENTS/PARTIES

No.	Comments	Responses
1.	<p>Civil Engineering and Development Department, New Territories North and West Development Office</p> <p>Emily L. F. Chan, via email dated 09 September 2011</p>	
	<p>I refer to your letter ref. 209840/03/LYPC/TC/00394 dated 18.8.2011 submitting the supplementary CAR/RAP for Area A.</p> <p>Please note that I have no comment on the report except that the summary of test results of Stage 2 SI Works currently bound in Appendix D should be placed in Appendix C.</p> <p>Please also incorporate comments from other departments in the report</p>	<p>Noted. The summary of test results of Stage 2 SI Works will be placed in the corresponding appendix accordingly.</p> <p>Noted.</p>
2.	<p>Environmental Protection Department, Environmental Assessment Division, Strategic Assessment Group</p> <p>Mr. Vincent Lau, via email dated 16 September 2011</p>	
	<p>I refer to the captioned Supplementary Contamination Assessment Report and Remediation Action Plan for Area A dated August 2011.</p> <p>Comments from our specialist colleague on land contamination/waste management (Dr. Jacqueline Wong, ph: 2835 1226) are given below:</p>	

No.	Comments	Responses
	<p>Section 2.1: The intervals of sampling depth need to be explicitly indicated</p>	<p>The last sentence of Section 2.1 has been revised as follow: <i>“But in order to also confirm the vertical extent of Arsenic contamination, it was later decided that soil samples should be collected at the same depth intervals as in Stage 1 SI i.e. 1.5-1.95mbgl, 3.0-3.45mbgl and 4.5-4.95mbgl.”</i></p>
	<p>Section 3.1: The consultants need to clarify the contradictory statements regarding any exceedance of RBRGs standard found in the soil samples</p>	<p>Section 3.1 has been revised as follow: <i>“At the sampling depths where Arsenic contamination was detected previously in Stage 1 SI (refer to Table 1.1), no Arsenic exceedances were found according to the laboratory testing results. However, among the depths where Arsenic contamination were not previously detected, marginal exceedances of the RBRG (Rural Residential) Arsenic limit were found in the samples collected at A-S03a1 (4.5-4.95 mbgl) and A-S03c1 (1.5-1.95 mbgl).”</i></p>
	<p>Section 4.1: The consultants need to justify the estimated vertical extent of contamination of the corresponding borehole (as shown in the referred Table 4.1) wrt the testing results obtained from Stage 2 SI works as per Appendix C.</p>	<p>Sections 4.1.1 and 4.1.2 have been added to provide details on the methodologies for the estimation of the soil contamination extent. A note has also been added to Table 4.1 which states that: <i>“[1] For such sample with contamination detected, the full depth of soil sampling is taken as contaminated. Besides, a depth of 0.5m above and below that sampling depth respectively will be taken as contaminated as a conservative estimate. For example, for the sampling depth of 3.0–3.5mgbl with contaminated laboratory testing finding, the vertical extent of contamination will be estimated from 2.5mgbl (i.e. 3mgbl - 0.5m) to 4mgbl (i.e. 3.5mgbl + 0.5m), and the vertical extent of contamination is therefore estimated as 1.5m.”</i></p>

No.	Comments	Responses
	<p>Section 5: The meaning of the first sentence in the second paragraph is unclear.</p>	<p>The second paragraph have been revised as follow:</p> <p><i>“According to the testing results, no further Arsenic exceedances were found at the sampling depths where such contamination was detected previously in Stage I SI. However, Arsenic concentrations in the soil samples collected from A-S03a1 at 4.5-4.95 mbgl and from A-S03c1 at 1.5-1.95 mgbl have marginally exceeded the RBRGs of Rural Residential land uses. These two boreholes were considered as two additional contaminated boreholes and their respective possible contamination zones have been estimated.”</i></p>