

Gammon Construction Limited

Reprovisioning and Upgrading of Salt  
Water Service Reservoirs in Western  
District for Water Supplies Department:  
*Final Environmental Monitoring and  
Audit Report*

December 2009

**Environmental Resources Management**

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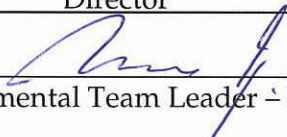
ENVIRONMENTAL MONITORING &  
AUDIT REPORT

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Reference 0067560

For and on behalf of ERM – Hong Kong, Limited	
Approved by:	Dr Robin Kennish
Signed:	
Position:	Director
Certified by:	 (Environmental Team Leader & Marcus Ip)
Date:	23 December 2009

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## CONTENTS

	<i>EXECUTIVE SUMMARY</i>	<i>I</i>
<i>1</i>	<i>INTRODUCTION</i>	<i>1</i>
<i>1.1</i>	<i>PURPOSE OF THE REPORT</i>	<i>1</i>
<i>1.2</i>	<i>STRUCTURE OF THE REPORT</i>	<i>1</i>
<i>2</i>	<i>PROJECT INFORMATION</i>	<i>3</i>
<i>2.1</i>	<i>BACKGROUND</i>	<i>3</i>
<i>2.2</i>	<i>PROJECT ORGANISATION</i>	<i>4</i>
<i>3</i>	<i>ENVIRONMENTAL MONITORING REQUIREMENTS</i>	<i>5</i>
<i>3.1</i>	<i>AIR QUALITY MONITORING</i>	<i>5</i>
<i>3.2</i>	<i>NOISE MONITORING</i>	<i>6</i>
<i>3.3</i>	<i>CULTURAL HERITAGE</i>	<i>7</i>
<i>4</i>	<i>IMPLEMENTATION STATUS OF ENVIRONMENTAL PROTECTION REQUIREMENTS</i>	<i>9</i>
<i>5</i>	<i>REVIEW OF THE EM&amp;A DATA</i>	<i>10</i>
<i>5.1</i>	<i>AIR QUALITY</i>	<i>10</i>
<i>5.2</i>	<i>NOISE</i>	<i>10</i>
<i>5.3</i>	<i>CULTURAL HERITAGE</i>	<i>11</i>
<i>5.4</i>	<i>WASTE MANAGEMENT</i>	<i>13</i>
<i>5.5</i>	<i>ENVIRONMENTAL SITE INSPECTION</i>	<i>13</i>
<i>5.6</i>	<i>CONCLUSION OF REVIEW</i>	<i>14</i>
<i>6</i>	<i>ENVIRONMENTAL NON-CONFORMANCE</i>	<i>15</i>
<i>6.1</i>	<i>SUMMARY OF MONITORING EXCEEDANCE</i>	<i>15</i>
<i>6.2</i>	<i>SUMMARY OF ENVIRONMENTAL NON-COMPLIANCE</i>	<i>15</i>
<i>6.3</i>	<i>SUMMARY OF ENVIRONMENTAL COMPLAINT</i>	<i>15</i>
<i>6.4</i>	<i>SUMMARY OF ENVIRONMENTAL SUMMON AND SUCCESSFUL PROSECUTION</i>	<i>15</i>
<i>7</i>	<i>CONCLUSION</i>	<i>16</i>

## LIST OF TABLES

Table 2.1	Summary of Current Environmental Licensing, Notification and Permit Status
Table 3.1	Air Monitoring Station
Table 3.2	Action and Limit Levels for Air Quality

Table 3.3	TSP Monitoring Equipment
Table 3.4	Noise Monitoring Station
Table 3.5	Action and Limit Level for Construction Noise Monitoring
Table 3.6	Noise Monitoring Equipment
Table 3.7	Monitoring Frequency
Table 3.8	Alert, Action and Alarm Levels
Table 5.1	Comparison of the HKAQO and Air Quality Monitoring Results
Table 5.2	Comparison of the HKAQO and Air Quality Monitoring Results
Table 5.3	Summary of Abnormal Readings for Cultural Heritage Monitoring recorded over the Construction phase of the Project
Table 5.4	Quantities of Different Waste
Table 6.1	Summary of Record of Exceedance

### *LIST OF ANNEXES*

Annex A	Location of Works Areas
Annex B	Project Organisation
Annex C	Location of Monitoring Stations and Photographs showing Monitoring Stations
Annex D	Event / Action Plans for Air, Construction Noise and Cultural Heritage Monitoring
Annex E	Summary of Implementation Status
Annex F	24-hour TSP Monitoring Results
Annex G	Construction Noise Monitoring Results
Annex H	Waste Flow Table

## EXECUTIVE SUMMARY

The construction works for Reprovisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department commenced on 21 July 2007 and was completed on 29 October 2009. This is the Final Environmental Monitoring and Audit (EM&A) Report to present the EM&A work carried out and review the data collected over the entire construction phase of the Project.

### Summary of construction works undertaken for the Project

The major construction works undertaken during the construction phase of the Project included:

- Slope work and portal / access tunnel construction;
- Tunnel excavation for Salt Water Services Reservoirs (SWSR) No. 1;
- SWSR No. 1 Construction;
- Tunnel excavation for SWSR No. 2; and
- SWSR No. 2 Construction

### Environmental Monitoring and Audit Progress

A summary of the monitoring activities in the construction phase of the Project is listed below:

24-hour TSP monitoring	1 set per week
Construction noise monitoring	1 set per week
Joint environmental site auditing	once per week
Building settlement monitoring	every day except Sundays and general holidays
Building tilt monitoring	at least once every day

### Air Quality

24-hour TSP measurements were carried out at the designated monitoring station AM1 during the construction phase of the Project. No exceedance was recorded over the construction phase of the Project. The review of air monitoring data indicates that the air quality has returned to the state before the commencement of the construction of the Project.

### Noise

30-minute noise measurements were carried out at the designated monitoring stations NM1 & NM2 during the construction phase of the Project. Only one isolated exceedance was recorded on 30 July 2007 in the first reporting period (ie 21 July to 20 August 2007). In general, there was no significant difference

in the noise levels before the commencement of construction of the Project and those measured during the construction of the Project.

### Cultural Heritage

Monitoring of potential building movements of the Elliot Treatment Works (ETW) during construction of the Designated Project was conducted over the entire construction phase of the Project. No exceedance in this respect was recorded for the entire construction phase of the Project.

### Construction Waste Management

Inert C&D materials and non-inert C&D wastes were generated during the construction phase of the Project. The non-inert C&D wastes after segregation were disposed of at SENT Landfill. Recommended mitigation measures in the PP were implemented by the Contractor as far as practicable and were considered effective in minimizing the total quantity of wastes generated during the construction period.

### Environmental Non-compliance

No non-compliance event was recorded during the construction of the Project. No environmental complaint and summons was received during the same period.

### Future Key Issues

Construction of the Designated Project (DP) was completed on 29 October, 2009. As a result, there will be no further environmental issues related to the construction of the Project.

ERM-Hong Kong, Limited (ERM) was appointed by Gammon Construction Limited (the Contractor) as the Environmental Team (ET) to implement the Environmental Monitoring and Audit (EM&A) programme for the Reprovisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department (the Project).

### **1.1 PURPOSE OF THE REPORT**

This is the final EM&A report which summarizes and reviews the impact monitoring results and audit findings for the EM&A programme over the construction phase of the Project.

### **1.2 STRUCTURE OF THE REPORT**

The structure of the report is as follows:

**Section 1 : Introduction**

Details the scope and structure of the report.

**Section 2 : Project Information**

Summarizes the background and scope of the Project, site description, construction programme, the construction works undertaken and the status of Environmental Permits/Licences over the construction phase of the Project.

**Section 3 : Environmental Monitoring Requirement**

Summarizes the monitoring parameters, monitoring programmes, monitoring methodologies, monitoring frequency, monitoring locations, Action and Limit Levels, environmental mitigation measures as recommended in the Project Profile (PP) and relevant environmental requirements.

**Section 4 : Implementation Status on Environmental Mitigation Measures**

Summarizes the implementation of environmental protection measures during the entire construction phase of the Project.

**Section 5 : Review of EM&A Data**

reviews and compares the EM&A data collected during the construction phase of the Project with the baseline EM&A data and annotates with explanation for any discrepancies.

**Section 6 : Environmental Non-conformance**

Summarizes any monitoring exceedance, environmental complaints and environmental summons within the construction phase of the Project.

## Section 7 : **Conclusion**



## 2.1

## BACKGROUND

The works for the Reprovisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department (the Project) constructed in rock beneath the northern hill slopes of Lung Fu Shan immediately adjacent to the present Water Supplies Department (WSD) facilities, south of Pok Fu Lam Road. The works areas of the Project are illustrated in *Annex A*.

The rock cavern comprises two salt water storage tunnels connected to a common section leading to an access portal. It was excavated using a non-explosive drill-and-break tunnelling method. The cavern was lined with concrete and the water storage reservoirs were constructed from reinforced concrete. Each of the two water storage tunnels of the rock cavern is approximately 60 m in length and 17 m in span. These storage tunnels are connected to a common section of approximately 40 m in length and 8 m in span, which leads to an access portal on the hill slope. The internal tank dimensions of each of the salt water service reservoirs are 46.8m (L) x 15m (W) x 9m (H) approximately. The two reservoirs are designed to provide a combined saltwater storage capacity of 12,000m<sup>3</sup>. The construction activities involved:

- Slope work and portal / access tunnel construction;
- Tunnel excavation for Salt Water Services Reservoirs (SWSR) No. 1;
- SWSR No. 1 Construction;
- Tunnel excavation for SWSR No. 2; and
- SWSR No. 2 Construction

The potential environmental impacts of the Project have been presented in the Project Profile (PP) "*Reprovisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department*" (Application No. DIR-150/2007), and an Environmental Permit (EP-279/2007) (EP) for the Project was granted on 4 June 2007. Under the requirements of Condition 3.2 of Environmental Permit EP-279/2007, an EM&A programme as set out in the EM&A Manual is required to be implemented. In accordance with the EM&A Manual, baseline monitoring of air quality and noise is required for the Project.

A Further Environmental Permit (FEP-01/279/2007) (FEP) for the construction phase of the Project was granted to Gammon Construction Limited on 23 October 2007.

The EP and FEP were amended and replaced by EP-279/2007/A and FEP-01/279/2007/A, respectively, on 24 December 2008.

The construction works commenced on 21 July 2007 and all construction works for the Project was completed by 29 October 2009. EPD was notified on 23 October 2009 of the completion of the construction works for the Designated Project (DP) and the termination of the construction phase EM&A programme. With the completion of the construction works, the FEP previously granted to Gammon Construction Limited was surrendered on 29 October 2009.

## 2.2

### *PROJECT ORGANISATION*

The Project organization chart and contact details are shown in *Annex B*.

### 3.1 AIR QUALITY MONITORING

#### 3.1.1 Monitoring Location

In accordance with the EM&A Manual, monitoring of ambient 24-hour Total Suspended Particulates (TSP) level was conducted at the monitoring station listed in *Table 3.1*. A map and a photograph showing the monitoring station are presented in *Annex C*.

**Table 3.1** *Air Monitoring Station*

Monitoring Station	Description
AM1	Chow Yei Ching Building, HKU

#### 3.1.2 Monitoring Parameter and Frequency

Weekly 24-hour TSP monitoring was conducted in accordance with the requirements stipulated in the EM&A Manual.

#### 3.1.3 Action and Limit Levels

The Action and Limit levels have been established in accordance with the EM&A Manual and are presented in *Table 3.2*.

**Table 3.2** *Action and Limit Levels for Air Quality*

Parameter	Air Monitoring Station	Action Level, $\mu\text{gm}^{-3}$	Limit Level, $\mu\text{gm}^{-3}$
24-hour TSP	AM1	173	260

#### 3.1.4 Monitoring Equipment

Continuous 24-hour TSP monitoring was performed using High Volume Samplers (HVS) with appropriate sampling inlets installed, located at the designated monitoring station. The performance specification of HVS complies with the standard method “*Determination of Suspended Particulate Matter in the Atmosphere (High Volume Method)*” as stipulated in US EPA Standard Title 40, Code of Federation Regulations Chapter 1 (Part 50 Appendix B). *Table 3.3* summarizes the equipment that was used in the 24-hour TSP monitoring.

**Table 3.3** *TSP Monitoring Equipment*

Monitoring Station	Equipment	Model (HVS, Calibration Kit)
AM1	HVS, Calibration Kit	GMWS-2310, CM-AIR-43

### 3.1.5 *Event Action Plan*

The Event / Action Plan (EAP) for air quality monitoring is presented in *Annex D*.

## 3.2 *NOISE MONITORING*

### 3.2.1 *Monitoring Location*

In accordance with the EM&A Manual, monitoring of construction noise impact was conducted at the monitoring stations listed in *Table 3.4*. A map and photographs showing the monitoring stations are presented in *Annex C*.

**Table 3.4** *Noise Monitoring Station*

Monitoring Station	Description
NM1	Tower 3 of The Belcher's
NM2	Starr Hall, HKU

### 3.2.2 *Action and Limit Levels*

Action and Limit (A/L) Levels provide an appropriate framework for the interpretation of monitoring results. Interpretation of monitoring results is undertaken through checking them against the Action and Limit (A/L) Levels defined in *Table 3.5*.

**Table 3.5** *Action and Limit Level for Construction Noise Monitoring*

Time Period	Action Level	Limit Level
0700 – 1900 hours on any day not being a Sunday or general holiday	When one documented complaint is received from any one of the sensitive receivers	75 dB(A)

### 3.2.3 *Monitoring Parameters and Frequency*

Weekly construction noise monitoring was conducted in accordance with the requirements stipulated in the EM&A Manual.

The construction noise levels were measured in terms of A-weighted equivalent continuous sound pressure level ( $L_{eq}$ ) in decibels dB(A). Supplementary information for data auditing, two statistical sound levels  $L_{10}$  and  $L_{90}$ ; the levels exceeded for 10 and 90 percent of the time respectively, were also recorded during the monitoring for reference.

### 3.2.4 *Monitoring Equipment*

The sound level meters and calibrator used for the noise measurement, as listed in *Table 3.6*, complies with IEC 651: 1979 and 804:1985 (Type 1) specification.

**Table 3.6**      **Noise Monitoring Equipment**

Monitoring Station	Monitoring Equipment
NM1	Rion NL-31
NM2	Rion NL-31

### 3.2.5      *Event / Action Plan*

The Event / Action Plan (EAP) for noise monitoring is presented in *Annex D*.

## 3.3      **CULTURAL HERITAGE**

### 3.3.1      *Monitoring Location and Methodology*

Building settlement markers and building tiltmeters were installed at the monitoring locations which have been agreed with Antiquities and Monuments Office (AMO) of Leisure and Cultural Services Department (LCSD) (*Annex C*). Building settlement marker BS10 was moved for a small distance of about 2m to BS10a due to difficulties in accessing BS10 after the provision of a security office. The tiltmeter at TM10 was replaced by a new piece of equipment with the designation of TM10R on 21 July 2008 subsequent to damages sustained by the original TM10 equipment during a storm. The monitoring frequency during the construction phase of the Project is summarized in *Table 3.7*.

Demolition of the former SWSR1 was completed on 25 August 2008 and there is no longer a need to monitor the potential effects of works nearby on the settlement of the structure of the former SWSR1. A building settlement marker, BS14, installed on the former SWSR1 and designated for the monitoring of the movements of this structure was also removed. As BS14 has served its intended purpose and there are other settlement monitoring markers on the ETW itself for settlement monitoring. The termination of monitoring at BS14 was endorsed by EPD on 28 October 2008 on the basis that the removal of BS14 would not affect in any way the monitoring of building settlement movements for the ETW.

**Table 3.7**      **Monitoring Frequency**

Instrument	Monitoring Frequency
Building settlement markers	Monitoring was taken every day except Sundays and general holidays
Building tiltmeters	Monitoring was taken at least once every day

### 3.3.2      *Alert, Action and Alarm Levels*

The Alert, Action and Alarm Levels which were agreed with AMO are presented in *Table 3.8*.

**Table 3.8**      *Alert, Action and Alarm Levels*

Instrument		Alert Level	Action Level	Alarm Level
Building settlement markers	Vertical	12 mm or 4 mm/day	20 mm or 6 mm/day	25 mm or 8 mm/day
	Tilt	1:1000	1:600	1:500
	Horizontal	4 mm	6 mm	8 mm
Building tiltmeters		0.1 Degree ( $\pm 1.75\text{mm/m}$ )	0.15 Degree ( $\pm 2.62\text{mm/m}$ )	0.2 Degree ( $\pm 3.49\text{mm/m}$ )

### 3.3.3      *Event / Action Plan*

The Event / Action Plan (EAP) for building movements monitoring is presented in *Annex D*.

## ***IMPLEMENTATION STATUS OF ENVIRONMENTAL PROTECTION REQUIREMENTS***

The Contractor has implemented environmental mitigation measures and requirements as stated in the Project Profile (DIR-150/2007), the Environmental Permit, Further Environmental Permit, EM&A Manual and the amended EP and FEP. The implementation status of environmental protection and pollution control/mitigation measures required in the Project Profile, EP, FEP and EM&A Manual during the construction phase of the Project is summarized in *Annex E*.

## 5.1 AIR QUALITY

The monitoring data for the 24-hour TSP levels at the monitoring station AM1 for the construction phase of the Project are presented in *Figure F1* in *Annex F*. No exceedance of action or limit level was recorded during the entire construction phase. The weather conditions during the air quality monitoring for the construction phase of the Project varied from sunny to rainy. Local influence near the monitoring station was mainly associated with vehicular emissions from the road traffic along Pok Fu Lam Road.

*Figure F1* in *Annex F* demonstrates that the impact monitoring data in general fall within the range of the baseline data for the environmental parameter concerned. The monitoring data recorded from mid-August to October 2009 are in general higher than the upper range of the baseline data, which is likely due to the activities of concurrent projects, ie construction of the HKU Centennial Campus, adjacent to the Project. The data provide support to the fact that the air quality has in general returned to the state before the commencement of the Project and that the air quality monitoring programme is effective in reflecting the air quality at nearby sensitive receivers in the vicinity of the Project.

A comparison was made between the monitoring results and the Hong Kong Air Quality Objectives (HKAQO) (*Table 5.1*).

**Table 5.1 Comparison of the HKAQO and Air Quality Monitoring Results**

Monitoring Station	HKAQO, $\mu\text{gm}^{-3}$	Measured 24-hour TSP Monitoring Results, $\mu\text{gm}^{-3}$ (a) (b)	
	24 hour <sup>(1)</sup>	Average	Range
AM1	260	81	63 – 138

**Notes:**

(a) Only 24-hour TSP monitoring results were compared as there is no 1-hour TSP criterion in HKAQO.

(b) Average and range of data were calculated using data obtained between the commencement and completion of the construction works for the Designated Project.

The monitoring results show that the average and range of 24-hour TSP levels recorded since the commencement of the construction works were well below the 24-hour TSP criterion in the HKAQO. The recommended mitigation measures in *Section 5.1* of the PP were implemented throughout the construction period and were considered effective.

## 5.2 NOISE

The monitoring data for the 30-minute construction noise measurements carried out at monitoring stations NM1 & NM2 during the construction phase of the Project are presented in *Figures G1* and *G2* in *Annex G*. The local



influence observed near the monitoring stations was mainly traffic noise from Pok Fu Lam Road and construction activities of the concurrent projects in the vicinity. Only one isolated exceedance of the Limit Level was recorded at Starr Hall, HKU (NM2) on 30 July 2007 with the recorded noise level at 76.2dB(A). Details of the exceedance are provided in *Section 6*. No other construction noise exceedance was recorded during the entire construction phase of the Project.

The review of the impact noise monitoring data also indicates that the noise levels during the construction phase of the Project remained in general within the range of the baseline monitoring data. Based on this, it is considered that the ambient noise environment has returned to the state before the commencement of the construction of the Project. The noise monitoring programme was considered effective in reflecting the noise environment at nearby sensitive receivers in the vicinity of the Project.

A comparison has also been made between the monitoring results and the daytime construction noise standard stipulated in *Annex 5* of the *Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)* in *Table 5.2*.

**Table 5.2** *Comparison of the Construction Noise Limit and Noise Monitoring Results*

Monitoring Station	Daytime Construction Noise Limit expressed as $L_{eq(30min)}$ in <i>Annex 5</i> of EIAO-TM, dB(A)	Measured Noise Monitoring Results expressed as $L_{eq(30min)}$ , dB(A) (Note)	
		Average	Range
NM1	75	70	65 – 75
NM2	75	71	67 – 76
<b>Note:</b> Average and range of data were calculated using data obtained between the commencement and completion of the construction works for the Designated Project.			

The monitoring results show that the average and range of noise levels recorded since the commencement of the construction works, except one isolated exceedance at NM2, were below the daytime construction noise criterion in *Annex 5* of the *EIAO-TM*. Recommended mitigation measures in *Section 5.2* of the PP were implemented throughout the construction period and were considered effective.

### 5.3 CULTURAL HERITAGE

The monitoring of building movement was conducted daily except Sundays and general holidays during the construction phase of the Project. No exceedance of the Alert, Action and Alarm Levels for building movements was recorded. Abnormal readings were identified for the tiltmeters on the dates indicated in *Table 5.3*. All the abnormal readings, except the one reported on 1 Apr 2008 at TM09, were found to be due to instrumentation errors and the relevant instruments were fixed immediately.

**Table 5.3** *Summary of Abnormal Readings for Cultural Heritage Monitoring recorded during the Construction Phase of the Project*

Reporting Period	Station	Date of Abnormal Reading
1 (21 Jul 2007 – 20 Aug 2007)	TM05	17 Aug 2007
	TM10	3 Aug 2007
2 (21 Aug 2007 – 20 Sept 2007)	TM02	15 Sept 2007
	TM05	20 Sept 2007
3 (21 Sept 2007 – 20 Oct 2007)	-	-
4 (21 Oct 2007 – 20 Nov 2007)	TM02	14 Nov 2007
	TM05	1 Nov 2007
	TM09	6 Nov 2007
5 (21 Nov 2007 – 20 Dec 2007)	TM05	8 Dec 2007
	TM09	24 Nov; and 11 Dec 2007
	TM10	10 Dec 2007
6 (21 Dec 2007 – 20 Jan 2008)	TM05	19 Jan 2008
	TM09	26 Dec 2007; and 6 Jan 2008
	TM10	27 & 28 Dec 2007; and 1 Jan 2008
7 (21 Jan 2008 – 20 Feb 2008)	TM02	5 Feb 2008
	TM09	20 Feb 2008
8 (21 Feb 2008 – 20 Mar 2008)	TM02	29 Feb 2008
9 (21 Mar 2008 – 20 Apr 2008)	TM09	1 Apr 2008 <sup>(Note)</sup>
	TM10	20 Apr 2008
10 (21 Apr 2008 – 20 May 2008)	TM05	29 Apr 2008
	TM10	21 Apr 2008
11 (21 May 2008 – 20 Jun 2008)	TM10	26 May and 6 Jun 2008
12 (21 Jun 2008 – 20 Jul 2008)	TM02	23 & 28 Jun; and 3 Jul 2008
	TM05	15 Jul 2008
	TM09	6 Jul 2008
	TM10R	24 Jun; and 16 & 18 Jul 2008
13 (21 Jul 2008 – 20 Aug 2008)	TM02	24, 25 & 30 Jul; and 6 & 7 Aug 2008
	TM09	17 Aug 2008
14 (21 Aug 2008 – 20 Sept 2008)	TM02	12 Sept 2008
	TM05	4 Sept 2008
	TM10R	28 Sept 2008
15 (21 Sept 2008 – 20 Oct 2008)	-	-
16 (21 Oct 2008 – 20 Nov 2008)	TM02	2 Nov 2008
	TM05	7 Nov 2008
	TM09	20 Nov 2008
17 (21 Nov 2008 – 20 Dec 2008)	TM09	30 Nov; and 17 & 18 Dec 2008
	TM10R	23 Nov 2008
18 (21 Dec 2008 – 20 Jan 2009)	TM05	19 Jan 2009
	TM10R	7 Jan 2009
19 (21 Jan 2009 – 20 Feb 2009)	TM02	10 Feb 2009
20 (21 Feb 2009 – 20 Mar 2009)	TM09	3, 13, 14 & 15 Mar 2009
	TM10R	2 Mar 2009
21 (21 Mar 2009 – 20 Apr 2009)	TM02	2 Apr 2009
	TM05	21 Mar 2009
22 (21 Apr 2009 – 20 May 2009)	TM02	26 Apr 2009
	TM05	15 May 2009
23 (21 May 2009 – 20 Jun 2009)	TM02	1 Jun 2009
	TM05	2 & 20 Jun 2009
	TM10	10 & 19 Jun 2009
24 (21 Jun 2009 – 20 Jul 2009)	TM02	14 Jul 2009
	TM05	1 Jul 2009
	TM09	30 Jun 2009
25 (21 Jul 2009 – 20 Aug 2009)	TM05	25 & 27 Jul 2009
	TM09	1 Aug 2009
26 (21 Aug 2009 – 20 Sept 2009)	TM02	23 Aug and 3 Sept 2009

Reporting Period	Station	Date of Abnormal Reading
27 (21 Sept 2009 – 29 Oct 2009)	TM05	23 Aug 2009
	TM09	23 Aug and 17 Sept 2009
	TM10R	21 Aug 2009
	TM05	28 Sept 2009
	TM09	29 Sept 2009
<b>Note</b>		
The abnormal reading was the result of human interference with the monitoring instruments from surveying activities within the building and the condition of the instrument was rectified immediately.		

The cultural heritage monitoring programme was considered effective in reflecting the potential effects of the construction activities of the Project on the Elliot Treatment Works adjacent to the access portal.

The recommended mitigation measures in *Section 5.7* of the PP were implemented throughout the construction period and were considered effective.

#### 5.4 WASTE MANAGEMENT

Wastes from this Project included mainly inert construction and demolition (C&D) wastes and non-inert C&D wastes. Reference has been made to the Monthly Summary Waste Flow Table prepared by Gammon Construction Limited (*Annex H*). The quantities of different types of wastes are summarized in *Table 5.4* with reference to relevant handling records and trip tickets for this Project. Appropriate measures were implemented by the Contractor to minimize dust impacts associated with waste management (*Annex E*).

**Table 5.4** *Quantities of Different Waste*

Month / Year	Quantity		
	C&D Materials (inert) <sup>(a)</sup>	C&D Materials (non-inert) <sup>(b)</sup>	Chemical Wastes
21 July 2007 – 29 October 2009	77,912.9 tonnes	186.6 tonnes	2,400 litres
<b>Notes:</b>			
(a) Inert C&D materials include bricks, concrete, building debris, rubble and excavated soil.			
(b) Non-inert C&D materials after segregation were disposed of at SENT Landfill.			

The recommended mitigation measures in *Section 5.4* of the PP were implemented by the Contractor as far as practicable and were considered effective in minimizing the total quantity of wastes generated during the construction period.

#### 5.5 ENVIRONMENTAL SITE INSPECTION

##### Weekly Site Inspection

Weekly site inspections were carried out by the ET over the construction period. These site inspections ensured that mitigation measures in the PP, the EM&A Manual and the requirements in the EP and FEP were properly

implemented by the Contractor. Findings in weekly site inspections revealed that there were no outstanding environment issues for the construction phase of the Project. No follow-up actions by the Contractor are required.

## **5.6** *CONCLUSION OF REVIEW*

The baseline monitoring data and impact monitoring results obtained during the construction phase of the Project have been reviewed. The monitoring results indicate that the construction of the Project has not caused any adverse impacts to the environment. Recommendations given in the PP are also considered to be adequate and effective for minimizing the environmental impacts.

### 6.1 SUMMARY OF MONITORING EXCEEDANCE

No exceedance was recorded for 24-hour TSP and building movements over the entire construction phase of the Project.

Only one isolated noise exceedance was recorded at Starr Hall, HKU (NM2) on 30 July 2007 within the first reporting period (ie 21 July to 20 August 2007). This was found not due to the works of the Project from the investigations conducted in accordance with the requirements of the EM&A Manual.

The noise exceedance recorded during the first reporting period and the corresponding investigation result are summarized in *Table 6.1*. A Notification of Exceedance with the detailed investigation report was issued to EPD immediately upon the identification of the above-mentioned exceedance.

**Table 6.1** *Summary of Record of Exceedance*

Station	Record of Exceedance	Result of Investigation
NM2	Exceedance of Limit Level for Construction Noise on 30 July 2007	An excavator and a breaker were being operated to demolish the existing salt water service reservoir, which were not associated with the Designated Project, and only site preparation work associated with the Designated Project was being undertaken. The dominant noise sources were identified as the demolition work of other concurrent projects. It was therefore concluded that the exceedance was likely due to other works rather than works of the Designated Project.

### 6.2 SUMMARY OF ENVIRONMENTAL NON-COMPLIANCE

No non-compliance event was recorded during the entire construction phase of the Project.

### 6.3 SUMMARY OF ENVIRONMENTAL COMPLAINT

No complaint was received for the entire construction phase of the Project.

### 6.4 SUMMARY OF ENVIRONMENTAL SUMMON AND SUCCESSFUL PROSECUTION

No summons was received during the entire construction phase of the Project.

The Final Environmental Monitoring and Audit (EM&A) Report summarizes the EM&A work undertaken and EM&A data collected during the construction phase of the Project in accordance with the EM&A Manual and the requirements under EP-279/2007, FEP-01/279/2007, EP-279/2007/A and FEP-01/279/2007/A over different stages of the Project.

Monitoring of air quality, construction noise and building movements for the protection of the Elliot Treatment works was conducted over the construction phase of the Project in accordance with the requirements in the EPs, FEPs and EM&A Manual. The monitoring programmes were considered effective in reflecting the environmental conditions at the sensitive receivers. The monitoring results indicate that the ambient environmental conditions around the Project have not been affected. The monitoring results also provide support to the fact that the construction of the Project has not caused adverse impacts to the environment, which is in line with the prediction in the PP.

Inert C&D materials and non-inert C&D wastes were generated during the construction phase of the Project. Recommended mitigation measures in the PP were implemented by the Contractor as far as practicable and were considered effective in minimizing the total quantity of wastes generated during the construction period.

Regular site inspections were conducted by the ET to monitor the implementation status of environmental mitigation measures over the construction phase of the Project. Findings from the weekly site inspections revealed that there were no outstanding environment issues in the Project. No follow-up actions will be required by the Contractor.

Only one isolated exceedance was recorded for construction noise, which was found not attributable to the works of the Project.

No complaint and summons/prosecution was received over the entire construction phase of the Project.

Annex A

## Locations of Works Areas

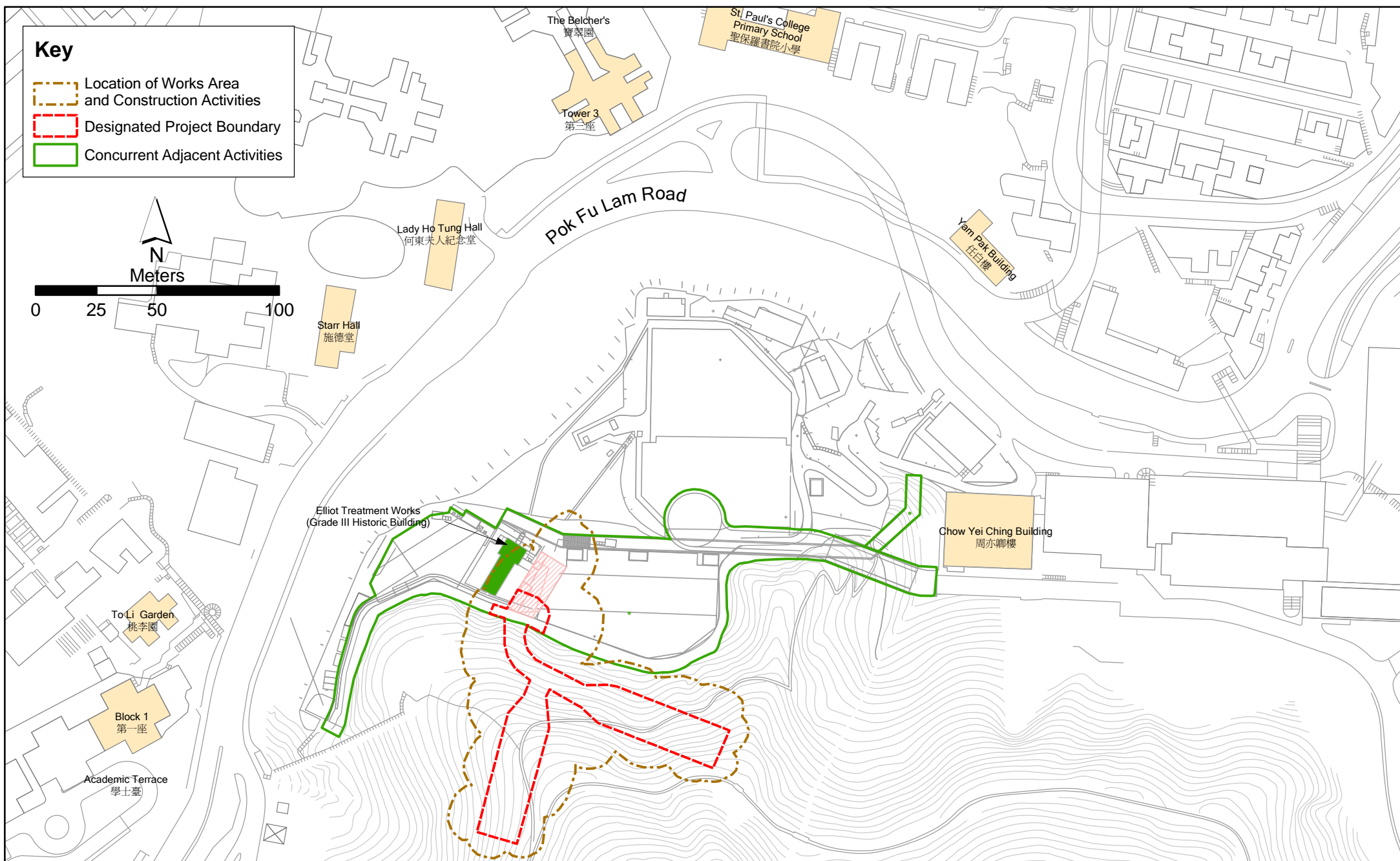


Figure A1

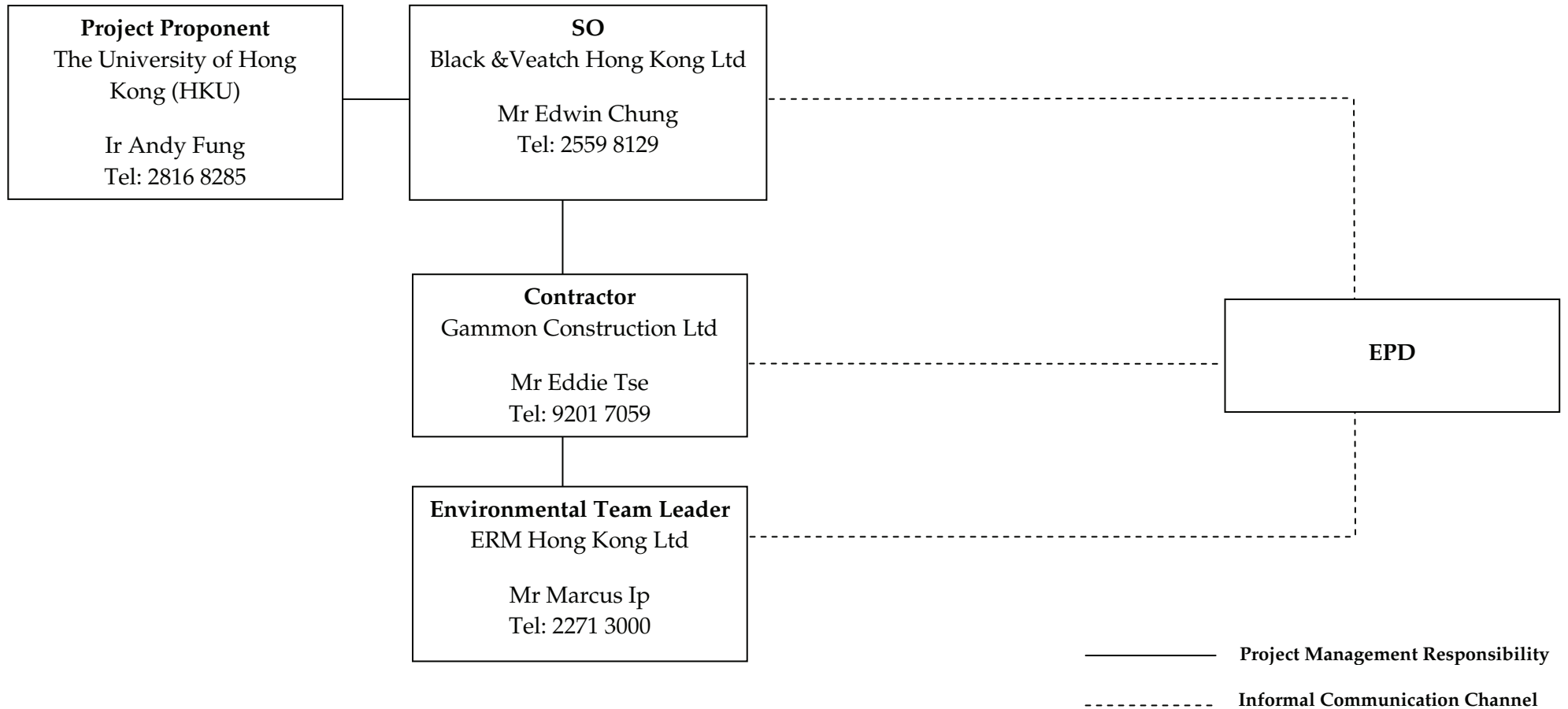
Project Location and Works Location



## Annex B

# Project Organization Chart and Contact Detail

*Project Organization (with contact details)*



Annex C

Location of Monitoring  
Stations and Photographs  
showing Monitoring  
Stations

### *Air quality Monitoring Station*



Air Quality Monitoring Station (AM1)

### *Noise Monitoring Station*



Noise Monitoring Station (NM1)



Baseline Noise Monitoring Station (NM2)

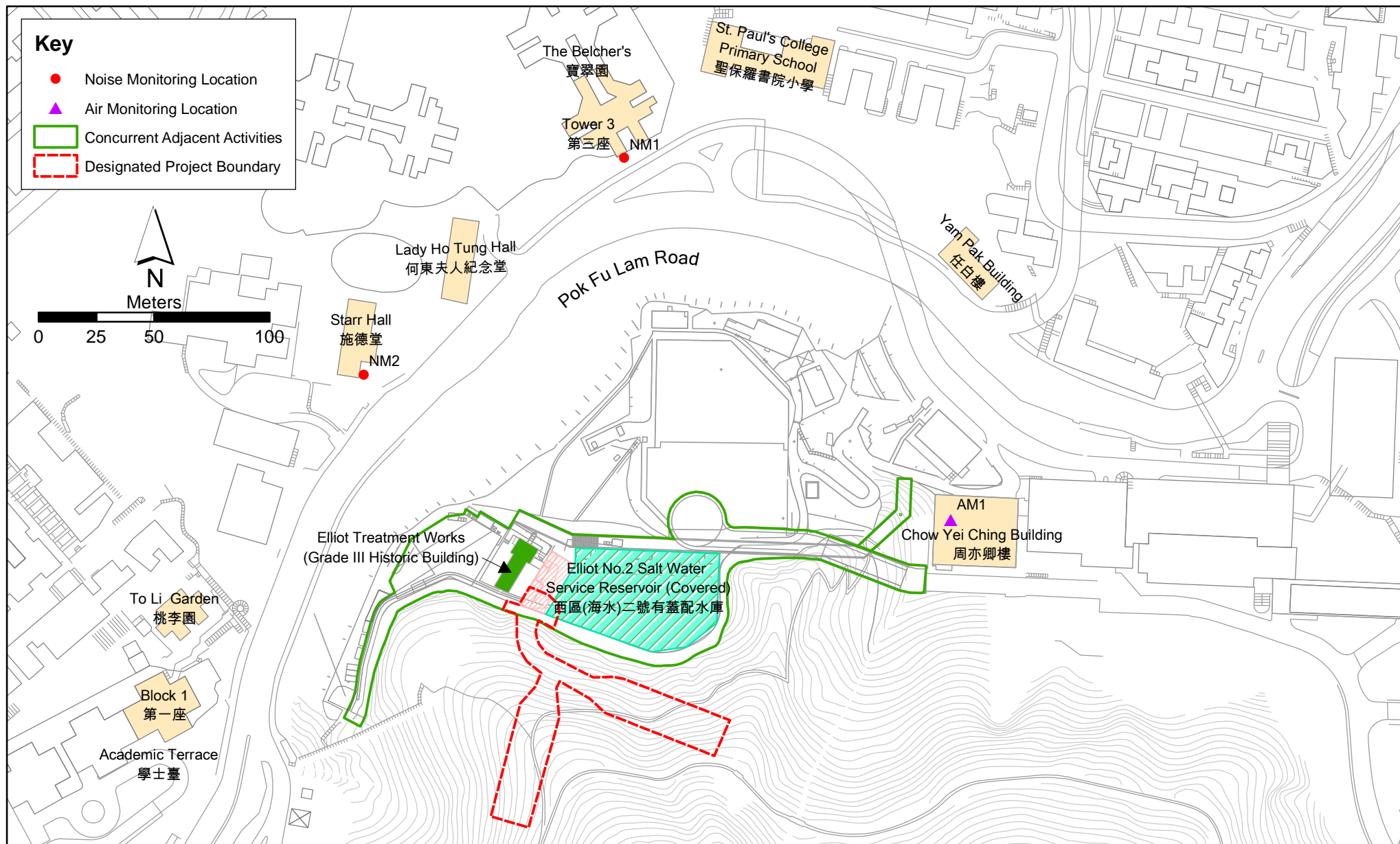
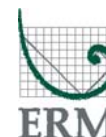


Figure C1

### Air and Noise Monitoring Locations

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Date: 03/07/2007

Environmental  
Resources  
Management



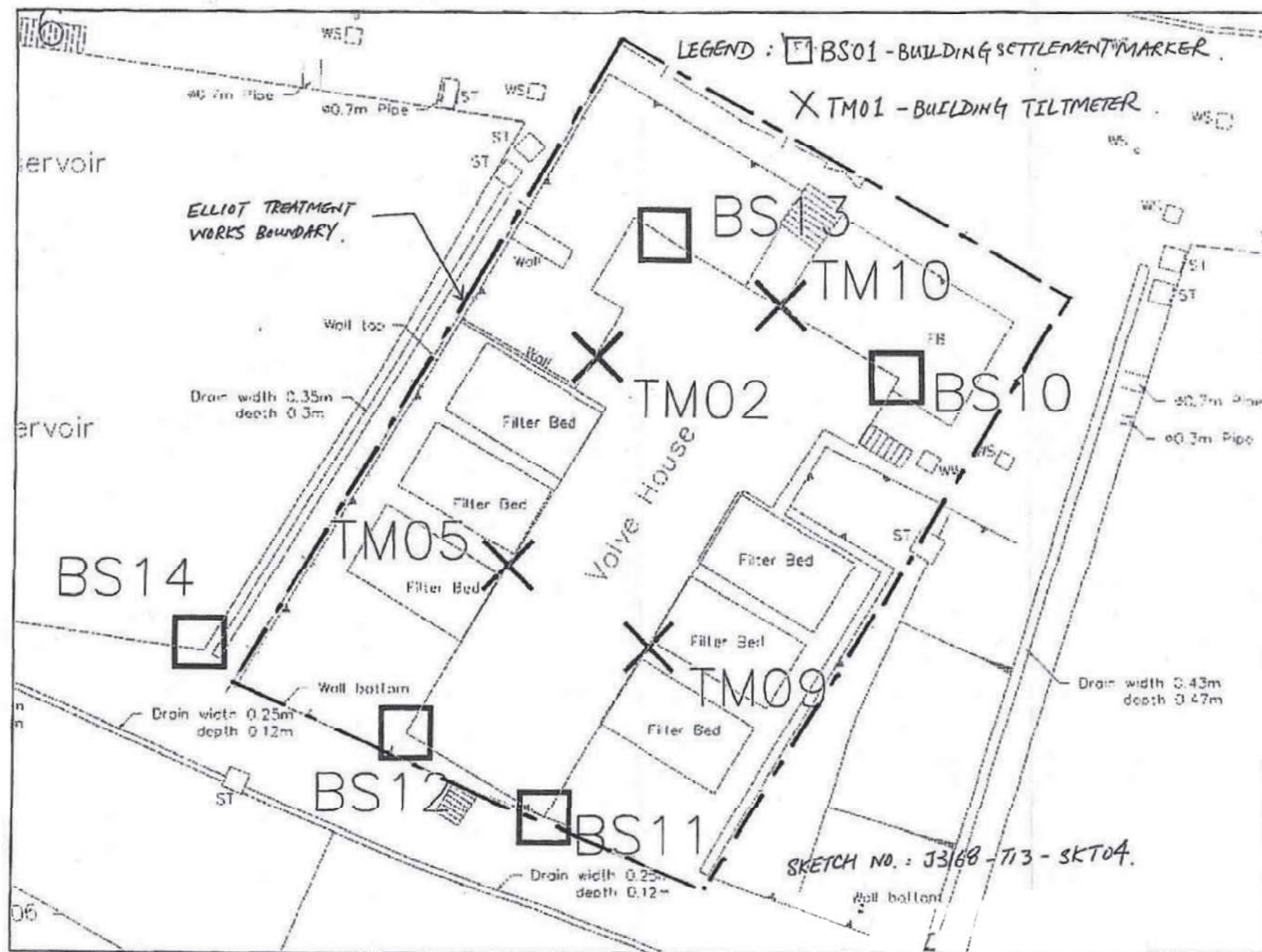


Figure C3

Locations for Monitoring of Potential Building Movements of Eliot Treatment Works

Annex D

## Event / Action Plans for Air, Construction Noise and Cultural Heritage Monitoring

**Table D1 Event Action Plans for Air Quality Monitoring**

Event	Action		
	ET Leader	Contractor	SO
<b>Action Level</b>			
Exceedance for one sample	<ol style="list-style-type: none"> <li>1. Notify SO and Contractor.</li> <li>2. Investigate the source(s) of exceedance.</li> <li>3. Report the investigation results and whether exceedance is due to contractor's works to the Contractor and SO.</li> <li>4. Review Contractor's air quality mitigation proposal and advise accordingly.</li> <li>5. Ensure remedial measures are properly implemented.</li> <li>6. Review subsequent monitoring results and report the findings to Contractor and SO.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance and rectify any unacceptable practice accordingly.</li> <li>2. Submit air mitigation proposal to ET and SO for agreement if ET indicates that exceedance is related to the construction works.</li> <li>3. Implement agreed proposal within a time scale as agreed with ET and SO.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing.</li> <li>2. Require Contractor to submit air mitigation proposal.</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>
Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>1. Notify SO and Contractor.</li> <li>2. Investigate the source(s) of exceedances.</li> <li>3. Report the investigation results and whether exceedances are due to contractor's works to the Contractor and SO.</li> <li>4. Review Contractor's air mitigation proposal and advise accordingly.</li> <li>5. Supervise and ensure remedial measures are properly implemented.</li> <li>6. Increase monitoring frequency to twice per week if exceedances are considered related to contractor's works until exceedance stops, and report the findings to Contractor and SO.</li> <li>7. If exceedances continue after 2 consecutive monitoring events, request meeting with Contractor and SO to discuss remedial actions.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance and rectify any unacceptable practice accordingly.</li> <li>2. Submit air mitigation proposal to ET and SO for agreement if ET indicates that exceedances are related to the construction works.</li> <li>3. Implement agreed proposal within a time scale as agreed with ET and SO.</li> <li>4. If exceedances continue after 2 consecutive monitoring events, meet with ET and the SO to formulate and implement further remedial measures until exceedance ceases.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedances in writing.</li> <li>2. Require Contractor to submit air mitigation proposal.</li> <li>3. Supervise the implementation of remedial measures.</li> <li>4. If exceedances continue after 2 consecutive monitoring events, arrange meeting with ET and the Contractor to formulate further remedial works until exceedance ceases.</li> </ol>



Event	Action		
	ET Leader	Contractor	Supervising Officer
<b>Limit Level</b>			
Exceedance for one sample	<ol style="list-style-type: none"> <li>1. Notify EPD, Contractor and SO.</li> <li>2. Investigate the source(s) of exceedance.</li> <li>3. Report the investigation results and whether exceedance is due to contractor's works to EPD, Contractor and SO.</li> <li>4. Review Contractor's air mitigation proposal and advise accordingly.</li> <li>5. Ensure remedial measures are properly implemented.</li> <li>6. Increase monitoring frequency to twice per week if exceedance is considered related to contractor's works until exceedance stops, and report the results to EPD, Contractor and SO.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance and rectify any unacceptable practice.</li> <li>2. Submit air mitigation proposal to ET and SO for agreement if ET indicates that exceedance is related to the construction works.</li> <li>3. Implement agreed proposal within a time scale as agreed with ET and The SO.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedances in writing.</li> <li>2. Require Contractor to submit air mitigation proposal.</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>
Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>1. Notify EPD, Contractor and SO.</li> <li>2. Investigate the source(s) of exceedances.</li> <li>3. Report the investigation results and whether exceedance is due to contractor's works to EPD, Contractor and SO.</li> <li>4. Review Contractor's air mitigation proposal and advise accordingly.</li> <li>5. Ensure remedial measures are properly implemented.</li> <li>6. Increase monitoring frequency to daily if exceedances are considered related to contractor's works until exceedance stops, and report the results to EPD, Contractor and SO.</li> <li>7. If exceedances continue after 2 consecutive monitoring events, request meeting with Contractor and SO to discuss remedial actions.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance and rectify any unacceptable practice.</li> <li>2. Submit air mitigation proposal to ET and SO for agreement within 3 working days of notification if ET indicates that exceedances are related to the construction works.</li> <li>3. Implement agreed proposal within a time scale as agreed with ET and SO.</li> <li>4. Amend working methods and proposal if appropriate.</li> <li>5. If exceedances continue after 2 consecutive monitoring events, meet with ET and the SO to formulate and implement further remedial measures, or stop relevant portion(s) of works as advised by the ET and / or as required by SO.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing.</li> <li>2. Require Contractor to submit air mitigation proposal.</li> <li>3. Supervise the implementation of remedial measures.</li> <li>4. If exceedances continue after 2 consecutive monitoring events, arrange meeting with ET and the Contractor to formulate further remedial works and to consider what portion(s) of works should be further mitigated or have to stop.</li> </ol>

**Table D2 Event Action Plans for Construction Noise**

Event	Action		
	ET Leader	Contractor	SO
<b>Action Level</b>			
Exceedance of Action Level	<ol style="list-style-type: none"> <li>1. Notify the Contractor and SO.</li> <li>2. Investigate the causes and check compliance of the Contractor.</li> <li>3. Report the investigation results to the Contractor and SO. If the exceedance (complaint) is related to construction works, classify the complaint as "valid", and discuss with the Contractor for their formulation of noise mitigation proposal.</li> <li>4. Review the noise mitigation proposal by the Contractor and advise accordingly.</li> <li>5. Ensure noise mitigation proposal are properly implemented, and conduct additional monitoring to verify the mitigation effectiveness.</li> <li>6. Produce complaint investigation report detailing complaint, investigation findings, actions taken and their effectiveness to the Contractor and SO.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance.</li> <li>2. Submit noise mitigation proposals to ET and SO.</li> <li>3. Implement noise mitigation proposal within the agreed time frame.</li> <li>4. Upon the receipt of complaint investigation report from ET, in consultation with the SO, provide responses to the complainant.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance (complaint) in writing.</li> <li>2. If the exceedance (complaint) is related to construction works, require Contractor to submit noise mitigation proposal for the analyzed noise problem.</li> <li>3. Supervise the implementation of noise mitigation proposal.</li> </ol>

Event	Action		
	ET Leader	Contractor	SO
Limit Level			
Exceedance of Limit Level	<ol style="list-style-type: none"> <li>1. Notify the Contractor, SO and EPD.</li> <li>2. Conduct additional noise monitoring and analyze Contractor's working procedures to determine possible cause(s) of exceedance.</li> <li>3. Provide interim report to the Contractor, SO and EPD on the causes and proposed actions to be taken for the exceedances if exceedance is related to construction works.</li> <li>4. Review Contractor's proposals for remedial actions and advise accordingly.</li> <li>5. Assess effectiveness of remedial actions by additional monitoring and report the results to the Contractor, SO and EPD.</li> <li>6. If exceedance continues, request meeting with Contractor and SO to discuss further remedial actions.</li> <li>7. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance.</li> <li>2. In responding to the interim report provided by the ET, prepare and submit proposals for remedial actions to ET and SO within 3 working days.</li> <li>3. Implement the agreed proposals.</li> <li>4. Resubmit proposals if problem still not under control.</li> <li>5. Meet with the ET and the SO to determine further remedial actions, and stop the relevant portion of works as advised by the ET and instructed by the SO until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing.</li> <li>2. Require Contractor to submit proposals for remedial actions for the analyzed noise problem.</li> <li>3. Supervise the implementation of remedial measures.</li> <li>4. If exceedance continues, arrange meeting with the Contractor and ET to determine further remedial actions, and consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>

**Table D3 Event Action Plans for Monitoring of Potential Building Movements**

Event	Action		
	ET Leader	Contractor	SO
Exceedance of Alert Level	<ol style="list-style-type: none"> <li>1. Notify the EPD and AMO.</li> <li>2. Review the action plan prepared by the Contractor and advise accordingly.</li> <li>3. Ensure action plan are properly implemented, review subsequent monitoring results to verify the mitigation effectiveness.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify the SO and ETL immediately.</li> <li>2. Submit a brief report describing the works being undertaken close by and other relevant observations.</li> <li>3. Propose a suitable plan of action which may include the installation of additional instruments and/or increasing the monitoring frequency.</li> <li>4. Submit a report to review the instrument responses, including differential deformations assess the effects on the monitored elements in the light of the relevant construction activities and predict further responses and their effect, based on the data trend to date.</li> <li>5. Submit a detailed action plan to the SO describing the measure to be taken in the event of an alarm trigger level being attained. The action plan will be subject to the approval of the SO.</li> <li>6. Report subsequent monitoring results to SO and ETL.</li> <li>7. Make preparations for implementing the Alarm Level trigger actions, in accordance with the approved action plan.</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the brief report submitted by the Contractor.</li> <li>2. Review and approve the action plan prepared by the Contractor.</li> <li>3. Supervise the implementation of action plan upon approval, review subsequent monitoring results and verify the mitigation effectiveness.</li> </ol>

Event	Action		
	ET Leader	Contractor	SO
Exceedance of Action Level	<ol style="list-style-type: none"> <li>1. Notify EPD and AMO immediately.</li> <li>2. Review the emergency plan prepared by the Contractor and advises accordingly.</li> <li>3. Ensure remedial proposal are properly implemented.</li> <li>4. Ensure action plan are properly implemented, review subsequent monitoring results to verify the mitigation effectiveness.</li> <li>5. Review the investigation report and report findings to EPD and AMO accordingly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify the SO and ETL immediately</li> <li>2. Undertake a joint inspection of the works with the SO.</li> <li>3. Implement the Alarm Level trigger actions, phased as appropriate, so that the Action Level is not reached in accordance with the action plan.</li> <li>4. Within 48 hours of exceeding an Action Level, devise and submit an emergency plan describing the measures to be taken in the event of an Alarm Level being attained.</li> <li>5. Discuss with the SO on the instrument response and review the effectiveness of the emergency plan.</li> <li>6. Agree with the SO, undertake additional measures in the affected area to avoid reaching the Action Level.</li> <li>7. Within 7 days, submit an investigation report to review the instrument responses, including differential deformations, assess the effect on monitored elements in the light of the relevant construction activities and predict further responses and their effect, based on the data trend to date.</li> </ol>	<ol style="list-style-type: none"> <li>1. Undertake a joint inspection of works with the Contractor.</li> <li>2. Review and approve the emergency plan prepared by the Contractor.</li> <li>3. Supervise the implementation of action plan upon approval, review subsequent monitoring results and verify the mitigation effectiveness.</li> <li>4. Review and approve the investigation report.</li> </ol>
Exceedance of Alarm Level	<ol style="list-style-type: none"> <li>1. Notify EPD and AMO immediately.</li> <li>2. Review the emergency plan prepared by the Contractor and advises accordingly.</li> <li>3. Ensure remedial proposal are properly implemented.</li> <li>4. Ensure action plan are properly implemented, review subsequent monitoring results to verify the mitigation effectiveness.</li> <li>5. Review the investigation report and report findings to EPD and AMO accordingly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Suspend all works within 30m of the instrument.</li> <li>2. Notify the SO and ETL immediately</li> <li>3. Undertake a joint inspection of the works with the SO.</li> <li>4. Implement emergency trigger action(s) based on the emergency plan approved by the SO. These emergency trigger actions will include measures to diminish the deformations and ground responses.</li> <li>5. Within 3 days, provide an investigation report to examine the construction method and a detailed report to review the deformation and ground response history and the trigger actions adopted related to the construction activities.</li> </ol>	<ol style="list-style-type: none"> <li>1. Undertake a joint inspection of works with the Contractor.</li> <li>2. Confirm the Contractor has stopped relevant construction works.</li> <li>3. Review and approve the emergency plan prepared by the Contractor.</li> <li>4. Supervise the implementation of action plan upon approval, review subsequent monitoring results and verify the mitigation effectiveness.</li> <li>5. Review and approve the investigation report.</li> </ol>

Annex E

## Summary of Implementation Status

## Annex E Environmental Mitigation Implementation Schedule

Environmental Protection Measures	Location	Implementation Agent	Implementation Status
<i>Construction Air Quality</i>			
The areas for temporary stockpiling of excavated materials should be provided with enclosed shelters.	Stockpile zone	Contractor	N/A
Stockpile of dusty material outside the cavern and the stockpile zone shelters should be covered entirely with impervious sheeting or sprayed with water or a dust suppression chemical to keep the entire surface wet.	Work areas	Contractor	Δ
Skip hoist for material transport should be totally enclosed by impervious sheeting.	Work areas	Contractor	N/A
Every vehicle should be washed to remove any dusty materials from its body and wheels before leaving a construction site.	Work areas	Contractor	√
The area where vehicle washing takes place and the section of the road between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores.	Work areas	Contractor	√
Where a site boundary adjoins a road, streets or other accessible to the public, hoarding of not less than 2.4 m high from ground level should be provided along the entire length except for a site entrance or exit.	Work areas	Contractor	√
Every stock of more than 20 bags of cement should be covered entirely by impervious sheeting placed in an area sheltered on the top and the 3 sides.	Work areas	Contractor	√
All dusty materials should be sheltered, covered entirely or sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet.	Work areas	Contractor	Δ
The height from which excavated materials dropped should be controlled to a minimum practical height to limit fugitive dust generation from unloading.	Work areas	Contractor	√
The load of dusty materials carried by vehicle leaving a construction site should be covered entirely by clean impervious sheeting to ensure dust materials do not leak from the vehicle.	Work areas	Contractor	√

### Remarks:

- √ Compliance of Mitigation Measures
- <> Compliance of Mitigation but need improvement
- x Non-compliance of Mitigation Measures
- ▲ Non-compliance of Mitigation Measures but rectified by Gammon
- Δ Deficiency of Mitigation Measures but rectified by Gammon
- N/A Not Applicable

Environmental Protection Measures	Location	Implementation Agent	Implementation Status
Diesel-powered equipment should be properly maintained to control gaseous emissions.	Work areas	Contractor	√
Regular watering should be provided to the unpaved haul road and dusty material.	All unpaved haul roads, bulldozed material, exposed site areas	Contractor	Δ
Excavation / earth moving operation should be sprayed with water.	Work areas	Contractor	√
Continuous 24-hour TSP monitoring should be conducted at designated location once per week throughout the construction period.	Designated location	ET	√
<b>Construction Noise</b>			
Noise enclosure at the portal of the Project should be provided in accordance with the submitted noise enclosure design plan.	Portal area	Contractor	√
Noise enclosure should be properly maintained to ensure that it is properly functioning throughout the construction stage of the Project.	Portal area	Contractor	√
Idling PME should be switched off.	Work areas	Contractor	√
Noisy PME should be placed inside the cavern or sited as far away from the NSRs as practicable.	Work areas	Contractor	√
Quiet PME should be used as far as practicable.	Work areas	Contractor	√
Stored materials and temporary structures, if applicable, should be sited in practical locations to screen NSRs from noisy on-site construction activities.	Work areas	Contractor	√
Work sequences should be scheduled to avoid the simultaneous use of noisy PME in close proximity to NSRs.	Work areas	Contractor	√
Quieter power units of stationary and earth moving plant with partial or full enclosures or vibratory isolation	All areas	Contractor	√
All plant and equipment to be used on the construction site shall be properly maintained in good operating condition.	All areas	Contractor	√
Construction noise monitoring should be conducted at designated locations once per week throughout the construction period	Designated locations	ET	√
<b>Construction Water Quality</b>			

Remarks:

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- Δ Deficiency of Mitigation Measures but rectified by Gammon
- N/A Not Applicable



Environmental Protection Measures	Location	Implementation Agent	Implementation Status
Discharge license for discharge of effluent from the construction site should be applied under the WPCO. The discharge quality must meet the requirements specified in the discharge license. All the runoff and wastewater generated from the works areas should be treated so that it satisfies all the standards listed in the TM-DSS.	-	Contractor	Δ
Provide proper sewage treatment and disposal facilities in the form of chemical toilets for site staff and workers.	Work areas	Contractor	√
Open stockpiles of construction material on the work site should be covered with tarpaulin or similar fabric during rainstorms.	Work areas	Contractor	Δ
Treatment facility (e.g. WetSep) should be provided on site to treat all tunneling groundwater.	Work areas	Contractor	√
All runoff should be properly collected and treated prior to discharge to the stormwater drain.	Work areas	Contractor	Δ
Peripheral interceptor drains around the site boundary should be provided to segregate surface runoff.	Site boundary	Contractor	√
Silt removal facilities, channels and manholes should be maintained and the deposited silt and grit should be removed regularly, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times	Work areas	Contractor	Δ
Earthworks final surfaces should be well compacted and the subsequent permanent work or surface protection should be carried out immediately after the final surfaces are formed to prevent erosion caused by rainstorms. Appropriate drainage like intercepting channels should be provided where necessary.	Work areas	Contractor	N/A
Open stockpiles of construction materials (e.g. aggregates, sand and fill material) on sites should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.	Work areas	Contractor	Δ

Remarks:

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- x Non-compliance of Mitigation Measures
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- Δ Deficiency of Mitigation Measures but rectified by Gammon
- N/A Not Applicable

Environmental Protection Measures	Location	Implementation Agent	Implementation Status
Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent storm run-off from getting into foul sewers. Discharge of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.	Work areas	Contractor	Δ
Water used in ground boring and drilling or rock /soil anchoring should as far as practicable be re-circulated after sedimentation. When there is a need for final disposal, the wastewater should be discharged into storm drains via silt removal facilities.	Work areas	Contractor	√
A wheel washing bay should be provided at every site exit if practicable and wash-water should have sand and silt settled out or removed before discharging into storm drains. The section of construction road between the wheel washing bay and the public road should be paved with backfall to reduce vehicle tracking of soil and to prevent site run-off from entering public road drains.	Wheel washing bay	Contractor	√
<b>Construction Waste</b>			
Contractor should register as a chemical waste producer if chemical wastes would be produced from the construction activities.	-	Contractor	√
Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container.	Work areas	Contractor	Δ
The Contractor shall use a licensed collector to transport and dispose of the chemical wastes in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.	Work areas	Contractor	√
Training to site personnel in proper waste management and chemical handling procedures should be provided.	Work areas	Contractor	√
Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors should be conducted.	Work areas	Contractor	√

Remarks:

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- x Non-compliance of Mitigation Measures
- ▲ Non-compliance of Mitigation Measures but rectified by Gammon
- Δ Deficiency of Mitigation Measures but rectified by Gammon
- N/A Not Applicable

Environmental Protection Measures	Location	Implementation Agent	Implementation Status
Appropriate measures to minimize windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers should be implemented.	Work areas	Contractor	√
Sufficient waste disposal points and regular collection of waste should be provided.	Work areas	Contractor	√
Sorting of demolition debris and excavated materials from demolition works to recover reusable/ recyclable portions (ie soil, broken concrete, metal, etc) should be implemented.	All areas	Contractor	√
Different types of waste should be segregate and stored in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal.	Work areas	Contractor	√
Encourage collection of aluminum cans by individual collectors by providing separate labeled bins to enable this waste to be segregated from other general refuse generated by the work force.	Work areas	Contractor	√
Proper storage and site practices should be implemented to minimize the potential for damage to contamination of construction materials.	Work areas	Contractor	√
Construction materials should be carefully planned and stocked to minimize amount of waste generated and avoid unnecessary generation of waste.	Work areas	Contractor	√
General refuse should be stored in enclosed bins or compaction units separate from C&D material. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D material. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.	Work areas	Contractor	√
A Waste Management Plan should be prepared in accordance with ETWB TCW No. 19/2005 and to be implemented throughout the construction stage.	Work areas	Contractor	√

Remarks:

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- <> Compliance of Mitigation but need improvement
- x Non-compliance of Mitigation Measures
- ▲ Non-compliance of Mitigation Measures but rectified by Gammon
- Δ Deficiency of Mitigation Measures but rectified by Gammon
- N/A Not Applicable

Environmental Protection Measures	Location	Implementation Agent	Implementation Status
A recording system with details on the amount of wastes and construction and demolition material generated, recycled and disposed (including the disposal sites) should be developed in accordance with ETWB TCW No.31/2004.	Work areas	Contractor	√
<b>Ecology</b>			
No construction works should be carried out on the ground surface within the secondary woodland habitat as shown in Figure 2 of Environmental Permit EP-279/2007. Fence or hoardings should be provided along the boundary to prevent vehicles movement, and encroachment of personnel, onto adjacent woodland areas.	Woodland areas	Contractor	Δ
No construction discharge should be discharged into the two natural seasonal streams as shown in Figure 2 of Environmental Permit EP-279/2007.	Work areas	Contractor	√
Storm water runoff should be directed into existing drainage channel via silt removal facility.	Work areas	Contractor	√
Channels, bunds or sand bag barriers will be provided on site to properly direct site runoff to such silt removal facilities.	Work areas	Contractor	Δ
<b>Landscape and Visual</b>			
Site hoarding, roof covers, noise barriers and offices should be coloured to complement the surrounding landscape and to minimize visual impacts.	Site boundary	Contractor	√
The Contractor should maintain the site in a neat and tidy state during construction phase.	All areas	Contractor	√
The portal should be finished with materials and finishes that complement the surrounding landscape and are of low reflectivity.	All areas	Contractor	N/A
New plantings should be installed at the location that is not conflicts with the completion of the reprovisioning works.	All areas	Contractor	N/A
<b>Cultural Heritage</b>			
Fencing should be erected around the entire Elliot Treatment Works.	Elliot Treatment Works	Contractor	√

Remarks:

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- <> Compliance of Mitigation but need improvement
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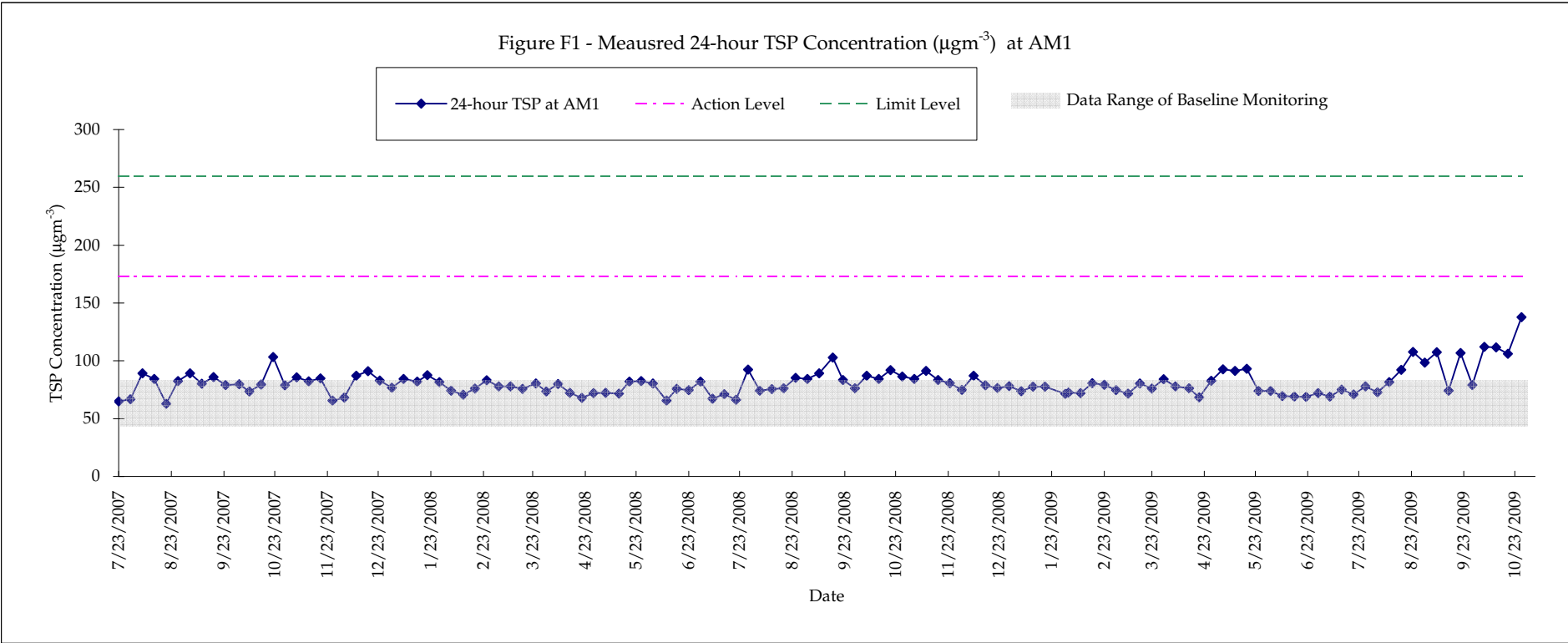
Environmental Protection Measures	Location	Implementation Agent	Implementation Status
Concurrent construction works of the Project with the adjacent works should be carefully planned to minimize the potential building movement on the Elliot Treatment Works.	Elliot Treatment Works	Contractor	√
Monitoring should be conducted at designated locations in accordance with the EM&A Manual.	Designated locations	Contractor	√

Remarks:

- √ Compliance of Mitigation Measures
- <> Compliance of Mitigation but need improvement
- x Non-compliance of Mitigation Measures
- ▲ Non-compliance of Mitigation Measures but rectified by Gammon
- Δ Deficiency of Mitigation Measures but rectified by Gammon
- N/A Not Applicable

## Annex F

# 24-hour TSP Monitoring Results

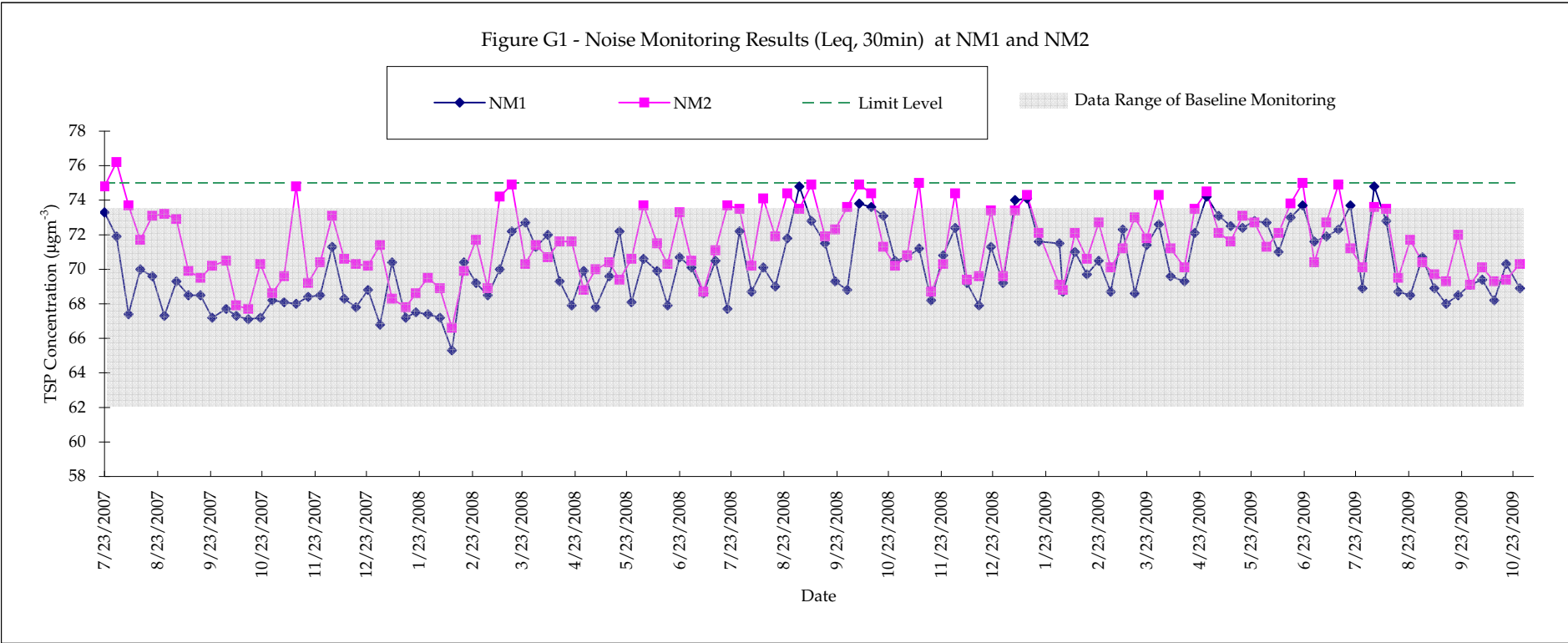


Annex G

## Construction Noise Monitoring Results



Annex G1 - Measured Noise Monitoring Data



Annex H

## Waste Flow Table

## Re-provisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department

**Name of Project Proponent: The University of Hong Kong**

**Project Commencement Date: 21 July 2007**

**Construction Completion Date: December 2008**

### Monthly Summary Waste Flow Table for Year 2008

Period	Actual Quantities of inert C&D Materials (in 10 <sup>3</sup> Kg) <sup>(1)</sup>					Actual Quantities of C&D Wastes (in 10 <sup>3</sup> Kg) <sup>(4)</sup>								
	Total Quantity Generated	Broken Concrete <sup>(2)</sup>	Reused in the Contract	Reused in other Projects <sup>(3)</sup>	Disposed as Public Fill	Metals		Plastic		Paper/cardboard packaging		Chemical Waste (L)		Other waste (e.g. general refuse)
	(a)	(b)	(c)	(d)	(a)-(b)-(c)-(d)	Recycle	Disposal	Recycle	Disposal	Recycle	Disposal	Recycle	Disposal	Disposal
21 Dec 07 – 20 Jan 08	5877	0	0	0	5877	0	0	0	0	0	0	0	0	0
21 Jan 08 – 20 Feb 08	9895	0	0	0	9895	0	0	0	0	0	0	0	0	0
21 Feb 08 – 20 Mar 08	11640	0	0	0	11640	0	0	0	0	0	0	0	0	12
21 Mar 08 – 20 Apr 08	8498	0	0	0	8498	0	0	0	0	0	0	0	0	0
21 Apr 08 – 20 May 08	3816	0	0	0	3816	0	0	0	0	0	0	0	0	0
21 May 08 – 20 Jun 08	2778.5	0	0	0	2778.5	0	0	0	0	0	0	0	0	0
21 Jun 08 – 20 Jul 08	4190	0	0	0	4190	0	0	0	0	0	0	0	0	0
21 Jul 08 – 20 Aug 08	9080	0	0	0	9080	0	0	0	0	0	0	0	0	0
21 Aug – 20 Sept 08	7900	0	0	0	7900	0	0	0	0	0	0	0	0	0
21 Sept – 20 Oct 08	1940	0	0	0	1940	0	0	0	0	0	0	0	0	0
21 Oct – 20 Nov 08	70	0	0	0	70	0	0	0	0	0	0	0	0	0
21 Nov – 20 Dec 08	0	0	0	0	0	0	0	0	0	0	0	0	0	16
<b>Total</b>	65684.5	0	0	0	65684.5	0	0	0	0	0	0	0	0	28

Note: <sup>(1)</sup> Inert C&D materials include bricks, concrete, building debris, rubble and excavated soil.

<sup>(2)</sup> Broken concrete for recycling into aggregates.

<sup>(3)</sup> Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material

<sup>(4)</sup> C&D material includes metals, paper / cardboard packaging waste, chemical waste and other wastes such as general refuse.

## **Re-provisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department**

**Name of Project Proponent: The University of Hong Kong**

**Project Commencement Date: 21 July 2007**

**Construction Completion Date: December 2008**

### **Monthly Summary Waste Flow Table for Year 2007**

Period	Actual Quantities of inert C&D Materials (in 10 <sup>3</sup> Kg) <sup>(1)</sup>					Actual Quantities of C&D Wastes (in 10 <sup>3</sup> Kg) <sup>(4)</sup>								
	Total Quantity Generated	Broken Concrete <sup>(2)</sup>	Reused in the Contract	Reused in other Projects <sup>(3)</sup>	Disposed as Public Fill	Metals		Plastic		Paper/cardboard packaging		Chemical Waste (L)		Other waste (e.g. general refuse)
	(a)	(b)	(c)	(d)	(a)-(b)-(c)-(d)	Recycle	Disposal	Recycle	Disposal	Recycle	Disposal	Recycle	Disposal	Disposal
21 July – 20 Aug 2007	890	0	10	0	880	0	0	0	0	0	0	0	0	2.55
21 Aug – 20 Sept 2007	2186	0	0	0	2186	0	0	0	0	0	0	0	0	2.00
21 Sept – 20 Oct 2007	1681.3	0	0	0	1681.3	0	0	0	0	0.04	0	0	0	2.00
21 Oct – 20 Nov 2007	2290	0	0	0	2290	0	0	0	0	0.02	0	0	0	2.00
21 Nov – 20 Dec 2007	5018.1	0	0	0	5018.1	0	0	0	0	0	0	0	0	0
<b>Total</b>	12065.4	0	10	0	12055.4	0	0	0	0	0.06	0	0	0	8.55

Note: <sup>(1)</sup> Inert C&D materials include bricks, concrete, building debris, rubble and excavated soil.

<sup>(2)</sup> Broken concrete for recycling into aggregates.

<sup>(3)</sup> Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material

<sup>(4)</sup> C&D material includes metals, paper / cardboard packaging waste, chemical waste and other wastes such as general refuse.

## **Re-provisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department**

**Name of Project Proponent: The University of Hong Kong**

**Project Commencement Date: 21 July 2007**

**Construction Completion Date: Oct 2009**

### **Monthly Summary Waste Flow Table for Year 2009**

Period	Actual Quantities of inert C&D Materials (in 10 <sup>3</sup> Kg) <sup>(1)</sup>					Actual Quantities of C&D Wastes (in 10 <sup>3</sup> Kg) <sup>(4)</sup>								
	Total Quantity Generated	Broken Concrete <sup>(2)</sup>	Reused in the Contract	Reused in other Projects <sup>(3)</sup>	Disposed as Public Fill	Metals		Plastic		Paper/cardboard packaging		Chemical Waste (L)		Other waste (e.g. general refuse)
	(a)	(b)	©	(d)	(a)-(b)-(c)-(d)	Recycle	Disposal	Recycle	Disposal	Recycle	Disposal	Recycle	Disposal	Disposal
21 Dec 08 – 20 Jan 09	50	0	0	0	50	0	0	0	0	0	0	0	0	12
21 Jan 09 – 20 Feb 09	0	0	0	0	0	0	0	0	0	0	0	0	0	12
21 Feb – 20 Mar 09	60	0	40	0	20	0	0	0	0	0	0	0	1200	16
21 Mar – 20 Apr 09	53	0	5	0	48	0	0	0	0	0	0	0	0	16
21 Apr – 20 May 09	0	0	0	0	0	0	0	0	0	0	0	0	0	12
21 May – 20 Jun 09	0	0	0	0	0	0	0	0	0	0	0	0	600	15
21 Jun – 20 Jul 09	0	0	0	0	0	0	0	0	0	0	0	0	600	16
21 Jul – 20 Aug 09	0	0	0	0	0	0	0	0	0	0	0	0	0	15
21 Aug – 20 Sept 09	0	0	0	0	0	0	0	0	0	0	0	0	0	18
21 Sept – 29 Oct 09	0	0	0	0	0	0	0	0	0	0	0	0	0	18
<b>Total</b>	163	0	45	0	118	0	0	0	0	0	0	0	2400	150

Note: <sup>(1)</sup> Inert C&D materials include bricks, concrete, building debris, rubble and excavated soil.

<sup>(2)</sup> Broken concrete for recycling into aggregates.

<sup>(3)</sup> Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material

<sup>(4)</sup> C&D material includes metals, paper / cardboard packaging waste, chemical waste and other wastes such as general refuse.