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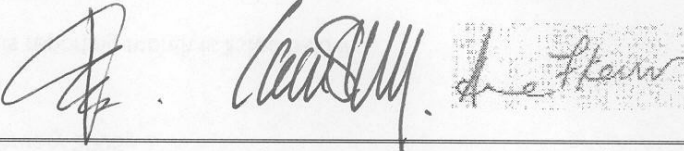
**CONSTRUCTION OF SEWERS, RISING MAINS
& SEWAGE PUMPING STATION AT KAM TIN, NAM SANG WAI
AND AU TAU IN YUEN LONG**

Baseline Monitoring Report (Designated Elements)

PREPARED FOR
Leader Civil Engineering Corporation Ltd

Quality Index

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Executive Summary

- ES.01 Leader Civil Engineering Corporation Ltd (the Contractor) has been awarded the DSD Contract DC/2005/02 Construction of Sewers, Rising Mains and Sewage Pumping Station at Kam Tin, Nam Sang Wai and Au Tau in Yuen Long (the Project). The Project requires an Environmental Monitoring and Audit (EM&A) program to be implemented by an Environmental Team (ET) throughout the contract period in compliance with the requirements as stated in the project Environmental Permit (EP-220/2005) and the project's Updated EM&A (Designated Elements) Manual.
- ES.02 Action-United Environmental Services and Consulting (AUES) has been commissioned by the Contractor to be an Environmental Team (ET) to implement the EM&A program in compliance with the EP and the project's Updated EM&A Manual. As part of the project EM&A program, baseline monitoring is required to determine the ambient environmental conditions.
- ES.03 The baseline EM&A monitoring was carried out by ET in compliance with the project's Updated EM&A Manual during the period between 24 Feb and 09 Mar 2006 at three designated air and six designated noise locations. Monitoring for the remaining two air and noise stations will commence upon land resumption later this year.
- ES.04 Action and Limit (A/L) levels for air and noise impact have been developed according to the criteria set out in the project's Updated EM&A Manual.

Action and Limit Levels for Air Quality and Noise

Monitoring Location	Action Level ($\mu\text{g}/\text{m}^3$)		Limit Level ($\mu\text{g}/\text{m}^3$)	
	1-Hr	24-Hr	1-Hr	24-Hr
AM1	391	184	500	260
AM2	386	178	500	260
AM7	383	204	500	260

Parameter	Action Level in dB(A)	Limit Level in dB(A)
0700-1900 hrs on normal weekdays	When one or more documented complaints are received	75 dB(A)

- ES.05 The A/L levels established will be used to evaluate the environmental impact in association with the construction of the project and to evaluate the effectiveness of the project mitigation measures.

1.0 INTRODUCTION

- 1.01 Leader Civil Engineering Corporation Ltd (the Contractor) has been awarded the DSD Contract DC/2005/02 Construction of Sewers, Rising Mains and Sewage Pumping Station at Kam Tin, Nam Sang Wai and Au Tau in Yuen Long (the Project). The Project is part of the Yuen Long and Kam Tin Sewerage and Sewage Disposal (YLKTSSD) Scheme. A site layout map showing the site boundary and the work areas is shown in **Annex A**. A project construction program is presented in **Annex B**.
- 1.02 The Project requires an Environmental Monitoring and Audit (EM&A) program to be implemented by an Environmental Team (ET) throughout the contract period in compliance with the requirements as stated in the project Environmental Permit (EP-220/2005) and the project's Updated EM&A (Designated Elements) Manual.
- 1.03 Action-United Environmental Services and Consulting (AUES) has been commissioned to be the independent environmental team (ET) to implement the required EM&A program in accordance with the requirements as set out in the EP and the project's Updated EM&A manual.
- 1.04 The baseline EM&A program for Designated Elements (DE) was carried out by ET in compliance with the project's Updated EM&A Manual during the period between 24 Feb and 09 Mar 2006. The baseline EM&A (DE) program consists of air quality and construction noise monitoring.
- 1.05 This baseline monitoring report presents the details of the baseline monitoring program including project background, monitoring methodology, results and findings, and Action/Limit (A/L) levels established for the subsequent EM&A program during the impact phase for the Construction of the Project.

Report Structure

- 1.06 The baseline monitoring report is structured into the following sections:

Section 1	Introduction
Section 2	Summary of Baseline Monitoring Requirements
Section 3	Baseline Monitoring Methodology
Section 4	Baseline Monitoring Results
Section 5	Conclusions

2.0 SUMMARY OF BASELINE EM&A REQUIREMENTS

- 2.01 Environmental monitoring and audit requirements are set out in the Updated EM&A manual. Air quality and construction noise have been identified to be the key monitoring parameters during the impact phase for the construction of the project.
- 2.02 A summary of the baseline EM&A requirements for air quality and construction noise are shown in **Table 2-1**. The locations of the air quality and noise monitoring stations are shown in **Annex C**.

Table 2-1 Summary of EM&A Requirements

Environmental Aspect	Monitoring Parameters
Air Quality	1-Hr TSP
	24-Hr TSP
Construction Noise	Continuous Leq 15min
	Supplementary L10 and L90 for reference.

- 2.03 Baseline air monitoring shall be carried out for a period of 14 days at five (AM1, AM2, AM5, AM6 & AM7) designated monitoring stations. In the present baseline monitoring program, air monitoring was carried out at AM1, AM2 & AM7. Air monitoring at AM5 and AM6 will commence when the contractor takes over the work site later this year. The 24-Hr TSP monitoring shall be carried out daily and the 1-Hr TSP monitoring three times per day.
- 2.04 Baseline noise monitoring shall be conducted for a period of 7 days at eight (NM1, NM2, NM3, NM4, NM5, NM6, NM7 & NM8) designated monitoring stations. In the present baseline monitoring program, noise monitoring was carried out at six designated stations. Noise monitoring at NM6 and NM7 will commence when the contractor takes over the work site later this year. Continuous measurements of Leq 15 shall be taken with supplementary L10 and L90 data to be collected.
- 2.05 The baseline EM&A program shall be conducted prior to commencement of the construction of the Project.
- 2.06 A summary of derivation of Action/Limit (A/L) Levels for air quality and construction noise is shown in **Tables 2-2** and **2-3**.

Table 2-2 Action and Limit Levels for Air Quality

Parameter	Action Level in ug/m ³	Limit Level in ug/m ³
1-Hr TSP	For baseline level ≤ 384 ug/m ³ , Action level = (Baseline*1.3 + Limit level)/2; For baseline level > 384 ug/m ³ , Action level = Limit level.	500
24-Hr TSP	For baseline level ≤ 200 ug/m ³ , Action level = (Baseline*1.3 + Limit level)/2; For baseline level > 200 ug/m ³ , Action level = Limit level.	260

Table 2-3 Action and Limit Levels for Construction Noise

Parameter	Action Level in dB(A)	Limit Level in dB(A)
0700-1900 hrs on normal weekdays	When one or more documented complaints are received	75 dB(A)

3.0 BASELINE MONITORING METHDOLOGY

MONITORING LOCATIONS

- 3.01 The project's Updated EM&A Manual requires air monitoring at five designated stations and noise monitoring at eight stations. In the present baseline monitoring program, monitoring was carried out at three designated air and six noise monitoring stations. Monitoring at the remaining two air and noise stations will commence upon land resumption later this year. The locations of the designated monitoring stations are shown in **Table 3-1** and geographically in **Annex C**.

Table 3-1 Location of Air Quality and Construction Noise Monitoring Stations

Air Quality (3 Stations)	
AM1	Worksite boundary facing scattered house in Nam Sang Wai
AM2	Worksite boundary in Nam Sang Wai
AM5*	Worksite boundary facing Fung Kat Heung
AM6*	Worksite boundary facing scattered near Route 3
AM7	Worksite boundary facing scattered house in Nam Sang Wai
Construction Noise (6 Stations)	
NM1	Yuk Yat Garden
NM2	Cheung Chun San Tusen
NM3	Village House in Nam Sang Wai
NM4	Village House in Nam Sang Wai
NM5	Village House in Nam Sang Wai
NM6*	Scattered House near Route 3
NM7*	Fung Kat Heung
NM8	Kam Hing Wai

Remarks: Monitoring at AM5 & AM6 and NM6 & NM7 will commence upon land resumption later this year.

MONITORING FREQUENCY AND PERIOD

1-Hr TSP Monitoring

- 3.02 The baseline 1-Hr TSP monitoring was conducted at the designated stations three times a day for 14 days during the baseline monitoring period from 23 Feb to 08 Mar 2006.

24-Hr TSP Monitoring

- 3.03 The baseline 24-Hr TSP monitoring was conducted at the designated stations daily for 14 days during the baseline monitoring period from 22 Feb to 08 Mar 2006.

Noise Monitoring

- 3.04 The baseline noise monitoring was undertaken at the designated stations daily for 7 days during the baseline period from 22 Feb to 10 Mar 2006. Continuous measurements of Leq 15min were taken with supplementary L10 and L90 data collected.

MONITORING EQUIPMENT

- 3.05 The monitoring equipment used by the ET in the baseline program is presented in **Table 3-2**:

Table 3-2 Monitoring Equipment Used in Baseline EM&A Program

Parameters	Monitoring Equipment	
Air Quality	1-Hr TSP	Sibata LD-3
	24-Hr TSP	Tisch High Volume Sampler 515N
Noise	Leq15min	B&K Type 2238
	On-site Calibration	B&K Type 4231

24-Hr TSP Monitoring

- 3.06 The 24-Hr TSP monitoring was carried out by a High volume sampler (HVS) in compliance with the updated EM&A Manual. The HVS employed complied with the PS specifications including.
- Power supply of 220v/50 hz for 24-hour continuous operation;
 - 0.6-1.7 m³/min (20-60 SCFM) adjustable flow rate;
 - A 7-day mechanical timer for 24-hour operation;
 - An elapsed time indicator with ± 2 minutes accuracy for 24-Hr operation;
 - Minimum exposed area of 63 in²;
 - Flow control accuracy of $\pm 2.5\%$ deviation over 24-Hr operation;
 - An anodized aluminum shelter to protect the filter and sampler;
 - A motor speed-voltage control to control mass flow rate with accuracy of $\pm 2.5\%$ deviation over 24-hr sampling period;
 - Provision of a flow recorder for continuous monitoring;
 - Provision of a peaked roof inlet;
 - Incorporation with a manometer; and
 - An 8"x10" stainless steel filter holder to hold, seal and easy to change the filter paper.
- 3.07 The filter papers used in 24-Hr TSP monitoring were of size 8"x10" and provided by a local HOKLAS-accredited laboratory, ALS Techichem Pty (HK) Limited (HOKLAS No. 66). The filters papers after measurements were returned to the laboratory for the required treatment and analysis.

1-Hr TSP Monitoring

- 3.08 Measurements of 1-Hr TSP monitoring were taken by a Sibata LD-3 Laser Dust Meter that is a portable and battery-operated laser photometer capable of performing real time 1-Hr TSP measurements.

METEOROLOGICAL INFORMATION

- 3.09 The meteorological information during the baseline period was obtained from Lau Fau Shan Station of the Hong Kong Observatory (HKO).

Noise Monitoring

- 3.10 Noise measurements were taken in terms of the A-weighted equivalent sound pressure level (Leq) measured in decibels (dB). Supplementary statistical results (L₁₀ and L₉₀) were also obtained for reference.
- 3.11 Hand-held sound level meters (B&K Model 2238) and associated acoustical calibrators in compliance with the International Electrotechnical Commission (IEC) Publication 651:1979 (Type 1) and 804:1985 (Type 1) specification were used for taking the baseline noise measurements.
- 3.12 Windshield was fitted in all measurements. All noise measurements were made with the meter set to FAST response and on the A-weighted equivalent continuous sound pressure level (Leq).
- 3.13 No noise measurement was made in the presence of fog, rain, wind with a steady speed exceeding 5 m/s or wind with gusts exceeding 10 m/s.

EQUIPMENT CALIBRATION

- 3.14 Initial calibration of the HVS was performed upon installation and thereafter at a six month intervals in accordance with the manufacturer's instruction using the NIST-certified standard calibrator (Tisch Calibration Kit Model TE-5025A). The calibration data are properly documented and the records are maintained by ET for future reference.
- 3.15 The 1-Hr TSP meter was calibrated by the supplier prior to purchase. Zero response of the equipment was checked before and after each monitoring event.
- 3.16 The sound level meters were calibrated using an acoustic calibrator prior to and after measurements. The meters are regularly calibrated in accordance with the manufacturer's instructions. Prior to and following each noise measurement, the accuracy of the sound level meter was checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements were considered valid only if the calibration levels before and after the noise measurement agree to within 1.0 dB.
- 3.17 The calibration certificates of the monitoring equipment used during the baseline monitoring program are attached in **Annex D**.

DATA MANAGEMENT AND DATA QA/QC CONTROL

- 3.18 The baseline monitoring data were handled by the ET's systematic data recording and management, which complies with in-house certified (ISO 9001:2000) Quality Management System. Standard Field Data Sheets (FDS) were used in the baseline monitoring program.
- 3.19 The monitoring data recorded in the equipment eg. 1-Hr TSP meters and noise meters were downloaded directly from the equipment at the end of each monitoring day. The downloaded monitoring data were input into a computerized database properly maintained by the ET. The laboratory results were input directly into the computerized database and QA/QC checked by personnel other than those who input the data.
- 3.20 For monitoring activities require laboratory analysis, the local laboratory follows the QA/QC requirements as set out under the HOKLAS scheme for all laboratory testing.

4.0 BASELINE MONITORING RESULTS

4.01 The baseline monitoring program commenced on 24 Feb and was successfully completed on 09 Mar 2006. The baseline monitoring schedules are presented in **Annex E** and the monitoring results are detailed in the following sub-sections.

AIR QUALITY

4.02 The baseline air quality monitoring data are summarized in **Tables 4-1, to 4-3**. Graphical plots of the 24-Hr TSP and 1-Hr TSP results are shown in **Annex F** respectively.

Table 4-1 Summary of 24-Hr and 1-Hr TSP Monitoring Results for AM1

Date	24-Hr TSP ($\mu\text{g}/\text{m}^3$)	1-Hr TSP ($\mu\text{g}/\text{m}^3$)			
		Start Time	1 st TSP Measurement	2 nd TSP Measurement	3 rd TSP Measurement
23-Feb-06	101	14:16	253	220	261
24-Feb-06	29	14:31	262	266	251
25-Feb-06	54	13:15	120	137	125
26-Feb-06	48	11:16	135	147	138
27-Feb-06	57	10:58	84	85	90
28-Feb-06	62	10:59	142	150	101
1-Mar-06	31	11:50	112	109	104
2-Mar-06	115	11:08	150	142	146
3-Mar-06	127	12:11	319	328	305
4-Mar-06	138	10:38	119	116	107
5-Mar-06*	172	09:43	543	531	556
6-Mar-06*	146	10:13	589	613	601
7-Mar-06	23	11:19	71	64	68
8-Mar-06	51	13:26	140	144	153
Average (Range)	82 (23 – 172)		217 (64 – 613)		

Remarks: Poor ambient air quality was observed by the ET and Air Pollution Index recorded by EPD was high on that date.

Table 4-2 Summary of 24-Hr and 1-Hr TSP Monitoring Results for AM2

Date	24-Hr TSP ($\mu\text{g}/\text{m}^3$)	1-Hr TSP ($\mu\text{g}/\text{m}^3$)			
		Start Time	1 st TSP Measurement	2 nd TSP Measurement	3 rd TSP Measurement
22-Feb-06	61				
23-Feb-06	71	13:53	242	215	224
24-Feb-06	38	14:20	303	302	288
25-Feb-06	73	13:02	119	130	136
26-Feb-06	14	11:00	128	147	130
27-Feb-06	21	10:45	86	83	97
28-Feb-06	27	10:30	128	136	109
1-Mar-06	40	11:33	126	134	128
2-Mar-06	73	10:48	146	138	151
3-Mar-06	94	12:00	230	241	228
4-Mar-06	94	10:12	106	97	93
5-Mar-06*	247	09:35	556	563	541
6-Mar-06*	138	10:05	561	552	573
7-Mar-06	34	11:08	76	68	62
8-Mar-06		13:04	134	142	140
Average (Range)	73 (14 – 247)		209 (62 – 573)		

Remarks: Poor ambient air quality was observed by the ET and Air Pollution Index recorded by EPD was high on that date.

Table 4-3 Summary of 24-Hr and 1-Hr TSP Monitoring Results for AM7

Date	24-Hr TSP ($\mu\text{g}/\text{m}^3$)	1-Hr TSP ($\mu\text{g}/\text{m}^3$)			
		Start Time	1 st TSP Measurement	2 nd TSP Measurement	3 rd TSP Measurement
22-Feb-06	151				
23-Feb-06	102	15:00	258	241	209
24-Feb-06	84	14:48	251	254	255
25-Feb-06	170	13:19	105	120	118
26-Feb-06	73	11:25	122	120	103
27-Feb-06	30	11:01	65	71	79
28-Feb-06	21	11:15	167	90	110
1-Mar-06	87	11:57	134	142	128
2-Mar-06	136	11:16	176	184	186
3-Mar-06	113	12:16	361	354	345
4-Mar-06	121	11:11	136	128	130
5-Mar-06*	257	09:51	451	431	432
6-Mar-06*	177	10:21	489	513	503
7-Mar-06	67	11:31	78	54	69
8-Mar-06		13:41	152	148	133
Average (Range)	114 (21 – 257)		205 (54 – 513)		

Remarks: Poor ambient air quality was observed by the ET and Air Pollution Index recorded by EPD was high on that date.

4.03 The meteorological data during the baseline monitoring period are summarized in **Annex G**.

DERIVATION OF ACTION/LIMIT LEVELS FOR AIR QUALITY

- 4.04 Following the criteria shown in **Table 2-2**, the A/L levels for 24-Hr and 1-Hr TSP have been derived as illustrated in **Table 4-4**.

Table 4-4 Action and Limit Levels for 24-Hr TSP and 1-Hr TSP Monitoring

Monitoring Location	Action Level ($\mu\text{g}/\text{m}^3$)		Limit Level ($\mu\text{g}/\text{m}^3$)	
	1-Hr TSP	24-Hr TSP	1-Hr TSP	24-Hr TSP
AM1	391	184	500	260
AM2	386	178	500	260
AM7	383	204	500	260

Remarks: 1-Hr TSP & 24-Hr TSP Action Level = (Baseline*1.3 + Limit level)/2

NOISE

- 4.05 The baseline noise monitoring results collected at the six designated monitoring stations. The monitoring results are summarised in **Tables 4-5**. All monitoring data and graphical plots are presented in **Annex F**.

Table 4-5 Summary of Noise Monitoring Results

Monitoring Station	Mean Noise Level, dB(A) / (Range)		
	L_{eq}	L_{10}	L_{90}
NM1	50.7 / (40.2 – 61.6)	52.6 / (42.0 – 65.5)	46.4 / (35.0 – 54.5)
NM2	54.0 / (45.8 – 69.7)	55.5 / (47.5 – 73.5)	47.2 / (40.5 – 58.0)
NM3	52.9 / (47.2 – 74.9)	53.5 / (48.5 – 80.0)	47.5 / (42.5 – 58.5)
NM4	54.9 / (46.7 – 83.5)	56.2 / (47.0 – 88.0)	51.2 / (44.0 – 69.5)
NM5	50.7 / (41.2 – 71.1)	51.4 / (42.5 – 73.5)	45.9 / (38.0 – 62.5)
NM8	54.0 / (40.1 – 76.2)	53.3 / (40.5 – 76.0)	45.1 / (35.5 – 56.0)

Remarks: Figures in bracket refer to the measurement range recorded at a particular station during the entire baseline period for general reference.

- 4.06 There was no rain and the wind speed was below 5m/s during all baseline noise measurements.

DERIVATION OF ACTION/LIMIT LEVELS FOR CONSTRUCTION MANUAL

- 4.07 The A/L levels for construction noise during the construction phase of the Project are illustrated in **Table 4-6**.

Table 4-6 Action and Limit Levels for Construction Noise

Parameter	Action Level in dB(A)	Limit Level in dB(A)
0700-1900 hrs on normal weekdays	When one or more documented complaints are received	75 dB(A)

5.0 CONCLUSIONS

- 5.01 A project baseline monitoring program was carried out by the ET in compliance with the updated EM&A Manual during the period between 22 Feb and 09 Mar 2006. The baseline monitoring program consists of air quality and noise monitoring.
- 5.02 The baseline air quality monitoring was carried out at three designated monitoring stations. A total of 42 monitoring events were taken for 24-Hr TSP, and 126 events for 1-Hr TSP during the baseline period.
- 5.03 The baseline noise monitoring was carried out at six designated monitoring stations. Continuous measurements of Leq 15min were taken with supplementary L₁₀ and L₉₀ statistical data collected.
- 5.04 Action and Limit (A/L) levels for the air quality and noise have been developed respectively according to the criteria as set out in the project's Updated EM&A Manual. The A/L levels will be used to evaluate the environmental impact in association with the construction of the project and to evaluate the effectiveness of the project mitigation measures.