

Ming Chun Construction
Co., Ltd.

**The Decommissioning
of Underground Fuel
Tanks at Tsuen Wan
No. 1 Pumping Station
Contact No.
WSD/ST 456/02**

Final Monthly
Environmental Monitoring
and Audit Report

First Issue

Ming Chun Construction Co., Ltd.

**The Decommissioning of Underground Fuel Tanks at Tsuen Wan
No. 1 Pumping Station Contact No. WSD/ST 456/02**

Environmental Monitoring and Audit

Final Environmental Monitoring and Audit Report – December 2003

January 2004

Ove Arup & Partners Hong Kong Ltd

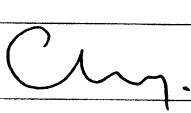
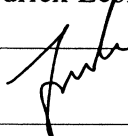
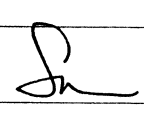
Level 5, Festival Walk, 80 Tat Chee Avenue, Kowloon Tong, Kowloon, Hong Kong

Tel +852 2528 3031 Fax +852 2268 3950

www.arup.com

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		Name	Angus Choi	Fredrick Lepng	Sam Tsoi
		Signature			
		Filename			
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			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
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		Name			
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ABBREVIATIONS AND ACTONYMS

A/L	Action or Limit Levels
Arup	Ove Arup & Partners Hong Kong Limited
B&K	Brüel & Kjær
CNP	Construction Noise Permit
CT	Contractor
DP	Designated Project
EA	Environmental Auditor
EIA	Environmental Impact Assessment
EM&A	Environmental Monitoring and Audit
EP	Environmental Permit
EPD	Environmental Protection Department
ER	Engineer / Engineer's Representative
ET	Environmental Team
HKPSG	Hong Kong Planning Standards and Guidelines
HKSAR	Hong Kong Special Administrative Region
NSR	Noise Sensitive Receiver
WSD	Water Supplies Department

EXECUTIVE SUMMARY

This is the final environmental monitoring and audit (EM&A) report summarising the EM&A works from 1 December 2003 to 12 December 2003.

The civil work contractor has already completed the concrete chamber demolition work on 7 November 2003 and the EM&A programme lasted 16 months from mid August 2002 to mid December 2003.

Daytime noise monitoring was conducted in $L_{eq(30min)}$ once per week at two monitoring locations. Two sets of measurement were conducted at both monitoring locations during the reporting month. The lowest noise level was 64.0 dB(A) recorded at Caritas Adult Education Centre (NM1) on 8 December 2003, and the highest noise level was 67.5 dB(A) recorded at Fong Hon Chu Gifted Education Centre (NM2) on 1 December 2003. No exceedance of the Action and Limit (A/L) Levels was recorded during the monitoring period.

Weekly environmental site audits were conducted on 4 and 11 December 2003. There was no significant noise, air and water quality impact identified from the construction activities in December 2003.

A total of 45.0m³ of Construction & Demolition (C&D) waste were disposed of at landfills in December 2003 and no C&D fill materials disposed of at the Public Filling Area in Tuen Mun by dump truck in December 2003.

No complaint on environmental issue was received in December 2003.

1. INTRODUCTION

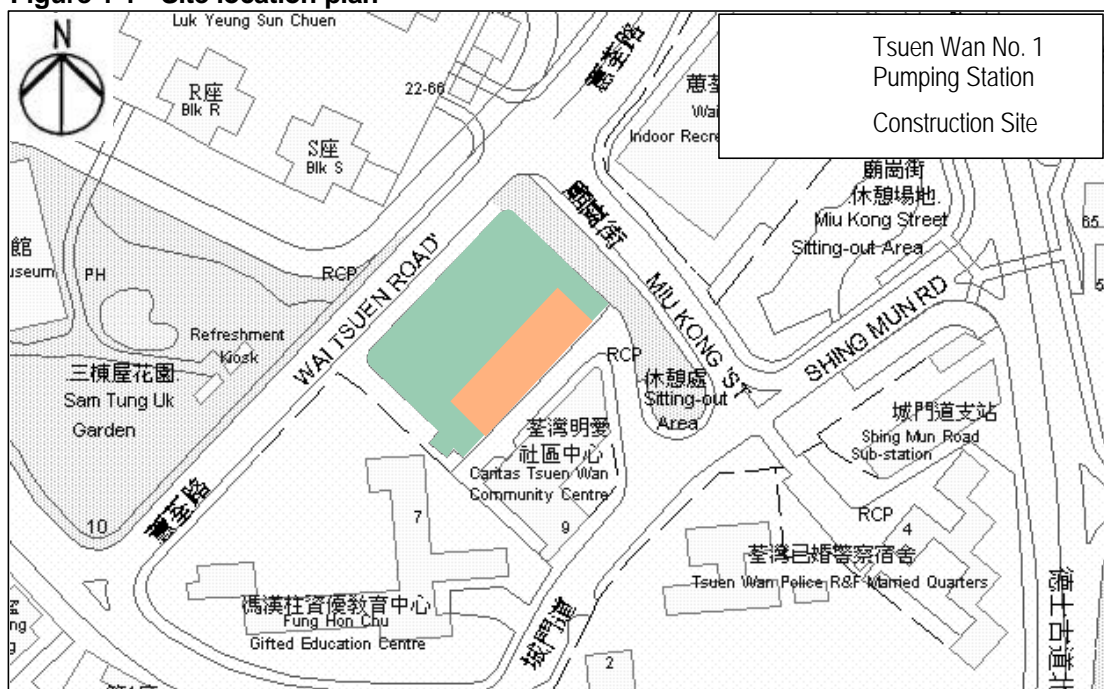
Ove Arup & Partners Hong Kong Limited (Arup) was appointed by Ming Chun Construction Co., Ltd. as the Environmental Team (ET) for the Designated Project (DP) under the Environmental Impact Assessment Ordinance *Contract No. WSD/ST 456/02 The Decommission of Underground Fuel Tanks at Tsuen Wan No. 1 Pumping Station* (hereafter called the “Project”) of the Water Supplies Department (WSD). The project was governed by the conditions as stipulated in an Environmental Permit (EP) and subsequently a Further Environmental Permit (FEP). Construction noise impact was monitored throughout the construction period, lasting for 16 months from mid August 2002 to mid December 2003.

1.1 Project Background

The Pumping Station has been in operation since 1955. All pumpsets, associated power supply, and control equipment are now approaching the end of their serviceable lives. To improve the operation of the Pumping Station, the existing manned equipment including pumpsets, electrical switchgears, and piping and valving systems will have to be replaced. The seven electrical motor driven and three diesel engine driven pumpsets currently in use are to be replaced by eight electrical pumpsets.

With the phasing out of the three diesel engine driven pumpsets, the four underground diesel fuel storage tanks at the Pumping Station, each with a capacity of 64,000 litres will be decommissioned, dismantled, and removed. The location of the site is shown in Figure 1-1.

Figure 1-1 Site location plan



1.2 Impact EM&A Requirements

The impact environmental monitoring and audit includes noise monitoring and environmental site inspection.

1.3 Purpose of the Report

The purpose of the monthly environmental monitoring and audit report is to present the progress on noise monitoring and environmental audit for the Project on a monthly basis.

As confirmed by the WSD via their letter dated 12 December 2003 (ref.: (25) in WSD/ST 456/02 Pt.7), the construction work under the Project has been completed and the EM&A programme shall be ceased thereafter.

This is the final monthly EM&A report prepared by Arup for submission to Ming Chun Construction Co., Ltd. summarising the monitoring methodology, locations, periods, frequencies, results and any observation from the noise monitoring and environmental audit from 1 December 2003 to 12 December 2003.

2. ENVIRONMENTAL STATUS

2.1 Construction Programme

The contractor has decommissioned and removed the underground diesel tanks in accordance with Section 2.2 of Environmental Impact Assessment Report (Final Revised Report) (December 2001). The following steps has been undertaken,

1. The top soil (turf) was removed to expose the concrete slab cover;
2. The concrete slab cover was removed and broken up;
3. The diesel storage tanks were cleaned of diesel residue before dismantling;
4. The cleaned diesel storage tanks and the associated pipelines were dismantled by flame-cutting method;
5. The underground concrete lined chamber and the concrete pedestals were broken up by hand held breaker and the previously approved chemical demolition agent.
6. The spoils were removed by excavator and dump trucks.

Referring to WSD's memo dated 20 November 2003 (ref: (10) in WSD/ST 456/02 Pt. 7) and letter dated 27 November 2003 (ref: (12) in WSD/ST 456/02 Pt. 7), the above demolition works were completed on 7 November 2003.

2.2 Construction Activities of the Month

As such, only minor construction activity was conducted in December 2003. The client confirmed that the construction works have been substantially completed on 7 November 2003.

3. SUMMARY OF EM&A REQUIREMENTS

Noise is the significant environmental impact identified for the construction period of the Project. In accordance with the EM&A Manual^[2] of the Project, noise impact monitoring, shall be performed by an ET at all specified monitoring locations during the construction stages. The monitoring schedule for December 2003 is attached in Appendix A.

3.1 Construction Noise Monitoring

3.1.1 Monitoring Parameters

Construction noise monitoring was measured in terms of the A-weighted equivalent continuous sound pressure level (L_{eq}). L_{10} and L_{90} shall also be recorded as supplementary reference information for data auditing.

3.1.2 Monitoring Frequency

Construction noise measurements were required to be conducted on a weekly basis according to the EM&A Manual. The monitoring time periods, monitoring parameters and frequency are specified in Table 3-1.

Table 3-1 Construction noise monitoring parameters and frequency

Time Period (when construction activity is found)	Parameters	Monitoring Frequency	No. of Measurements for Each Monitoring
Between 0700-1900 hours on normal weekdays	$L_{eq(30\text{ min})}$	Once per week	1
Between 1900-2300 hours on normal weekdays	$L_{eq(5\text{ min})}^*$		3 (consecutive)
Between 2300-0700 hours of next day			
Between 0700-1900 hours on holidays			

Remarks: * The $L_{eq(5\text{ min})}$ will only be measured if construction activities are conducted in holidays and between the period of 1900 and 0700 hours during normal weekdays.

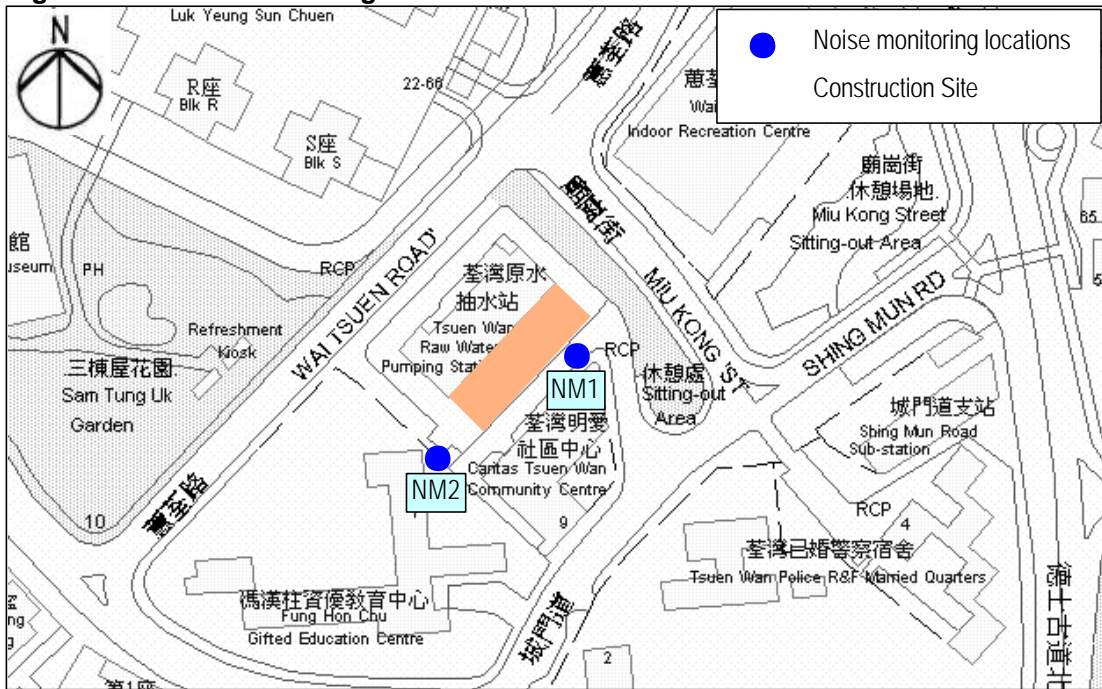
3.1.3 Monitoring Locations

A total of two noise monitoring locations were specified. They are given in Table 3-4 and shown in Figure 3-1. The measurements were taken at a position 1m from the exterior of building façade and at a position of 1.2m above ground.

Table 3-2 Construction noise monitoring locations

Noise Monitoring Station No.	Location
NM1	Caritas Adult Education Centre
NM2	Fong Hon Chu Gifted Education Centre

Figure 3-1 Noise monitoring locations



3.2 Performance Limits and Event-Action Plans

The monitoring results shall be checked against appropriate standards and requirements. A two-tier system performance limits was established in the Project specific EM&A Manual. The “Action Level” and the “Limit Level” are established according to the EPD requirements. Corresponding actions will be taken by ET, ER and CT in accordance with the Event-Action Plan if the monitoring results exceed the performance limits.

3.2.1 Construction Noise Impact

The Action and Limit (A/L) levels for the construction noise extracted from the Baseline Monitoring Report^[3] are tabulated in Table 3-3.

Table 3-3 Action and Limit Levels for construction noise

Time Period	Action	Limit
0700 - 1900 hours on any day not being a Sunday or public holiday	When one documented complaint is received	70dB(A) ^{(1) (2)}

Remarks: (1) As NM1 and NM2 are both considered educational establishments, limit level is corrected to 70dB(A) instead of the conventional 75dB(A).

(2) For educational establishments, the limit level shall be reduced to 65dB(A) during examination periods.

Table 3-4 details the actions required to be carried out by different parties in the case of an exceedance of performance limits being detected.

Table 3-4 Event/Action plan for construction noise

Event	Action	
	ET Leader or ER	Contractor
Action Level	<ol style="list-style-type: none"> 1. Notify Contractor 2. Analyse investigation 3. Require Contractor to propose measures for the analysed noise problem 4. Increase monitoring frequency to check mitigation effectiveness 	<ol style="list-style-type: none"> 1. Submit noise mitigation proposals to Environmental Team Leader/Engineer's Representative 2. Implement noise mitigation proposals
Limit Level	<ol style="list-style-type: none"> 1. Notify Contractor 2. Notify EPD 3. Require contractor to implement mitigation measures 4. Increase monitoring frequency to check mitigation effectiveness 	<ol style="list-style-type: none"> 1. Implement mitigation measures 2. Prove to Environmental Team Leader/ER effectiveness of measures applied

3.3 Site Inspection and Environmental Complaint Handling

3.3.1 Site Inspection Frequency and Areas Covered

Regular site inspections shall be carried out on a weekly basis. The areas of inspection cover the different environmental impacts, such as air, noise, water and waste, and their pollution controls and mitigation measures for both within and outside the site area.

Ad hoc site inspection will be carried out if significant environmental non-compliance is identified. Inspections may also be carried out subsequent to receipt of any environmental complaints, or as part of the investigation work, as specified in the Event-Action Plans.

3.3.2 Site Inspection Procedures

- a) The CT and/or ER will advise the Environmental Auditor (EA) for all information on any environmental related aspects.
- b) The EA will conduct discussion with the CT and/or ER to sort out and forecast any potential environmental impact.
- c) The EA will conduct a site walk with the CT and/or ER, particularly the areas with extensive construction works.
- d) The EA will conduct inspection for the main environmental facilities and measures such as the wheel washing facilities located at the site exits, water spraying truck, temporary noise barrier, and the internal noise-reducing measures of the heavy equipment etc, to ensure that these environmental facilities operate normally and effectively.
- e) The EA will fill up a site inspection checklist during the site inspection for recording of any special observations.
- f) The EA will conduct post-discussion with the CT and/or ER for the establishment of additional/special measures if any non-conformance is found. The completion date for such additional measures will be confirmed during the post-discussion.
- g) The EA will propose a reasonable timeframe together with the CT and/or ER, for the preparation of the proposal for the remediation of environmental non-compliance.
- h) The completed site inspection checklist will be signed by the EA, the CT and/or ER, for reference and for taking actions in accordance with the agreed procedures, reporting systems and time frame.

3.3.3 Environmental Complaints

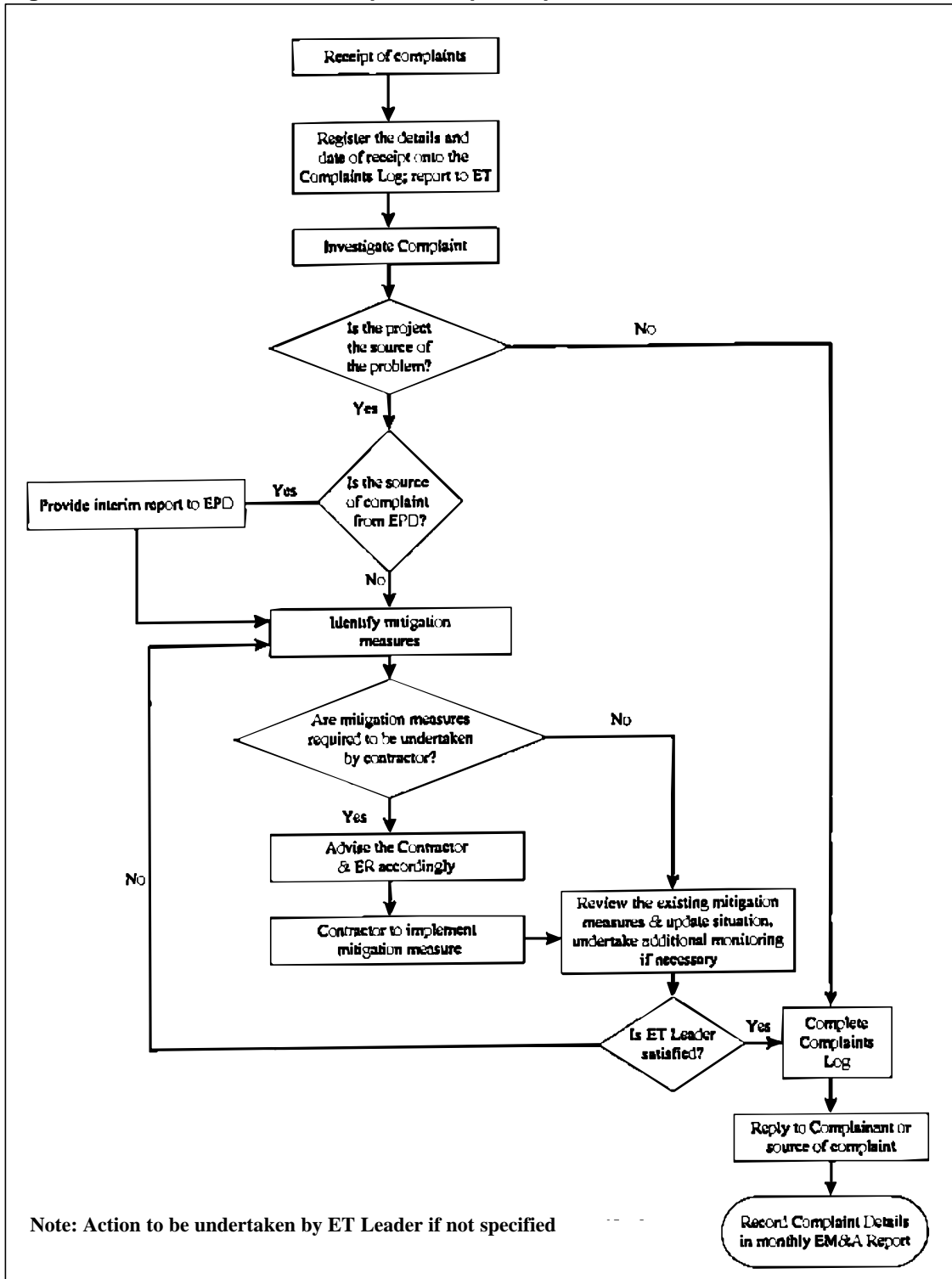
In accordance with the EM&A Manual, environmental complaints will be referred to the ET for initiation of the complaint investigation procedures. The ET will undertake the following procedures upon receipt of the complaints:

- a) The ET will record the details of the complaint and the date of receipt onto the complaint database, and inform ER immediately.
- b) The ET will perform compliant investigation to determine its validity, and to assess whether the source of the problem is due to work activities.
- c) The ER will instruct the CT to identify mitigation measures in consultation with the ET, if the complaint is valid and due to works.
- d) The ET will liaise with the CT on their mitigation measure proposals and implementation, if required.
- e) The ET will conduct review of the CT's response on the identified mitigation measures, and of the updated situation.
- f) The ET will submit interim report to EPD if the complaint is received via EPD. The interim report will clearly state the status of the complaint investigation and the follow-up action within the time frame assigned by EPD.
- g) The ET will undertake additional monitoring and audit to verify the situation if necessary, and ensure that any valid reason for complaint does not recur.
- h) The ET will report on the investigation results and the subsequent actions to the source of complaint for responding to the complainant (If the source of complaint is via EPD, the results will be reported within the time frame assigned by EPD).
- i) The ET will record the details of the complaint, investigation, subsequent actions and results in the monthly EM&A reports.

During the complaint investigation work undertaken by the ET, the CT and ER shall cooperate with the ET on providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified as necessary after the investigation, the CT shall promptly carry out the required mitigation to the satisfaction of ET. The ER shall ensure that the CT has carried out such identified measures.

A flow chart of the complaint response procedures is shown in Figure 3-2 for reference.

Figure 3-2 Flow chart of the complaint response procedure



4. NOISE

4.1 Monitoring Equipment

An integrating sound level meter was used for the noise monitoring. The sound level meter complies with the International Electrotechnical Commission Publications (IEC) 651:1979 (Type 1) and 804:1985 (Type 1) specifications. An acoustical calibrator in compliance with IEC 942:1988 (Type 1) was used to calibrate the sound level meter before and after each set of measurements to confirm that the data drift was less than 1dB(A). The detailed descriptions of the noise equipment are listed in Table 4-1.

Table 4-1 Equipment list for construction noise monitoring

Equipment	Manufacturer & Model No.	Precision Grade	Qty.
Integrating sound level meter	Briel & Kjaer 2238	IEC 651 Type 1	1
Windshield	Briel & Kjaer UA0237	IEC 804 Type 1	1
Acoustical calibrator	Briel & Kjaer 4226	IEC 942 Type 1	1
	Briel & Kjaer 4231		
LCD wind speed indicator	Kestrel Vane Anemometer	--	1

4.2 Methodology

4.2.1 Field Measurement

- The sound level meter and the battery were checked to ensure that they were in proper condition.
- The sound level meter was set on a tripod at 1.2m above ground and at 1m from the exterior of the building façade.
- Before conducting the measurement, the sound level meter was calibrated by an acoustical calibrator.
- The measurement parameter was set to A-weighted sound pressure level. The time weighting was set in fast response and the time period of measurement at 30 minutes.
- The wind speed was checked during noise monitoring to ensure the steady wind speed did not exceed 5m/s, or wind with gusts did not exceed 10m/s.

- Any abnormal conditions that generated intrusive noise during the measurement were recorded on the field record sheet.
- After each measurement, the equivalent continuous sound pressure level (L_{eq}), L_{10} and L_{90} were recorded on the field record sheet.
- The sound level meter was re-calibrated by the acoustical calibrator to confirm that there was no significant drift of reading.

4.2.2 Equipment Maintenance and Calibration

The sound level meter complies with the standards of IEC 651 (Fast, Slow, Impulse rms detector tests) and IEC 804 (L_{eq} functions). The acoustical calibrator model no. 4231 is in compliance with IEC 942. Both equipment are calibrated annually in-house using Brüel & Kjær (B&K) calibrator model no. 4226.

The National Physical Laboratory in Teddington, London, which is accredited by National Measurement accreditation Service (NAMAS), annually calibrates the B&K calibrator model no. 4226. All in-house calibrations that are undertaken can be traced back to the National Physical Laboratory. The calibration certificate of the equipment is given in Monthly EM&A Report – August 2003^[4]. Table 4-2 summarizes the calibration date of the sound level meter used for this project.

Table 4-2 Summary of calibration dates of noise monitoring equipment

Sound level meter	Serial number	Last calibration date	Next calibration date (on or before)
B&K 2238	2320696	18 August 2003	17 September 2004

4.3 Results and Observations

4.3.1 Weather Conditions and Other Factors

Weather condition was sunny during the monitoring period. The major noise source was the operational noise of the pumping station and traffic noise from nearby roads.

4.3.2 Summary Results

The noise monitoring results are summarised in Table 4-3 for the daytime periods, and the details are attached in Appendix B.

Table 4-3 Daytime noise monitoring results (0700 – 1900 hours on normal weekdays)

Date of Monitoring	Monitoring Parameters	Monitoring Results, dB(A) (30 min)	
		NM1	NM2
01/12/03 (Mon)	L _{eq}	66.5	67.5
	L ₁₀	68.0	69.0
	L ₉₀	64.5	65.5
08/12/03 (Mon)	L _{eq}	64.0	67.0
	L ₁₀	67.5	69.5
	L ₉₀	60.5	62.0

5. SITE INSPECTION, ENVIRONMENTAL COMPLAINTS, ENVIRONMENTAL LICENSES AND NON-COMPLIANCE RECORDS

5.1 Site Audit Results

Weekly environmental site audits were conducted on 4 and 11 December 2003. There was no significant noise, air and water quality impact identified from the construction activities in December 2003.

5.2 Waste Disposal

A total of 45.0m³ of Construction & Demolition (C&D) waste was disposed of at landfills in December 2003 and no C&D fill materials disposed of at the Public Filling Area in Tuen Mun by dump truck in December 2003.

5.3 Complaint Record

No complaint on environmental issue was received in December 2003 or since the commencement of the Project.

5.4 Non-compliances

No non-compliance on environmental issue was recorded in December 2003.

5.5 Environmental Licenses

No environmental license or permit was granted by EPD in December 2003. Copies of Environmental Licenses/ Permits are attached in Monthly EM&A Report – August 2002.

6. REFERENCES

- [1] Ove Arup & Partners Hong Kong Limited. February 2003. The Decommissioning of Underground Fuel Tanks at Tsuen Wan No.1 Pumping Station, Monthly Environmental Monitoring and Audit Report – January 2003.
- [2] Ove Arup & Partners Hong Kong Limited. December 2001 The Decommissioning of Underground Fuel Tanks at Tsuen Wan No.1 Pumping Station, Environmental Monitoring & Audit Manual.
- [3] Ove Arup & Partners Hong Kong Limited. August 2002. The Decommissioning of Underground Fuel Tanks at Tsuen Wan No.1 Pumping Station, Environmental Baseline Monitoring Report.
- [4] Ove Arup & Partners Hong Kong Limited. September 2003. The Decommissioning of Underground Fuel Tanks at Tsuen Wan No.1 Pumping Station, Monthly Environmental Monitoring and Audit Report – August 2003.

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APPENDIX A

**Monitoring schedule for
December 2003**

Environmental Monitoring and Audit Schedule - December 2003

Note 1: L30 denotes $L_{eq(30 \text{ min})}$ Monitoring

Dec-2003						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1 L30 monitoring	2	3	4 Site Inspection	5	6
7	8 L30 monitoring	9	10	11 Site Inspection	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

APPENDIX B

**Detailed noise
monitoring results for
December 2003**

Details of Noise Impact Monitoring

Date	NSR No.	Time periods		Weather condition	Avg. wind speed (m/s)	Noise Level dB(A)			Influencing factors/ Site condition
		Start	Finish			L _{eq}	L ₁₀	L ₉₀	
1-Dec-03	NM1	15:00	15:30	Sunny	0.5	66.5	68.0	64.5	Traffic Noise
1-Dec-03	NM2	15:10	15:40	Sunny	0.6	67.5	69.0	65.5	Traffic Noise
8-Dec-03	NM1	16:30	17:00	Sunny	0.4	64.0	67.5	60.5	Traffic Noise
8-Dec-03	NM2	16:45	17:15	Sunny	0.5	67.0	69.5	62.0	Traffic Noise