

Gammon Construction Limited

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

November 2009

Environmental Resources Management


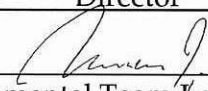
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*Twenty-seventh Monthly
Environmental Monitoring and Audit
Report*

November 2009

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:	20 November 2009

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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. This is the twenty-seventh monthly Environmental Monitoring and Audit (EM&A) report presenting the EM&A work carried out during the period from 21 September 2009 to 29 October 2009 in accordance with the EM&A Manual.

Summary of construction works undertaken during reporting period

The major construction works undertaken during this reporting period were water test for SWSR Nos.1 and 2; and permanent works (wall) for access tunnel.

Environmental Monitoring and Audit Progress

A summary of the monitoring activities in this reporting period is listed below:

24-hour TSP monitoring	6 times
Construction noise monitoring	6 times
Joint environmental site auditing	6 times
Building settlement monitoring	every day except Sundays and general holidays
Building tilt monitoring	at least once every day

Air Quality

Four sets of 24-hour TSP measurements were carried out at the designated monitoring station AM1 during the reporting period. No exceedance was recorded during this reporting period.

Noise

Four sets of 30-minute noise measurements were carried out at the designated monitoring stations NM1 & NM2 during the reporting period. No exceedance was recorded during the reporting period.

Cultural Heritage

Monitoring of potential building movements of the Elliot Treatment Works (ETW) during construction of the Designated Project was conducted during the reporting period. No exceedance of Alarm, Action and Alert Levels in this respect was recorded during this reporting period.

Construction Waste Management

Wastes from this Project include inert construction and demolition (C&D) materials, non-inert C&D wastes and chemical wastes. A total of 18 tonnes of non-inert C&D waste, no chemical wastes and no inert C&D materials were generated during the reporting period. The non-inert C&D wastes after segregation were disposed of at SENT Landfill.

Environmental Non-compliance

No non-compliance event was recorded during the reporting period.

No environmental complaint and summons was received in this reporting period.

Future Key Issues

Construction of the Designated Project (DP) was completed on 29 October 2009, and therefore no further works will be undertaken within the Project area. A letter notifying the completion of the construction works for the DP and proposing the termination of EM&A programme was sent to EPD on 23 October 2009. The ET will prepare a Final EM&A report to summarise findings of the construction EM&A programme for EPD approval.

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

Construction of the Designated Project (DP) was completed on 29 October, 2009. This is the twenty-seventh, also the last, EM&A report which summarizes the impact monitoring results and audit findings for the EM&A programme during the reporting period from **21 September 2009 to 29 October 2009**.

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 background and scope of the project, site description, construction programme, the construction works undertaken and the status of Environmental Permits/Licenses during the reporting period.

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 EIA report and relevant environmental requirements.

Section 4 : Implementation Status on Environmental Mitigation Measures

Summarizes the implementation of environmental protection measures during the reporting period.

Section 5 : Monitoring Results

Summarizes the monitoring results obtained in the reporting period.

Section 6 : Environmental Site Auditing

Summarizes the audit findings of the weekly site inspections undertaken within the reporting period.

Section 7 : **Environmental Non-conformance**

Summarizes any monitoring exceedance, environmental complaints and environmental summons within the reporting period.

Section 8 : **Future Key Issues**

Summarizes the impact forecast and monitoring schedule for the next three months.

Section 9 : **Conclusion**

2.1 BACKGROUND

Project background, associated construction works, organization chart and contact details are all detailed in *Section 2* of the first Monthly EM&A Report.

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.

The construction works commenced on 21 July 2007 and are scheduled to be completed by September 2009. An updated construction programme is shown in *Annex A*.

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.

2.2 CONSTRUCTION ACTIVITIES

A summary of the major construction activities undertaken in this reporting period is shown in *Table 2.1*. The locations of the construction activities are shown in *Annex A*.

Table 2.1 *Summary of Construction Activities Undertaken during the Reporting Period*

Construction Activities Undertaken
<ul style="list-style-type: none"> • Site Clearance works for Fire Inspection • Fire Inspection • Water Pipes tests • Road Sign Construction • Construction of DN600 S.W. Overflow Pit • Cat ladder erection • E&M works • Road Sign Construction • Thrust Blocks, and • Cradle Supports

A summary of the relevant permits, licences, and/or notifications on environmental protection for this Project is presented in *Table 2.2*.

Table 2.2 *Summary of Current Environmental Licensing, Notification and Permit Status*

Permit/ Licences/ Notification	Reference	Validity Period	Remarks
Environmental Permit	EP-279/2007	Throughout the construction and operation of the Project	Permit granted on 4 June 2007– superseded by EP-279/2007/A on 24 December 2008 (see below)
Notification of Construction Works under Air Pollution Control (Construction Dust) Regulation	--	--	Reference Number for Notification Pursuant to APC (Construction Dust) Regulation: 001019768
Effluent Discharge Licence	EP880/W10/XX0275	N/A	Discharge of industrial trade effluent into communal storm water drain
Chemical Waste Producer Registration	5919-141-G2336-17	N/A	Chemical waste types: spent paint, acid, alkaline, adhesive, diesel fuel, lubricating oil and bitumen.
Further Environmental Permit	FEP-01/279/2007	Throughout the construction of the Project	Permit granted on 23 October 2007 – superseded by FEP-01/279/2007/A on 24 December 2008 (see below)
Amended Environmental Permit	EP-279/2007/A	Throughout the construction and operation of the Project	Permit granted on 24 December 2008
Amended Further Environmental Permit	FEP-01/279/2007/A	Throughout the construction of the Project	Permit granted on 24 December 2008
Construction Noise Permit	GW-RS0512-09	18 August 2009 (19:00 hour) to 10 October 2009 (0700 hour)	Permit granted on 14 July 2009
	GW-RS0514-09	14 August 2009 (19:00 hour) to 30 September 2009 (0700 hour)	Permit granted on 14 July 2009

Permit/ Licences/ Notification	Reference	Validity Period	Remarks
	GW-RS0622-09	19 August 2009 (19:00 hour) to 5 October 2009 (0700 hour)	Permit granted on 19 August 2009

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 B*.

Table 3.1 *Air Monitoring Station*

Monitoring Station	Description
AM1	Chow Yei Ching Building, HKU

3.1.2 Monitoring Parameter, Frequency and Programme

Weekly 24-hour TSP monitoring was conducted in accordance with the requirements stipulated in the EM&A Manual. The monitoring programme for this reporting period is shown in *Annex C*.

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, μgm^{-3}	Limit Level, μgm^{-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

Installation

The HVS at AM1 was placed on the rooftop of Chow Yei Ching Building at about 33 m above local ground level. The HVS was free-standing with no obstruction.

The following criteria were considered in the installation of the HVS:

- appropriate support to secure the samplers against gusty wind was provided at AM1;
- a minimum of 2-metre separation from walls, parapets and penthouses was required for rooftop samplers;
- no furnace or incinerator flues were nearby;
- airflow around the sampler was unrestricted; and
- permission was obtained to set up the samplers and to gain access to the monitoring stations.

Preparation of Filter Papers by SGS Hong Kong Ltd

- glass fibre filters were labelled and sufficient filters that were clean and without pinholes were selected;
- all filters were equilibrated in the conditioning environment for 24 hours before weighing. The conditioning environment temperature was around 25 °C and not variable by more than ± 3 °C; the relative humidity (RH) was 40%; and
- SGS Hong Kong Ltd, a HOKLAS accredited laboratory, implements comprehensive quality assurance and quality control programmes.

Field Monitoring

- the power supply was checked to ensure that the HVS was working properly;
- the filter holder and the area surrounding the filter were cleaned;
- the filter holder was removed by loosening the foul bolts and a new filter, with stamped number upward, on a supporting screen was aligned carefully;
- the filter was properly aligned on the screen so that the gasket formed an airtight seal on the outer edges of the filter;
- the swing bolts were fastened to hold the filter holder down to the frame. The pressure applied should be sufficient to avoid air leakage at the edges;

- then the shelter lid was closed and secured with the aluminium strip;
- the HVS was warmed-up for about 5 minutes to establish run-temperature conditions;
- a new flow rate record sheet was set into the flow recorder;
- the flow rate of the HVS was checked and adjusted at around 1.21 m³/min. The range specified in the EM&A Manual was between 0.6 – 1.7 m³/min;
- the programmable timer was set for a sampling period of 24 hours ± 1 hour, and the starting time, weather condition and the filter number were recorded;
- the initial elapsed time was recorded;
- at the end of sampling, the sampled filter was removed carefully and folder in half length so that only surfaces with collected particulate matter were in contact;
- it was then placed in a clean plastic envelope and sealed;
- all monitoring information was recorded on a standard data sheet; and
- filters were sent to SGS Hong Kong Ltd for analysis.

Maintenance and Calibration

- the HVS and its accessories were maintained in good working condition, such as replacing motor brushes routinely and checking electrical wiring to ensure a continuous power supply; and
- the flow rate of HVS with mass flow controller were calibrated using an orifice calibrator. Initial calibrations of the dust monitoring equipments were conducted upon installation and prior to commissioning. Five-point calibration was carried out for HVS using Tisch TE-5025 A Calibration Kit. The calibration records for the HVS are given 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 B*.

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 normal weekdays	When one documented complaint is received from any one of the sensitive receivers	75 dB(A) ^(Note)
Note: Acceptable Noise Levels for Area Sensitivity Rating of A/B/C. Limit Level is reduced to 70dB(A) for schools and 65dB(A) during school examination periods.		

3.2.3 *Monitoring Parameters, Frequency and Programme*

Weekly construction noise monitoring was conducted in accordance with the requirements stipulated in the EM&A Manual. The monitoring programme for this reporting period is shown in *Annex C*.

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 and Methodology*

Noise measurements were conducted in accordance with the calibration and measurement procedures as stated in *Annex – General Calibration and Measurement Procedures of Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-TM)* issued under the *Noise Control Ordinance (NCO) (Cap.400)*.

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. The calibration certificates of the sound level meters are given in *Annex D*.

Table 3.6 *Noise Monitoring Equipment*

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

Immediately prior to and following the noise measurements, the accuracy of the measurement equipment was checked using an acoustic calibrator generating a known sound pressure level at a known frequency.

Measurements were accepted as the calibration level from before and after the noise measurement agree to within 1.0 dB.

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 H*). 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 reporting period 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 (±1.75mm/m)	0.15 Degree (±2.62mm/m)	0.2 Degree (± 3.49mm/m)

IMPLEMENTATION STATUS OF ENVIRONMENTAL PROTECTION REQUIREMENTS

Environmental Control Requirements under EIAO

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 is summarized in *Annex E*. The status of the submissions required under the EP and FEP during the reporting period is presented in *Table 4.1*.

Table 4.1 *Status of Required Submission*

EP Condition	Submission	Submission Date
Condition 3.3	Submission of Twenty-sixth Monthly EM&A Report	21 October 2009

Other Environmental Control Requirements

Mitigation measures including the provision of temporary drainage system, wastewater treatment facilities and sedimentation tanks were implemented by the Contractor to manage and treat construction effluents and runoff. In accordance with the discharge licence issued under *Water Pollution Control Ordinance* (WPCO), effluent sampling and testing for suspended solids is required to be conducted monthly to ensure that the quality of treated effluent at designated discharge points complies with the criteria stipulated in the discharge licence. A total of two effluent samples collected separately at the two discharge points were tested by the Contractor during the reporting period and the test results indicated compliance.

5 MONITORING RESULTS

5.1 AIR QUALITY

Six sets of 24-hour TSP measurements were carried out at the monitoring station AM1 during the reporting period. The monitoring data for 24-hour TSP together with wind data and graphical presentations are presented in *Annex F*. The weather condition during the monitoring period varied from sunny to cloudy. The local impacts near the monitoring station were mainly associated with vehicular emissions from the road traffic along Pok Fu Lam Road. No exceedance of the Action and Limit Levels for 24-hour TSP was recorded during the reporting period.

5.2 NOISE

Six sets of 30-minute construction noise measurements were carried out at monitoring stations NM1 & NM2 during the reporting period. The monitoring results together with graphical presentations are presented in *Annex G*. The local impacts observed near the monitoring stations were mainly traffic noise from Pok Fu Lam Road and the concurrent projects undertaken in the vicinity. No exceedance of the Action and Limit Levels for construction noise was recorded during the reporting period.

5.3 CULTURAL HERITAGE

The monitoring results of building settlement markers and tiltmeters were presented in *Annex H*. Instrumentation errors were identified for the tiltmeters on the dates specified below and the relevant instruments were fixed immediately.

- TM05: 28 September 2009; and
- TM09: 29 September and 13 October 2009.

No exceedance of the Alert, Action and Alarm Levels for building movements was recorded during the reporting period.

5.4 WASTE MANAGEMENT

Wastes from this Project include 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 I*). The quantities of different types of wastes are summarized in *Table 5.1* with reference to relevant handling records and trip tickets for this Project. Appropriate measures have been implemented by the

Contractor to minimize dust impact associated with waste management
(Annex E).

Table 5.1 **Quantities of Different Waste**

Month / Year	Quantity		
	C&D Materials (inert) ^(a)	C&D Materials (non-inert) ^(b)	Chemical Wastes
21 September 2009 – 29 October 2009	0 tonne	18 tonne	0 litre
Notes:			
(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.			

Weekly site inspections were carried out by the representatives of the Contractor and the ET. Six site inspections were conducted on 22 and 29 September 2009; and 7, 13, 20 and 29 October 2009. No non-compliance event was recorded during the reporting period.

7 ENVIRONMENTAL NON-CONFORMANCE

7.1 SUMMARY OF MONITORING EXCEEDANCE

No exceedance of the Action Level for 24-hour TSP and construction noise was recorded at monitoring stations during the reporting period.

7.2 SUMMARY OF ENVIRONMENTAL NON-COMPLIANCE

No non-compliance event was recorded during the reporting period.

7.3 SUMMARY OF ENVIRONMENTAL COMPLAINT

No complaint was received during the reporting period.

7.4 SUMMARY OF ENVIRONMENTAL SUMMON AND SUCCESSFUL PROSECUTION

No summons was received during the reporting period.

8.1 KEY ISSUES FOR THE COMING MONTH

Construction of the Designated Project (DP) was completed on 29 October 2009, and therefore no further works will be undertaken within the Project area. A letter notifying the completion of the construction works for the DP and proposing the termination of EM&A programme was sent to EPD on 23 October 2009.

8.2 MONITORING SCHEDULE FOR THE COMING MONTHS

No TSP and construction noise monitoring was scheduled as termination of the EM&A programme is proposed following completion of construction works for the Project on 29 October 2009.

The Environmental Monitoring and Audit (EM&A) Report presents the EM&A work undertaken during the period from 21 September 2009 to 29 October 2009 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.

No exceedance of the Action Level for 24-hour TSP and construction noise was recorded at the monitoring stations during the reporting period.

No non-compliance event was recorded during the reporting period.

There was no complaint and summons/prosecution received during the reporting period.

A letter notifying the completion of the construction works for the DP and proposing the termination of EM&A programme was sent to EPD on 23 October 2009. The ET will prepare a Final EM&A report to summarise findings of the construction EM&A programme for EPD approval.

Annex A

Locations of Works Areas and Construction Activities during the Reporting Period, and updated Construction Programme

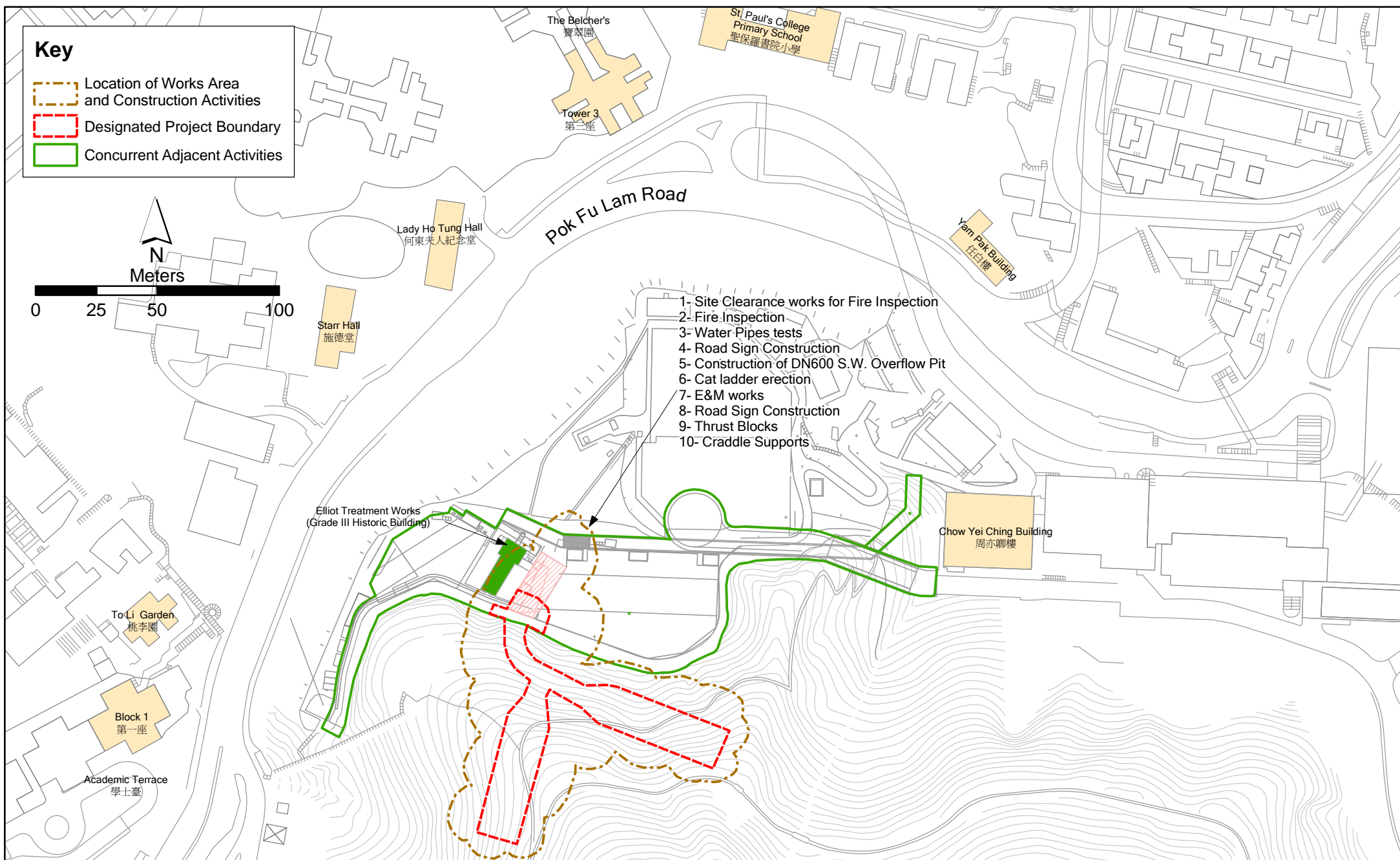
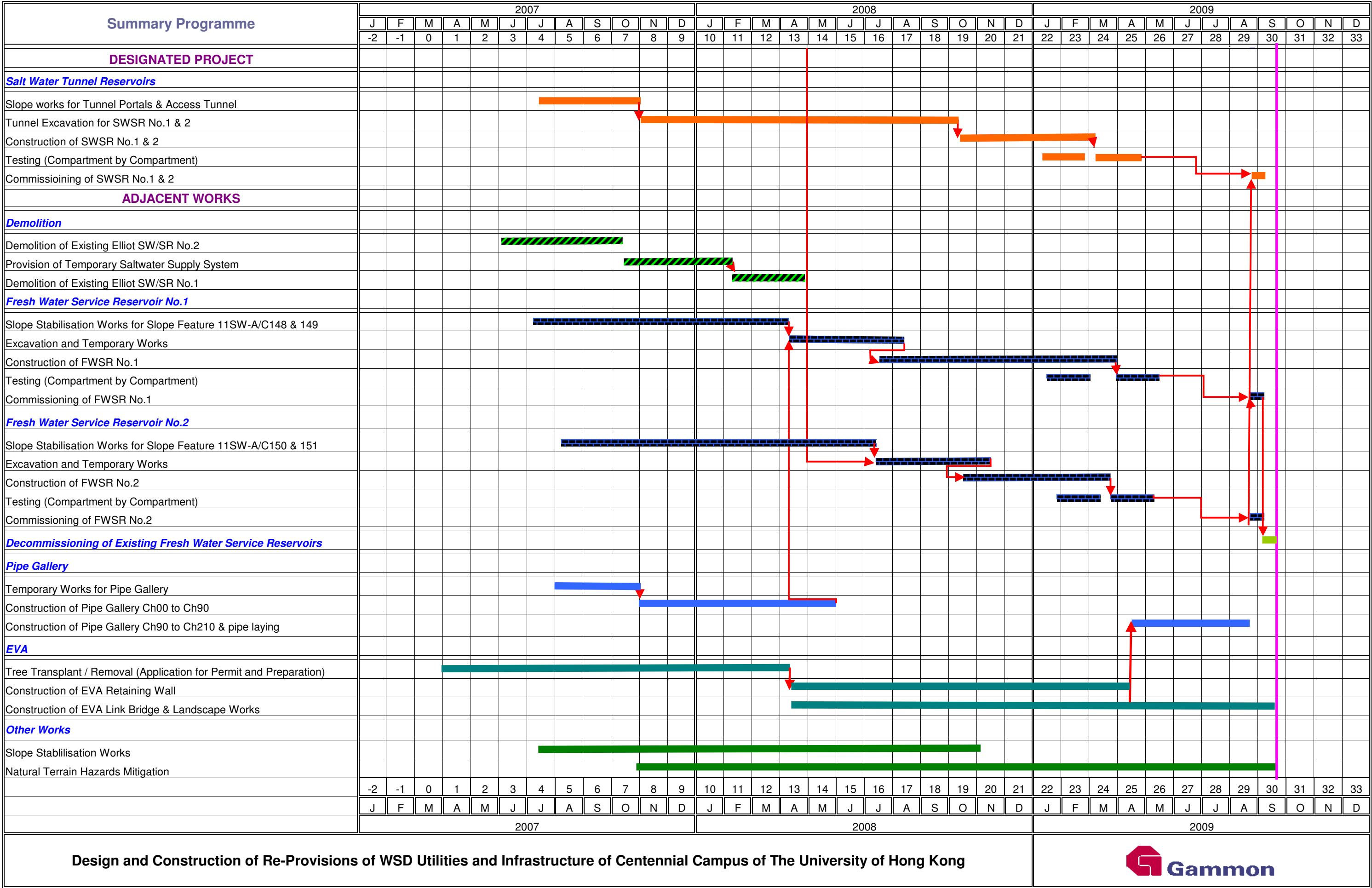


Figure A1

Project Location and Works Location



Activity ID	Activity Description	Early Start	Early Finish	2009		
				AUG	SEP	OCT
				16	17	18
ADJACENT WORKS						
Salt Water Service Reservoirs & Tunnel						
Auxilliary Works for SWSRs						
TR01940	Drainage & Pit Work in Tunnel Portal Area	05-MAR-09A	10-NOV-09			
Emergency Vehicle Access (EVA)						
EVA Retaining Wall						
EV20170	Western Section - Retaining Wall	06-JUL-09*	04-NOV-09			
EV20200	Eastern Section - Retaining Wall	01-JUN-09*	04-NOV-09			
EV20220	Backfill	27-JUN-09*	20-OCT-09			Backfill
EV20240	Road Drainage	27-JUL-09	15-NOV-09			
Fresh Water Service Reservoirs						
Fresh Water Service Reservoir No. 1						
FW10505	Roof Waterproofing	15-JUN-09	10-NOV-09			
FW10510	Roof Water Test (Memb)	15-JUL-09	14-NOV-09			
Fresh Water Service Reservoir No. 2						
FW20505	Roof Waterproofing	15-JUL-09	10-NOV-09			
FW20510	Roof Water Test (Memb)	15-AUG-09	15-NOV-09	Roof Water Test (Memb)		
Pipe Laying						
Permanent Pipelines						
PP10430	Pipe Works in Portal Area	29-MAY-09*	15-OCT-09			Pipe Works in Portal Area
DESIGNATED PROJECT						
Salt Water Service Reservoirs & Tunnel						
Salt Water Service Reservoir No.1						
TR10510	Functional Test of Telemetry/SCADA at SWSR No.1	11-MAY-09	30-JUN-09			
Salt Water Service Reservoir No.2						
TR20610	Functional Test of Telemetry/SCADA at SWSR No.2	20-MAY-09	09-JUL-09			
Auxilliary Works for SWSRs						
TR00920	Pipe Works in Tunnel	04-MAR-09A	15-OCT-09			Pipe Works in Tunnel
TR00960	Structure Works in Tunnel (Inclu Vent. Duct)	04-MAR-09A	17-OCT-09			Structure Works in Tunnel (Inclu Vent. Duct)
TR01040	T&C for E&M Systems for Tunnel	02-JUL-09	21-OCT-09			T&C for E&M Systems for Tunnel

Annex B

Location of Monitoring Stations and Photographs showing Monitoring Stations

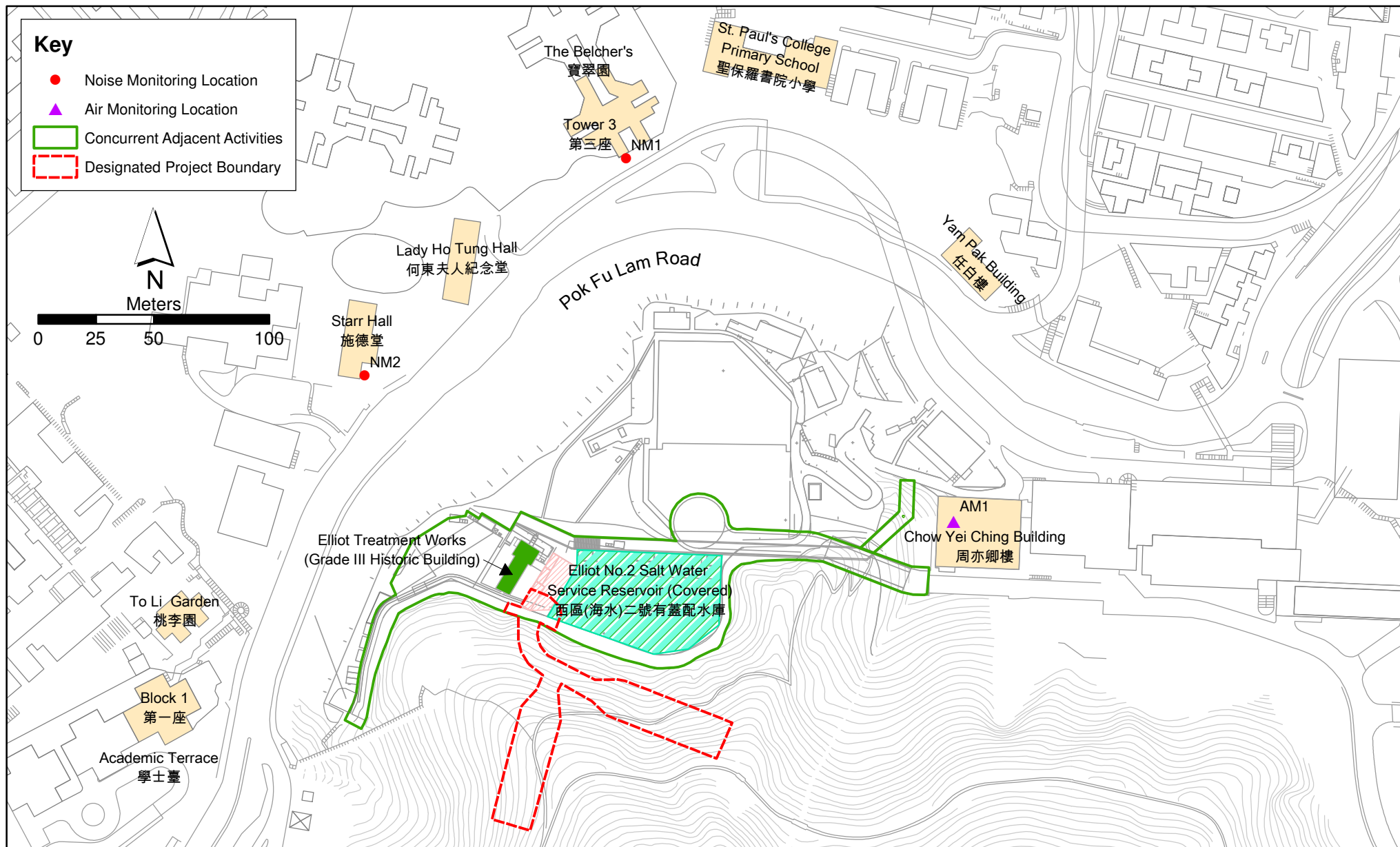


Figure B1

Air and Noise Monitoring Locations

File: 0067560_1.mxd
Date: 03/07/2007

Environmental
Resources
Management



Air quality Monitoring Station



Air Quality Monitoring Station (AM1)

Noise Monitoring Station



Noise Monitoring Station (NM1)



Baseline Noise Monitoring Station (NM2)

Annex C

Monitoring Schedule

Reprovisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department
Air Quality and Noise Monitoring Schedule - August 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1-Aug
2-Aug	3-Aug	4-Aug	5-Aug	6-Aug	7-Aug	8-Aug
	Air Monitoring Noise Monitoring					
9-Aug	10-Aug	11-Aug	12-Aug	13-Aug	14-Aug	15-Aug
	Air Monitoring Noise Monitoring					
16-Aug	17-Aug	18-Aug	19-Aug	20-Aug	21-Aug	22-Aug
	Air Monitoring Noise Monitoring					
23-Aug	24-Aug	25-Aug	26-Aug	27-Aug	28-Aug	29-Aug
	Air Monitoring Noise Monitoring					
30-Aug	31-Aug					
	Air Monitoring Noise Monitoring					

Reprovisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department
Air Quality and Noise Monitoring Schedule - September 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1-Sep	2-Sep	3-Sep	4-Sep	5-Sep
6-Sep	7-Sep	8-Sep	9-Sep	10-Sep	11-Sep	12-Sep
	Air Monitoring Noise Monitoring					
13-Sep	14-Sep	15-Sep	16-Sep	17-Sep	18-Sep	19-Sep
	Air Monitoring Noise Monitoring					
20-Sep	21-Sep	22-Sep	23-Sep	24-Sep	25-Sep	26-Sep
	Air Monitoring Noise Monitoring					
27-Sep	28-Sep	29-Sep	30-Sep			
	Air Monitoring Noise Monitoring					

Reprovisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department
Air Quality and Noise Monitoring Schedule - October 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1-Oct	2-Oct	3-Oct
4-Oct	5-Oct	6-Oct	7-Oct	8-Oct	9-Oct	10-Oct
	Air Monitoring Noise Monitoring					
11-Oct	12-Oct	13-Oct	14-Oct	15-Oct	16-Oct	17-Oct
	Air Monitoring Noise Monitoring					
18-Oct	19-Oct	20-Oct	21-Oct	22-Oct	23-Oct	24-Oct
	Air Monitoring Noise Monitoring					
25-Oct	26-Oct	27-Oct	28-Oct	29-Oct	30-Oct	31-Oct
	Air Monitoring Noise Monitoring					

Annex D

Calibration Reports for HVSs and Sound Level Meter

High-Volume TSP Sampler
5-Point Calibration Record

Location : HKU
Calibrated by : K.T.Ho
Date : 20/7/09

Sampler

Model : GMWS-2310 ACCU-VOL
Serial Number : S/N 1060

Calibration Office and Standard Calibration Relationship

Serial Number : CM-AIR-52
Service Date : 15 Dec 2008
Slope (m) : 0.057423
Intercept (b) : -0.026110
Correlation Coefficient(r) : 0.999909

Standard Condition

Pstd (hpa) : 1013
Tstd (K) : 298.18

Calibration Condition

Pa (hpa) : 1012
Ta(K) : 303

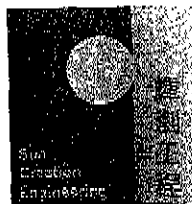
Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (indicated flow)	Y
1 18 holes	10.2	3.216	1.627	60	60.4
2 13 holes	8.6	2.953	1.496	56	56.4
3 10 holes	6.2	2.507	1.273	47	47.3
4 7 holes	5.0	2.251	1.146	42	42.3
5 5 holes	2.8	1.685	0.862	41	31.2

Sampler Calibration Relationship

Slope(m): 38.664 Intercept(b): -1.9935 Correlation Coefficient(r): 0.9994

Checked by: Magnum Fan

Date: 23/7/09



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Certificate No. : C092284

Certificate of Calibration

This is to certify that the equipment

Description : Sound Level Meter

Manufacturer : Rion

Model No. : NL-3J

Serial No. : 00410224

*has been calibrated for the specific items and ranges.
The results are shown in the Calibration Report No. C092284.*

The equipment is supplied by

Co. Name : Envirotech Services Co.

*Address : Shop 6, G/F., Casio Mansion, 209 Shaaukeiwan Road,
Hong Kong*

Date of Issue : 8 May 2009

Certified by :

K C Lee

The test equipment used for calibration are traceable to the National Standards as specified in this report.
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Calibration and Testing Laboratory of Sun Creation Engineering Limited

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Website: www.suncreation.com



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Report No. : C092284

Calibration Report

ITEM TESTED

DESCRIPTION : Sound Level Meter

MANUFACTURER : Rion

MODEL NO. : NL-31

SERIAL NO. : 00410224

TEST CONDITIONS

AMBIENT TEMPERATURE : $(23 \pm 2)^{\circ}\text{C}$ RELATIVE HUMIDITY : $(55 \pm 20)\%$

LINE VOLTAGE : ---

TEST SPECIFICATIONS

Calibration

DATE OF TEST : 7 May 2009

JOB NO. : IC09-1058

TEST RESULTS

The results apply to the particular unit-under-test only.

All results are within manufacturer's specification. (after adjustment)

The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via :

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory

Tested by :

H.C. Chan

Date : 8 May 2009

The test equipment used for calibration are traceable to the National Standards as specified in this report.
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Calibration and Testing Laboratory of Sun Creation Engineering Limited

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E-mail: calibra@suncreation.com

Website: www.suncreation.com



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Report No. : C092284

Calibration Report

1. The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 24 hours, and switched on to warm up for over 10 minutes before the commencement of the test.
2. Self-calibration using the internal standard (after adjustment) was performed before the test 6.1.2 - 6.4.
3. The results presented are the mean of 3 measurements at each calibration point.
4. Test equipment :

Equipment ID	Description	Certificate No.
CL280	40 MHz Arbitrary Waveform Generator	C090024
CL281	Multifunction Acoustic Calibrator	DC090052

5. Test procedure : MA101N.

6. Results :

6.1 Sound Pressure Level

6.1.1 Reference Sound Pressure Level

UUT Setting				Applied Value		UUT Reading (dB)		IEC 651 Type 1 Spec. (dB)
Range (dB)	Mode	Weight	Response	Level (dB)	Freq. (kHz)	Before Adjustment	After Adjustment	
20 - 100	L _A	A	Fast	94.00	1	* 91.4	94.0	± 0.7

* Out of Mfr's Spec.

6.1.2 Linearity

UUT Setting				Applied Value		UUT Reading (dB)
Range (dB)	Mode	Weight	Response	Level (dB)	Freq. (kHz)	
30 - 120	L _A	A	Fast	94.00	1	94.0 (Ref.)
				104.00		104.0
				114.00		114.3

IEC 651 Type 1 Spec. : ± 0.4 dB per 10 dB step and ± 0.7 dB for overall different.

6.2 Time Weighting

6.2.1 Continuous Signal

UUT Setting				Applied Value		UUT Reading (dB)	IEC 651 Type 1 Spec. (dB)
Range (dB)	Mode	Weight	Response	Level (dB)	Freq. (kHz)		
20 - 100	L _A	A	Fast	94.00	1	94.0	Ref.
			Slow			94.0	+ 0.1

The test equipment used for calibration are traceable to the National Standards as specified in this report.
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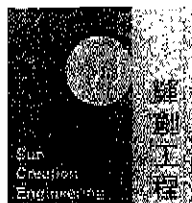
Co. 4/F, Tang Shiu Wai Exchange Building 1 Hong On Lane, Tuen Mun, New Territories, Hong Kong

Tel: 2927 2606

Fax: 2744 8085

E-mail: callab@suncreation.com

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輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Report No. : C092284

Calibration Report

6.2.2 Tone Burst Signal (2 kHz)

UUT Setting				Applied Value		UUT	IEC 651 Type 1	
Range (dB)	Mode	Weight	Response	Level (dB)	Burst Duration	Reading (dB)	Spec. (dB)	
20 - 110	L _A	A	Fast	106.00	Continuous	106.0	Ref.	
	L _{Amax}				200 ms	105.0	-1.0 ± 1.0	
	L _A	Slow	Slow		Continuous	106.0	Ref.	
	L _{Amax}				500 ms	102.0	-4.1 ± 1.0	

6.3 Frequency Weighting

6.3.1 A-Weighting

UUT Setting				Applied Value		UUT	IEC 651 Type 1
Range (dB)	Mode	Weight	Response	Level (dB)	Freq.	Reading (dB)	Spec. (dB)
20 - 100	L _A	A	Fast	94.00	31.5 Hz	54.9	-39.4 ± 1.5
					63 Hz	68.1	-26.2 ± 1.5
					125 Hz	78.0	-16.1 ± 1.0
					500 Hz	90.8	-3.2 ± 1.0
					1 kHz	94.0	Ref.
					2 kHz	95.2	+1.2 ± 1.0
					4 kHz	94.7	+1.0 ± 1.0
					8 kHz	90.2	-1.1 (+1.5 ; -3.0)

6.3.2 C-Weighting

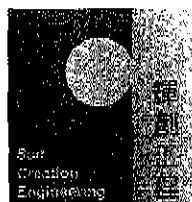
UUT Setting				Applied Value		UUT	IEC 651 Type 1
Range (dB)	Mode	Weight	Response	Level (dB)	Freq.	Reading (dB)	Spec. (dB)
20 - 100	L _C	C	Fast	94.00	31.5 Hz	91.3	-3.0 ± 1.5
					63 Hz	93.4	-0.8 ± 1.5
					125 Hz	93.9	-0.2 ± 1.0
					500 Hz	94.1	0.0 ± 1.0
					1 kHz	94.0	Ref.
					2 kHz	93.8	-0.2 ± 1.0
					4 kHz	92.9	-0.8 ± 1.0
					8 kHz	88.4	-3.0 (+1.5 ; -3.0)

The test equipment used for calibration are traceable to the National Standards as specified in this report.
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Sun Creation Engineering Limited Calibration and Testing Laboratory

Report No. : C092284

Calibration Report

6.4 Time Averaging

UUT Setting				Applied Value					UUT	IEC 60804
Range (dB)	Mode	Weight	Integrating Time	Freq (kHz)	Burst Duration (ms)	Burst Duty Factor	Burst Level (dB)	Equivalent Level (dB)	Reading (dB)	Type 1 Spec (dB)
20 - 110	Leq	A	10 sec	4	1	1/10	110.0	100	100.1	± 0.5
						1/10 ²		90	90.1	± 0.5
			60 sec			1/10 ³		80	80.0	± 1.0
			5 min			1/10 ⁴		70	70.0	± 1.0

Remarks : - Mfr's Spec : IEC 651 & IEC 60804 Type 1

- Uncertainties of Applied Value : 94 dB : 31.5Hz - 125 Hz : ± 0.35 dB
- 500 Hz : ± 0.30 dB
- 1 kHz : ± 0.20 dB
- 2 kHz - 4 kHz : ± 0.35 dB
- 8 kHz : ± 0.45 dB
- 104 dB : 1 kHz : ± 0.10 dB (Ref. 94 dB)
- 114 dB : 1 kHz : ± 0.10 dB (Ref. 94 dB)
- Burst equivalent level : ± 0.2 dB (Ref. 110 dB continuous sound level)

- The uncertainties are for a confidence probability of not less than 95 %.

Note :

The values given in this Calibration Report only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environment changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Sun Creation Engineering Limited shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to the National Standards as specified in this report.
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E-mail: callab@suncreation.com

Website: www.suncreation.com



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Certificate No. : C093472

Certificate of Calibration

This is to certify that the equipment

Description : Sound Level Calibrator

Manufacturer : Rion

Model No. : NC-73

Serial No. : 10997142

has been calibrated for the specific items and ranges.

The results are shown in the Calibration Report No. C093472.

The equipment is supplied by

Co. Name : Envirotech Services Co.

*Address : Shop 6, G/F., Casio Mansion, 209 Shaukeiwan Road,
Hong Kong*

Date of Issue : 6 July 2009

*Certified by : Chan H C Chan
H C Chan*

The test equipment used for calibration are traceable to the National Standards as specified in this report.
This report shall not be reproduced except in full and with prior written approval from this laboratory.

Calibration and Testing Laboratory of Sun Creation Engineering Limited

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Website: www.suncreation.com



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Report No. : C093472

Calibration Report

ITEM TESTED

DESCRIPTION : Sound Level Calibrator
MANUFACTURER : Rion
MODEL NO. : NC-73
SERIAL NO. : 10997142

TEST CONDITIONS

AMBIENT TEMPERATURE : $(23 \pm 2)^{\circ}\text{C}$
LINE VOLTAGE : —

RELATIVE HUMIDITY : $(55 \pm 20)\%$

TEST SPECIFICATIONS

Calibration

DATE OF TEST : 3 July 2009

JOB NO. : IC09-1664

TEST RESULTS

The results apply to the particular unit-under-test only.
All results are within manufacturer's specification.
The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via :

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory
- Rohde & Schwarz Laboratory, Germany
- Fluke Everett Service Center, USA
- Agilent Technologies, USA

Tested by :


K.C. Lee

Date : 6 July 2009

The test equipment used for calibration are traceable to the National Standards as specified in this report.
This report shall not be reproduced except in full and with prior written approval from this laboratory.

Calibration and Testing Laboratory of Sun Creation Engineering Limited

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Page 1 of 2



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Report No. : C093472

Calibration Report

1. The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 24 hours before the commencement of the test.
2. The results presented are the mean of 3 measurements at each calibration point.
3. Test equipment :

<u>Equipment ID</u>	<u>Description</u>	<u>Certificate No.</u>
TST150A	Measuring Amplifier	C080751
CL129	Universal Counter	C093121
CL281	Multifunction Acoustic Calibrator	DC090052

4. Test procedure : MA100N.

5. Results :

5.1 Sound Level Accuracy

UUT Nominal Value	Measured Value (dB)		Mfr's Spec. (dB)	Uncertainty of Measured Value (dB)
	Before Adjustment	After Adjustment		
94 dB, 1 kHz	93.9	94.0	± 0.5	± 0.2

5.2 Frequency Accuracy

UUT Nominal Value (kHz)	Measured Value (Hz)		Mfr's Spec.	Uncertainty of Measured Value (Hz)
	Before Adjustment	After Adjustment		
1	991.7	991.7	1 kHz $\pm 2\%$	± 0.1

Remark : - The uncertainties are for a confidence probability of not less than 95 %.

Note :

The values given in this Calibration Report only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environment changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Sun Creation Engineering Limited shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to the National Standards as specified in this report.
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Calibration and Testing Laboratory of Sun Creation Engineering Limited

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Page 2 of 2



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Certificate No. : C093733

Certificate of Calibration

This is to certify that the equipment

Description : Sound Level Meter

Manufacturer : Rion

Model No. : NL-31

Serial No. : 00320533

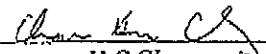
*has been calibrated for the specific items and ranges.
The results are shown in the Calibration Report No. C093733.*

The equipment is supplied by

Co. Name : Envirotech Services Co.

*Address : Shop 6, G/F., Casio Mansion, 209 Shaukeiwan Road,
Hong Kong*

Date of Issue : 16 July 2009

*Certified by : 
H C Chan*

The test equipment used for calibration are traceable to the National Standards as specified in this report.
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Calibration and Testing Laboratory of Sun Creation Engineering Limited

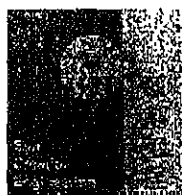
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Tel: 2927 2606

Fax: 2714 8986

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Website: www.suncreation.com



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Report No. : C093733

Calibration Report

ITEM TESTED

DESCRIPTION : Sound Level Meter
MANUFACTURER : Rion
MODEL NO. : NL-31
SERIAL NO. : 00320533

TEST CONDITIONS

AMBIENT TEMPERATURE : $(23 \pm 2)^{\circ}\text{C}$
LINE VOLTAGE : ---

RELATIVE HUMIDITY : $(55 \pm 20)\%$

TEST SPECIFICATIONS

Calibration check

DATE OF TEST : 15 July 2009

JOB NO. : IC09-1740

TEST RESULTS

The results apply to the particular unit-under-test only.
All results are within manufacturer's specification.
The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via :

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory
- Rohde & Schwarz Laboratory, Germany
- Fluke Everett Service Center, USA
- Agilent Technologies, USA

Tested by :


K. C. Lee

Date : 16 July 2009

The test equipment used for calibration are traceable to the National Standards as specified in this report.
This report shall not be reproduced except in full and with prior written approval from this laboratory.

Calibration and Testing Laboratory of Sun Creation Engineering Limited

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Page 1 of 4



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Report No. : C093733

Calibration Report

- The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 24 hours, and switched on to warm up for over 10 minutes before the commencement of the test.
- Self-calibration was performed before the test.
- The results presented are the mean of 3 measurements at each calibration point.
- Test equipment :

Equipment ID	Description	Certificate No.
CL280	40 MHz Arbitrary Waveform Generator	C090024
CL281	Multifunction Acoustic Calibrator	DC090052

- Test procedure : MAIN.

- Results :

6.1 Sound Pressure Level

6.1.1 Reference Sound Pressure Level

UUT Setting				Applied Value		UUT Reading (dB)	IEC 60651 Type 1 Spec. (dB)
Range (dB)	Mode	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
30 - 120	L _A	A	Fast	94.00	1	94.2	± 0.7

6.1.2 Linearity

UUT Setting				Applied Value		UUT Reading (dB)
Range (dB)	Mode	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	
30 - 120	L _A	A	Fast	94.00	1	94.2 (Ref.)
				104.00		104.2
				114.00		114.2

IEC 60651 Type 1 Spec. : ± 0.4 dB per 10 dB step and ± 0.7 dB for overall different.

6.2 Time Weighting

6.2.1 Continuous Signal

UUT Setting				Applied Value		UUT Reading (dB)	IEC 60651 Type 1 Spec. (dB)
Range (dB)	Mode	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
30 - 120	L _A	A	Fast	94.00	1	94.2	Ref.
			Slow			94.1	± 0.1

The test equipment used for calibration are traceable to the National Standards as specified in this report.
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Calibration and Testing Laboratory of Sun Creation Engineering Limited

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輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Report No. : C093733

Calibration Report

6.2.2 Tone Burst Signal (2 kHz)

UUT Setting				Applied Value		UUT	IEC 60651	
Range (dB)	Mode	Frequency Weighting	Time Weighting	Level (dB)	Burst Duration	Reading (dB)	Type I Spec. (dB)	
20 - 110	L _A	A	Fast	106.00	Continuous	106.0	Ref.	
	L _{Amax}				200 ms	105.0	-1.0 ± 1.0	
	L _A		Slow		Continuous	106.0	Ref.	
	L _{Amax}				500 ms	102.0	-4.1 ± 1.0	

6.3 Frequency Weighting

6.3.1 A-Weighting

UUT Setting				Applied Value		UUT	IEC 60651 Type I
Range (dB)	Mode	Frequency Weighting	Time Weighting	Level (dB)	Freq.	Reading (dB)	Spec. (dB)
30 - 120	L _A	A	Fast	94.00	31.5 Hz	55.0	-39.4 ± 1.5
					63 Hz	68.3	-26.2 ± 1.5
					125 Hz	78.3	-16.1 ± 1.0
					250 Hz	85.7	-8.6 ± 1.0
					500 Hz	91.0	-3.2 ± 1.0
					1 kHz	94.2	Ref.
					2 kHz	95.2	+1.2 ± 1.0
					4 kHz	94.4	+1.0 ± 1.0
					8 kHz	90.1	-1.1 (+1.5 ; -3.0)
					12.5 kHz	83.9	-4.3 (+3.0 ; -6.0)

6.3.2 C-Weighting

UUT Setting				Applied Value		UUT	IEC 60651 Type I
Range (dB)	Mode	Frequency Weighting	Time Weighting	Level (dB)	Freq.	Reading (dB)	Spec. (dB)
30 - 120	L _C	C	Fast	94.00	31.5 Hz	91.4	-3.0 ± 1.5
					63 Hz	93.6	-0.8 ± 1.5
					125 Hz	94.1	-0.2 ± 1.0
					250 Hz	94.3	0.0 ± 1.0
					500 Hz	94.3	0.0 ± 1.0
					1 kHz	94.2	Ref.
					2 kHz	93.9	-0.2 ± 1.0
					4 kHz	92.7	-0.8 ± 1.0
					8 kHz	88.3	-3.0 (+1.5 ; -3.0)
					12.5 kHz	82.1	-6.2 (+3.0 ; -6.0)

The test equipment used for calibration are traceable to the National Standards as specified in this report.
This report shall not be reproduced except in full and with prior written approval from this laboratory.

Calibration and Testing Laboratory of Sun Creation Engineering Limited

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輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Report No. : C093733

Calibration Report

6.4 Time Averaging

Time Averaging										
UUT Setting				Applied Value					UUT	IEC 60804
Range (dB)	Mode	Frequency Weighting	Time Weighting	Freq. (kHz)	Burst Duration (ms)	Burst Duty Factor	Burst Level (dB)	Equivalent Level (dB)	Reading (dB)	Type 1 Spec. (dB)
20 - 110	L _{eq}	A	10 sec	4	1	1/10	110.0	100	100.3	± 0.5
			1/10 ²			90		90.3	± 0.5	
			1/10 ³			80		80.3	± 1.0	
			1/10 ⁴			70		70.3	± 1.0	
			60 sec							
			5 min							

Remarks : Mfr's Spec. : IEC 60651 & IEC 60804 Type 1

- Uncertainties of Applied Value : 94 dB : 31.5 Hz - 125 Hz : ± 0.35 dB
 250 Hz - 500 Hz : ± 0.30 dB
 1 kHz : ± 0.20 dB
 2 kHz - 4 kHz : ± 0.35 dB
 8 kHz : ± 0.45 dB
 12.5 kHz : ± 0.70 dB
 104 dB : 1 kHz : ± 0.10 dB (Ref. 94 dB)
 114 dB : 1 kHz : ± 0.10 dB (Ref. 94 dB)
 Burst equivalent level : ± 0.2 dB (Ref. 110 dB continuous sound level)

- The uncertainties are for a confidence probability of not less than 95 %.

Note :

The values given in this Calibration Report only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environment changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Sun Creation Engineering Limited shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to the National Standards as specified in this report.
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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	√
Construction Noise			
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	√
Construction Water Quality			

Remarks:

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- 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

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- 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	√
Construction Waste			
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	√
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	Δ

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- 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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- 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	√
Ecology			
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	√
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
Landscape and Visual			
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
Cultural Heritage			
Fencing should be erected around the entire Elliot Treatment Works.	Elliot Treatment Works	Contractor	√

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
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:

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

Annex F

24-hour TSP Monitoring Results

Impact 24-hr TSP Monitoring Results

24-hour TSP Monitoring Results at Station AM1 (Rooftop of Chow Yei Ching Building)

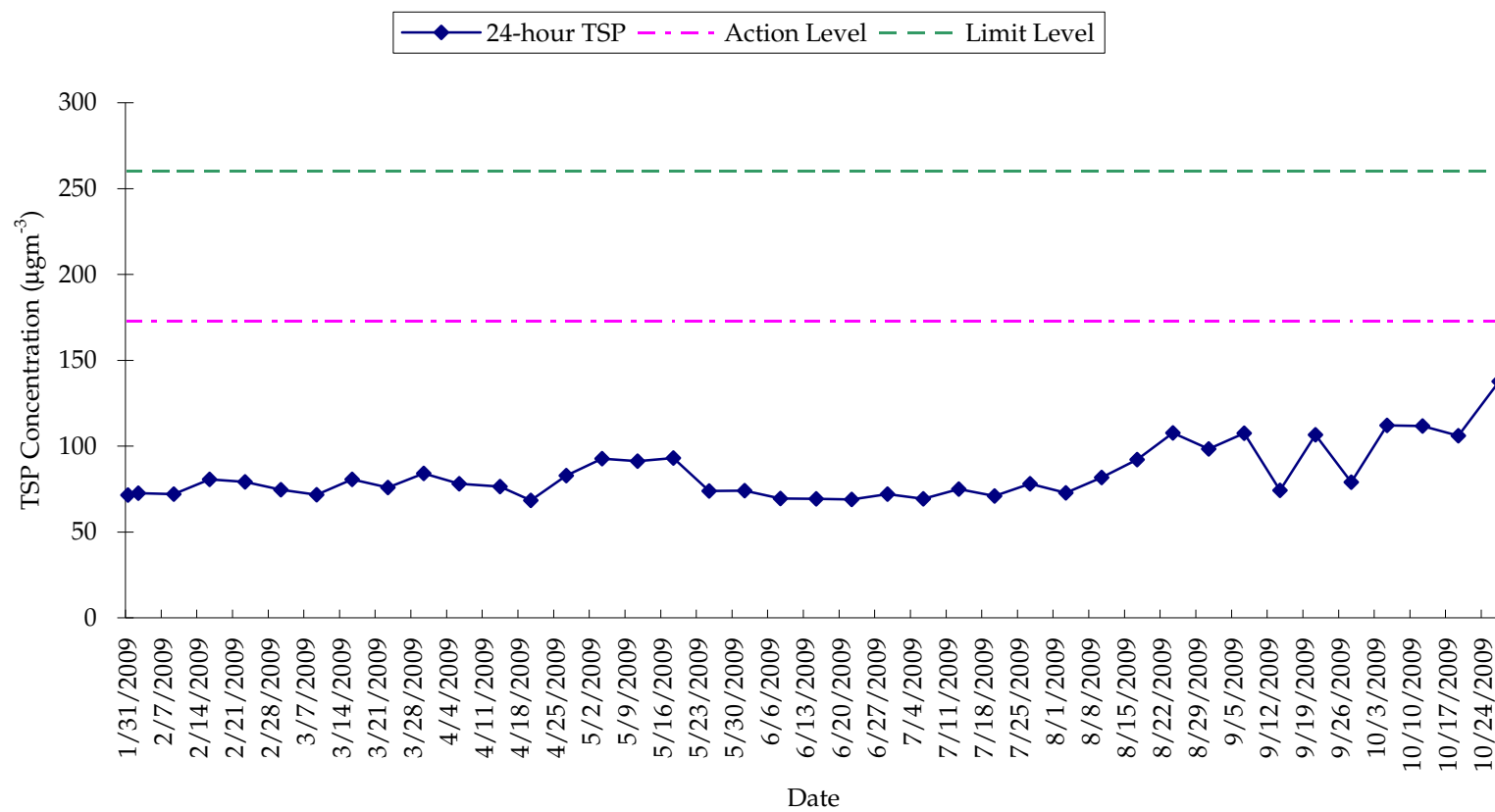
Date	Filter Weight (g)		Flow Rate (m ³ /min.)		Elapse Time		Sampling Time(hrs.)	Conc. (µg/m ³)	Weather Condition	Ave. Air Temp. (°C)	Particulate weight(g)	Av. flow (m ³ /min)	Total vol. (m ³)
	Initial	Final	Initial	Final	Initial	Final							
21-Sep-09	2.7956	2.9661	1.11	1.11	12157.1	12181.1	24.0	107	Sunny	30	0.1705	1.11	1598.4
28-Sep-09	2.7945	2.9207	1.11	1.11	12181.1	12205.1	24.0	79	Rainy	27	0.1262	1.11	1598.4
5-Oct-09	2.7887	2.9677	1.11	1.11	12205.1	12229.1	24.0	112	Sunny	30	0.1790	1.11	1598.4
12-Oct-09	2.7994	2.9778	1.11	1.11	12229.1	12253.1	24.0	112	Fine	25	0.1784	1.11	1598.4
19-Oct-09	2.8976	3.0671	1.11	1.11	12253.1	12277.1	24.0	106	Cloudy	25	0.1695	1.11	1598.4
27-Oct-09	2.8438	3.0638	1.11	1.11	12277.1	12301.1	24.0	138	Sunny	24	0.2200	1.11	1598.4
								Min	106				
								Max	138				
								Average	117				

Meteorological Data Extracted from King's Park Stations of the Hong Kong Observatory

Date	Weather	King's Park Station				
		Average Air Temperature (°C)	Average Wind Speed (km/h)	Average Relative Humidity (%)	Total Rainfall (mm) ⁽¹⁾	Prevailing Wind Direction (Degrees)
21-Sep-09	Sunny	28.6	5.1	82.0	10.0	110
28-Sep-09	Rainy	25.3 ⁽²⁾	11.3 ⁽²⁾	88.0 ⁽²⁾	53.5 ⁽²⁾	050 ⁽²⁾
05-Oct-09	Sunny	28.3	9.3	46.0	0.0	20
12-Oct-09	Fine	25.1	14.9	83.0	1.5	100
19-Oct-09	Cloudy	25.5	12.7	82.0	2.0	110
27-Oct-09	Sunny	24.0	14.5	71.0	0.0	110

Remark: (1) Rainfall measured in increment of 0.5 mm. Amount of < 0.5 mm cannot be detected;
(2) missing (less than 24 hourly observations a day).

Figure F1 - Measured 24-hour TSP Concentration (μgm^{-3}) at AM1



Annex G

Construction Noise Monitoring Results

Construction Noise Monitoring Results

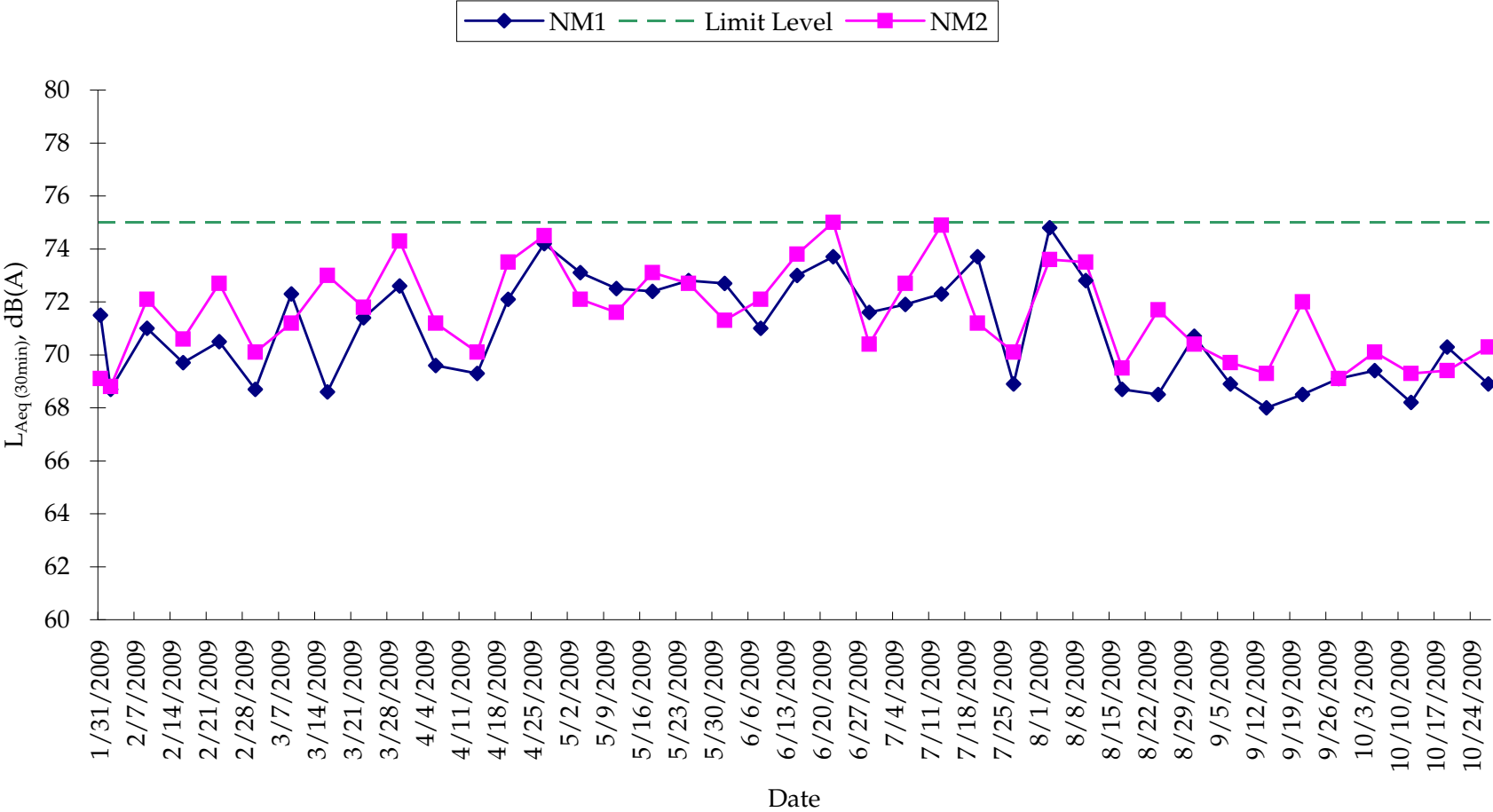
Monitoring Location: NM1 - Refuge Floor of Tower 3, The Belcher's

Date	Measurement Period, hours		Measured Noise Level, dB(A)			Noise Criteria, L _{eq(30mins)} , dB(A)	Compliance (Y/N)	Remark
	Start	End	L _{eq}	L ₁₀	L ₉₀			
21-Sep-09	10:15	10:45	68.5	70.3	67.2	75.0	Y	-
28-Sep-09	10:00	10:30	69.1	70.8	67.3	75.0	Y	-
5-Oct-09	14:08	14:38	69.4	71.0	67.9	75.0	Y	-
12-Oct-09	13:14	13:44	68.2	69.7	66.5	75.0	Y	-
19-Oct-09	10:05	10:35	70.3	71.6	68.8	75.0	Y	-
27-Oct-09	8:50	9:20	68.9	70.0	67.4	75.0	Y	-

Monitoring Location: NM2 - Roof of Starr Hall

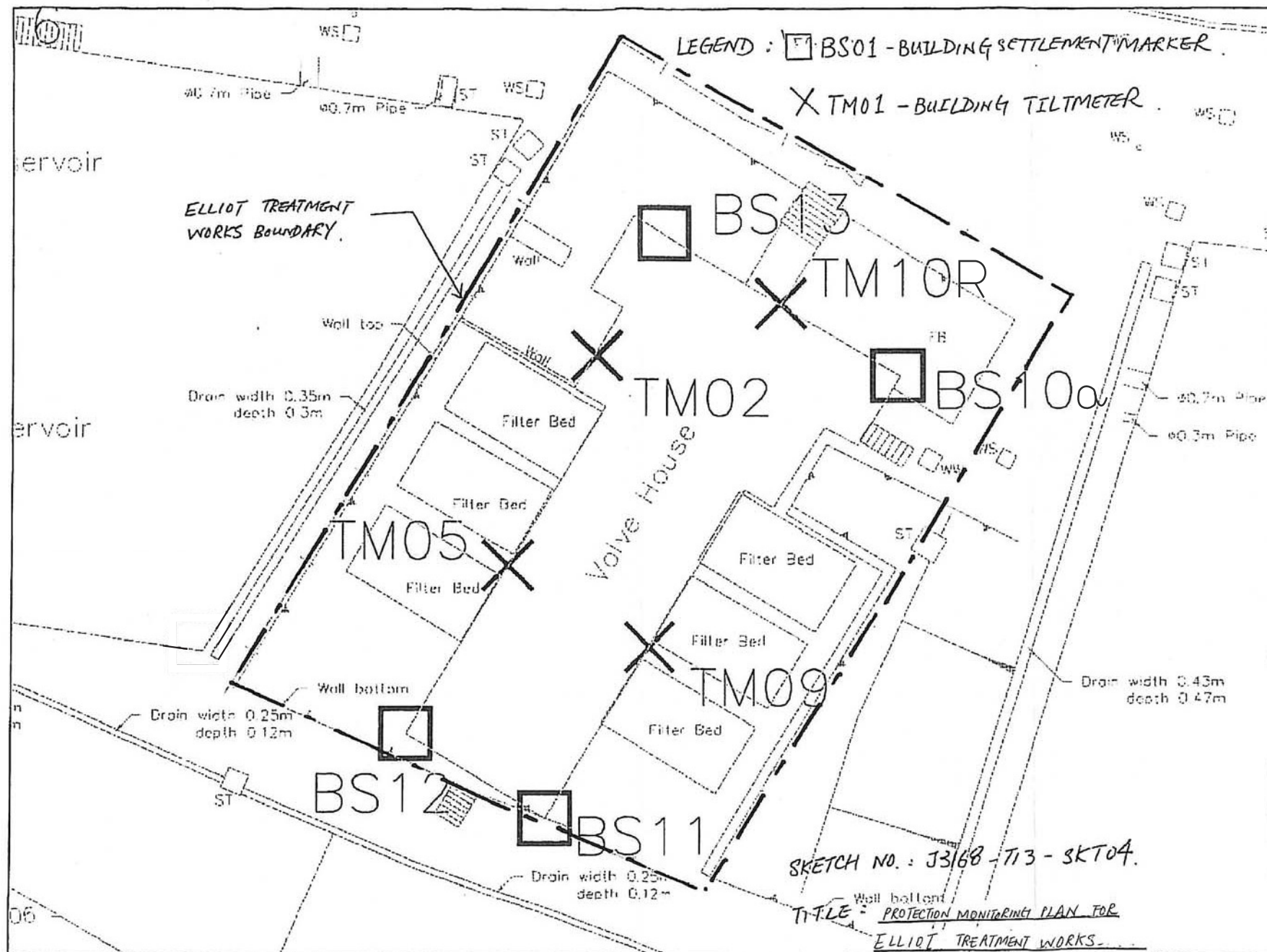
Date	Measurement Period, hours		Measured Noise Level, dB(A)			Noise Criteria, L _{eq(30mins)} , dB(A)	Compliance (Y/N)	Remark
	Start	End	L _{eq}	L ₁₀	L ₉₀			
21-Sep-09	11:00	11:30	72.0	73.9	68.2	75.0	Y	-
28-Sep-09	10:50	11:20	69.1	70.9	66.7	75.0	Y	-
5-Oct-09	14:52	15:22	70.1	72.0	67.5	75.0	Y	-
12-Oct-09	14:05	14:35	69.3	71.1	67.3	75.0	Y	-
19-Oct-09	10:45	11:15	69.4	71.1	67.4	75.0	Y	-
27-Oct-09	10:50	11:20	70.3	72.1	68.2	75.0	Y	-

Figure G1 - Noise Monitoring Results ($L_{eq, 30min}$)



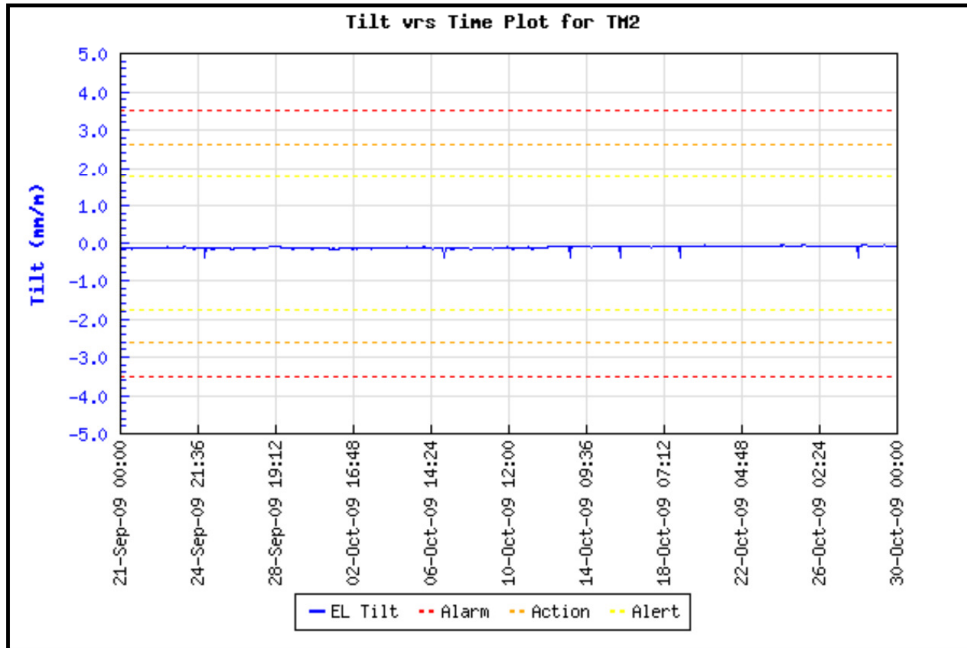
Annex H

Cultural Heritage Monitoring Results



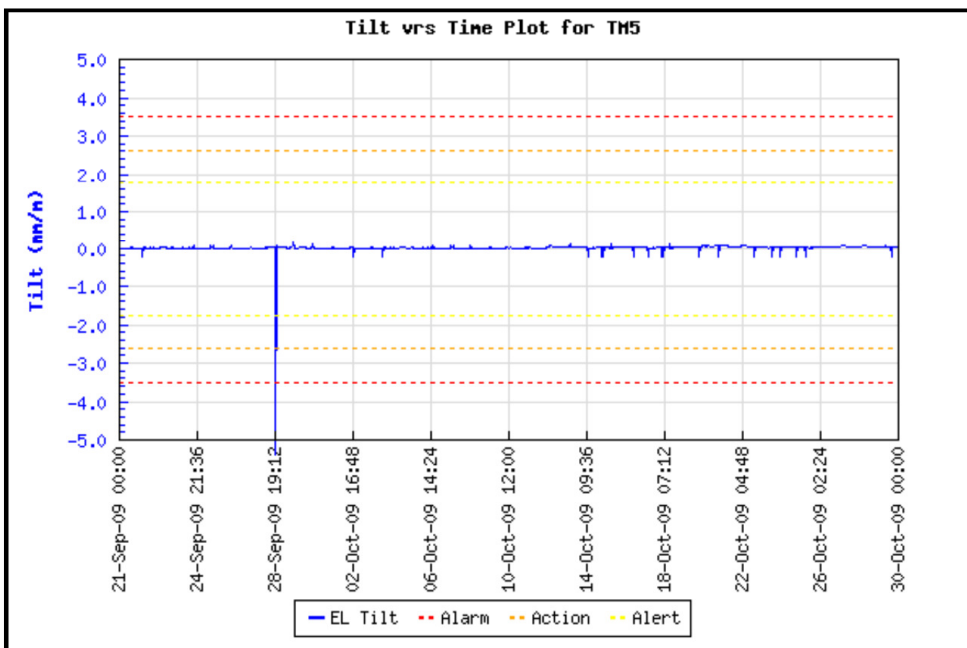
ELECTROLEVEL TILT SENSOR MONITORING RECORD SHEET

Instrument ID : TM2 Type : Electro Level
Easting : 831797.083 Northing : 816014.766 Initial Level : 92.664 mPD
Location : Valve House
Remark : Radio Transmitter Serial No. 50348; +ve Reading => Rotation towards West South



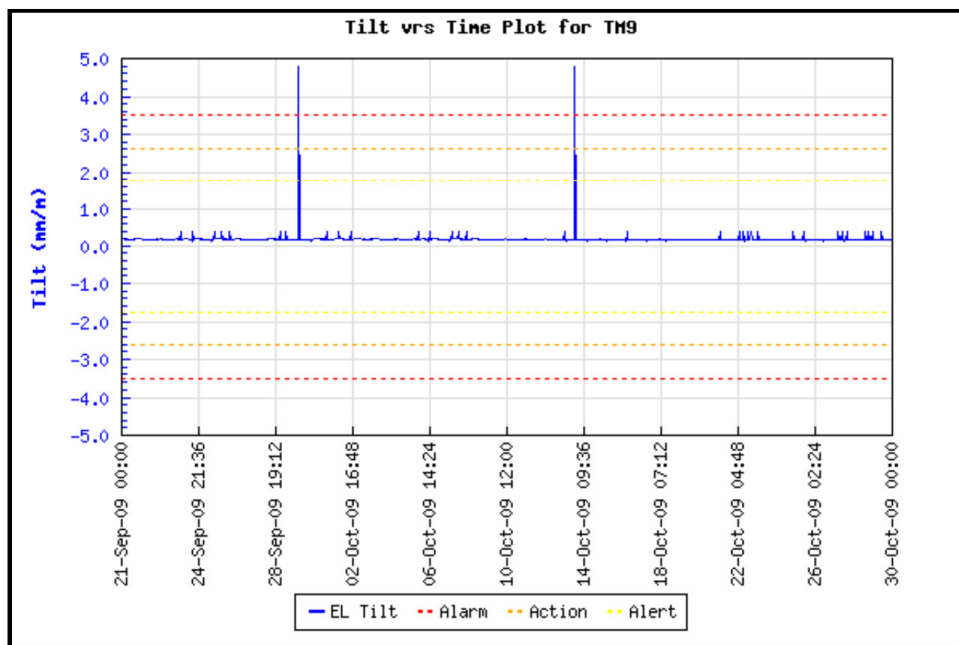
ELECTROLEVEL TILT SENSOR MONITORING RECORD SHEET

Instrument ID : TM5 Type : Electro Level
Easting : 831792.223 Northing : 816014.081 Initial Level : 92.714 mPD
Location : Valve House
Remark : Radio Transmitter Serial No. 50194; +ve Reading => Rotation towards West South



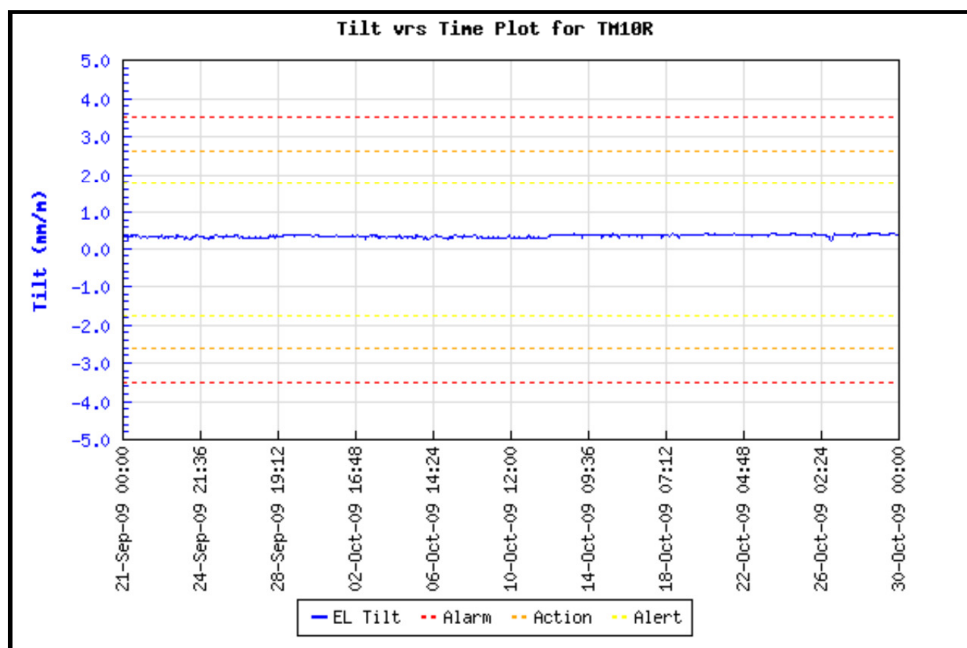
ELECTROLEVEL TILT SENSOR MONITORING RECORD SHEET

Instrument ID : TM9 Type : Electro Level
Easting : 831797.988 Northing : 816000.532 Initial Level : 92.709 mPD
Location : Valve House
Remark : Radio Transmitter Serial No. 50284; +ve Reading => Rotation towards North East



ELECTROLEVEL TILT SENSOR MONITORING RECORD SHEET

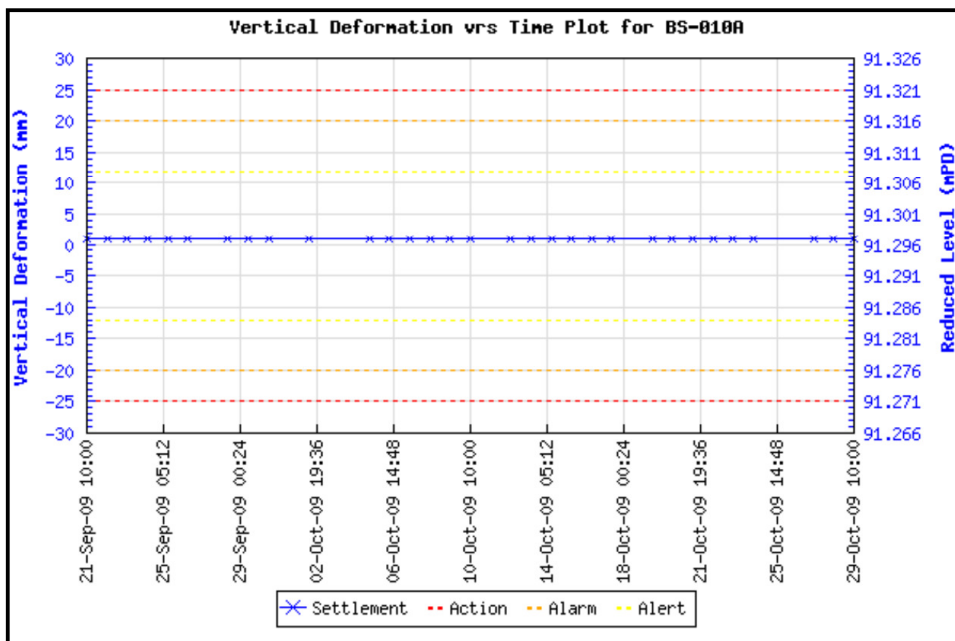
Instrument ID : TM10R Type : Electro Level
Easting : 831805.802 Northing : 816017.577 Initial Level : 92.744 mPD
Location : Valve House
Remark : Radio Transmitter Serial No. 50270; +ve Reading => Rotation towards West North



SETTLEMENT MONITORING RECORD SHEET

Instrument ID : BS-010A
Easting : 831808.247
Location : Valve House
Remark :

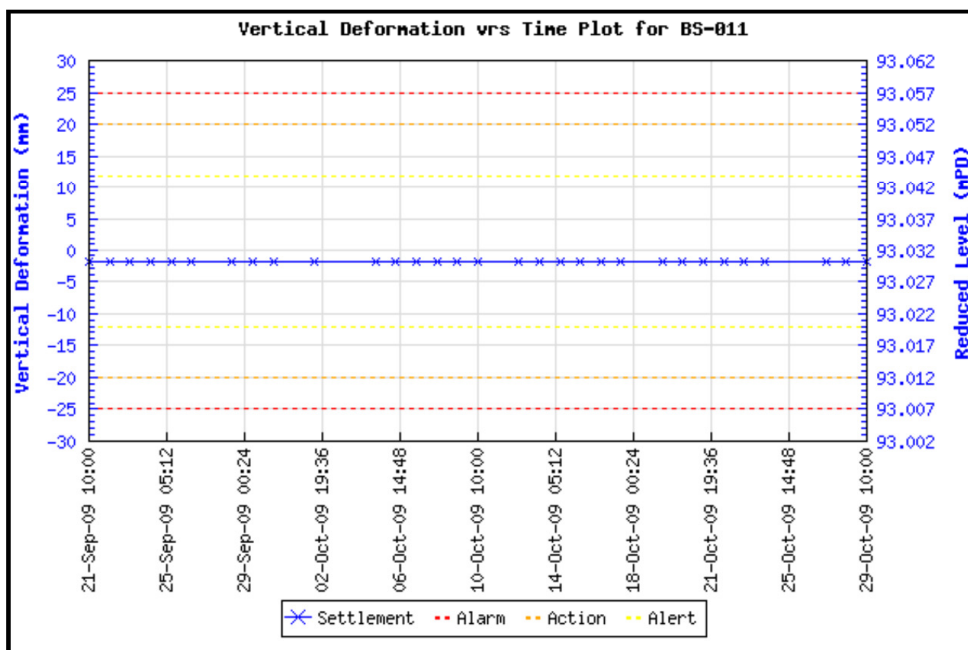
Type : Building Settlement Marker Type DMP5
Northing : 816016.001 Initial Level : 91.296 mPD



SETTLEMENT MONITORING RECORD SHEET

Instrument ID : BS-011
Easting : 831795.830
Location : Valve House
Remark :

Type : Building Settlement Marker Type DMP5
Northing : 815997.133 Initial Level : 93.032 mPD



SETTLEMENT MONITORING RECORD SHEET

Instrument ID : BS-012

Easting : 831796.239

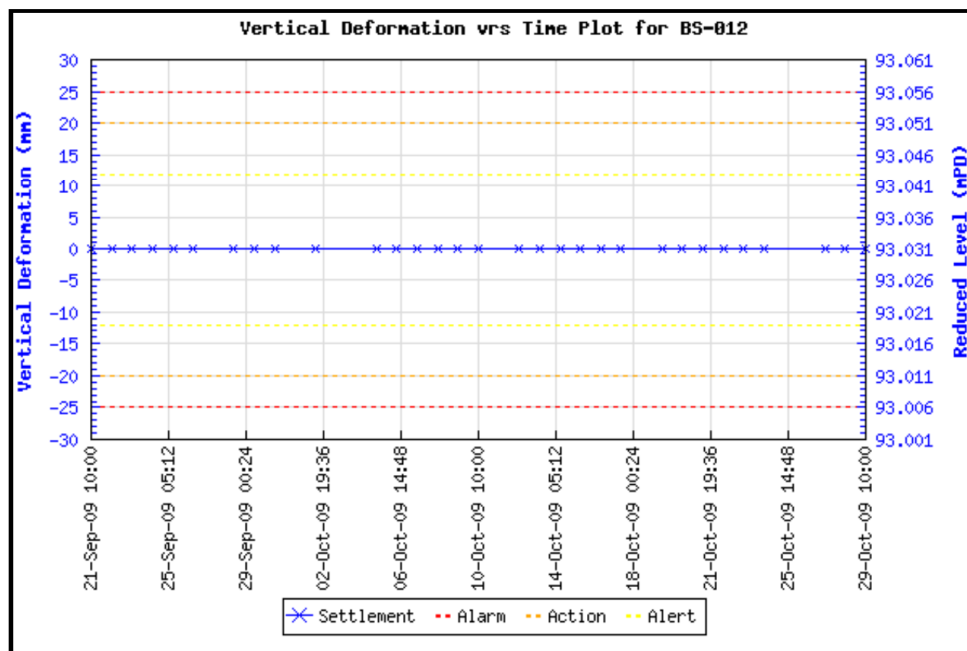
Location : Valve House

Remark :

Type : Building Settlement Marker Type DMP5

Northing : 816000.503

Initial Level : 93.031 mPD



SETTLEMENT MONITORING RECORD SHEET

Instrument ID : BS-013

Easting : 831800.605

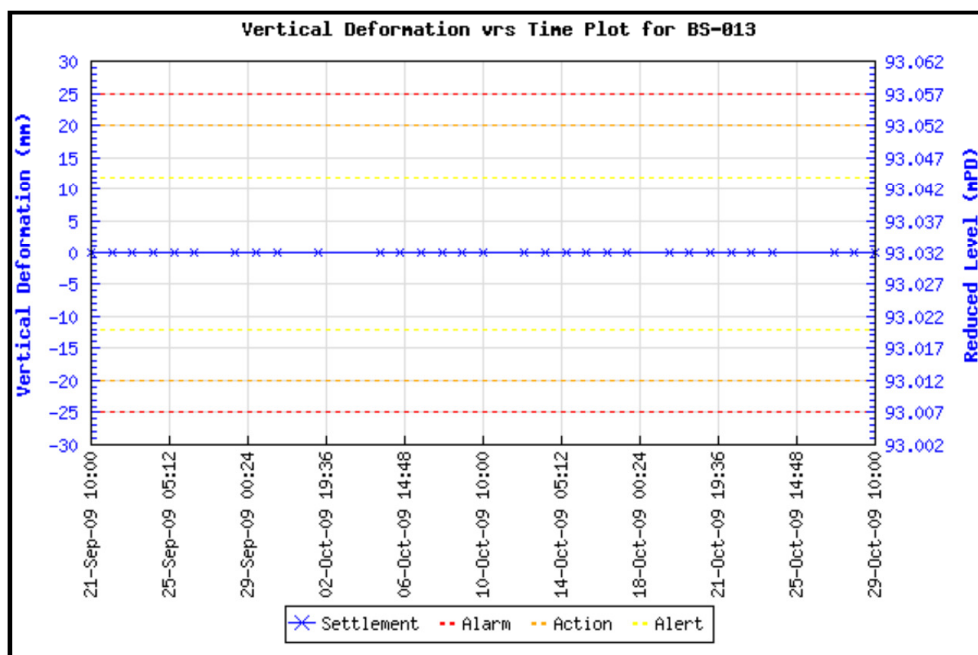
Location : Valve House

Remark :

Type : Building Settlement Marker Type DMP5

Northing : 816020.664

Initial Level : 93.032 mPD



Annex I

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: Oct 2009

Monthly Summary Waste Flow Table for Year 2009

Period	Actual Quantities of inert C&D Materials (in 10 ³ Kg) ⁽¹⁾					Actual Quantities of C&D Wastes (in 10 ³ Kg) ⁽⁴⁾								
	Total Quantity Generated	Broken Concrete ⁽²⁾	Reused in the Contract	Reused in other Projects ⁽³⁾	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
Total	163	0	45	0	118	0	0	0	0	0	0	0	2400	150

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

⁽²⁾ Broken concrete for recycling into aggregates.

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

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