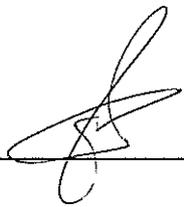


MTR Corporation Limited

West Island Line Project

Baseline Monitoring Report (Part 5)

Verified by: \_\_\_\_\_ 

Position: Independent Environmental Checker

Date: 4 December 2009

MTR Corporation Limited

West Island Line Project

Baseline Monitoring Report (Part 5)

Certified by: Glenn Frommes

Position: Environmental Team Leader

Date: 3 December 2009

## ***EXECUTIVE SUMMARY***

### ***1 INTRODUCTION***

#### ***1.1 BACKGROUND***

#### ***1.2 ORGANISATION OF THE REPORT***

### ***2 AIR QUALITY***

#### ***2.1 MONITORING METHODOLOGY***

#### ***2.2 CALIBRATION REQUIREMENTS***

#### ***2.3 MONITORING PROCEDURES***

#### ***2.4 MONITORING RESULTS***

### ***3 NOISE***

#### ***3.1 MONITORING METHODOLOGY***

#### ***3.2 CALIBRATION REQUIREMENTS***

#### ***3.3 MONITORING RESULTS***

### ***4 CONCLUSION***

#### ***4.1 BASELINE LEVELS***

#### ***4.2 ACTION AND TARGET LEVELS***

***ANNEX A TSP Baseline Measurements***

***ANNEX B Noise Baseline Measurements***

***ANNEX C Calibration Certificates for Monitoring Equipment***

## ***EXECUTIVE SUMMARY***

### *Background*

MTR Corporation Limited (MTRCL) proposes to build a new railway line, the West Island Line (WIL) which is an extension of the Island Line to the Western District. The route length of the fully underground WIL is approximately 3 km with three new underground stations namely Sai Ying Pun Station (SYP), University Station (UNI) and Kennedy Town Station (KET).

### *Impact Assessment and Baseline Monitoring*

With the development of the Environmental Monitoring and Audit Manual (EM&A Manual) in accordance with the guideline set out in the Environmental Impact Assessment (EIA) report prepared by ENSR Asia (HK) Limited in October 2008, Baseline Monitoring (Part 5) have been conducted for both dust and noise at the proposed monitoring locations in the vicinity of Works Area I to establish baseline levels for both dust and noise for the civil construction work within Works Area I.

### *Results and Conclusions*

Baseline monitoring (Part 5) had been carried out in accordance with the recommendations contained in the Technical Memoranda associated with EIAO, Air Pollution Control Ordinance and Noise Control Ordinance, where applicable. Results and Conclusions of the report were presented in the subsequent sections of the Baseline Monitoring Report.

## **1 INTRODUCTION**

### **1.1 BACKGROUND**

#### *The West Island Line Project*

MTR Corporation Limited (MTRCL) proposes to build a new railway line, the West Island Line (WIL) which is an extension of the Island Line to the Western District. The route length of the fully underground WIL is approximately 3 km with three new underground stations namely Sai Ying Pun (SYP), University (UNI) and Kennedy Town (KET).

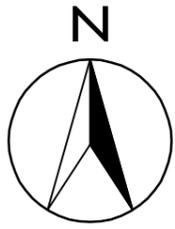
The location of works areas is shown in Figure 1.

- 1.1.1 An EIA study (refer to EIA Report dated October 2008) has been conducted by ENSR Asia (HK) Limited for the proposed WIL Project. An EM&A Manual has provided guidelines in the preparation of this baseline monitoring report.
- 1.1.2 Baseline levels have been established for both dust and noise, by which the performance of the construction Contractor may be measured in meeting the required environmental protection standards and requirements under the Environmental Permit, during the course of the construction work. These are presented in subsequent sections of this report.
- 1.1.3 This Baseline Monitoring Report (Part 5) presents the results for the baseline monitorings conducted for both dust and noise at the proposed monitoring locations in the vicinity of Works Area I and establishes baseline levels for both dust and noise for the civil construction work within Works Area I. Baseline monitorings for other works areas are to be conducted subsequently and the baseline monitoring reports for these works areas will be submitted accordingly.

### **1.2 ORGANISATION OF THE REPORT**

Following the introduction, the remainder of this Report is arranged as follows:

- Section 2 describes the air quality monitoring methodology and analyses the monitoring results;
- Section 3 describes the noise quality monitoring methodology and analyses the monitoring results.
- Section 4 Conclusions



816800 N



830900 E

831900 E

832900 E

SAI WAN

SAI YING RUN

WESTERN HAR



Little Green Island

815800 N

FIG 1.3



FIG 1.4

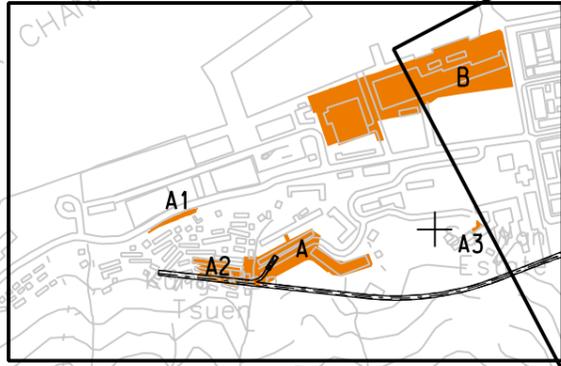


FIG 1.5



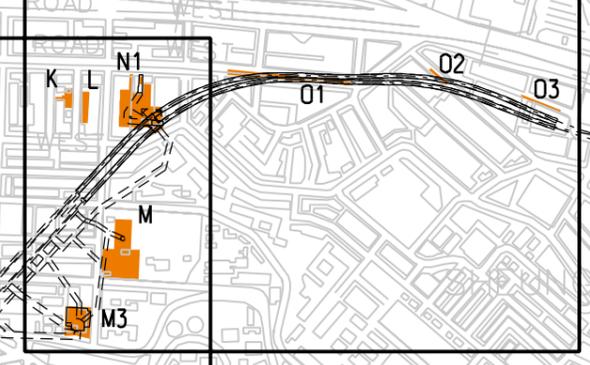
FIG 1.6



FIG 1.7



FIG 1.8



**LEGEND:**

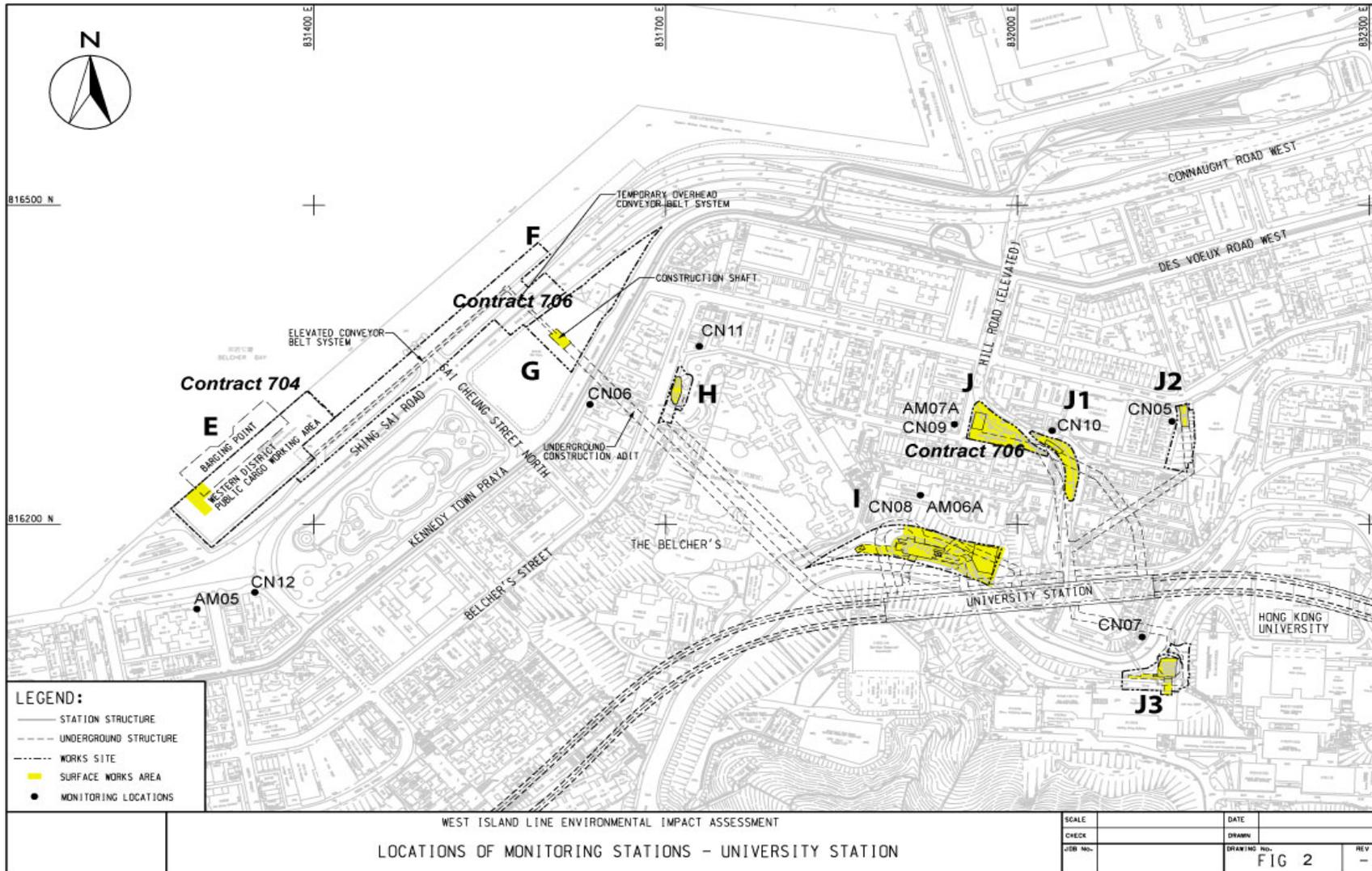
	WORKS AREA/WORKS SITE
	WORKS AREA (UNDERGROUND)

WEST ISLAND LINE  
 ENVIRONMENTAL REPORT FOR VARIATION OF ENVIRONMENTAL PERMIT APPLICATION (EP-313/2008)  
 MAJOR GROUND LEVEL WORKS AREAS/ WORKS SITES - KEY PLAN

SCALE	A3 1:10000	DATE	JUN. 09
CHECK	FWYW	DRAWN	WDF
JOB No.	60017115	Figure 1	REV -



2009-6-15 11:30:38 D:\X



## **2 AIR QUALITY**

### **2.1 MONITORING METHODOLOGY**

Monitoring was undertaken to establish baseline levels for both 1-hour and 24-hour Total Suspended Particulates (TSP) in the vicinity of the major works areas along WIL, namely the construction sites for stations/entrances and associated structures. This provides data against which any environmental impacts due to construction activities can be compared. During the construction period impact monitoring will only be conducted for 24-hour TSP, although 1-hour TSP monitoring may also be conducted and used in following up on complaints or exceedances, in order to provide a more rapid indication of the source of the problem at hand.

Baseline monitoring station (AM6a) which is approved as an alternative monitoring location to the original monitoring station (AM6) as specified in the EM&A Manual for both 1-hour and 24-hour TSP measurements has been established at St. Paul's College Primary School, see figure 2.

Three separate 1-hour TSP measurements daily for a period of at least 14 days were made at the monitoring stations to establish the ambient 1-hour TSP levels.

24-hour TSP measurements were carried out over a period of at least 14 days at the monitoring stations to establish the ambient 24-hour TSP levels.

24-hour samples were collected by High Volume Sampler (Graseby-Andersen) following United States Environmental Protection Agency regulations and 1-hour TSP levels were measured by real time dust monitor (MIE - DataRam).

### **2.2 CALIBRATION REQUIREMENTS**

The flow rate of the high volume sampler with mass flow controller will be calibrated using an orifice calibrator. Initial calibration (five points) will be conducted upon installation and prior to commissioning. Calibration will be carried out every six months. Calibration certificate is attached in Annex C.

The sensing system of MIE is calibrated by clean filtered air passing through the flow-sensing system, providing a controlled check of the zero-concentration condition. Calibration of the MIE by certified laboratory or manufacturer shall be carried out every two years and properly documented. Calibration certificate is attached in Annex C.

The samplers shall be properly maintained. Prior to dust monitoring commencing, appropriate checks shall be made to ensure that all equipment and necessary power supply are in good working condition.

## 2.3 MONITORING PROCEDURES

### *1-Hour TSP Levels Monitoring*

TSP is sampled by drawing air into the MIE where particulate concentrations are measured instantaneously with an in-built silicon detector sensing light scattered by the particles in the sampled air (optical sensing stage). Continuous TSP levels are indicated on the MIE along with a 'Time Weighted Average' value.

### *24-Hour TSP Levels Monitoring*

The sampling procedure follows to that described in the App. B of Pt 50 in 40CFR Ch.1 (U.S. Environmental Protection Agency). TSP is sampled by drawing air through a conditioned, pre-weighed filter paper inside the high volume sampler at a controlled rate. After 24-hour sampling the filter paper with retained particles shall be collected and returned to the laboratory for drying in a desiccator followed by accurate weighing. TSP levels are calculated from the ratio of the mass of particulate retained on the filter paper to the total volume of air sampled.

## 2.4 MONITORING RESULTS

2.4.1 1-Hour TSP baseline monitoring was conducted at the monitoring station between 12 October 2009 and 25 October 2009. The average 1-hour TSP baseline levels have been established from the baseline data listed in *Annex A*, and are shown in *Table 2.4a* below.

Weather conditions throughout the monitoring period were mild and relatively dry, with light wind normally from the east for the majority of the time, with some days from the west.

***Table 2.4a***                      ***1-hour TSP Baseline Level***

<b>Monitoring Location</b>	<b>Average 1-h TSP Level (<math>\mu\text{g}/\text{m}^3</math>)</b>
St. Paul's College Primary School (AM6a)	72

Note: TSP levels are to the nearest whole number, with values of 0.5 rounded up

It was noted that there were construction works at University of Hong Kong during the monitoring period. Road traffic was observed around the area along Pok Fu Lam Road. The dust particulates generated from the construction works and the exhaust fumes from the road traffic around the area contribute to the background TSP levels.

*Action and Limit Levels*

To provide an early indication of any deterioration in the Contractor's environmental performance, action levels were derived based on the measured baseline levels. Limit level is set at 500µg/m<sup>3</sup> for the 1-hour TSP level as recommended for consideration in the EIAO-TM.

For 1-hour TSP the action level for baseline smaller than or equal to 384µg/m<sup>3</sup> is the average of 130% of the baseline and the limit level. For baseline greater than 384µg/m<sup>3</sup> the action level is 500µg/m<sup>3</sup>. The derived level for the monitoring station is shown in *Table 2.4b* below.

**Table 2.4b Baseline, Action and Limit Levels for 1-hour TSP**

Monitoring Location	Baseline Level (µg/m <sup>3</sup> )	Action Level (µg/m <sup>3</sup> )	Limit Level (µg/m <sup>3</sup> )
St. Paul's College Primary School (AM6a)	72	297	500 <sup>(1)</sup>

<sup>(1)</sup> - 1-hour TSP criterion recommended in the EIAO-TM

Note: TSP levels are to the nearest whole number, with values of 0.5 rounded up

This baseline level can be expected to vary throughout the year, particularly with the weather changes between the wet and dry season, and changes in other construction works in the locality.

It is therefore recommended that baseline level be checked every six months, preferably when there are no MTRCL construction activities ongoing in the vicinity.

#### 2.4.2 24-hour TSP

24-hour TSP baseline monitoring was conducted at the monitoring station between 12 October 2009 and 25 October 2009.

Weather conditions throughout 24-hour-TSP monitoring period were mild and relatively dry, with light wind normally from the east for the majority of the time, with some days from the west.

The averaged 24-hour TSP baseline level has been established from the baseline data listed in *Annex A*, and are shown in *Table 2.4c* below.

**Table 2.4c** **24-hour TSP Baseline Levels**

Monitoring Location	Average 24-h TSP Level ( $\mu\text{g}/\text{m}^3$ )
St. Paul's College Primary School (AM6a)	42

Note: TSP levels are to the nearest whole number, with values of 0.5 rounded up

It was noted that there were construction works at University of Hong Kong during the monitoring period. Road traffic was observed around the area along Pok Fu Lam Road. The dust particulates generated from the construction works and the exhaust fumes from the road traffic around the area contribute to the background TSP levels.

*Action and Limit Levels*

To provide an early indication of any deterioration in the Contractor's environmental performance, action levels were derived based on the measured baseline levels. The Air Quality Objective limit level for 24-hour TSP is set at  $260\mu\text{g}/\text{m}^3$ .

For 24-hour TSP the action level for baseline smaller than or equal to  $200\mu\text{g}/\text{m}^3$  is the average of 130% of the baseline and the limit level. For baseline greater than  $200\mu\text{g}/\text{m}^3$  the action level is  $260\mu\text{g}/\text{m}^3$ . The derived levels for each monitoring station are shown in *Table 2.4d* below.

***Table 2.4d Baseline, Action and Limit Levels for 24-hour TSP***

---

<b>Monitoring Location</b>	<b>Baseline Level (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Action Level (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Limit Level (<math>\mu\text{g}/\text{m}^3</math>)</b>
St. Paul's College Primary School (AM6a)	42	157	260

---

Note: TSP levels are to the nearest whole number, with values of 0.5 rounded up

This baseline level can be expected to vary throughout the year, particularly with the weather changes between the wet and dry season, and changes in other construction works in the locality.

It is therefore recommended that baseline level be checked every six months, preferably when there are no MTRC construction activities ongoing in the vicinity.

### **3 NOISE**

#### **3.1 MONITORING METHODOLOGY**

Monitoring was undertaken to establish noise baseline levels in the vicinity of the Works Area I, to provide data against which any environmental impacts due to construction activities can be compared.

The baseline monitoring station as specified in the EM&A Manual were established at the following location, see Figure 2:

CN8 - St. Paul's College Primary School

Consecutive noise measurements were undertaken over a period of at least 14 days to establish the ambient noise levels at representative nearest sensitive receivers. Continuous 5 minute A-weighted noise levels were recorded throughout the daytime, evening and night-time on weekdays (Monday to Saturday) and also on Sundays. The noise levels were presented for weekdays over each 30 minute period between 0700 and 1900hr to produce the baseline conditions.

Monitoring was conducted using B&K sound analysis equipment – B&K SLM 2236. Microphones were extended 1.2 metres from building facades and oriented towards the works area.

Weather conditions throughout the monitoring period were mild and relatively dry, with light wind normally from the east, with some days from the west.

#### **3.2 CALIBRATION REQUIREMENTS**

B&K 2236 sound level meters which complied with the International Electrotechnical Commission Publication 651:1979 (Type 1) and 804:1985 (Type 1), specification as referred to in the Technical Memoranda to the NCO were used for the baseline monitoring. The B&K sound level meters and B&K 4231 calibrator are verified by the certified laboratory or manufacturer once every two years to ensure they perform to the same level of accuracy as stated in the manufacturer's specifications. Calibration certificates are attached in Annex C.

Immediately prior to and following each set of measurements at any NSR, the accuracy of the sound level meter was checked using an acoustic calibrator generating a known sound pressure level at a known frequency. If the calibration levels before and after the measurement differ by more than 1.0dB the measurement shall be repeated to obtain a reliable result (note: maximum deviation during this initial baseline monitoring period was 0.3dB). Periods of prolonged or repeated overloading of the sound level meter detector were avoided by setting the meter with adequate headroom prior to commencing measurements. Measurements were recorded to the nearest 0.1 dB, with values of 0.05 being rounded up.

Limit levels for these locations are shown in *Table 3.3 c*.

***Table 3.3c Limit Levels for Construction Noise***

<b>Time Period</b>	<b>Noise Level (dB) for NSR around Works Area I</b>
Daytime (0700-1900), Monday through Saturday excluding Public Holidays	$L_{Aeq\ 30mins} 70^{(1)}$
All evenings (1900-2300)	Subject to control under the Noise Control Ordinance
General Holidays (including all Sundays) during the daytime and evening (0700-2300)	Subject to control under the Noise Control Ordinance
All night time periods (2300-0700)	Subject to control under the Noise Control Ordinance

<sup>(1)</sup>Limit level guideline, for educational establishments the limit level shall be 70, reduced to 65 during examination periods.

### 3.3 MONITORING RESULTS

Noise baseline monitoring was conducted at the monitoring station CN8 between 12 October 2009 and 25 October 2009.

5 minute, "fast" detector response, levels were recorded in the following indices,  $L_{Aeq}$ ,  $L_{A10}$ ,  $L_{A90}$ . The baseline data was initially downloaded into a spreadsheet, directly from the noise loggers in ASCII format for checking, and then imported into the database. The  $L_{Aeq}$  results for each 5 minute period of weekday were averaged. An average of two 24 hour Sunday periods was covered in the monitoring periods. 'Time Slot Averaged', 'Noise Control Period Averaged' baseline noise levels are presented for the monitoring location in *Annex B*.

At the monitoring station CN8, it was observed that the ambient noise and the vehicular traffic along Pok Fu Lam Road and the construction works at University of Hong Kong contributed to the background noise.

## **4 CONCLUSION**

### **4.1 BASELINE LEVEL**

#### *4.1.1 Air*

##### *1-hour TSP*

1-hour TSP baseline monitoring was conducted at the monitoring station, namely St. Paul's College Primary School (AM6a) between 12 October 2009 and 25 October 2009. Baseline TSP levels were recorded in the range of 48  $\mu\text{g}/\text{m}^3$  and 95  $\mu\text{g}/\text{m}^3$ .

##### *24-hour TSP*

24-hour TSP baseline monitoring was conducted at the monitoring station at St. Paul's College Primary School (AM6a) between 12 October 2009 and 25 October 2009. Baseline TSP results between 24  $\mu\text{g}/\text{m}^3$  and 84  $\mu\text{g}/\text{m}^3$  had been recorded.

#### *4.1.2 Noise*

Baseline monitorings were conducted at the monitoring station, namely St. Paul's College Primary School (CN8) from 12 October 2009 to 25 October 2009. Baseline noise levels have been established for weekday and Sunday periods.

Baseline noise levels between 59.2 and 61.7 dB(A) had been recorded at the monitoring station CN8 from 0700 – 1900hr for the monitoring station.

The noise sources noticed at the monitoring station CN8 were the vehicular traffic along Pok Fu Lam Road and the construction works at University of Hong Kong in the vicinity.

### **4.2 ACTION AND TARGET LEVELS**

#### *4.2.1 Air*

##### *1-hour TSP*

The 1-hour TSP action level have been calculated from baseline levels and presented in Table 2.4b. Limit level is set at 500  $\mu\text{g}/\text{m}^3$  for the 1-hour TSP limit suggested in the EIAO-TM. The 1-hour TSP monitoring is intended to use in following up on complaints or exceedances, in order to provide a more rapid indication of the source of the problem at hand.

### *24-hour TSP*

24-hour TSP action levels have been calculated from baseline levels and are presented in Table 2.4d. The Air Quality Objective limit level for 24-hour TSP is set at 260  $\mu\text{g}/\text{m}^3$ .

### *4.2.2 Noise*

Action level exceedance occurs when one or more documented complaints are received.

Limit level is set at  $L_{Aeq\ 30mins}70^{(1)}$  for normal working hours (i.e. 0700 – 1900 hours on any day not being a Sunday or general holiday), as suggested in EIAO-TM and the Practice Note for Professional Persons ProPECC PN2/93. For restricted hours (i.e. 1900 – 0700 hours for weekdays and all day on Sundays and general holidays), limit level shall be subjected to control under the Noise Control Ordinance (NCO).

<sup>(1)</sup>Limit level guideline, for educational establishments the limit level shall be 70, reduced to 65 during examination periods.

## ANNEX A

### TSP Baseline Measurements

Project: West Island Line

Report for Location: St. Paul College Primary School (AM6a)

Samples between: 12/10/2009 and 25/10/2009

Report Date 23/11/2009

<u>Sample Code</u>	<u>Date</u>	<u>Start Time</u>	<u>Parameter</u>	<u>Value</u>	<u>Unit</u>
AM6a/001	12/10/2009	15:00	Total Suspended Particulate (1 hr)	56.4	µg/cu.m
AM6a/002	13/10/2009	13:30	Total Suspended Particulate (1 hr)	48.7	µg/cu.m
AM6a/003	14/10/2009	13:45	Total Suspended Particulate (1 hr)	74.6	µg/cu.m
AM6a/004	15/10/2009	13:15	Total Suspended Particulate (1 hr)	86.6	µg/cu.m
AM6a/005	16/10/2009	14:45	Total Suspended Particulate (1 hr)	67.6	µg/cu.m
AM6a/006	17/10/2009	15:00	Total Suspended Particulate (1 hr)	94.5	µg/cu.m
AM6a/007	18/10/2009	15:00	Total Suspended Particulate (1 hr)	56.4	µg/cu.m
AM6a/008	19/10/2009	14:15	Total Suspended Particulate (1 hr)	81.0	µg/cu.m
AM6a/009	20/10/2009	14:45	Total Suspended Particulate (1 hr)	61.9	µg/cu.m
AM6a/010	21/10/2009	13:30	Total Suspended Particulate (1 hr)	77.0	µg/cu.m
AM6a/011	22/10/2009	13:15	Total Suspended Particulate (1 hr)	90.4	µg/cu.m
AM6a/012	23/10/2009	13:15	Total Suspended Particulate (1 hr)	89.3	µg/cu.m
AM6a/013	24/10/2009	14:00	Total Suspended Particulate (1 hr)	63.3	µg/cu.m
AM6a/014	25/10/2009	13:00	Total Suspended Particulate (1 hr)	54.8	µg/cu.m

Note: The figures are the average of 3 separate 1-hour TSP measurements obtained daily

Project: West Island Line

Report for Location: St. Paul College Primary School (AM6a)

Samples between: 12/10/2009 and 25/10/2009

Report Date 23/11/2009

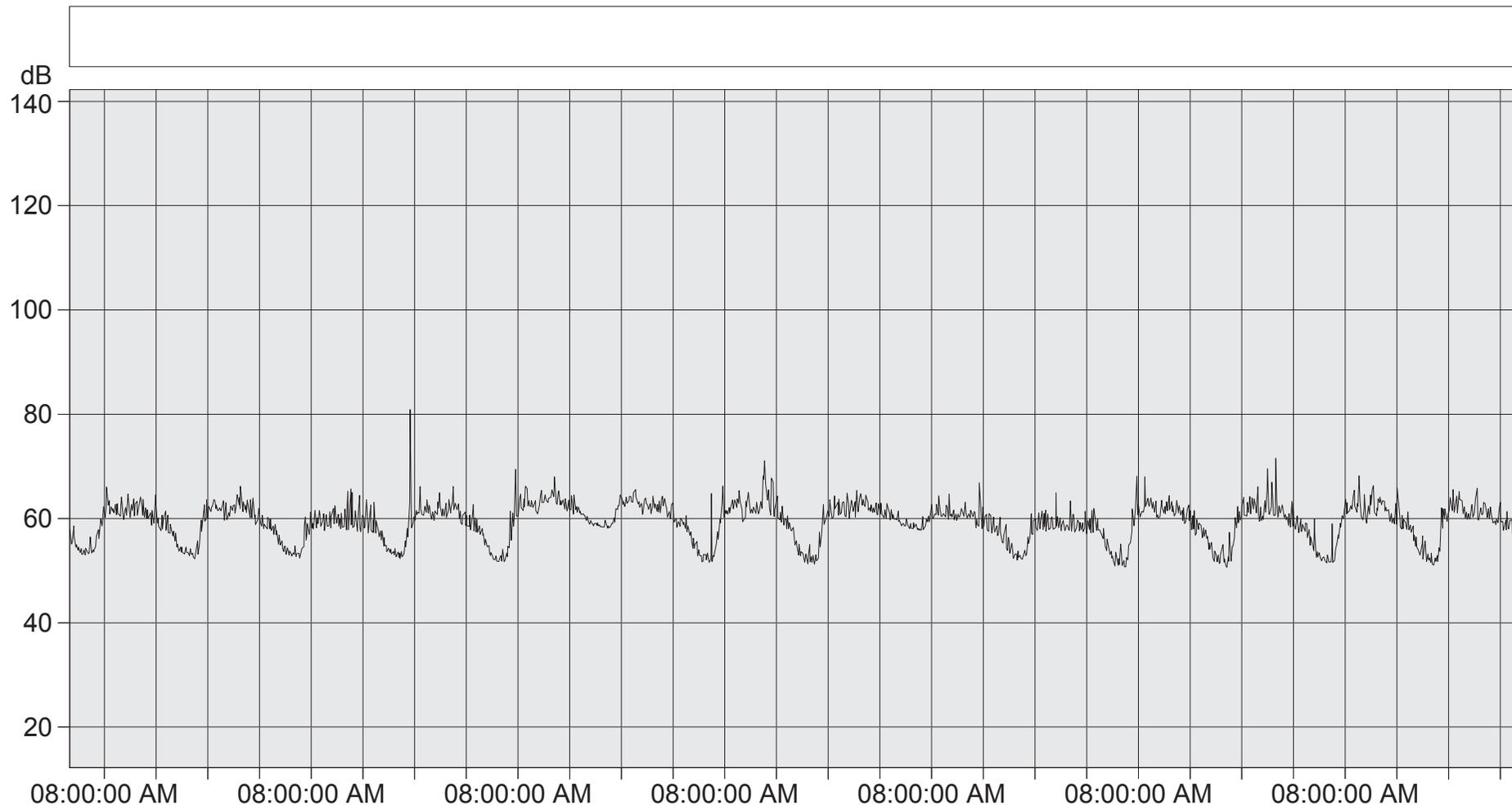
<u>Sample Code</u>	<u>Date</u>	<u>Parameter</u>	<u>Value</u>	<u>Unit</u>
AM6a/001	12/10/2009	Total Suspended Particulate (24 hr)	65.2	µg/cu.m
AM6a/002	13/10/2009	Total Suspended Particulate (24 hr)	66.7	µg/cu.m
AM6a/003	14/10/2009	Total Suspended Particulate (24 hr)	23.9	µg/cu.m
AM6a/004	15/10/2009	Total Suspended Particulate (24 hr)	31.2	µg/cu.m
AM6a/005	16/10/2009	Total Suspended Particulate (24 hr)	52.0	µg/cu.m
AM6a/006	17/10/2009	Total Suspended Particulate (24 hr)	24.9	µg/cu.m
AM6a/007	18/10/2009	Total Suspended Particulate (24 hr)	57.1	µg/cu.m
AM6a/008	19/10/2009	Total Suspended Particulate (24 hr)	83.4	µg/cu.m
AM6a/009	20/10/2009	Total Suspended Particulate (24 hr)	27.6	µg/cu.m
AM6a/010	21/10/2009	Total Suspended Particulate (24 hr)	27.1	µg/cu.m
AM6a/011	22/10/2009	Total Suspended Particulate (24 hr)	42.4	µg/cu.m
AM6a/012	23/10/2009	Total Suspended Particulate (24 hr)	35.5	µg/cu.m
AM6a/013	24/10/2009	Total Suspended Particulate (24 hr)	24.2	µg/cu.m
AM6a/014	25/10/2009	Total Suspended Particulate (24 hr)	29.8	µg/cu.m

Note: 1. The air sampler is operated in constant flow rate

## ANNEX B

### Noise Baseline Measurements

WIL-CN08



## ANNEX C

### Calibration Certificates for Monitoring Equipment

## Noise Baseline Report

Project: West Island Line  
Report for Location: St. Paul's College Primary School (CN8)  
Baseline between: 12/10/09 - 25/10/09

Report date: 23/11/09

Parameter : Leq

### Time Slot Averaged Baselines

Weekdays Noise Level, dB(A)

	L <sub>Aeq,30min</sub>	L <sub>10</sub>	L <sub>90</sub>
07:00-07:30	59.2	60.9	57.0
07:30-08:00	60.1	61.5	58.1
08:00-08:30	60.7	62.3	58.8
08:30-09:00	60.7	62.2	59.0
09:00-09:30	61.3	62.9	59.4
09:30-10:00	61.7	63.3	59.7
10:00-10:30	61.4	63.0	59.6
10:30-11:00	61.2	62.6	59.6
11:00-11:30	61.5	63.0	59.8
11:30-12:00	60.7	62.2	58.8
12:00-12:30	60.2	61.9	58.3
12:30-13:00	60.0	61.5	58.1
13:00-13:30	61.2	62.7	59.4
13:30-14:00	61.4	63.0	59.4
14:00-14:30	61.0	62.5	59.3
14:30-15:00	61.1	62.6	59.3
15:00-15:30	61.2	62.6	59.5
15:30-16:00	61.5	62.8	59.7
16:00-16:30	61.5	62.9	59.9
16:30-17:00	61.3	62.8	59.6
17:00-17:30	61.1	62.7	59.3
17:30-18:00	60.7	62.2	59.0
18:00-18:30	60.3	61.7	58.5
18:30-19:00	59.6	61.2	57.7

### Noise Control Period Averaged Baselines

Weekdays Noise Level, dB(A)

	L <sub>Aeq,30min</sub>	L <sub>10</sub>	L <sub>90</sub>
07:00-19:00	60.9	62.4	59.1
	L <sub>Aeq,5min</sub>	L <sub>10</sub>	L <sub>90</sub>
19:00-23:00	59.1	61.0	56.7
23:00-07:00	55.6	57.0	53.7

Sundays/General Holidays Noise Level, dB(A)

	L <sub>Aeq,5min</sub>	L <sub>10</sub>	L <sub>90</sub>
07:00-19:00	61.8	63.3	60.0
19:00-23:00	59.4	61.4	56.9
23:00-07:00	54.4	56.3	52.0

Logarithmic Averaging is being used.

**ThermoFisher**  
SCIENTIFIC  
27 FORGE PARKWAY  
FRANKLIN MA 02038  
TOLL FREE: 866-282-0430  
TEL: 508-553-6949  
FAX: 508-541-8366  
[www.thermo.com/aqi](http://www.thermo.com/aqi)

## DR2000 CALIBRATION CERTIFICATE

This calibration is traceable to the National Institute of Standards and Testing

<u>SERIAL NUMBER:</u>	<u>2003</u>
<u>CALIBRATION RATIO:</u>	<u>0.991</u>
<u>AVG. DR CONCENTRATION:</u>	<u>2.47 mg/m3</u>
<u>MASTER AVG CONCENTRATION:</u>	<u>2.04 mg/m3</u>
<u>PDR BACKGROUND CONCENTRATION:</u>	<u>0.332 mg/m3</u>

TEMPERATURE:	73 F
RH:	39 %

CALIBRATION MASTER: D187  
LAST CALIBRATED: 5/1/2009

TECHNICIAN: \_\_\_\_\_ KL

DATE: \_\_\_\_\_ 5/19/2009

# ANDERSEN INSTRUMENTS INC.

GS2310 Series Sampler Calibration  
(Dickson Recorder)

## SITE

Location -> St' Paul's College Primary

Date -> 29-Jul-09

Sampler -> 1294-1113

Tech -> Chan Kin Fung

## CONDITIONS

Sea Level Pressure	(hpa)	1003	Sampler Elevation	(feet)	300
Sea Level Pressure	(in Hg)	29.62	Corrected Pressure	(mm Hg)	744.67
Temperature	(deg C)	32	Temperature	(deg K)	305.00
Seasonal SL Pressure	(in Hg)	29.62	Corrected Seasonal	(mm Hg)	744.67
Seasonal Temperature	(deg C)	32.00	Seasonal Temperature	(deg K)	305.00

## CALIBRATION ORIFICE

Make -> Andersen Instruments Inc.

Qstd Slope -> 1.99

Model -> 25A

Qstd Intercept -> -0.014012

Serial# -> 5303

Date Certified ->

## CALIBRATION

	Plate or	H <sub>2</sub> O	Qstd	I	IC	LINEAR	
	Test #	(in)	(M <sup>3</sup> /min)	(chart)	(corrected)	REGRESSION	
1	18	11.9	1.703	61	59.685	Slope =	38.0092
2	13	9.7	1.538	55	53.814	Intercept =	-4.6473
3	10	7.4	1.345	48	46.965	Corr. Coeff. =	0.9993
4	7	4.6	1.062	37	36.202		
5	5	3	0.859	28	27.396		

## Calculations

$Qstd = 1/m [\text{Sqrt} (H_2O (Pa/Pstd) (Tstd/Ta)) - b]$

$IC = I [\text{Sqrt} (Pa/Pstd) (Tstd/Ta)]$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$1/m ((I) [\text{Sqrt} (298/Tav) (Pav/760)]) - b)$

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



This is to certify that the above equipment has been calibrated in accordance with manufacturer's procedure.

**Balance Calibration Report**  
**Tested to MTRC Method WI/707M/01**

Laboratory Equipment Identification Number			BA0011		
Manufacturer	Sartorius	Model	A200S-**DIB	Serial No.	1065989
Capacity	120g	Discrimination	0.1mg	Type	Top Loading
Location	Concrete Testing Area		Temperature	25°C	

Reference Mass Set Used (Equip. ID. No.)		RM001	
Manufacturer	Troemner	OIML Classification	F1
Last Calibration Date	29-04-2002	Calibrated By	South China National Centre of Metrology

**(1) Repeatability of Reading**

Reference Mass (g)	Standard Deviation of Balance Reading (g)	Maximum Difference Between Successive Readings (g)
10	0.000071	0.0002
60	0.0001333	0.0002
120	0.0001287	0.0003

**Standard Deviation of the Balance = 0.0001333**

**(2) Departure from Nominal Value**

Reading (g)	Correction (g)	Uncertainty (g)
10.0001	-0.0001	±0.000361
20.0001	-0.00005	
30.0001	-0.00005	
40.0001	0.00003	
50.0002	-0.00028	
60.0001	-0.00018	
70.000	0.00002	
80.0001	-0.00008	
90.0000	0.00005	
100.0001	-0.00025	

**Maximum Correction = -0.00028**

(3) Off-Centre Loading

A mass of approximately 60 was moved to various position on the balance pan. The balance readings obtained at different position are given in the table.

Centre	Front	Back	Left	Right
60.0001	60.0001	60.0004	59.9997	59.9997

Maximum Difference = 0.0007

(4) Hysteresis

Load (g)	Hysteresis (g)
50	-0.0001333

(5) Limit of Performance of the Balance =  $\pm 0.000680$

Checked by : Kenny Li

Certified by : 

Date : 13-02-2009

Date : 16/2/2009

Notes:

1.The balance has been tested according to the specifications laid down in Chapter 6 of the CSIRO Publication "The Calibration of Balances - by David B. Prowse".

2.Uncertainties quoted in this report have been estimated on the basis of there being not more than one chance in one hundred that any value differs from the true value by more than the stated uncertainty.

3.The Limit of Performance is the tolerance band within which all readings of the balance will fall.



# MAXLAB CALIBRATION CERTIFICATE

## Certificate Information

Date of Issue 30<sup>th</sup> December, 2008

Certificate Number MLCN081194S

## Customer Information

Company Name MTR Corporation Limited  
Address MTR Tower, Telford Plaza,  
33 Wai Yip St., Kowloon Bay,  
Kowloon,  
Hong Kong

## Unit Under Test (UUT)

Description Precision Integrating Sound Level Meter  
Manufacturer Brüel & Kjær  
Model Number Type 2236  
Serial Number 1794284  
Equipment Number -

## Calibration Result

- \* The UUT range indication was found defective, but range selection and measurement were not affected.
- \* All calibration results are within the manufacturer's specification.
- \* Calibration data are detailed on the attached sheet(s).

## Approved By

Laboratory Manager

- \* Calibration equipment used for this calibration are traceable to national / international standards.
- \* The results on this Calibration Certificate only relate to the values measured at the time of the calibration and the uncertainties quoted will not include allowance for the UUT long term drift, variation with environmental changes, vibration and shock during transportation, overloading, mishandling, misuse, and the capacity of any other laboratory to repeat the measurement.
- \* MaxLab Calibration Centre Limited shall not be liable for any loss or damage resulting from the use of the UUT.
- \* The copy of this Certificate is owned by MaxLab Calibration Centre Limited. No part of this Certificate may be reproduced without the prior written approval of MaxLab Calibration Centre Limited.



# MAXLAB CALIBRATION CERTIFICATE

### Certificate Information

**Date of Issue** 30<sup>th</sup> December, 2008      **Certificate Number** MLCN081194S

### Calibration Status

**Date of Calibration** 30<sup>th</sup> December, 2008  
**Calibration Equipment Used** 4231 (MLTE008)/ CA0801167/ 24<sup>th</sup> Feb 2010  
**Calibration Procedure** MLCG00 & MLCG15.  
**Calibration Uncertainty** ±0.2 dB

<b>Calibration Condition</b>	<b>Lab</b>	<b>Temperature</b>	23 °C ± 5 °C
		<b>Relative Humidity</b>	55% ± 25%
	<b>UUT</b>	<b>Stabilizing Time</b>	24 hours
		<b>Warm-up Time</b>	10 minutes
		<b>Supply Voltage</b>	Not applicable

### Calibration Data

UUT Setting				UUT Rdg	Std Rdg	UUT Error	UUT Error Limit
Frequency Wt.	Parameter	Response	Range (dB)				
A (1 kHz Input)	SPL	F	20 - 100	93.9 dB	94 dB	-0.1 dB	0.7 dB
		S		93.9 dB	94 dB	-0.1 dB	0.7 dB
		I		93.9 dB	94 dB	-0.1 dB	0.7 dB
C (1 kHz Input)		F	20 - 100	93.9 dB	94 dB	-0.1 dB	0.7 dB
		S		93.9 dB	94 dB	-0.1 dB	0.7 dB
		I		93.9 dB	94 dB	-0.1 dB	0.7 dB
L (1 kHz Input)		F	20 - 100	94.0 dB	94 dB	0.0 dB	0.7 dB
		S		94.0 dB	94 dB	0.0 dB	0.7 dB
		I		94.0 dB	94 dB	0.0 dB	0.7 dB
A (1 kHz Input)	F	40 - 120	113.9 dB	114 dB	-0.1 dB	0.7 dB	
	S		113.9 dB	114 dB	-0.1 dB	0.7 dB	
	I		113.9 dB	114 dB	-0.1 dB	0.7 dB	



# MAXLAB CALIBRATION CERTIFICATE

## Certificate Information

Date of Issue

6<sup>th</sup> November, 2008

Certificate Number

MLCN080972S

## Customer Information

Company Name

MTR Corporation Limited

Address

MTR Tower, Telford Plaza,  
33 Wai Yip St., Kowloon Bay,  
Kowloon,  
Hong Kong

## Unit Under Test (UUT)

Description

Sound Level Calibrator

Manufacturer

Brüel & Kjær

Model Number

4231

Serial Number

1795393

Equipment Number

-

## Calibration Result

- \* All calibration results within the manufacturer's specification.
- \* Calibration data are detailed on the attached sheet(s).

## Approved By

Laboratory Manager

- \* Calibration equipment used for this calibration are traceable to national / international standards.
- \* The results on this Calibration Certificate only relate to the values measured at the time of the calibration and the uncertainties quoted will not include allowance for the UUT long term drift, variation with environmental changes, vibration and shock during transportation, overloading, mishandling, misuse, and the capacity of any other laboratory to repeat the measurement.
- \* MaxLab Calibration Centre Limited shall not be liable for any loss or damage resulting from the use of the UUT.
- \* The copy of this Certificate is owned by MaxLab Calibration Centre Limited. No part of this Certificate may be reproduced without the prior written approval of MaxLab Calibration Centre Limited.



# MAXLAB CALIBRATION CERTIFICATE

## Certificate Information

Date of Issue 6<sup>th</sup> November, 2008 Certificate Number MLCN080972S

## Calibration Status

Date of Calibration	6 <sup>th</sup> November, 2008		
Calibration Equipment Used	4231 (Spec) (MLTE008)/ CA0801167/ 24 <sup>th</sup> Feb 2008 1351 (MLTE049)/ MLEC08/06/02/ 14 <sup>th</sup> Jun 2009		
Calibration Procedure	MLCG00 & MLCG15.		
Calibration Uncertainty	± 0.1 dB		
Calibration Condition	Lab	Temperature	23 °C ± 5 °C
		Relative Humidity	55% ± 25%
	UUT	Stabilizing Time	24 hours
		Warm-up Time	Not applicable
		Supply Voltage	Not applicable

## Calibration Data

UUT Setting	STD Rdg	UUT Error	UUT Error Limit
94 dB	94.0 dB	0.0 dB	0.2 dB
114 dB	114.0 dB	0.0 dB	0.2 dB