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 7) have been conducted for both dust and noise at the proposed monitoring locations in the vicinity of Works Areas C&D to establish baseline levels for both dust and noise for the civil construction work within Works Areas C&D.

Results and Conclusions

Baseline monitoring (Part 7) 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 7) presents the results for the baseline monitorings conducted for both dust and noise at the proposed monitoring locations in the vicinity of Works Areas C&D and establishes baseline levels for both dust and noise for the civil construction work within Works Area C&D. Baseline monitorings for other works areas are to be conducted subsequently and the baseline monitoring reports for these works areas will be submitted accordingly.

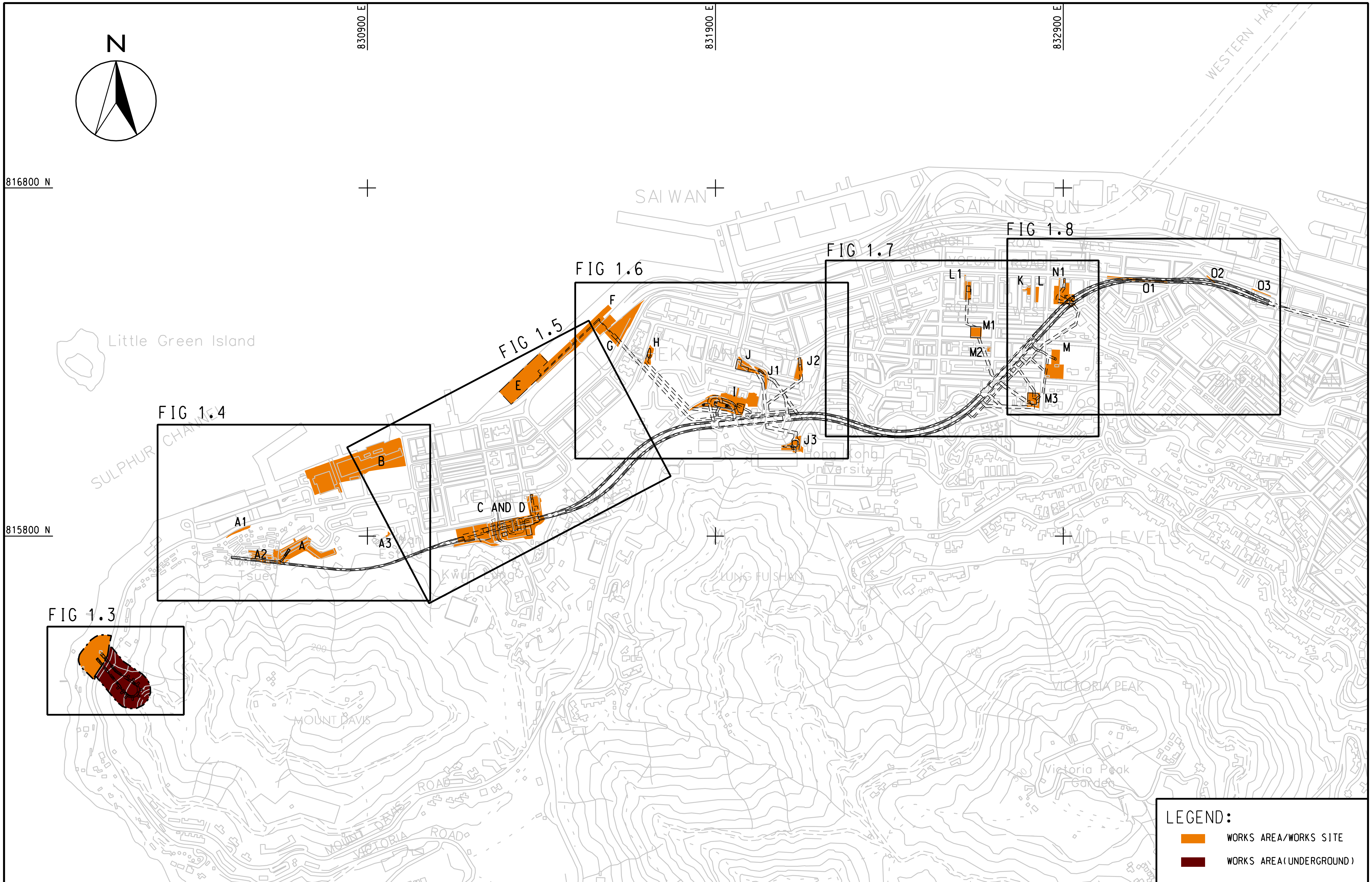
1.2 ORGANISATION OF THE REPORT

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

1.3 BASELINE MONITORING FOR GROUND-BORNE NOISE

Tunnel Boring Machine (TBM) will be operated for the tunnel construction between the propose Sai Ying Pun Station and the existing Sheung Wan Station to be constructed under civil works Contract 703 and all other tunnels will be constructed by drill and blast method. A Construction Ground-borne Noise Monitoring Plan including baseline monitoring for the ground-borne noise monitoring locations in the vicinity of the above tunnel section as specified in the WIL EM&A Manual Section 3.1 will be submitted to EPD for approval in 2011 according to the Contract 703 construction programme for TBM operation. Since TBM will not be used for the tunnels near Works Areas C&D, it is not necessary to include baseline monitoring for the ground-borne noise in this Baseline Monitoring Report (Part 7).



2009-6-15 11:30:38 DAIXL

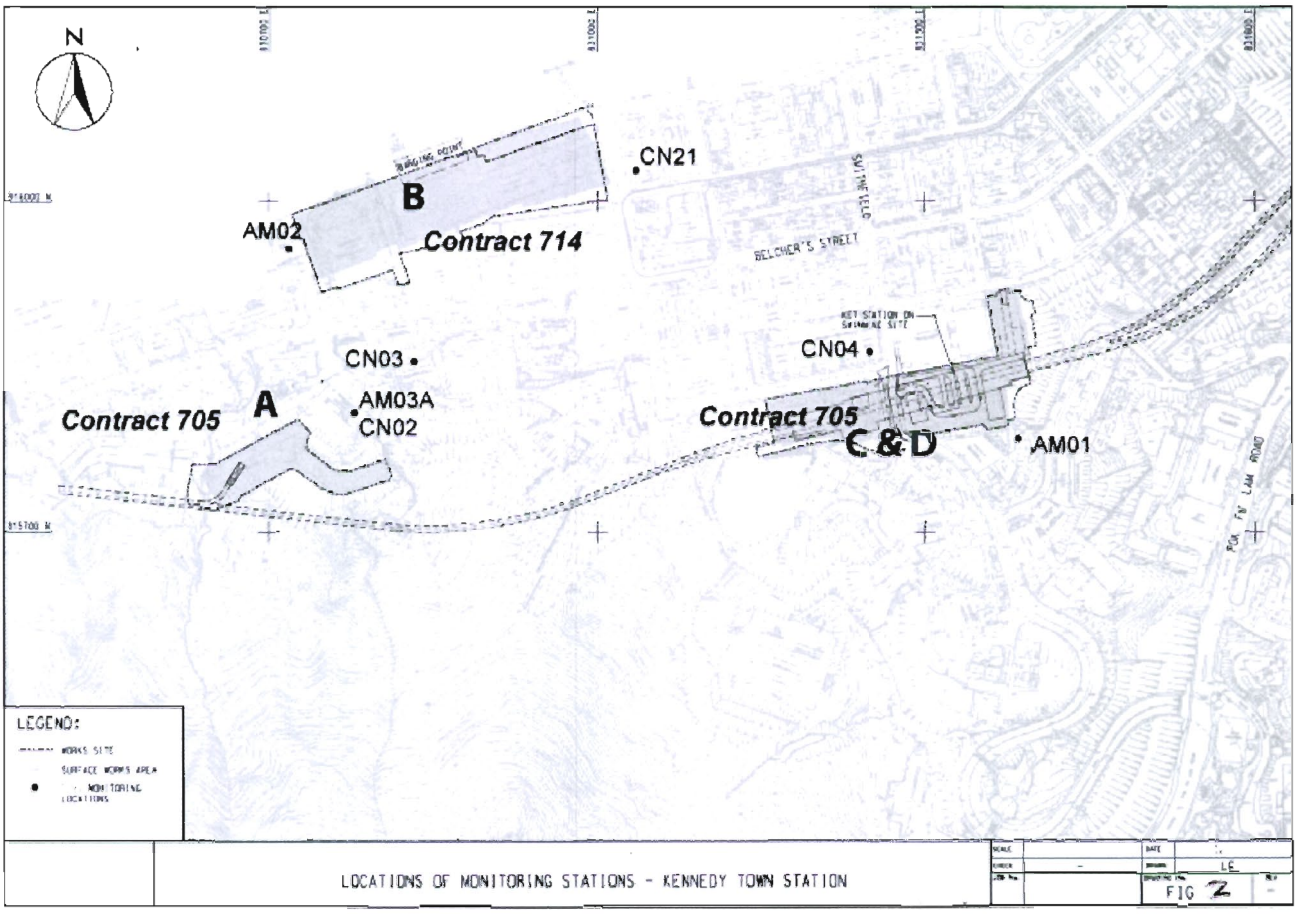
AECOM

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 -

p:\projects\60017115\DRAWING\FIGURE\VARIATION\FIG 1.2.dgn


N
B
Contract 714
AM02
CN21
CN03
AM03A
CN02
A
Contract 705
CN04
Contract 705
C & D
AM01
LEGEND:
WORKS SITE
SURFACE WORKS AREA
MONITORING LOCATIONS
LOCATIONS OF MONITORING STATIONS - KENNEDY TOWN STATION
FIG 2

2 AIR QUALITY

2.1 MONITORING METHODOLOGY

Monitoring was undertaken by the Environmental Team 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 (AM1) as specified in the EM&A Manual for both 1-hour and 24-hour TSP measurements has been established at Pokfield Garden, 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 Sates 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 by Science International Corporation. 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 by ThermoFisher Scientific 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 18 February 2010 and 3 March 2010. 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 south for the majority of the time, with some days from the north.

Table 2.4a 1-hour TSP Baseline Level

Monitoring Location	Average 1-h TSP Level (μg/m^3)
Pokfield Garden (AM1)	79

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

It was noted that there was no construction work with dust generating activities in the vicinity as well as in Works Areas C and D during the monitoring period. Road traffic was observed around the area along Pokfield Road. The dust particulates generated from 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^3 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^3 is the average of 130% of the baseline and the limit level. For baseline greater than 384μg/m^3 the action level is 500μg/m^3. 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/m3)	Action Level (μg/m3)	Limit Level (μg/m3)
Pokfield Garden (AM1)	79	301	500(1)

(1) - 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 18 February 2010 and 3 March 2010.

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

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 (μg/m^3)**
Pokfield Garden (AM1)	62

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

It was noted that there was no construction work with dust generating activities in the vicinity as well as in Works Areas C and D during the monitoring period. Road traffic was observed around the area along Pokfield Road. The dust particulates generated from 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 260μg/m^3.

For 24-hour TSP the action level for baseline smaller than or equal to 200μg/m^3 is the average of 130% of the baseline and the limit level. For baseline greater than 200μg/m^3 the action level is 260μg/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

Monitoring Location	Baseline Level (μg/m^3)	Action Level (μg/m^3)	Limit Level (μg/m^3)
Pokfield Garden (AM1)	62	170	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 by the Environmental Team to establish noise baseline levels in the vicinity of the Works Area C&D, 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:

CN4 - Luen Tak Apartments

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 south.

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 by MaxLab Calibration Centre Limited 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 a*.

Table 3.3a Limit Levels for Construction Noise

Time Period	**Noise Level (dB) for NSR around Works Areas C&D**
Daytime (0700-1900), Monday through Saturday excluding Public Holidays	$L_{Aeq\ 30mins}75^{(1)}$
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

(1) 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 CN4 between 2 September 2009 and 16 September 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 CN4, it was observed that the ambient noise and the vehicular traffic along Forbes Street and Smithfield Road 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 at Pokfield Garden (AM1) between 18 February 2010 and 3 March 2010. Baseline TSP levels were recorded in the range of 45 μg/m^3 and 125 μg/m^3.

24-hour TSP

24-hour TSP baseline monitoring was conducted at the monitoring station at Pokfield Garden (AM1) between 18 February 2010 and 3 March 2010. Baseline TSP levels between 30 μg/m^3 and 126 μg/m^3 had been recorded.

4.1.2 Noise

Baseline monitorings were conducted at the monitoring station at Luen tak Apartments (CN4) from 2 September 2009 to 16 September 2009. Baseline noise levels have been established for weekday and Sunday periods.

Baseline noise levels between 64.7 and 67.4 dB(A) had been recorded at the monitoring station CN4 from 0700 – 1900hr for the monitoring station.

The noise sources noticed at the monitoring station CN4 were the vehicular traffic along Forbes Street and Smithfield Road 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 μg/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 $\mu g/m^3$.

4.2.2 Noise

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

Limit level is set at $L_{Aeq\ 30mins}75$[(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).

(1) 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: Pokfield Garden (AM1)
Samples between: 18/02/2010 and 03/03/2010

Report Date 29/03/2010

Sample Code	Date	Start Time	Parameter	Value	Unit
AM1/001	18/02/2010	13:45	Total Suspended Particulate (1 hr)	80.2	µg/cu.m
AM1/002	19/02/2010	13:30	Total Suspended Particulate (1 hr)	74.0	µg/cu.m
AM1/003	20/02/2010	13:45	Total Suspended Particulate (1 hr)	113.2	µg/cu.m
AM1/004	21/02/2010	13:15	Total Suspended Particulate (1 hr)	78.4	µg/cu.m
AM1/005	22/02/2010	14:45	Total Suspended Particulate (1 hr)	117.9	µg/cu.m
AM1/006	23/02/2010	14:30	Total Suspended Particulate (1 hr)	76.0	µg/cu.m
AM1/007	24/02/2010	13:00	Total Suspended Particulate (1 hr)	82.9	µg/cu.m
AM1/008	25/02/2010	14:15	Total Suspended Particulate (1 hr)	63.5	µg/cu.m
AM1/009	26/02/2010	13:45	Total Suspended Particulate (1 hr)	125.4	µg/cu.m
AM1/010	27/02/2010	13:30	Total Suspended Particulate (1 hr)	73.0	µg/cu.m
AM1/011	28/02/2010	13:15	Total Suspended Particulate (1 hr)	66.6	µg/cu.m
AM1/012	01/03/2010	13:15	Total Suspended Particulate (1 hr)	54.5	µg/cu.m
AM1/013	02/03/2010	14:00	Total Suspended Particulate (1 hr)	45.3	µg/cu.m
AM1/014	03/03/2010	13:00	Total Suspended Particulate (1 hr)	49.1	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: Pokfield Garden (AM1)
Samples between: 18/02/2010 and 03/03/2010

Report Date 29/03/2010

Sample Code	Date	Parameter	Value	Unit
AM1/001	18/02/2010	Total Suspended Particulate (24 hr)	78.2	µg/cu.m
AM1/002	19/02/2010	Total Suspended Particulate (24 hr)	52.3	µg/cu.m
AM1/003	20/02/2010	Total Suspended Particulate (24 hr)	86.8	µg/cu.m
AM1/004	21/02/2010	Total Suspended Particulate (24 hr)	65.1	µg/cu.m
AM1/005	22/02/2010	Total Suspended Particulate (24 hr)	90.6	µg/cu.m
AM1/006	23/02/2010	Total Suspended Particulate (24 hr)	54.8	µg/cu.m
AM1/007	24/02/2010	Total Suspended Particulate (24 hr)	55.6	µg/cu.m
AM1/008	25/02/2010	Total Suspended Particulate (24 hr)	42.1	µg/cu.m
AM1/009	26/02/2010	Total Suspended Particulate (24 hr)	126.3	µg/cu.m
AM1/010	27/02/2010	Total Suspended Particulate (24 hr)	69.7	µg/cu.m
AM1/011	28/02/2010	Total Suspended Particulate (24 hr)	44.2	µg/cu.m
AM1/012	01/03/2010	Total Suspended Particulate (24 hr)	29.9	µg/cu.m
AM1/013	02/03/2010	Total Suspended Particulate (24 hr)	33.0	µg/cu.m
AM1/014	03/03/2010	Total Suspended Particulate (24 hr)	33.8	µg/cu.m

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

ANNEX B

Noise Baseline Measurements

Noise Baseline Report

Project: West Island Line
Report for Location: Luen Tak Apartments (CN4)
Baseline between: 02/09/09 - 16/09/09

Report date: 03/02/10

Parameter : Leq

Time Slot Averaged Baselines
Weekdays Noise Level, dB(A)

	LAeq,30min	L10	L90
07:00-07:30	64.7	66.4	62.6
07:30-08:00	65.3	66.9	63.3
08:00-08:30	66.1	68.1	64.4
08:30-09:00	67.1	68.7	65.0
09:00-09:30	66.4	67.9	64.7
09:30-10:00	67.2	68.8	65.0
10:00-10:30	67.2	68.7	65.2
10:30-11:00	67.4	68.8	65.6
11:00-11:30	67.3	68.9	65.4
11:30-12:00	66.9	68.2	65.2
12:00-12:30	66.2	67.7	64.5
12:30-13:00	66.1	67.5	64.2
13:00-13:30	66.4	67.9	64.5
13:30-14:00	67.1	68.8	65.0
14:00-14:30	66.2	67.7	64.4
14:30-15:00	66.8	68.4	64.9
15:00-15:30	67.1	69.1	64.6
15:30-16:00	66.5	68.2	64.6
16:00-16:30	66.5	68.0	64.7
16:30-17:00	66.4	68.2	64.7
17:00-17:30	66.5	68.3	64.4
17:30-18:00	66.3	68.1	64.3
18:00-18:30	66.3	67.8	64.4
18:30-19:00	65.5	66.9	63.9

Noise Control Period Averaged Baselines
Weekdays Noise Level, dB(A)

	LAeq,30min	L10	L90
07:00-19:00	66.5	68.1	64.6

	LAeq,5min	L10	L90
19:00-23:00	64.6	66.2	62.7
23:00-07:00	60.3	61.9	58.5

Sundays/General Holidays Noise Level, dB(A)

	LAeq,5min	L10	L90
07:00-19:00	65.9	67.5	63.7
19:00-23:00	65.2	67.0	63.3
23:00-07:00	60.1	61.6	58.2

Logarithmic Averaging is being used.

ANNEX C

Calibration Certificates for Monitoring Equipment

Calibration Certificate for Real Time Dust Monitor

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

DR2000 CALIBRATION CERTIFICATE

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

SERIAL NUMBER:	**2003**	
CALIBRATION RATIO:	**0.991**	
AVG. DR CONCENTRATION:	**2.47**	**mg/m3**
MASTER AVG CONCENTRATION:	**2.04**	**mg/m3**
PDR BACKROUND CONCENTRATION:	**0.332**	**mg/m3**

TEMPERATURE: 73 F
RH: 39 %

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

TECHNICIAN: KL **DATE:** 5/19/2009

Calibration Certificate for High Volume Sampler

ANDERSEN INSTRUMENTS INC.

GS2310 Series Sampler Calibration

(Dickson Recorder)

SITE

Location -> Pok Field Garden Date -> 17-Feb-10

Sampler -> 994-0879 Tech -> Chan Kin Fung

CONDITIONS

Sea Level Pressure	(hpa)	1019.7	Sampler Elevation	(feet)	106
Sea Level Pressure	(in Hg)	30.11	Corrected Pressure	(mm Hg)	762.25
Temperature	(deg C)	16.8	Temperature	(deg K)	289.80
Seasonal SL Pressure	(in Hg)	30.11	Corrected Seasonal	(mm Hg)	762.25
Seasonal Temperature	(deg C)	16.80	Seasonal Temperature	(deg K)	289.80

CALIBRATION ORIFICE

Make -> Andersen Instruments Inc. Qstd Slope -> 1.99

Model -> 25A Qstd Intercept -> -0.014012

Serial# -> 5303 Date Certified ->

CALIBRATION

	Plate or Test #	H_2O (in)	Qstd (M^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
1	18	14.8	1.970	64	64.995	Slope =	31.3996
2	13	12	1.775	59	59.917	Intercept =	3.8090
3	10	9.2	1.555	52	52.809	Corr. Coeff. =	0.9980
4	7	5.8	1.236	43	43.669		
5	5	3.6	0.975	33	33.513		

Calculations

Qstd = 1/m [Sqrt (H_2O (Pa/Pstd) (Tstd/Ta)) - b]

IC = I [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) [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.

MTR Corporation
Internal Calibration

Project Laboratory MTR

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℃	

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 = ± 0.000680

Checked by : Kenny Li Certified by : _____

Date : 13-02-2009 Date : 16/12/2009

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.

Calibration Certificates for Sound Level Meter and Calibrator

MAXLAB

CALIBRATION CERTIFICATE

Certificate Information

Date of Issue	30th 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 service is provided under a HKQAA ISO9001:2000 certified quality system of Certificate No. CC1929.

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MAXLAB

CALIBRATION CERTIFICATE

Certificate Information

Date of Issue	30th December, 2008	***Certificate Number***	MLCN081194S

Calibration Status

Date of Calibration			30th December, 2008
Calibration Equipment Used			4231 (MLTE008)/ CA0801167/ 24th Feb 2010
Calibration Procedure			MLCG00 & MLCG15.
Calibration Uncertainty			±0.2 dB
Calibration Condition	***Lab***	***Temperature***	23 °C ± 5 °C
		Relative Humidity	55% ± 25%
	UUT	***Stabilizing Time***	24 hours
		Warm-up Time	10 minutes
		Supply Voltage	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

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MAXLAB
CALIBRATION CERTIFICATE

Certificate Information

Date of Issue	6th November, 2008	***Certificate Number***	MLCN080969S

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	1795385
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 service is provided under a HKQAA ISO9001:2000 certified quality system of Certificate No. CC1929.

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MAXLAB
CALIBRATION CERTIFICATE

Certificate Information

Date of Issue	6th November, 2008	*Certificate Number*	MLCN080969S

Calibration Status

Date of Calibration			6th November, 2008
Calibration Equipment Used			4231 (Spec) (MLTE008)/ CA0801167/ 24th Feb 2008 1351 (MLTE049)/ MLEC08/06/02/ 14th 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

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