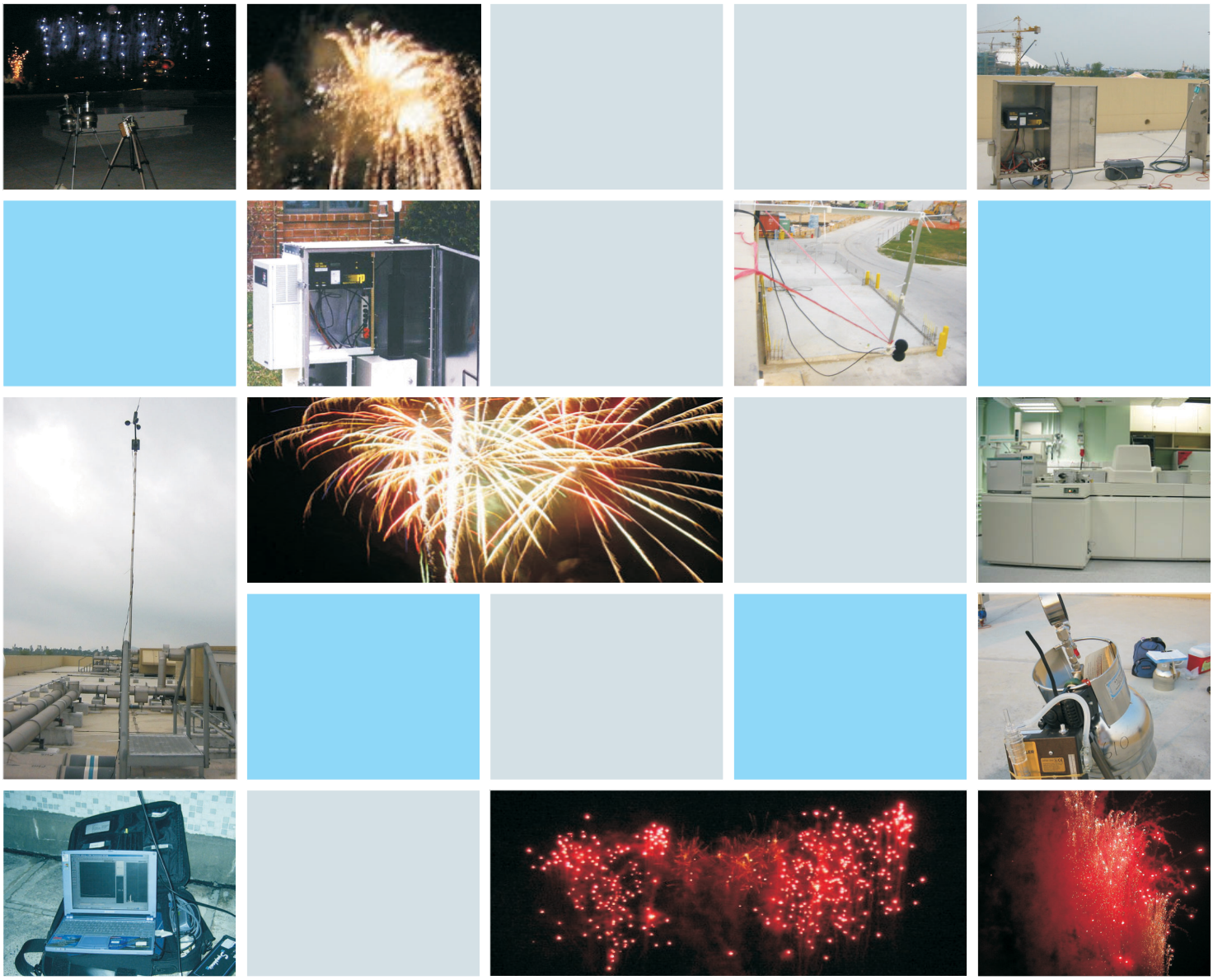


Hongkong International
Theme Parks Limited

Air Quality and Noise Monitoring During Trial Fireworks Displays

Monitoring Report

June 2005

Environmental Resources Management
21/F Lincoln House
Taikoo Place 979 King's Road
Island East Hong Kong
Telephone 2271 3000
Facsimile 2723 5660

www.erm.com

ERM

Delivering sustainable solutions in a more competitive world

Hong Kong International Theme Parks Limited

Air Quality and Noise Monitoring During Trial Fireworks Displays: *Monitoring Report*

29 June 2005

Reference 0031338

For and on behalf of
Environmental Resources Management

Approved by: Freeman Cheung

Signed:

Position: Executive Director

Date: 29 June 2005

CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

The Hong Kong Disneyland (HKDL) will provide a nightly firework show. Quantitative assessments of the likely environmental impacts have been previously undertaken as part of the Construction of an International Theme Park Environmental Impact Assessment (approved Theme Park EIA report (February 2000)) [1]. The Theme Park EIA report concluded that the fireworks show would not cause any significant impacts to the surrounding environment. The findings were confirmed by a Trial Test conducted in Orlando in 2000 which confirmed that no significant impact would occur in the air quality aspect and it would be feasible in designing a fireworks show which would meet the noise criterion of 55 dB(A) $L_{eq\ 15\ minutes}$.

Findings from these assessments contributed to the grant of an Environmental Permit under the *Environmental Impact Assessment Ordinance* (EIAO) by the Environmental Protection Department (EPD) to the Civil Engineering Department on 6th May 2000 and subsequently, Hong Kong International Theme Parks Ltd (HKITP) applied for a Further Environmental Permit (FEP-01/059/2000) which was granted on 21st July 2000.

In accordance with the requirements stated in Section 3.1 of the Further Environmental Permit (FEP-01/059/2000), the Permit Holder (HKITP) shall carry out trial fireworks displays and associated air and noise monitoring. The details of the trial and monitoring programme shall be submitted to the Director of Environmental Protection (Director) for agreement at least one month prior to the trial fireworks displays. The results of the trial fireworks displays shall be submitted to the Director for agreement prior to the operation of the Project. The results of the trial tests and associated air quality data shall be provided to the Advisory Council on the Environment for consultation, as directed by the Director.

An Air Quality Sampling Plan and a Noise Monitoring Plan for the trial fireworks displays were submitted to the Director and agreed in April 2005. The agreed methodology in the submitted Air Quality Sampling Plan and a Noise Monitoring Plan was adopted for the air quality and noise monitoring of the trial fireworks displays.

The trial fireworks displays and associated air and noise monitoring was undertaken on 6th May 2005 based on an initial fireworks show design. Key to the initial fireworks show design is to establish the maximum scenario in terms of the environmental permit requirement for any subsequent show refinement. The same display and monitoring was also undertaken on 7th May 2005 to ensure that backup data is available for the trial fireworks

[1] Construction of an International Theme Park in Penny's Bay of North Lantau and its Essential Associated Infrastructures, February 2000, ERM-Hong Kong, Ltd

displays, should the monitoring result on 6th May 2005 be incomplete or unsuccessful. ERM-Hong Kong, Ltd (ERM) was commissioned by the HKITP to conduct the air quality and noise monitoring for the trial fireworks displays dated 6th and 7th May 2005.

It was concluded in the approved Theme Park EIA report (February 2000) that the fireworks show would not cause any significant impacts to the surrounding environment and therefore it was recommended that operational monitoring for key parameters including 24-hour RSP, barium, copper and dioxins, and 1-hour H_2S shall be undertaken during the first operational year for verification purposes. However, the purpose of the trial fireworks displays monitoring was to provide information on the firework emission characteristics and in particular to confirm the requirement in the EIA that certain metals will not be used as part of the fireworks composition. Hence, more comprehensive air samplings parameters were adopted in the trial fireworks displays monitoring. The objectives of the trial fireworks displays are furthered discussed in *Section 1.2*.

1.2 OBJECTIVES OF THE TRIAL FIREWORKS DISPLAYS

This report presents the results of the air and noise monitoring performed on 6th and 7th May 2005. The key objectives of the trial fireworks displays are as follows:

- To establish the ambient air and noise levels at the agreed monitoring locations;
- To provide information on firework emission characteristics and to determine the significance of impacts on sensitive receivers; and
- To collect the noise performance data for the trial fireworks displays at the agreed monitoring locations and to determine the significance of impacts on sensitive receivers.

1.3 STRUCTURE OF THE REPORT

After this introductory section, the remainder of this report is arranged as follows:

Section 2 describes the air quality sampling methodology, the sampling results and the quality assurance and quality control of the sampling;

Section 3 describes the noise monitoring methodology, and the noise monitoring result; and

Section 4 presents an overall conclusion for the air and noise monitoring.

2 AIR QUALITY MONITORING

2.1 SAMPLING METHODOLOGY

2.1.1 Meteorological Monitoring

A temporary meteorological station (Model: Weather Monitor II, Davis) was set up on 29th April 2005 at the rooftop of the Central Maintenance Facility, located approximately 95 m and 165 m from the nearest pyrotechnics launching area and fireworks launching area, respectively. The wind sensor was positioned on a 3 m mast at the rooftop of the Central Maintenance Facility, approximately 9 m above the ground level. 1-minute average wind speed and wind data were recorded throughout the baseline monitoring period and the trial fireworks displays period.

Figure 2.1 On-site Meteorological Station located on the Rooftop of Central Maintenance Facility

2.1.2 *Sampling Parameters*

With reference to the approved Theme Park EIA report (February 2000), the Orlando Trial Test and agreed Air Quality Sampling Plan (refer to *Annex A*), sampling parameters including respirable suspended particulates (RSP), continuous RSP, 17 types of metals [1], sulphate, dioxins, total volatile organic compounds (TVOCs), speciated VOCs [2] and hydrogen sulfide (H_2S) have been collected for the Hong Kong trial fireworks displays dated 6th May 2005 to confirm the Orlando Trial Test findings. The same set of parameters was collected on 7th May 2005 as backup data. As indicated in *Table 2.1*, different sampling parameters have been collected for the on-site and off-site sampling locations to ensure that the different objectives are met.

RSP, metals, H_2S, VOCs and dioxins are the potential sources of air quality impacts discussed under the approved Theme Park EIA report (February 2000). These pollutants were monitored to provide information for the verification purpose and to confirm "No Use" of prohibited metals [3] in the fireworks show under the requirement stated in the further EP (FEP-01/059/2000).

2.1.3 *Sampling Locations*

Three on-site sampling locations and two off-site sampling locations were identified and agreed with the EPD for the trial fireworks displays. The sampling locations are summarized in *Table 2.1* and are shown in *Figures 2.2* to *2.4*. The purpose of the on-site monitoring is to capture the plume characteristic from the fireworks show such that the contribution of pollutants to the atmosphere from fireworks, if any, can be quantified; while the off-site locations were to demonstrate that the trial fireworks displays would not adversely affect the air quality at the air sensitive receivers (ASRs) during the operational phase.

(1) Metals include aluminium (Al), antimony (Sb), arsenic (As), barium (Ba), chromium (Cr), copper (Cu), iron (Fe), lead (Pb), magnesium (Mg), manganese (Mn), particulate mercury (Hg), molybdenum (Mo), nickel (Ni), potassium (K), strontium (Sr), titanium (Ti) and zinc (Zn).

(2) Freon 12, chloromethane, freon 114, vinyl chloride, 1,3-butadiene, bromomethane, chloroethane, freon 11, 1,1-Dichloroethene, dichloromethane, freon 113, 1,1-dichloroethane, cis-1,2-dichloroethene, chloroform, 1,2-dichloroethane, 1,1,1-trichloroethane, benzene, carbon tetrachloride, 1,2-dichloropropane, trichloroethene, cis-1,3-dichloropropene, trans-1,3-dichloropropene, 1,1,2-trichloroethane, toluene, 1,2-dibromoethane, tetrachloroethene, chlorobenzene, ethylbenzene, m,p-xylene, styrene, 1,1,2,2-tetrachloroethane, o-xylene, 4-ethyltoluene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, m-dichlorobenzene, o-dichlorobenzene, 1,2,4-trichlorobenzene and hexachlorobutadiene.

(3) Prohibited metals include chromium, lead, mercury, arsenic, manganese, nickel and zinc.

Table 2.1 Sampling Locations

Sampling Location ID	Description	Sampling Parameters
On-site Sampling Locations		
AIR1	Rooftop of Hollywood Hotel	RSP, metals, sulphate, dioxins, TVOC, VOCs and H_2S
AIR2	Rooftop of Building #304 Buzz Light Year	RSP, metals, sulphate, dioxins, TVOC, VOCs and H_2S
AIR3	Rooftop of Building #609 Central Maintenance Facility	RSP, continuous RSP, metals, sulphate, dioxins, TVOC, VOCs and H_2S
Off-site Sampling Locations		
AIR4	Rooftop of Peng Lai Court in Peng Chau	24-hr RSP and H_2S
AIR5	Rooftop of Crestmont Villa Management Office in Discovery Bay	24-hr RSP and H_2S

On-site Sampling locations

In order to capture the highest possible on-site pollutant concentrations, historical wind data collected as part of the *Infrastructure for Penny's Bay Development – Contract 1* and *Penny's Bay Reclamation Stage 2* have been reviewed. During April 2004, the prevailing wind was from the southeast (up to 32% of the time); whilst the second highest frequency was from the southwest (14% of the time). Based on this information, both the Buzz Light Year (AIR2) and Building #609 Central Maintenance Facility (AIR3) are considered to be located in the downwind location; while the Hollywood Hotel (AIR1) is located in the upwind location. Prior to the trial fireworks displays, the on-site weather data gathered from 29th April 2005 to 4th May 2005 were also reviewed and indicated that the prevailing wind was from the south and southwest. It was therefore decided the continuous RSP sampling equipment is to be located at the Central Maintenance Facility (AIR3), downwind from the launch area.

Hollywood Hotel – AIR1

The Hollywood Hotel (AIR1) is an eight storey high hotel, located approximately 330 m from the nearest launch area. It is the nearest building structure located to the south of the launch area for capturing the plume due to northerly wind. The sampling location was set at the rooftop approximately 27 m above the ground level. The sampling location is presented in *Figure 2.2*.

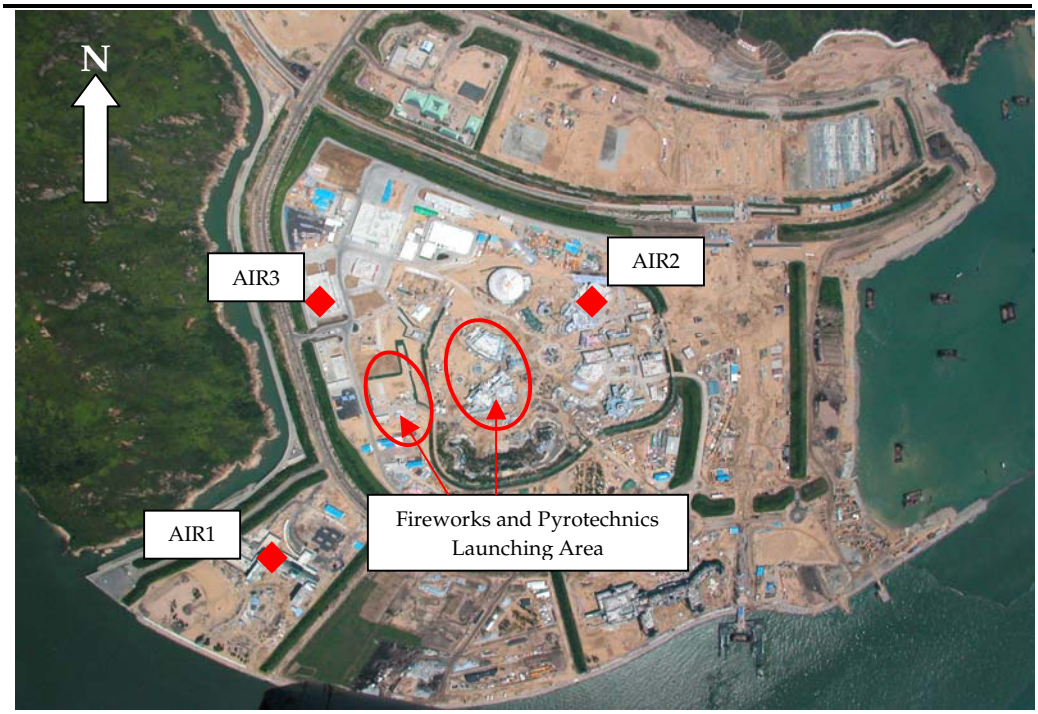
Building #304 Buzz Light Year – AIR2

Buzz Light Year (AIR2) is a single storey high building, located approximately 180 m from the nearest launching area (Rooftops). The sampling location was set at the rooftop approximately 12m above the ground level. The sampling location is presented in *Figure 2.2*.

Building #609 Central Maintenance Building – AIR3

Building #609 Central Maintenance Building (AIR3) is a single storey high building, located approximately 95 m from the main launch area. The sampling location was set at the rooftop approximately 9 m above the ground level. The sampling location is presented in *Figure 2.2*.

Figure 2.2 ***On-site Sampling Locations***



Off-site Sampling locations

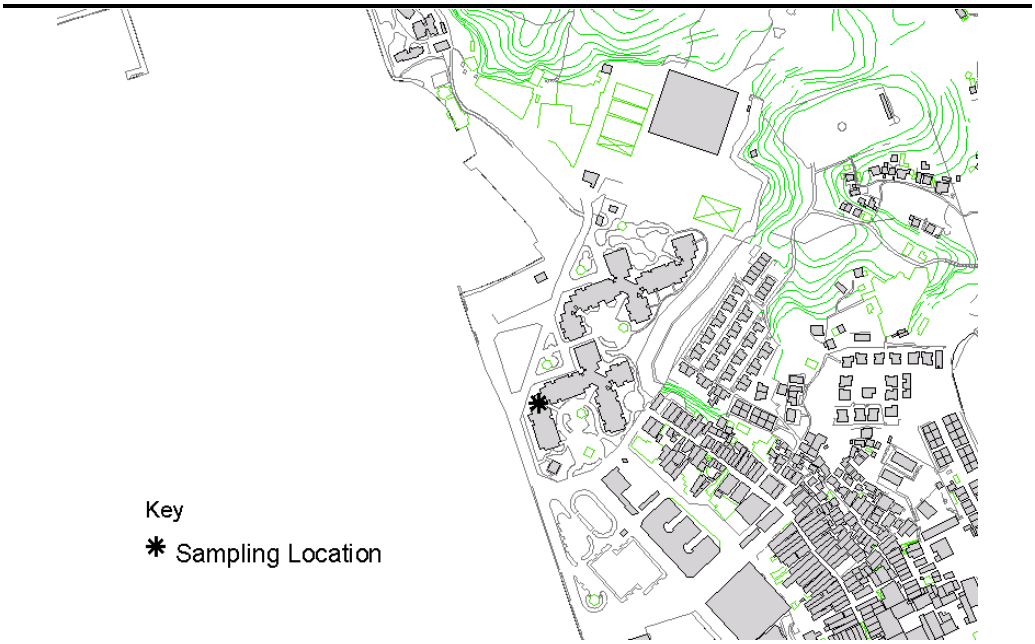
As discussed in *Section 2.1.3*, the purpose of the off-site locations was to demonstrate that the trial fireworks displays would not adversely affect the nearby ASRs. It was identified during site visits that there are no residential building within Peng Chau that has an unobstructed line of sight to Penny's Bay. Peng Lai Court in Peng Chau has been identified as one of the highest building in Peng Chau, with an open surrounding environment and enough rooftop surface area to support sampling equipment. It is therefore considered that Peng Lai Court is a suitable sampling location representing ASRs in Peng Chau.

Crestmont Villa in Discovery Bay is the nearest residential building with an unobstructed line of sight to Penny's Bay. However, during the period of the monitoring, the Crestmont Villa was under renovation and therefore, it was not considered suitable for the air monitoring. The Crestmont Villa Management Office (AIR5) was therefore selected as the sampling location, though it is approximately 85m separated from Crestmont Villa, is still considered an appropriate location representing the surrounding residential developments.

Peng Lai Court, Peng Chau – AIR4

Peng Lai Court (AIR4) is a 5 to 6 storey high building, located approximately 2.8km from the main launch area. The sampling location was set at the rooftop approximately 15m above the ground level. The sampling location is presented in *Figure 2.3*.

Figure 2.3 Peng Lai Court in Peng Chau (AIR4)



Crestmont Villa Management Office (AIR5) is a single storey high building, located approximately 2.7km from the main launch area. The sampling location was set at the rooftop approximately 5 m above the ground level. The sampling location is presented in *Figure 2.4*.

Figure 2.4 Crestmont Villa Management Office in Discovery Bay (AIR5)

2.1.4 *Laboratory*

The details of laboratory for sampling and analysis of the sampling parameters are summarized in *Table 2.2*.

Table 2.2 Laboratory for Sampling and Analysis

Laboratory	Corresponding Address
Hong Kong Productivity Council	HKPC Building, 78 Tat Chee Avenue, Kowloon Tong, Kowloon
Hong Kong Polytechnic University	PolyU Technology & Consultancy Co. Ltd Hunghom, Kowloon
Hong Kong Baptist University	Room W700, Hong Kong Baptist University, 24 Waterloo Road, Kowloon Tong, Kowloon

2.1.5 *Sampling and Laboratory Analysis Methodology*

A summary of the sampling and laboratory analysis methodologies is presented in *Table 2.3*.

Table 2.3 Summary of Sampling and Laboratory Analysis Method

Sampling Parameter	Method	Equipment
RSP	EPA IO-2.1	High volume sampler
Metals	EPA IO-2.1 & 3.5	High volume sampler
Sulphate	EPA IO-2.1 & 4.2	High volume sampler
Dioxins	EPA TO-9A	High volume sampler with PUF filter
TVOC	EPA Method 18	Canister with constant-flow air pump
VOCs (speciated)	EPA TO14A	Canister with constant-flow air pump
Continuous RSP	EPA IO-1.3 TEOM	TEOM
24-hour RSP	EPA IO-2.1	High volume sampler
H_2S	Methylene blue	Impinges with active air pump

Metals and sulphate were collected from RSP filter sample since the detonation of the fireworks generates RSP. This is the basic assumption used in the approved Theme Park EIA Report (February 2000)and the associated metals and sulphate emissions would therefore be in this particle size range. Reference would also be made to the continuous RSP data collected by TEOM for QC purpose.

Duplicate TVOC, speciated VOCs and dioxins samples were collected for QC purpose. Field blank for all parameters were also collected prior to the trial fireworks displays.

The sampling instruments and procedures have followed the standard US EPA Methods, and could be found on the US EPA website (http://www.epa.gov/ttnamti1/inorg.html, http://www.epa.gov/ttn/emc/promgate.html and http://www.epa.gov/ttn/amtic/airtox.html).

24-hour RSP sampling was also conducted at two off-site sampling locations (Peng Lai Court (AIR4) & Crestmont Villa Management Office (AIR5)). Baseline 24-hour RSP samples were also collected prior to the trial fireworks

displays to establish the background concentrations. H_2S sampling was conducted at all five locations 2 hours prior to the trial fireworks displays and also 1 hour during the fireworks displays.

The sampling equipment setup at each sampling locations are shown in *Annex B*.

2.1.6 Sampling Period

The sampling periods at each sampling locations are summarized in *Table 2.4*. The sampling periods for each sampling parameters are the same at all sampling locations for the trial fireworks displays on 6th May 2005. The same sampling were repeated on 7th May 2005 as backup.

Table 2.4 Sampling Period

Sampling Parameter	Sampling Period	
	Baseline	**Trial Fireworks Display (6th & 7th May)**
On-site Sampling Locations		
RSP	2 hours (18:00 – 20:00)	1 hour (21:00 – 22:00)
Continuous RSP by TEOM	The equipment was started from 18:00 (6th May) to 23:00 (7th May)	
Metals	2 hours (18:00 – 20:00)	1 hour (21:00 – 22:00)
Sulphate	2 hours (18:00 – 20:00)	1 hour (21:00 – 22:00)
Dioxins	2 hours (18:00 – 20:00)	1 hour (21:00 – 22:00)
TVOC	2 hours (18:00 – 20:00)	1 hour (21:00 – 22:00)
VOCs (speciated)	2 hours (18:00 – 20:00)	1 hour (21:00 – 22:00)
H_2S	2 hours (18:00 – 20:00)	1 hour (21:00 – 22:00)
Off-site Sampling Locations		
24-hour RSP	24 hours (13:52 of 28th Apr – 13:52 of 29th Apr)	24 hours (14:00 of 6th May – 14:00 of 7th May; 16:00 of 7th May – 16:00 of 8th May)
H_2S	2 hours (18:00 – 20:00)	1 hour (21:00 – 22:00)

2.2 SAMPLING RESULTS AND DISCUSSION

2.2.1 Meteorological Monitoring

The wind speed and wind direction were measured at the on-site meteorological station (Model: Weather Monitor II, Davis) located at the rooftop of the Central Maintenance Facility throughout the trial fireworks displays period. The variations of the wind speed and wind direction throughout the period of ambient monitoring and during the trial fireworks displays on both 6th and 7th May are presented in *Figures 2.5* and *2.6*.

On 6th May 2005, during the ambient monitoring (18:00 – 20:00), the wind direction recorded was from WSW and NNW. The wind speed recorded was 0.9 to 3.6 ms^{-1} and the average wind speed was 2.4 ms^{-1}. During the trial fireworks displays period (21:00 to 22:00), the wind direction was from NNW and N. The wind speed recorded was 1.8 to 4.0 ms^{-1} and the average wind speed was 2.8 ms^{-1}. Therefore, the AIR1 (Hollywood Hotel) and AIR4 (Peng Lai Court in Peng Chau) were considered to be in the downwind sampling locations.

On 7th May 2005, during the ambient monitoring (18:00 – 20:00), the wind direction recorded was mostly from E and SE. The wind speed recorded was 0.4 to 3.1 ms^{-1} and the average wind speed was 1.6 ms^{-1}. During the trial fireworks displays period (21:00 – 22:00), the wind direction was also mostly E and SE. The wind speed recorded was 0.4 to 2.7 ms^{-1} and the average wind speed was 1.4 ms^{-1}. Therefore, the AIR3 (Building #609 Central Maintenance Facility) was the downwind sampling location.

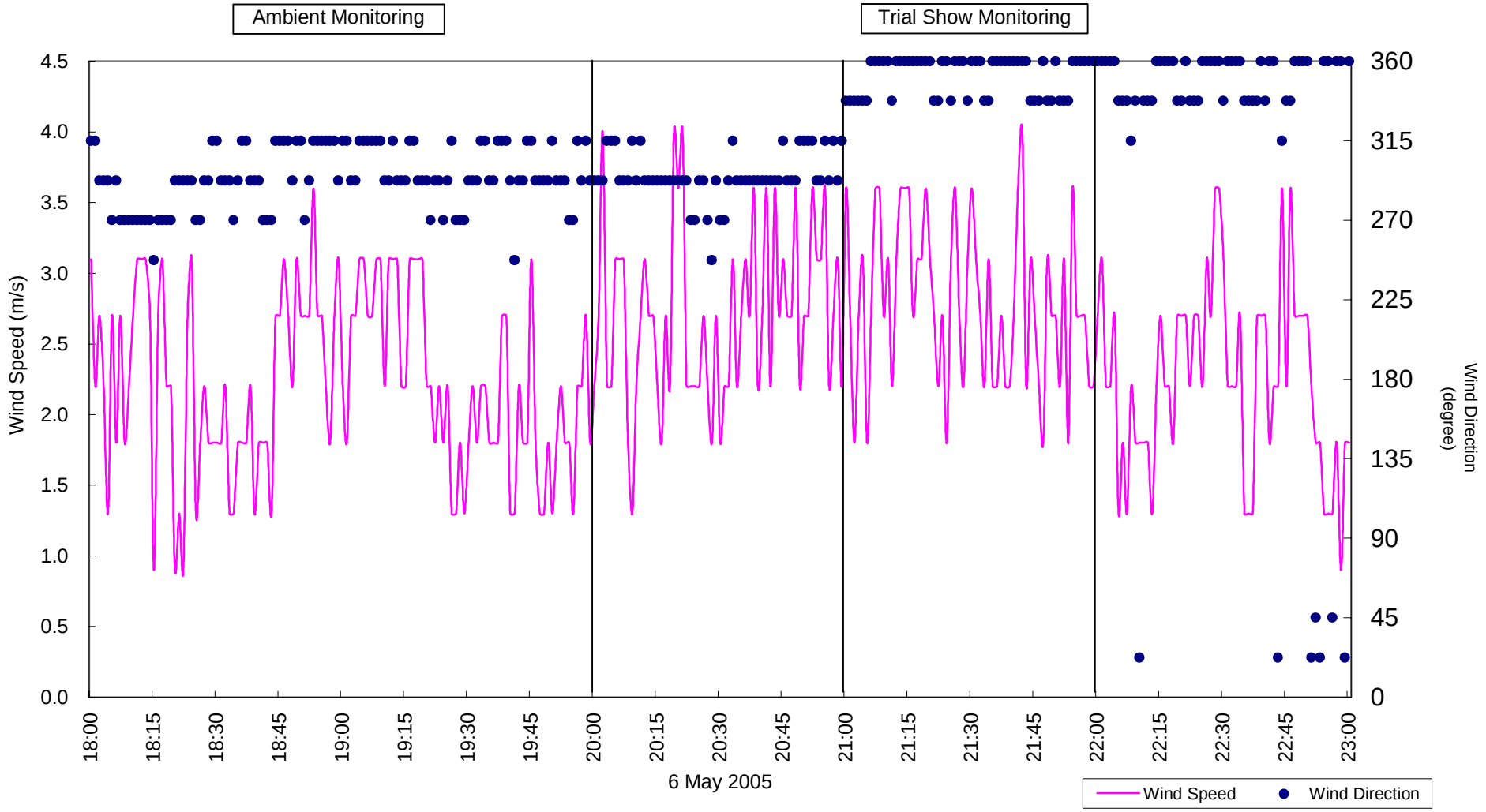


Figure 2.5 Meteorological Monitoring Results on 6th May 2005

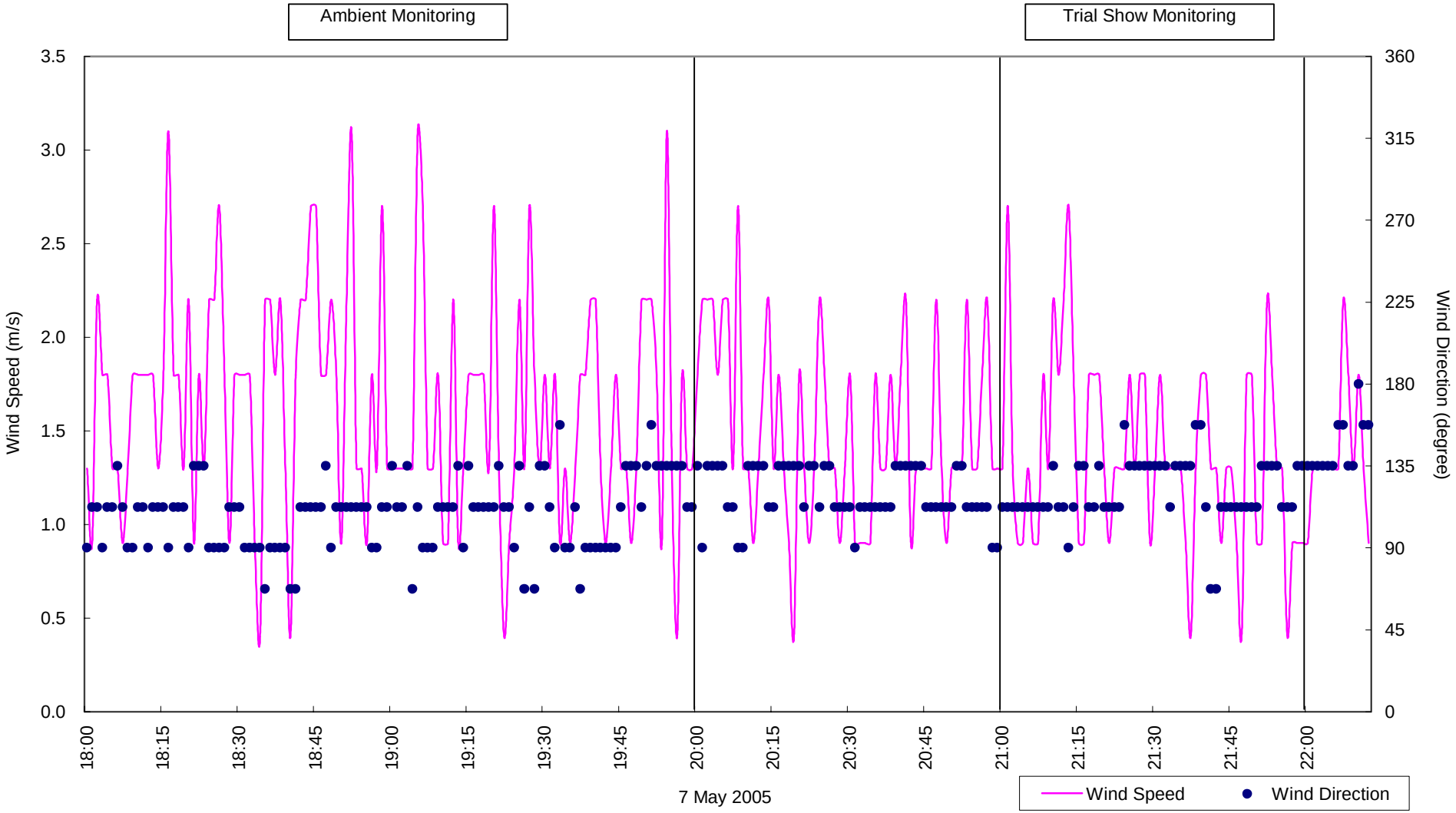


Figure 2.6 Meteorological Monitoring Results on 7th May 2005

2.2.2 RSP

RSP was monitored using PM_{10} high volume air samplers (HVSs) at the three on-site sampling locations (AIR1 to AIR3) and the two off-site sampling locations (AIR4 and AIR5).

The monitored RSP results are summarized in *Tables 2.5* and *2.6*.

On-site RSP Measurement on 6th May 2005

The ambient RSP concentration was measured between 18:00 and 20:00 at Hollywood Hotel (AIR1), Buzz Light Year (AIR2) and Central Maintenance Facility (AIR3) and the ambient RSP concentrations measured were 151 μg m^{-3}, 146 μg m^{-3} and 102 μg m^{-3} at AIR1 to AIR3, respectively. During the ambient monitoring, the measured RSP concentration was contributed by the background air quality and the dust generated from the surrounding open worksites in Penny's Bay.

The RSP measurement during the trial fireworks displays was conducted between 21:00 and 22:00 for 1 hour. The "trial fireworks displays" RSP concentrations measured were 70 μg m^{-3}, 121 μg m^{-3} and 81 μg m^{-3} at AIR1 to AIR3, respectively. During the sampling period of the trial fireworks displays, no construction activities were observed in the vicinity of the sampling locations.

Continuous RSP concentrations were also monitored by TEOM at AIR3 during both periods of ambient monitoring and during the trial fireworks displays. 1-minute RSP concentrations were measured. However, due to the data memory error of the TEOM, the continuous RSP concentrations collected on 6th May 2005 were lost.

RSP concentrations measured at the EPD air quality monitoring station at Tung Chung (TC AQMS) were used to provide the background RSP concentration as reference. The background RSP concentrations measured at TC AQMS between 18:00 and 20:00 were 69.5 μg m^{-3} and 68.1 μg m^{-3} [(1)], respectively whereas that measured during the time period of the trial fireworks displays was 61.9 μg m^{-3}.

With reference to the on-site wind data, the downwind location should be the southern part of the Disney site at AIR1 (Hollywood Hotel) (please refer to *Section 3.1*) due to the northerly wind. However, since the wind speed was low (an average of 2.8 ms^{-1}) and AIR1 (Hollywood Hotel) is distant from the fireworks launch area, the measured RSP concentration at AIR1 (70 μg m^{-3}) was similar to the background RSP concentration at the TC AQMS and the contribution from the trial fireworks displays was low.

(1) Reference to real-time 1-hour average RSP concentration on EPD's website (http://www.epd-asg.gov.hk/english/24pollu/pc_24station.php?station=Tung%20Chung)

AIR2 and AIR3 were the upwind locations. During the trial fireworks displays, it was observed that the dust plume was blown to the southern part of the Disney site due to the northerly wind. The RSP concentration measured AIR3 is low and similar to the background RSP. However, the RSP concentrations measured at AIR2 and AIR3 were mostly contributed from the background RSP and also from open worksites within Penny's Bay. The contribution from the trial fireworks displays is small due to its upwind location.

On-site RSP Measurement on 7th May 2005

The ambient RSP concentrations were measured at the same time period (from 1800 to 2000) as on 6th May at Hollywood Hotel (AIR1), Buzz Light Year (AIR2) and Central Maintenance Facility (AIR3) and the ambient RSP concentrations measured were 77 μg m^{-3}, 89 μg m^{-3} and 94 μg m^{-3} at AIR1 to AIR3, respectively. During the ambient monitoring, no construction activities were observed and therefore, the measured RSP concentration was mostly attributed to the background air quality.

The RSP measurement during trial fireworks displays was conducted between 21:00 and 22:00 for 1 hour. The "trial fireworks displays" RSP concentrations measured were 82 μg m^{-3}, 120 μg m^{-3} and 191 μg m^{-3} at AIR1 to AIR3, respectively. During the trial fireworks displays, no construction activities were observed in the vicinity of the sampling locations.

RSP concentrations measured at the TC AQMS were recorded. The background hourly RSP concentrations measured at TC AQMS between 18:00 and 20:00 were 62.4 μg m^{-3} and 63.5 μg m^{-3}, respectively whereas that measured during the time period of the trial fireworks displays was 53.6 μg m^{-3}.

With reference to the wind direction and wind speed measured on site, AIR3 was the downwind location (please refer to *Section 3.1*). Comparing the ambient RSP results against the RSP concentration measured at TC AQMS, the ambient RSP concentrations measured at AIR1 to AIR3 were slightly higher due to the open worksites in Penny's Bay. During the trial fireworks displays, the RSP concentrations measured at AIR1 to AIR3 were elevated and that measured at AIR3 was double the ambient RSP concentration. In addition, the measured RSP concentration at AIR2 was similar to that measured on 6th May as AIR2 was not in the downwind location and was mainly affected by the open worksite areas.

Continuous RSP concentrations were also monitored by TEOM at AIR3. The RSP concentration profile from 18:00 to 23:00 on 7 May 2005 was plotted and shown in *Figure 2.7*. Since the AIR3 was located at the downwind location, it is clearly indicated in the graphical plot of the RSP variation that a sharp peak occurred during the trial fireworks displays (at around 21:17). This proves that the TEOM successfully captured the dust plume from the trial fireworks displays and supports the opinion that the elevated RSP results measured by HVS at AIR3 are due to the emissions from the trial fireworks displays. The

RSP concentrations increased from 21:10 to reach the highest concentration (517.3 μgm^{-3}) at 21:17 and then dropped back to the ambient level. The trial fireworks displays ran from 21:06 to 21:13 and the increase in the RSP concentration from 21:10 is due to the trial fireworks displays. There is a slight delay in the reported concentration profile due to the time required for the plume to travel and the time lag for the data analysis of the TEOM. The 1-hour rolling average RSP recorded between 21:00 and 22:00 was 161.6 $\mu g\ m^3$.

In the absence of hourly AQO criteria for hourly RSP in Hong Kong, occupational exposure limit (OEL) of RSP is adopted for reference as in the approved Theme Park EIA report (February 2000)for the comparison of the measured 1-hour RSP levels. With reference to the OEL (8-hour) for RSP (3,000 $\mu g\ m^{-3}$ [1]), the highest measured hourly RSP level during the trial fireworks displays (191 $\mu g\ m^{-3}$) at AIR3 is 6% of the OEL.

Off-site RSP Measurement

24-hour RSP baseline measurements were also undertaken at the two off-site sampling locations on 29th April 2005. At the off-site sampling locations (Peng Chau (AIR4) and Discovery Bay (AIR5)), the baseline 24-hour RSP concentrations were very low, 15 μgm^{-3} and 36 μgm^{-3} at AIR4 and AIR5, respectively. On 6th May, Peng Chau was at downwind location and the measured 24-hour RSP concentrations at AIR4 and AIR5 were 18 μgm^{-3} and 40 μgm^{-3}, respectively. Due to the large separation between the firework launch area and the AIR4 and AIR5, the contribution from the trial fireworks displays is low. On 7th May, AIR4 and AIR5 were in the upwind locations and the measured 24-hour RSP concentrations were 40 μgm^{-3} and 59 μgm^{-3}, respectively. The measured results are considered to be comparable to the annual averaged 24-hour RSP concentrations measured at EPD Tung Chung and Central/Western AQMS (54 $\mu g\ m^{-3}$ and 53 $\mu g\ m^{-3}$, respectively). The measured RSP concentration at AIR4 is considered to be affected by the prevailing background RSP concentration and the nearby open stockpiles located along the waterfront adjacent to Peng Lai Court. The measured RSP at AIR5 is also considered to be affected by the prevailing background concentration and local activities such as the maintenance activities at Crestmont Villa. However, the measured 24-hour RSP concentrations are well below the AQO criteria (180 μgm^{-3}) at Peng Chau and Discovery Bay on both days.

[1] Reference to Code of Practice on Control of Air Impurities (Chemical Substances) in the Workplace by the HK Labour Department

Table 2.5 Summary of RSP Monitoring Results – On-site Sampling Locations

Sampling Location	Sampling Description	Sampling Time	Sampling Duration (hr)	Amount in Filter (mg)	Air Volume (m^3)	Concentration ($\mu g\ m^{-3}$)[a]	Hourly RSP Concentration measured at EPD Tung Chung AQMS ($\mu g\ m^{-3}$) [b]	AQO Criteria
6th May 2005								
AIR1 – Hollywood Hotel	Ambient	18:00 – 20:00	2	20.6	137	151	68.8 [c]	-
	Trial fireworks displays	21:00 – 22:00	1	4.7	67	70	61.9	-
AIR2 – Buzz Light Year	Ambient	18:00 – 20:00	2	19.9	137	146	68.8 [c]	-
	Trial fireworks displays	21:00 – 22:00	1	8.2	68	121	61.9	-
AIR3 – Central Maintenance Facility	Ambient	18:00 – 20:00	2	13.8	136	102	68.8 [c]	-
	Trial fireworks displays	21:00 – 22:00	1	5.6	69	81	61.9	-
Field Blank at AIR3			1	<1	-	-		-
7th May 2005								
AIR1 – Hollywood Hotel	Ambient	18:00 – 20:00	2	10.5	137	77	63.0 [c]	-
	Trial fireworks displays	21:00 – 22:00	1	5.6	68	82	53.6	-
AIR2 – Buzz Light Year	Ambient	18:00 – 20:00	2	12.2	137	89	63.0 [c]	-
	Trial fireworks displays	21:00 – 22:00	1	8.1	67	120	53.6	-
AIR3 – Central Maintenance Facility	Ambient	18:00 – 20:00	2	13.0	138	94	63.0 [c]	-
	Trial fireworks displays	21:00 – 22:00	1	13.0	68	191	53.6	-
Field Blank at AIR3			1	<1	-	-		-

Notes:

(a) No blank-corrected.

(b) Reference to www.epd.gov.hk

(c) Hourly RSP concentrations are calculated by averaging of the hourly RSP concentrations measured at EPD Tung Chung AQMS from 18:00 to 20:00 hours on 6th and 7th May 2005.

Table 2.6 Summary of RSP Monitoring Results – Off-site Sampling Locations

Sampling Location	Sampling Description	Sampling Time	Sampling Duration (hr)	Amount in Filter (mg)	Air Volume (m^3)	Concentration ($\mu g\ m^{-3}$)[(a)]	Annual Averages of RSP Concentration measured at EPD Central and Western / Tung Chung AQMS ($\mu g\ m^{-3}$)[(b)]	AQO Criteria
28th – 29th April 2005								
AIR4	Baseline	13:52 (28th Apr) – 13:52 (29th Apr)	24	26.7	1,724	15	53/54	180
AIR5	Baseline	12:12 (28th Apr) – 12:12 (29th Apr)	24	66.0	1,835	36	53/54	180
6th May 2005								
AIR4	Impact	14:00 (6th May) – 14:00 (7th May)	24	31.1	1,700	18	53/54	180
AIR5	Impact	14:00 (6th May) – 14:00 (7th May)	24	71.8	1,779	40	53/54	180
Field Blank at AIR3			1	<1	-	-	53/54	-
7th May 2005								
AIR4	Impact	16:25 (7th May) – 16:25 (8th May)	24	62.3	1,570	40	53/54	180
AIR5	Impact	16:00 (7th May) – 16:00 (8th May)	24	107.3	1,805	59	53/54	180

Notes:
(a) No blank-corrected.
(b) Reference to www.epd.gov.hk

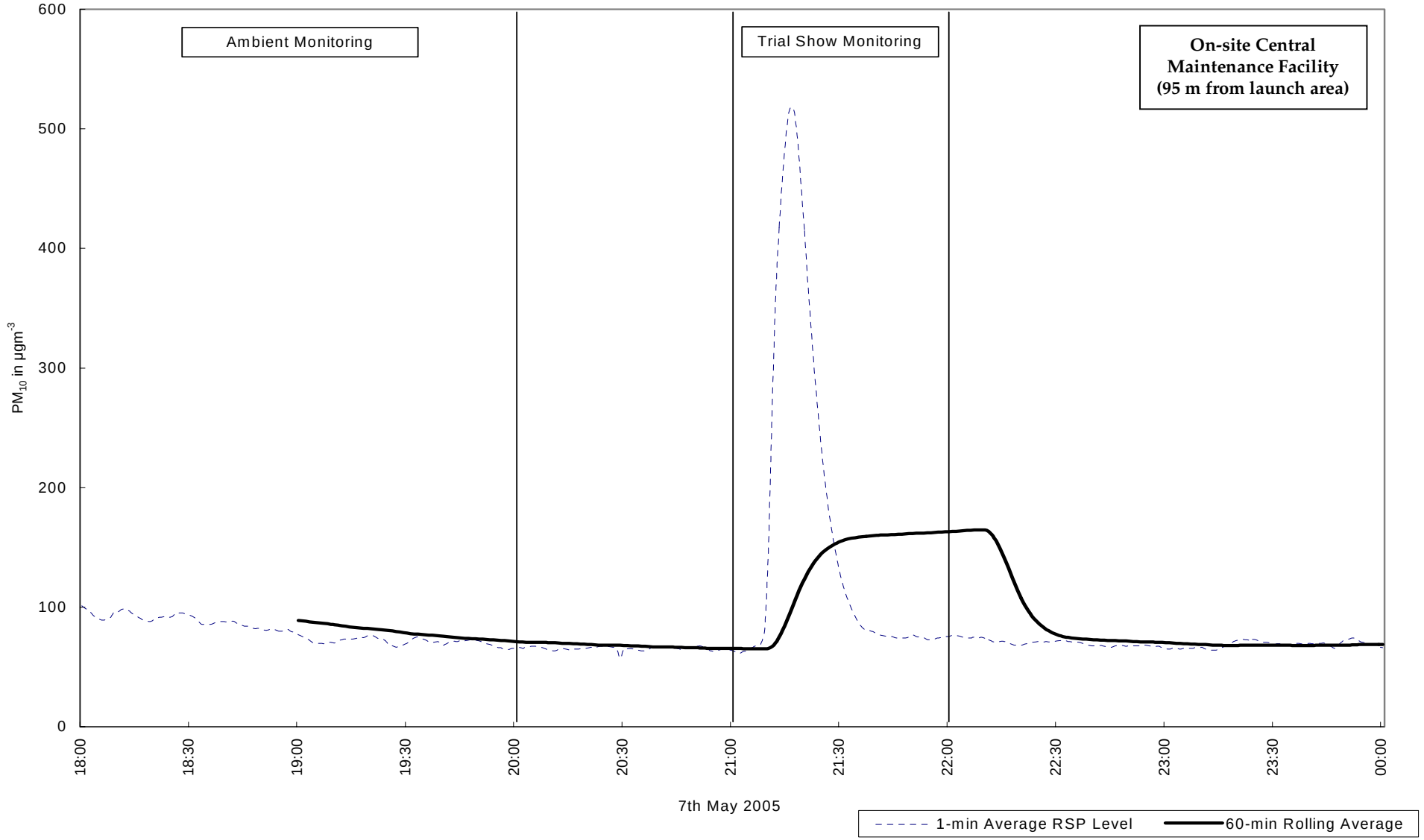


Figure 2.7 RSP Concentration Profile Measured at On-Site Central Maintenance Facility By TEOM on 7 May 2005

2.2.3 Metals

Metals were measured at the three on-site sampling locations and the results (from the RSP filter samples) and blank-corrected concentrations are summarized in *Annex C* and *Table 2.7*, respectively. All the measured results show very low in concentrations and are likely to be attributed to general fluctuations of the background levels.

In accordance with the requirement stated in *Paragraph 3.5 of the Further Environmental Permit (FEP-01/059/2000)* under the *EIAO*, pyrotechnics or fireworks that contain chromium, lead, mercury, arsenic, manganese, nickel or zinc should not be used for any displays in the theme park. The measured concentrations of all these prohibited metals are either not detectable or very low on both 6th and 7th May.

It should be noted that since the measured QC results of zinc (474.411 ppb) has exceeded the expected QC range, which is 400 + / - 50, therefore the measured zinc results on 6th May are deemed to be invalid.

The measured concentration of Barium (Ba) is the highest recorded in this exercise, which is in line with the prediction presented in the approved Theme Park EIA Report (February 2000). The measured results during ambient monitoring and during the trial fireworks displays on both 6th and 7th May are still very low.

In the absence of statutory guidelines for short-term measured metals concentrations in Hong Kong, international guidelines such as *WHO guidelines*, *USEPA guidelines*, *California Air Resource Board (CARB) guidelines* or *Occupational Exposure Limits (OEL)* are adopted for reference as in the approved Theme Park EIA report (February 2000). The available international guidelines are also summarized in the *Table 2.7*. With reference to the OEL (8-hour) for Ba (0.5 mg m^{-3}), the measured results during ambient monitoring and during the trial fireworks displays on both 6th and 7th May are well below the respective OEL (the maximum of 1% of the OEL). The other metal concentrations are also low and well below any known toxicity levels or occupational exposure limits.

Table 2.7 Summary of Metal Concentration (Blank-corrected)

Sampling Location	Sampling Duration	Metal Concentration (mg m^{-3}) [a] [b]																
		Al	Sb	As	Ba	Cr	Cu	Fe	Pb	Mg	Mn	Hg	Mo	Ni	K	Sr	Ti	Zn
6 May 2005																		
AIR1	Ambient (2 hours)	- [c]	-	-	$2.12x10^{-3}$	-	$4.71x10^{-6}$	$1.15x10^{-4}$	$2.06x10^{-5}$	-	$5.22x10^{-6}$	-	-	$1.28x10^{-6}$	-	-	-	- [g]
	Trial (1 hour)	$2.39x10^{-3}$	-	$2.84x10^{-6}$	$2.39x10^{-3}$	$9.78x10^{-6}$	$6.34x10^{-6}$	$1.60x10^{-4}$	$8.96x10^{-6}$	-	$4.85x10^{-6}$	-	-	-	$4.33x10^{-3}$	$2.61x10^{-5}$	-	- [g]
AIR2	Ambient (2 hours)	$8.03x10^{-4}$	$7.66x10^{-7}$	$2.19x10^{-7}$	$8.76x10^{-4}$	-	$6.61x10^{-6}$	$2.32x10^{-4}$	$1.91x10^{-5}$	$2.92x10^{-5}$	$5.95x10^{-6}$	-	-	$9.85x10^{-7}$	$4.38x10^{-4}$	-	-	- [g]
	Trial (1 hour)	-	-	-	-	$1.32x10^{-6}$	$4.85x10^{-6}$	$5.15x10^{-5}$	$3.68x10^{-6}$	-	$2.21x10^{-6}$	-	-	$3.68x10^{-7}$	-	-	-	- [g]
AIR3	Ambient (2 hours)	-	-	$7.35x10^{-8}$	-	$8.46x10^{-7}$	$5.11x10^{-6}$	$9.38x10^{-5}$	$6.12x10^{-5}$	-	$3.20x10^{-6}$	-	-	$4.78x10^{-7}$	-	-	-	- [g]
	Trial (1 hour)	$1.01x10^{-3}$	$2.90x10^{-7}$	$1.01x10^{-6}$	$4.78x10^{-3}$	$4.86x10^{-6}$	$9.35x10^{-6}$	$1.70x10^{-4}$	$3.05x10^{-5}$	$1.01x10^{-4}$	$8.04x10^{-6}$	-	-	-	$1.59x10^{-3}$	-	-	- [g]
7 May 2005																		
AIR1	Ambient (2 hours)	-	-	-	-	$4.67x10^{-6}$	$1.13x10^{-6}$	$5.84x10^{-5}$	$1.68x10^{-6}$	-	$7.30x10^{-7}$	$1.28x10^{-7}$	-	-	-	-	-	-
	Trial (1 hour)	-	-	-	-	-	$1.84x10^{-6}$	-	$2.94x10^{-6}$	-	-	-	-	-	-	-	-	-
AIR2	Ambient (2 hours)	-	$1.82x10^{-7}$	-	-	-	$4.49x10^{-6}$	$2.92x10^{-5}$	$2.19x10^{-6}$	-	$1.68x10^{-6}$	-	-	$9.85x10^{-7}$	-	-	-	-
	Trial (1 hour)	-	-	-	-	$4.18x10^{-6}$	$5.00x10^{-6}$	$2.99x10^{-5}$	$3.43x10^{-6}$	-	$1.94x10^{-6}$	-	$3.73x10^{-7}$	$3.51x10^{-6}$	-	-	-	-
AIR3	Ambient (2 hours)	-	-	-	-	-	$2.79x10^{-6}$	$2.17x10^{-5}$	$2.68x10^{-6}$	$7.25x10^{-6}$	$1.01x10^{-6}$	-	-	$1.81x10^{-7}$	-	-	-	-
	Trial (1 hour)	-	$1.61x10^{-4}$	-	-	-	$7.90x10^{-5}$	$7.35x10^{-5}$	$2.91x10^{-5}$	$3.82x10^{-4}$	$1.26x10^{-5}$	-	-	-	$1.47x10^{-3}$	$6.99x10^{-5}$	$5.15x10^{-6}$	-
Occupation Exposure Limit (8 hour) (mg m^{-3})		10 [d]	0.5 [d]	0.01 [d]	0.5 [d]	0.5 [d]	1 [d]	1 [e]	0.05 [d]	4 [e]	0.2 [d]	0.025 [d]	10 [e]	1.5 [d]	0.05 [d]	-	4 [d]	10 [d]
Acute Reference Exposure Level (mg m^{-3}) (1 hour) [f]		-	-	$1.9x10^{-4}$	-	-	0.1	-	-	-	-	$1.8 x10^{-3}$	-	$6 x10^{-3}$	-	-	-	-

Notes:

(a) Blank-corrected means the exact pollutant levels from the ambient and emission source (measured level subtract field-blank level)

(b) Field blank value is the pollutant level in the sampling media.

(c) "-" represents the sampling value < field blank value

(d) Reference to Code of Practice on Control of Air Impurities (Chemical Substances) in the Workplace by Hong Kong Labour Department

(e) Reference to EH 40/2002 OEL 2002, UK

(f) Reference to OEHHA/ARB Approved Health Value for Use in Hot Spot Facility Risk Assessment (http://www.oehha.org/risk/chemicaldb/acutereference.asp?name=sulfates&number=)

(g) Since the measured QC result of zinc (474.411ppb) has exceeded the expected QC range which is 400 + / 50, therefore, the measured zinc results are deemed to be invalid.

2.2.4 *Sulphate*

Sulphates were measured at the three on-site sampling locations and the results (from the RSP filter samples) are summarized in *Table 2.8*. The measured sulphates results are ranged from 0.73 to 3.53 μg m^{-3}.

There are no statutory guidelines or OELs for short-term measured sulphates concentrations in Hong Kong or UK but the *Office of Environmental Health Hazard Assessment* (OEHHA/ARB) specifies an 1-hour acute reference exposure level of 120 μg m^{-3} for sulphates [1]. All the measured sulphates concentrations are well below the 1-hour acute reference exposure level.

Table 2.8 Sulphate Monitoring Results

Sampling Location	Sampling Description	Sampling Time	Sampling Duration (hr)	Amount in Filter (mg)	Air Volume (m^3) [a]	Concentration (μg m^{-3})[b]
6th May 2005						
AIR1	Ambient	18:00 – 20:00	2	0.20	137	1.50
	Trial	21:00 – 22:00	1	0.049	67	0.73
AIR2	Ambient	18:00 – 20:00	2	0.17	137	1.20
	Trial	21:00 – 22:00	1	0.078	68	1.10
AIR3	Ambient	18:00 – 20:00	2	0.14	136	1.00
	Trial	21:00 – 22:00	1	0.063	69	0.91
Field Blank			-	0.0045	-	-
7th May 2005						
AIR1	Ambient	18:00 – 20:00	2	0.17	137	1.2
	Trial	21:00 – 22:00	1	0.089	68	1.31
AIR2	Ambient	18:00 – 20:00	2	0.17	137	1.2
	Trial	21:00 – 22:00	1	0.12	67	1.79
AIR3	Ambient	18:00 – 20:00	2	0.17	138	1.2
	Trial	21:00 – 22:00	1	0.24	68	3.53
Field Blank			-	<0.0025	-	-

Notes:

(a) The air volume has been corrected to 25°C and 1 atmosphere.

(b) No blank-corrected.

[1] Acute Reference Exposure Level of sulphate is reference to OEHHA/ARB Approved Health Values for Use in Hot Spot Facility Risk Assessment (http://www.oehha.org/risk/chemicaldb/index.asp?error=Unknown+Chemical&chemname=&casnum=)

2.2.5 *Hydrogen Sulphide*

Hydrogen sulphide (H_2S) was measured at all on-site and off-site sampling locations and the results are summarized in *Table 2.9*. The measured ambient H_2S concentrations were below the detection limit on both 6th and 7th May, except at AIR1 (1.7 μg m^{-3}) and AIR4 (1.64 μg m^{-3}) on 6th May. With the odour threshold value of H_2S, i.e., 0.66 μg m^{-3}, the odour level at AIR 1 and AIR 4 during ambient monitoring period on 6th May was 2.6 OU and 2.5 OU, respectively.

During trial fireworks displays on both 6th and 7th May, the measured H_2S concentrations at all on-site and off-site sampling locations are below the detection limit and therefore, it can be concluded that the contribution from the trial fireworks displays are insignificant.

Table 2.9 Hydrogen Sulphide Monitoring Results [(a) (b)]

Sampling Location	Sampling Description	Sampling Time	Sampling Duration (hr)	Amount in Sample (μg/sample)	Air Volume (m^3) [(c)]	Concentration (μg m^{-3})
6th May 2005						
On-site Sampling Locations						
AIR1	Ambient	18:00 – 20:00	2	0.3	0.1814	1.7
	Trial	21:00 – 22:00	1	ND	0.0902	ND
AIR2	Ambient	18:00 – 20:00	2	ND	0.1812	ND
	Trial	21:00 – 22:00	1	ND	0.0907	ND
AIR3	Ambient	18:00 – 20:00	2	ND	0.1828	ND
	Trial	21:00 – 22:00	1	ND	0.091	ND
Off-site Sampling Locations						
AIR4	Ambient	18:00 – 20:00	2	0.3	0.1834	1.64
	Trial	21:00 – 22:00	1	ND	0.0917	ND
AIR5	Ambient	18:00 – 20:00	2	ND	0.1786	ND
	Trial	21:00 – 22:00	1	ND	0.0905	ND
Field Blank			-	ND	-	-
7th May 2005						
On-site Sampling Locations						
AIR1	Ambient	18:00 – 20:00	2	ND	0.1836	ND
	Trial	21:00 – 22:00	1	ND	0.0907	ND
AIR2	Ambient	18:00 – 20:00	2	ND	0.1825	ND
	Trial	21:00 – 22:00	1	ND	0.0915	ND
AIR3	Ambient	18:00 – 20:00	2	ND	0.1828	ND
	Trial	21:00 – 22:00	1	ND	0.0913	ND
Off-site Sampling Locations						
AIR4	Ambient	18:00 – 20:00	2	ND	0.1786	ND
	Trial	21:00 – 22:00	1	ND	0.0905	ND
AIR5	Ambient	18:00 – 20:00	2	ND	0.1834	ND
	Trial	21:00 – 22:00	1	ND	0.0917	ND
Field Blank			-	ND	-	-

Notes:

(a) No blank-corrected.

(b) ND = not detected.

(c) The air volume is at 25°C and 1 atmosphere.

2.2.6 *Volatile Organic Compounds*

TVOCs and speciated VOCs were measured at on-site sampling locations and the results are summarized in *Tables 2.10 – 2.12*, respectively. All the measured TVOC concentrations were below the practical quantitation limit (PQL) during both ambient monitoring and trial fireworks displays periods on 6th and 7th May. Therefore, it can be concluded that the contribution of TVOCs from the trial show is insignificant.

Table 2.10 TVOC Monitoring Results

Sampling Location	Sampling Description	Sampling Duration (hr)	TVOC Monitoring Results (ppmv) [a]	
			Sampling Results [b]	PQL [c]
6th May 2005				
AIR1 – Hollywood Hotel	Ambient	2	ND	2.5
	Trial	1	ND	2.5
AIR2 – Buzz Light Year	Ambient	2	ND	2.5
	Trial	1	ND	2.5
AIR3 – Central	Ambient	2	ND	2.5
Maintenance Facility	Trial	1	ND	2.5
Field Blank			ND	2.5
7th May 2005				
AIR1 – Hollywood Hotel	Ambient	2	ND	2.5
	Trial	1	ND	2.5
AIR2 – Buzz Light Year	Ambient	2	ND	2.5
	Trial	1	ND	2.5
AIR3 – Central	Ambient	2	ND	2.5
Maintenance Facility	Trial	1	ND	2.5
Field Blank			ND	2.5

Notes:
(a) No blank-corrected
(b) ND = not detected
(c) PQL = Practical Quantitation Limit

Most of the speciated VOCs measured are below the PQL, the exceptions are Freon 12, Freon 11, Freon 113, dichloromethane, toluene, ethylbenzene, m,p-xylene, o-xylene, p-dichlorobenzene, o-dichlorobenzene and 1,2,4-trichlorobenzene. The measured levels of these VOCs are slightly higher than their respective PQL. The exception was dichloromethane for which a concentration of 67 ppbv was measured at Hollywood Hotel (AIR1) during the trial fireworks displays on 6th May 2005. The measured dichloromethane concentrations at all on-site sampling locations showed inconsistent results, with four of a total of six data sets measured during the trial fireworks displays lower than the ambient levels. These fluctuations are likely attributed to the natural background variations and hence contribution from the trial fireworks displays is not expected.

There are no statutory criteria for short-term measured VOCs concentrations in Hong Kong, and therefore the international guidelines for OELs are adopted for reference as in the approved Theme Park EIA report (February 2000). The OELs (8 hour) of dichloromethane and toluene are both 50 ppmv. Compared to the highest measured results of dichloromethane and toluene

during trial fireworks displays on both 6th and 7th May, the measured highest dichloromethane (67 ppbv) and toluene (7.6 ppbv) are well below their respective OELs.

Table 2.11 Summary of VOC (Speciated) Results (6th May 2005)

VOC	VOC Concentrations (ppbv) [a] [b] [c]													
	AIR1				AIR2				AIR3				Field Blank	PQL
	Ambient	PQL	Trial fireworks displays	PQL	Ambient	PQL	Trial fireworks displays	PQL	Ambient	PQL	Trial fireworks displays	PQL		
Freon 12	1.3	2.4	1.4	3.2	1.3	3.4	1.4	3.1	1.9	3.1	0.78	3.4	ND (< 0.2)	1.0
Chloromethane	1.7	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	ND (< 0.6)	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Freon 114	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	0.98	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Vinyl chloride	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	0.85	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
1,3-Butadiene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	ND (< 0.6)	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Bromomethane	ND (< 0.5)	2.4	ND (< 0.6)	3.2	1.0	3.4	0.79	3.1	2.0	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Chloroethane	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	ND (< 0.6)	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Freon 11	0.56	2.4	0.86	3.2	0.82	3.4	0.79	3.1	1.2	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
1,1-Dichloroethene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	0.99	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Dichloromethane	42	2.4	67	3.2	43	3.4	11	3.1	7.6	3.1	5.4	3.4	ND (< 0.2)	1.0
Freon 113	ND (< 0.5)	2.4	0.90	3.2	0.73	3.4	0.69	3.1	1.1	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
1,1-Dichloroethane	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	0.88	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
cis-1,2-Dichloroethene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	0.98	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Chloroform	ND (< 0.5)	2.4	0.84	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	1.2	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
1,2-Dichloroethane	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	1.0	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
1,1,1-Trichloroethane	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	0.75	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Benzene	0.73	2.4	1.0	3.2	1.0	3.4	1.1	3.1	1.6	3.1	0.85	3.4	ND (< 0.2)	1.0
Carbon tetrachloride	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	0.62	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
1,2-Dichloropropane	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	ND (< 0.6)	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Trichloroethene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	0.97	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
cis-1,3-Dichloropropene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	0.80	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
trans-1,3-Dichloropropene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	0.91	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
1,1,2-Trichloroethane	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	0.81	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Toluene	2.3	2.4	7.6	3.2	3.4	3.4	7.5	3.1	2.4	3.1	7.2	3.4	ND (< 0.2)	1.0
1,2-Dibromoethane	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	1.1	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Tetrachloroethene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	1.1	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Chlorobenzene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	1.4	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Ethylbenzene	ND (< 0.5)	2.4	1.4	3.2	0.76	3.4	1.8	3.1	1.3	3.1	1.1	3.4	ND (< 0.2)	1.0
m,p-Xylene	ND (< 0.5)	2.4	2.6	3.2	1.1	3.4	3.7	3.1	2.5	3.1	2.1	3.4	ND (< 0.2)	1.0
Styrene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	2.5	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
1,1,2,2-tetrachloroethane	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	1.2	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
o-Xylene	ND (< 0.5)	2.4	0.94	3.2	ND (< 0.6)	3.4	1.2	3.1	1.1	3.1	1.4	3.4	ND (< 0.2)	1.0
4-Ethyltoluene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	0.87	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
1,3,5-Trimethylbenzene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	0.99	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
1,2,4-Trimethylbenzene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	0.95	3.1	1.5	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
m-Dichlorobenzene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	2.8	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
Benzyl chloride	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	1.8	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
p-Dichlorobenzene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	3.8	3.1	0.94	3.4	ND (< 0.2)	1.0
o-Dichlorobenzene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	2.8	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0
1,2,4-Trichlorobenzene	0.73	2.4	0.70	3.2	1.5	3.4	1.07	3.1	5.1	3.1	5.6	3.4	ND (< 0.2)	1.0
Hexachlorobutadiene	ND (< 0.5)	2.4	ND (< 0.6)	3.2	ND (< 0.6)	3.4	ND (< 0.6)	3.1	1.5	3.1	ND (< 0.7)	3.4	ND (< 0.2)	1.0

Notes:

(a) No blank-corrected.

(b) ND = not detected which is below MDL (Method Detection Limit)

(c) The result, which is lower than the PQL, should be taken with caution.

Table 2.12 Summary of VOC (Speciated) Results (7th May 2005)

VOC	VOC Concentrations (ppbv) [a] [b] [c]													
	AIR1				AIR2				AIR3				Field Blank	PQL
	Ambient	PQL	Trial fireworks displays	PQL	Ambient	PQL	Trial fireworks displays	PQL	Ambient	PQL	Trial fireworks displays	PQL		
Freon 12	0.74	2.3	ND (< 0.7)	3.3	1.2	3.2	1.2	2.9	1.2	3.1	1.2	3.3	ND (< 0.2)	1.0
Chloromethane	ND (< 0.5)	2.3	0.67	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Freon 114	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Vinyl chloride	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
1,3-Butadiene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Bromomethane	ND (< 0.5)	2.3	ND (< 0.7)	3.3	0.79	3.2	0.76	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Chloroethane	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Freon 11	ND (< 0.5)	2.3	ND (< 0.7)	3.3	0.81	3.2	0.77	2.9	0.76	3.1	0.80	3.3	ND (< 0.2)	1.0
1,1-Dichloroethene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Dichloromethane	1.2	2.3	0.94	3.3	32	3.2	4.3	2.9	3.5	3.1	4.6	3.3	ND (< 0.2)	1.0
Freon 113	ND (< 0.5)	2.3	ND (< 0.7)	3.3	0.70	3.2	0.68	2.9	0.64	3.1	0.73	3.3	ND (< 0.2)	1.0
1,1-Dichloroethane	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
cis-1,2-Dichloroethene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Chloroform	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
1,2-Dichloroethane	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
1,1,1-Trichloroethane	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Benzene	0.54	2.3	ND (< 0.7)	3.3	0.91	3.2	0.83	2.9	0.86	3.1	1.0	3.3	ND (< 0.2)	1.0
Carbon tetrachloride	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
1,2-Dichloropropane	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Trichloroethene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
cis-1,3-Dichloropropene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
trans-1,3-Dichloropropene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
1,1,2-Trichloroethane	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Toluene	2.2	2.3	1.1	3.3	5.6	3.2	2.9	2.9	4.84	3.1	2.6	3.3	ND (< 0.2)	1.0
1,2-Dibromoethane	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Tetrachloroethene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Chlorobenzene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Ethylbenzene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	1.4	3.2	1.1	2.9	2.0	3.1	1.0	3.3	ND (< 0.2)	1.0
m,p-Xylene	0.55	2.3	ND (< 0.7)	3.3	2.2	3.2	1.7	2.9	2.5	3.1	1.4	3.3	ND (< 0.2)	1.0
Styrene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
1,1,2,2-tetrachloroethane	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
o-Xylene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	0.72	3.2	ND (< 0.6)	2.9	0.88	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
4-Ethyltoluene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	0.66	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
1,3,5-Trimethylbenzene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
1,2,4-Trimethylbenzene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	1.5	3.2	0.87	2.9	0.96	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
m-Dichlorobenzene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
Benzyl chloride	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
p-Dichlorobenzene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
o-Dichlorobenzene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0
1,2,4-Trichlorobenzene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	1.1	3.2	1.3	2.9	0.80	3.1	0.76	3.3	ND (< 0.2)	1.0
Hexachlorobutadiene	ND (< 0.5)	2.3	ND (< 0.7)	3.3	ND (< 0.6)	3.2	ND (< 0.6)	2.9	ND (< 0.6)	3.1	ND (< 0.7)	3.3	ND (< 0.2)	1.0

Notes:
(a) No blank-corrected.
(b) ND = not detected which is below MDL (Method Detection Limit)
(c) The result which is lower than the PQL should be taken with caution.

2.2.7 PCDD/PCDF

Dioxins and furans were measured at three on-site sampling locations and the measured results (with Total pg I-TEQ/m^3) and the dioxin concentrations are summarized in *Tables 2.13* and *Annex D*, respectively.

Table 2.13 Total PCDD/PCDF Monitoring Results

Sampling Location	Sampling Description	Sampling Duration (hr)	Total PCDD/PCDF Monitoring Results (pg I-TEQ/m^3)
6th May 2005			
AIR1	Ambient	2	0.043
	Trial fireworks displays	1	0.096
AIR2	Ambient	2	0.063
	Trial fireworks displays	1	0.100
AIR3	Ambient	2	0.046
	Trial fireworks displays	1	0.075
7th May 2005			
AIR1	Ambient	2	0.0346
	Trial fireworks displays	1	0.066
AIR2	Ambient	2	0.031
	Trial fireworks displays	1	0.106
AIR3	Ambient	2	0.104
	Trial fireworks displays	1	0.065

The total hourly PCDD/PCDFs results during the trial fireworks displays were between 0.075 and 0.100 pg I-TEQ/m^3 on 6th May and between 0.065 and 0.106 pg I-TEQ/m^3 on 7th May.

On 6th May, Buzz Light Year (AIR2) and Central Maintenance Facility (AIR3) were both upwind locations and the measured dioxins concentrations during the trial fireworks displays were higher than the measured ambient, indicating that the increase in dioxins are not due to the fireworks display.

On 7th May, Hollywood Hotel (AIR1) and Buzz Light Year (AIR2) were the upwind locations and the measured dioxins concentrations during the trial fireworks displays were higher than the measured ambient. However, the measured dioxin concentration at the Central Maintenance Facility (AIR3), which was located downwind from the launch area, during the trial fireworks displays was lower than the measured ambient, confirming that fireworks displays do not contribute to dioxins concentrations in the atmosphere.

The averaged 24-hour ambient dioxin concentration measured at Penny's Bay (PB) from November 2002 to August 2003 under the project *Infrastructure for Penny's Bay Development – Contract 2* is in a range of 0.0071 pg I-TEQ/m^3 to 0.2973 pg I-TEQ/m^3 [1].

[1] Reference to the Infrastructure for Penny's Bay Development - Contract 2 (http://www.pennysbaycontract2.com/default.htm)

The total dioxin background concentrations measured at Tsing Yi for the operation of Chemical Waste Treatment Centre (CWTC) were in a range of 0.035 pg I-TEQ/m^3 to 0.2 pg I-TEQ/m^3 from October 1999 to February 2005.

The ambient 24-hour dioxin concentrations measured at Tsuen Wan and Central/Western Air Quality Monitoring Stations (AQMSs) from May 2004 to April 2005 was in a range of 0.036 pg I-TEQ/m^3 to 0.093 pg I-TEQ/m^3 and 0.035 pg I-TEQ/m^3 to 0.132 pg I-TEQ/m^3, respectively.

It should be noted that the sampling periods for the trial fireworks displays are different from the ambient 24-hour dioxin levels reported above and therefore the measured results cannot be directly compared with the ambient concentrations measured at PB, Tsing Yi, Tsuen Wan and Central/Western AQMSs. In any case, the measured levels of the most toxic congeners are low at all sampling locations.

By reviewing the background dioxin concentrations measured at Penny's Bay, Tsing Yi, Tsuen Wan and Central/Western AQMSs, there are significant fluctuations of the ambient dioxin levels, indicating that the increase of the dioxin concentrations during trial fireworks displays on both days are likely attributed to general fluctuations of background levels.

2.3 QUALITY ASSURANCE AND CONTROL (QA/QC)

2.3.1 Introduction

This air quality monitoring programme was followed the quality assurance and control (QA/QC) requirements of the methods or higher levels if appropriate, with any exceptions or qualified data noted.

Overall sampling and analytical precision was assessed for dioxins and VOCs (total and speciated) by operating co-located samplers for these parameters at Site AIR2 (Building #306 Buzz Light Year). No project-specific precision objectives for field duplicates were established prior to the test, but the precision levels obtained for any pollutants found well above detection limits were generally within typical requirements.

Laboratory blanks and field blanks were used with each method (except TEOM monitoring) to assess any background pollutant levels in the sampling media or in the environment the media were exposed to.

Dr. Frank S C Lee of the Hong Kong Polytechnic University is the independent QA coordinator (QAC) of this project. He has reviewed PCDD/PCDF, total and speciated, metals and RSP results; checked calculations for one run; and provided an assessment of overall data quality. The QAC also reviewed raw data provided for PCDD/PCDF, total and speciated, metals and RSP. The remainder of this section provides the results of the independent QA review.

All the calibration details, QA/QC results and duplicate results are presented in *Annexes E ,F* and *G*, respectively.

2.3.2 QA/QC Review for RSP

The QAC reviewed the data supplied by HKPC. The following findings were made:

- RSP results & sampling record provided by HKPC were acceptable and can be easily traced by auditor for QA/QC evaluation.
- Average sample flow rate obtained from the high volume air samplers were varied within 10% of the normal setting.

2.3.3 QA/QC Review of Metals Results

The QAC reviewed the data supplied by HKPC. QC data indicated acceptable recoveries and method blank results for metals were all below the detection limits.

However, the method QC result of zinc (474.411 ppb) has exceeded its expected QC range, which is 400 + / - 50, therefore the blank-corrected zinc results are deemed to be invalid.

2.3.4 QA/QC Review of Sulphate Results

The data supplied by HKPC was reviewed. QC data indicated acceptable recoveries and field blank results were all below the detection limit.

2.3.5 QA/QC Review of H_2S Results

QC data indicated acceptable recoveries and field blank results were all below the detection limit.

2.3.6 QA/QC Review of Total VOC Results

The QAC reviewed the data supplied by HKPC. The following findings were made:

- QC data indicated acceptable recoveries.
- Field blanks were below detection limits.
- Field duplicate samples were acceptable.

2.3.7 QA Review of Speciated VOC Results

The VOC analyses were performed using TO-14A by HKPC. QC results showed LCS recovery ranging from 78.5-110.5% for spiked compounds and it is within the acceptable range of 70-130%.

In summary, no significant problems were found with the presented data package. LCS and sample duplicate results were acceptable. The original sample traceability form was included with the data package.

2.3.8 QA/QC Review of PCDD/PCDF Results

Specific items checked for the PCDD/PCDF analysis included:

- Checked surrogate and internal standards recoveries for all samples.
- Reviewed the field blank sample results.
- Reviewed method blank results with internal standards recoveries.
- Transcribed results from summary page to final table.
- Checked sample ID for traceability from sample preparation to analysis.
- Examined analyst's interpretation and notations for correctness.

The QC data were within typical and acceptable ranges for standard USEPA guidelines. Audited data were found to be traceable through sample preparation and analytical raw data and correctly calculated from the final extract volume, dilution factor, and unit conversion.

The field duplicate dioxin samples were reviewed and the results were acceptable.

2.4 CONCLUSIONS

Based on the test results, the air sampling was successful in collecting air quality impact data for the short-term fireworks event on 7th May. Due to the loss of the TEOM data during the trial fireworks displays on 6th May, no representative continuous RSP results were recorded on 6th May.

The sampling locations, which were determined based on the expected wind direction and location of the launching area, appeared to be appropriately sited to cover both downwind situation normally during summertime (mainly southerly and southeasterly wind) and also during wintertime (mainly northerly wind).

RSP, metals, sulphate, H_2S, TVOC, speciated VOCs, dioxins and furans were measured on-site before the trial fireworks displays and during the trial fireworks displays on 7th May. An elevation of RSP concentration during trial fireworks displays was observed at the Central Maintenance Facility (AIR3) on 7th May and this proves that the air monitoring at AIR3 successfully captured the dust plume and resulted in a short-term increase in the measured RSP concentrations. 17 metals were measured and the measured levels were low or not detected. In the absence of statutory guidelines for short-term metals concentrations, international guidelines such as acute reference exposure levels (reference to OEHHA/ARB) or occupational exposure limits (OEL) are adopted for reference as in the approved Theme Park EIA report (February 2000). All measured concentrations are well below any acute reference exposure levels or OEL. Though the measured concentrations of

barium was the highest among these 17 metals, this is in line with the prediction carried out in the approved Theme Park EIA Report (February 2000). The measured levels of sulphate at all on-site sampling locations during the trial fireworks displays were low. No H_2S were detected during the trial fireworks displays on both days. The measured TVOC, 42 speciated VOCs and dioxins were also low and most VOC samples were below detection limit. The measured levels of the most toxic congeners were low at all sampling locations.

As most of the key parameters including the types of fireworks devices used, the distance between launch areas and the sampling locations, and the meteorological conditions and background air quality in the trial fireworks displays differ from the Trial Test conducted in Orlando in year 2000, the measured results obtained from the Hong Kong trial fireworks displays could not be directly compared with those results of the previous Trial Test conducted in Orlando. In general, the findings from the Orlando Trial Test were similar to the current monitoring results which showed short-term elevation of RSP levels for the downwind monitoring station and low concentrations of the metals, sulphates, VOCs and dioxins were measured from both monitoring exercises.

24-hour RSP concentrations and H_2S were also measured at the off-site sampling locations in Peng Chau and Discovery Bay, which are the nearest Air Sensitive Receivers (ASRs) to the Hong Kong Disneyland. Even though Peng Chau was considered to be in the downwind location on 6th May, the measured 24-hour RSP concentration at Peng Chau was low. Due to the large separation between the fireworks launch area and the off-site sampling locations, the contribution from the trial fireworks displays on both 6th May and 7th May were low. The measured RSP levels were well below the statutory RSP criterion. The results are considered to be comparable to the annual averaged RSP concentrations measured at EPD Tung Chung and Central/Western AQMSs. H_2S concentration was measured in Peng Chau and Discovery Bay and H_2S concentration was detected in Peng Chau during the ambient monitoring on 6th May. No H_2S concentrations were detectable in Peng Chau and Discovery Bay during the trial fireworks displays on either day.

The trial monitoring results concur with EIA prediction that HKDL fireworks program would not cause any significant impacts to the surrounding environment. Therefore in accordance with the recommendations of the approved Theme Park EIA report (February 2000), an operational monitoring program for key parameters including 24-hour RSP, barium, copper and dioxins and 1-hour H_2S shall be undertaken during the first operational year for verification purpose.

3 NOISE MONITORING

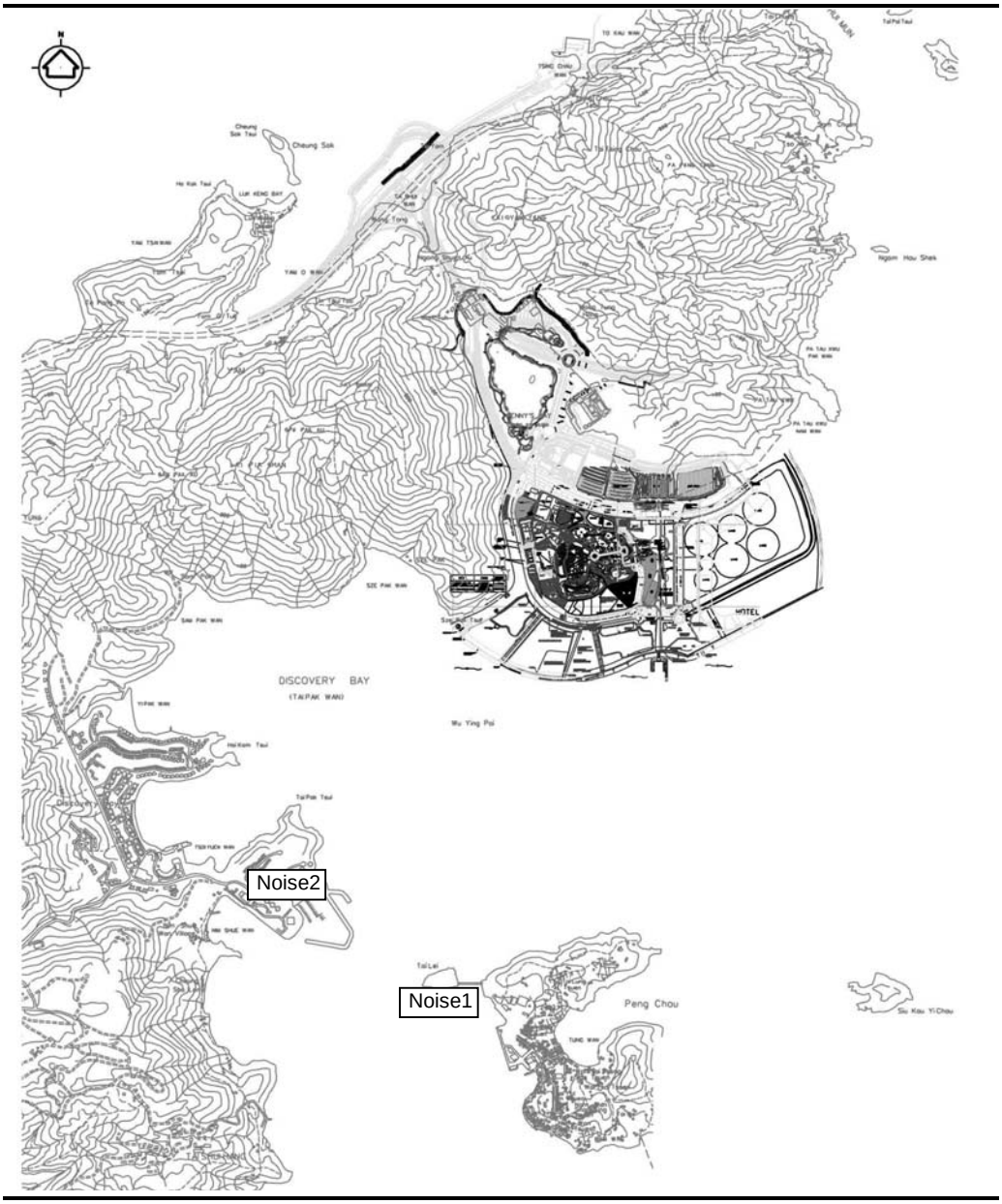
3.1 NOISE MONITORING LOCATION

Noise monitoring was conducted at the two agreed off-site monitoring locations including the following:

NOISE1: Tai Lei, Peng Chau; and
NOISE2: Rooftop of Cherish Court in Discovery Bay.

The monitoring locations are shown in *Figure 3.1*.

Figure 3.1 Noise Monitoring Locations



3.1.1 *Site Description*

Tai Lei, Peng Chau

Tai Lei, Peng Chau is located approximately 2.7 km from the main launch area. Due to the fact that there are no suitable permanent building façade within Tai Lei which has an unobstructed view to HKDL and free of extraneous noise disturbance, the container located at end of the Tai Lei ferry pier was selected as the measurement location. The façade measurement location was set at 1.2 m above the ground level with a direct view over looking HKDL. The monitoring location and photographical records of the equipment set up are presented in *Figures 3.2* and *3.3*, respectively.

Figure 3.2 Tai Lei, Peng Chau: NOISE1

Figure 3.3 Photographical Record of Equipment Set up

Rooftop of Cherish Court, Discovery Bay

Cherish Court is located approximately 2.4 km from the main launch area. The façade measurement location was set at rooftop of Cherish Court approximately 53 m above the ground level, with an unobstructed view over looking HKDL. Several locations within the Discovery Bay were considered for undertaking the noise measurements. In view of its location and height, it was considered that the rooftop of Cherish Court represents the worst affected location in terms of firework noise impacts. The monitoring location and photographical records of the equipment set up are presented in *Figures 3.4* and *3.5*, respectively.

Figure 3.4 ***Rooftop of Cherish Court, Discovery Bay: NOISE2***

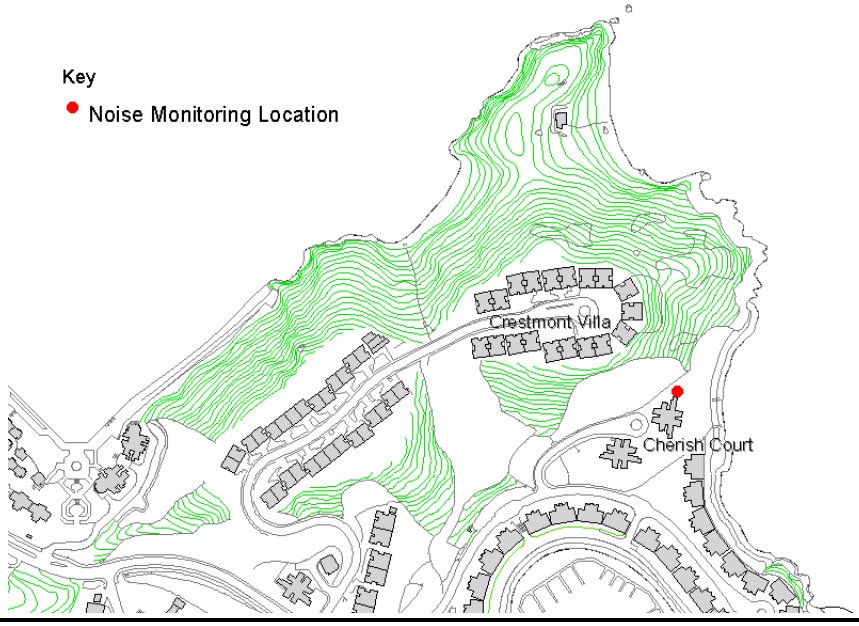


Figure 3.5 ***Photographical Record of Equipment Set up***

3.2 MONITORING METHODOLOGY

Façade noise measurements were carried out at NOISE1 and NOISE2. The sound level meter and calibrator used for the noise monitoring, as listed in *Table 3.1* below, complies with IEC 651: 1979 and 804:1985 (Type 1) specification. The microphone was positioned at 1m from a façade, which has a direct line of sight to the Theme Park perimeter.

Table 3.1 Noise Measurement Equipments

Monitoring Location	Monitoring Equipment
NOISE1 –Tai Lei, Peng Chau	01-dB - Stell ~ Symphonie Measurement System B&K 4231 calibrator
NOISE2 – Cherish Court, Discovery Bay	01-dB - Stell ~ Symphonie Measurement System B&K 4231 calibrator

Noise monitoring was conducted with reference to the calibration and measurement procedures as stated in the *Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites*. Immediately prior to and following each noise measurement the accuracy of the monitoring 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.

Noise measurements were made without the presence of fog and rain, and with steady wind speed and gusts not exceeding 5m/s and 10m/s, respectively. Measurement of L_{Aeq} has been recorded at 100ms interval.

A $L_{Aeq, 15\ minute}$ noise measurement was made starting from the start of the trial fireworks displays. Ambient noise levels of at least 15 minutes were also measured prior to and immediately after the 15 minutes firework measurement period for establishing the averaged background noise level. During the measurement, a detailed log of noise event was undertaken to record down any significant extraneous noise activities. The noise measurement was conducted in accordance with the agreed monitoring methodology (refer to *Annex H)*. Any significant influences on the measured noise levels were taken into account in accordance with standard acoustical principles and practices.

3.3 MONITORING RESULTS

During the fireworks noise measurement, any significant extraneous noise levels were taken into account in accordance with standard acoustical principles and practices. The monitoring results are presented in the following Sections.

3.3.1 6th May 2005

As discussed in *Section 2.1.1*, a meteorological station was set up at the rooftop of the Central Maintenance Facility within HKDL. 1-minute average wind speed and wind data were recorded throughout the noise monitoring period.

On 6th May 2005, the wind direction recorded during the 15-minute trial fireworks displays (21:06 – 21:21) was 93% from the north and 7% from the north-northwest. The wind speed recorded was between 2.2 to 3.6 ms^{-1} with an average wind speed of 3.2 ms^{-1}. Both monitoring locations (ie Tai Lei, Peng Chau (NOISE1) and Cherish Court, Discovery Bay (NOISE2)) were therefore considered to be in the downwind locations with the wind blowing from the source to the monitoring locations. Such downwind conditions are favourable for sound propagation, as wind blowing towards the receivers from the source will diffract the sound waves downwards, resulting in increased noise levels, hence representing a worst case scenario.

The actual trial fireworks displays was started on 21:06.

Tai Lei, Peng Chau – NOISE1

The background noise measurement was started on 20:45. During the firework noise measurement, there were no significant local noise sources affecting the measurement.

The measured results are presented in *Table 3.2*.

Table 3.2 Monitoring Results ($L_{eq, 15\ min}$ dB(A))

	Noise Levels
Ambient measurement before the trial fireworks displays	53.1
Ambient measurement after the 15min trial fireworks displays	55.1
Averaged Background Noise Levels	54.2
$L_{eq, 15min}$ measurement during the trial fireworks displays	56.1
Corrected Fireworks Noise Levels	**51.5**
Noise Criterion ($L_{eq, 15min}$)	**55**

Cherish Court, Discovery Bay – NOISE2

The background measurement was started on 20:48 and the background measurement was conducted taking into consideration the influence of the significant extraneous noise in accordance with standard acoustical principles and practices. Extended background noise measurements have been conducted following the trial fireworks displays to ensure the background noise measurement was representative. The measured results are presented in *Table 3.3*.

Table 3.3 Monitoring Results ($L_{eq, 15\ min}$ dB(A))

	Noise Levels
Ambient measurement before the trial fireworks displays [a]	52.9
Ambient measurement after the 15min trial fireworks displays [b]	53.5
Averaged Background Noise Levels	53.3
$L_{eq, 15min}$ measurement during the trial fireworks displays	57.0
Corrected Fireworks Noise Levels	**54.6**
Noise Criterion ($L_{eq, 15min}$)	**55**

Note:

(a) Due to the influence of extraneous noise from equipment set up, a total of 9 min of ambient noise measurement was conducted prior to the firework trial fireworks displays.

(b) Extend background noise measurement was conducted to ensure sufficient noise data for establishing the average ambient sound pressure level

The monitoring results indicated that the corrected firework noise levels at both monitoring locations have complied with the stipulated noise criterion of $L_{eq, 15\ min}$ 55 dB(A). It is also considered that the noise monitoring results have represented a worst-case scenario since both monitoring locations are considered to be in the downwind location throughout the 15-minute firework noise monitoring period.

3.3.2 7th May 2005

On 7th May 2005, the wind direction recorded during the 15-minute trial fireworks displays (21:06 – 21:21) was 67% from the east-southeast, 26% from the south-east and 7% from the east. The wind speed recorded was between 0.9 to 2.7 ms^{-1} with an average wind speed of 1.6 ms^{-1}. Both monitoring locations (i.e., Peng Chau RTF (NOISE1) and Cherish Court, Discovery Bay (NOISE2)) were therefore considered to be in the upwind locations.

The actual trial fireworks displays was started on 21:06.

Tai Lei, Peng Chau – NOISE1

The background noise measurement was started on 20:46.

During the firework noise measurement, it was observed that there were four noisy speedboats passing by with people cheering and shouting as the boat went pass the monitoring location having a significant influence on the measured noise levels. There were also human activities including people cheering nearby having some influence on the measured noise levels. In view of the significant influence of the extraneous noise during the noise monitoring, and after discussion and agreement with the EPD, the noise measurement results for the 7th May show are deemed to be invalid due to the significant extraneous noise.

Cherish Court, Discovery Bay – NOISE2

Extended background measurement was conducted starting at 20:08. It was observed that throughout the trial fireworks displays, the noise measurement was continuously influenced by significant extraneous noise, such as people

cheering and shouting, party poppers, dogs barking, located approximately 80m from the measurement location. In view of the significant influence of the extraneous noise during the noise monitoring, and after discussion and agreement with the EPD, the noise measurement results for the 7th May show are deemed to be invalid due to the significant extraneous noise.

3.4 CONCLUSIONS

In accordance with the requirements stated in the Section 3.1 of the Further Environmental Permit (FEP-01/059/2000), trial fireworks displays was held on 6th May 2005. Monitoring was also undertaken on 7th May 2005, to ensure that backup data is available should problem with the 6th May data be encountered. Noise monitoring was undertaken at the agreed monitoring location, Peng Chau, Tai Lei and rooftop of Cherish Court, Discovery Bay.

The monitoring results conducted for the 6th May 2005 trial fireworks displays indicated that the firework noise levels at both monitoring locations (Peng Chau, Tai Lei and Cherish Court, Discovery Bay) have complied with the stipulated noise criterion of $L_{eq, 15\ min}$ 55 dB(A). It is considered that the noise monitoring results for the 6th May 2005 represented a worst-case scenario since both monitoring locations are considered to be in the downwind location throughout the 15 minute firework noise monitoring period.

With reference to the on-site wind data, both monitoring locations are considered to be in the upwind locations throughout the 15-minute firework noise monitoring during the 7th May 2005 trial fireworks displays. The noise measurements conducted at Peng Chau, Tai Lei and Cherish Court, Discovery Bay were influenced by significant extraneous noise throughout the trial fireworksdisplays. After discussion and agreement with the EPD, the noise measurement results for the 7th May show are deemed to be invalid due to the significant extraneous noise.

4 OVERALL CONCLUSIONS

In accordance with the requirements stated in the *Section 3.1 of the Further Environmental Permit (FEP-01/059/2000)*, the Permit Holder (HKITP) shall carry out trial fireworks displays and associated air and noise monitoring prior to the operation of the Hong Kong Disneyland. Trial fireworks displays and the associated air and noise monitoring were held on 6th May 2005. The same display and monitoring was also undertaken on 7th May 2005, to ensure that backup data is available should problem with the 6th May data be encountered.

4.1 AIR QUALITY MONITORING

Air monitoring were conducted at three on-site monitoring locations, the rooftop of Hollywood Hotel, Building #306 Buzz Light Year and Building #609 Central Maintenance Facility; and two off-site locations, Peng Lai Court in Peng Chau and Crestmont Villa Management Office in Discovery Bay on 6th and 7th May 2005. To confirm the Orlando Trial Test findings, respirable suspended particulates (RSP), 17 types of metals, sulphate, hydrogen sulphide (H_2S), total volatile organic compounds (TVOC), speciated VOCs and dioxins were measured two hours prior to the trial fireworks displays and one hour during the trial fireworks displays for the on-site monitoring locations. In addition, 24-hour RSP and 1-hour H_2S were measured at the two off-site monitoring locations.

Due to the loss of TEOM data collected on 6th May 2005, the data collected for 6th May 2005 was therefore not considered to be representative.

Based on the 7th May 2005 results, the on-site air sampling was successful in capturing the dust plume from the short-term trial fireworks displays, as demonstrated by a temporary elevation of RSP concentration during the trial fireworks displays at the Central Maintenance Facility (AIR3). However, the measured concentrations of pollutants including metals, sulphate, H_2S, TVOC, speciated VOCs, dioxin were low. In the absence of statutory guidelines for short-term metals, sulphate, TVOC and speciated VOCs concentrations, international guidelines such as acute reference exposure levels (reference to OEHHA/ARB) or occupational exposure limits (OEL) are adopted for reference as in the approved Theme Park EIA report (February 2000). All measured concentrations are well within the respective criteria, any acute reference exposure levels (reference to OEHHA/ARB) or occupational limits by HK Labour Department or UK EH40/2002.

24-hour RSP concentrations and H_2S were also measured at the off-site monitoring locations in Peng Chau and Discovery Bay which are the nearest Air Sensitive Receivers (ASRs) to the Hong Kong Disneyland. Even though Peng Chau was considered in the downwind location on 6th May, the measured 24-hour RSP concentration was very low and the results are

considered to be comparable to the averaged 24-hour RSP concentrations measured at EPD Tung Chung and Central/Western AQMS. Due to the large separation between the fireworks launch area and the off-site monitoring locations, the contribution from the trial fireworks displays on both 6th May and 7th May were low and the measured RSP levels were well below the statutory RSP criterion in Peng Chau and Discovery Bay. H_2S concentration was measured in Peng Chau and Discovery Bay and H_2S concentration was detected in Peng Chau during the ambient monitoring on 6th May. No H_2S concentrations were detectable during the trial fireworks displays on either days.

The trial monitoring results concur with EIA prediction that HKDL fireworks program would not cause any significant impacts to the surrounding environment. Therefore in accordance with the recommendations of the approved Theme Park EIA report (February 2000), an operational monitoring program for key parameters including 24-hour RSP, barium, copper and dioxins and 1-hour H_2S shall be undertaken during the first operational year for verification purpose.

4.2 NOISE MONITORING

The monitoring results conducted for the 6th May 2005 trial fireworks displays indicated that the firework noise levels at both monitoring locations (Tai Lei, Peng Chau and Cherish Court, Discovery Bay) have complied with the stipulated noise criterion of $L_{eq, 15\ min}$ 55 dB(A). It is considered that the noise monitoring results for the 6th May 2005 represented a worst-case scenario since both monitoring locations are considered to be in the downwind location throughout the 15-minute firework noise monitoring period.

With reference to the on-site wind data, both monitoring locations are considered to be in the upwind location throughout the 15-minute firework noise monitoring during the 7th May 2005 trial fireworks displays. The noise measurements conducted at Peng Chau, Tai Lei and Cherish Court, Discovery Bay were influenced by significant extraneous noise throughout the trial fireworks displays and after discussion and agreement with the EPD, the noise measurement results for the 7th May show are deemed to be invalid due to the significant extraneous noise.

Annex A

Air Quality Sampling Plan of Fireworks Displays

Air Quality Sampling of Firework Displays

Test Trial Show

Introduction/Background

The 'Environmental Impact Assessment for an International Theme Park' report (EIA) concluded fireworks emissions would not give rise to adverse air quality impact. Nevertheless, section 3.1 of the Further Environmental Permit (FEP-01/059/2000) required sampling of the emissions from a firework trial display to be conducted in Hong Kong prior to operation and the results be provided to the Director of Environmental Protection for agreement. This sampling will provide information on firework emission characteristics during the trial firework displays and in particular to confirm the commitment in the EIA that certain metals will not be used as part of the fireworks composition. This document describes the proposed details of the monitoring arrangement for the trial test,

HKDL Firework Test Trial Air Quality Sampling

Sampling Sites

There will be three sampling sites located on the roofs of permanent structures (*Figure 1*) to give the highest probability of collecting a representative sample upwind and downwind from the firework plume. These sites are located in close proximity of the launch areas to capture the highest possible pollutant concentrations from the trial firework display.

Based on wind data collected in Penny's Bay, the prevailing wind in April 2004 was from the southeast (up to 32% of the time). The second highest frequency was from the southwest (14%). Therefore, Site 1 will be the upwind location, and both Sites 2 and 3 will be the downwind locations. The continuous respirable suspended particulates (RSP) sampling device will be located at Site 3 downwind from the launch areas. Sites 1 & 2 are around 200 – 250 m from the nearest launch position whereas Site 3 is about 90 m from the nearest launch position. These sites were selected because they are the nearest downwind structures with enough rooftop surface area to support sampling equipment. The buildings are at least 9 m above ground.

In addition, 24-hour RSP sampling will be conducted during the trial firework display at two additional locations: the rooftop of Peng Lai Court on Peng Chau and the rooftop of the Management Office of Crestmont Villa at Discovery Bay (*Figure 2*). It is also proposed that H_2S sampling be conducted at all five sampling locations during the trial show. The purpose of sampling at these locations will be to demonstrate that the fireworks show will not adversely affect the air quality at the air sensitive receivers during the operational phase. It should be noted that the proposed air sampling locations are subject to obtaining site access from the management offices and power supply for the monitoring equipment. Should there be any change in proposed air sampling locations after the approval of this plan, these will be presented to Director of Environmental Protection for agreement.

Methods

There will be two sampling periods for the Hong Kong trial test. The first sampling period will be to establish baseline levels and will run for two hours prior to the test trials. It is anticipated that the sampling will begin at 1600 and end at 1800. The specific start time will be finalized after the start time of the trial shows are determined. The sample period for the test trials will start at the beginning of the firework displays for one hour.

Metals and sulfate will be collected from RSP filter sample since the detonation of the fireworks generates RSP. This is the basic assumption used in the Approved Theme Park EIA Report and the associated metals and sulfate emissions will therefore be in this particle size range. The collected RSP samples will be analysed using the appropriate testing methods listed in *Table 1*. Reference will also be made to the continuous RSP data collected by TEOM for QC purpose and no duplicate sample will be made for the RSP samples.

24-hour RSP sampling will be conducted at two identified sensitive receivers at Peng Chau and Discovery Bay. Baseline 24-hour RSP samples will be collected at these two locations before the trial firework shows to establish the background concentrations. Short term H2S sampling will be conducted at all five sampling locations immediately before the trial firework display and during the fireworks display.

The sampling instruments and procedures will follow standard USEPA methods, and can be found on the USEPA website (http://www.epa.gov/ttnamti1/inorg.html). The test methods and number of samples are listed in *Table 1*.

Table 1. Summary of test methods, and number of samples

Parameter	Test Method	No of locations	No of baseline samples	No of samples (trial monitoring)	No of QC samples(1)	Total samples
TVOC	EPA Method 18	3	3	3	1	7
VOC (speciated)	EPA TO14-A	3	3	3	1	7
RSP(2)	EPA IO-2.1	3	3	3	-	6
Metals(2,4)	EPA IO-2.1 & 3.5	3	3	3	-	6
Sulfate(2,4)	EPA IO-2.1 & 4.2	3	3	3	-	6
Continuous RSP(2,3)	EPA IO-1.3 TEOM	1	-	-	-	1
PCDD/PCDF	EPA TO-9A	3	3	3	1	7
24-hour RSP(2,5)	EPA IO-2.1	2	2	2	-	4
H_2S(2,6)	Methylene Blue	5	5	5	-	10

Note:

(1) QC samples will be collected at one site location during the trial fireworks shows.

(2) There are no QC samples for RSP, metals, sulfate, continuous RSP, 24-hour RSP and H_2S monitoring.

(3) One continuous RSP sampler at downwind location only, measured continuously throughout the two sampling periods, and will be reported as one-hour rolling average.

(4) Metals and sulfate from the RSP filter samples and metals will include: aluminium (Al), antimony (Sb), arsenic (As), barium (Ba), chromium (Cr), copper (Cu), iron (Fe), lead (Pb), magnesium (Mg), manganese (Mn), particulate mercury (Hg), molybdemum (Mo), nickel (Ni), potassium (K), strontium (Sr), titanium (Ti), and zinc (Zn).

(5) 24-hour RSP samples will be collected at Peng Chau and Discovery Bay only.

(6) Baseline H_2S samples will be collected over two hours period prior to the trial firework display and the trial monitoring will occur over one hour period during the trial fireworks display..

Weather data will also be measured concomitant with the air quality sampling. Wind speed and direction will be monitored continuously during the pre-display period and the firework display period with aid of a data-logger. The weather data will be averaged and recorded for one minute.

Results and Reporting Structure

The final report will describe sampling and analytical methods. It will include field notes regarding instrument operating conditions, weather, and general observations about the show. It will also contain the raw data, data analysis and conclusions.

Comparisons will be made between results obtained in a trial test previously held in Orlando in year 2000[1]. The results from this sampling can also be used to confirm Disney's commitment not to use fireworks containing chromium, lead, mercury, arsenic, manganese, nickel or zinc for any display in the theme park. A further comparison will also be made between the background data obtained immediate prior to the firework display, and data collected during the firework show. Comparisons will also be made among the three sample sites. These aforementioned comparisons will give some of the most accurate information to date on firework emission characteristics. However, two 24-hour RSP sampling locations, at Peng Chau and Discovery Bay, will be used to demonstrate that emissions from firework shows will not adversely affect the local air quality.

One might desire to compare results with established ambient air quality criteria or objectives. However, this is not possible, since few data exist on air quality impacts from fireworks, and most importantly, no ambient air quality objectives or criteria exist that are directly applicable for the short duration (approximately 5 minutes) of the fireworks event. Even though there are published air quality objectives for some of these parameters, these values are based on extended periods of exposure (i.e., 8 hours/day, 40 hours/week), and are not directly comparable to the exposure from a relatively short-term firework display. For example, the Air Quality Objective for RSP is based on a 24-hour exposure and other exposure criteria are often based on 8-hour continuous exposures. Thus, we feel that without extensive epidemiological investigations, it is beyond the scope of this project to extrapolate, from established objectives or criteria. However, reference to the established short term Occupational Exposure Levels (OEL)[2]/Acute Reference Exposure Levels[3] or other similar references will also be made to determine the extent and potential exposures of the measured pollutant concentrations but these are not considered as the assessment criteria as explained above. Reference will also be made to the odour threshold of H_2S (0.66 ug/m^3) in determining the odour level.

---

[1] In March 2000, a special firework display was conducted in Orlando, Florida to present a proposed firework display that could be adopted in the HKDL. The purpose of this event was to demonstrate the various elements of the show, and provide an opportunity to collect noise and air quality data on firework emissions. The monitoring results and subsequent analysis concluded that even though sample sites were relatively close to the launch area, pollutant levels were low. The results were presented to ACE in April 2000 and found satisfactory. The primary objective of the HKDL trial show is to reconfirm the firework emission characteristics and air sampling results obtained from the Orlando display.

[2] Occupational Exposure Limit - Short-Term Exposure Limit (OEL-STEL) (15-minutes average) established under "Code of Practice on Control of Air Impurities (Chemical Substances) in the Workplace" issued by Labour Department in 2002 to protect workers.

[3] Acute Reference Exposure Levels (1-hour average) established under the Office of Environmental Health Hazard Assessment (OEHHA) and the Air Resources Board (ARB) in California (www.oehha.ca.gov/air/hot_spots/)

List of Figures

Figure 1 Aerial photograph of resort development site with firework launch area and proposed sampling locations

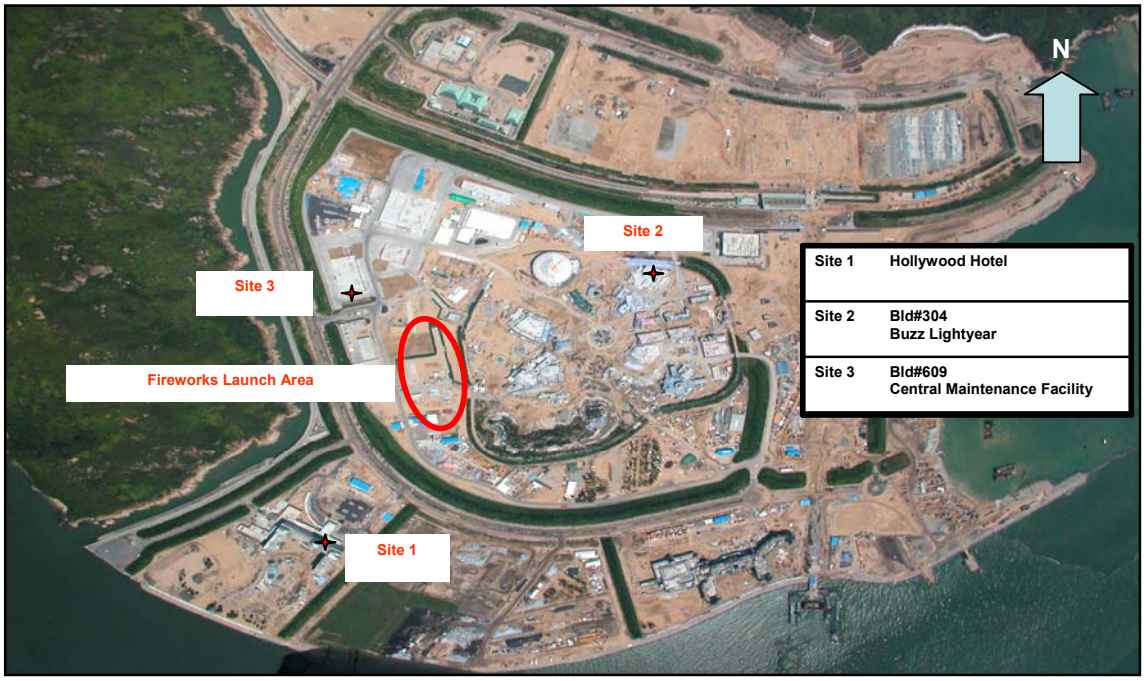
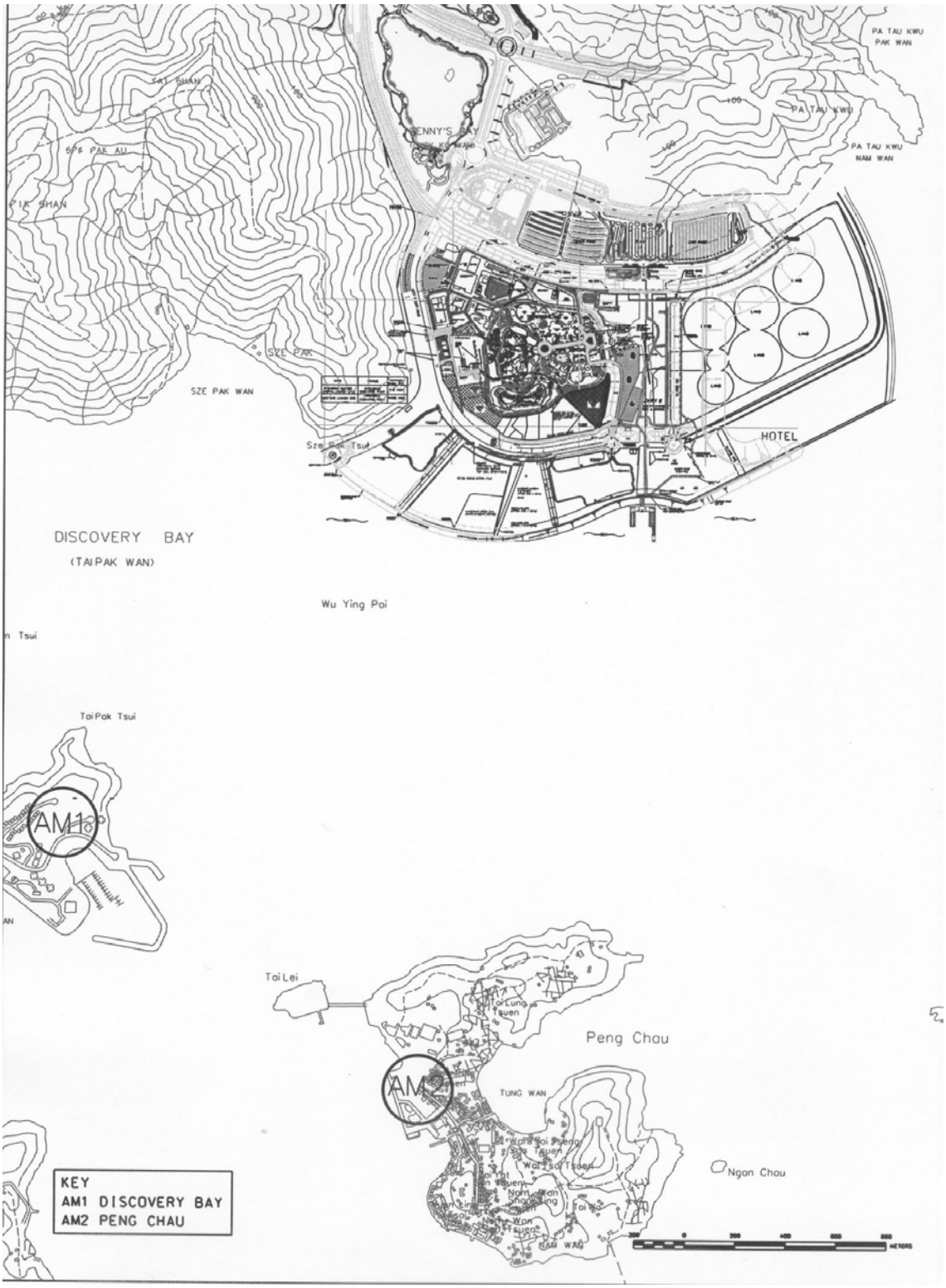


Figure 2 Proposed off-site monitoring locations at Discovery Bay and Peng Chau



Annex B

Photolog of Air Monitoring Equipment Set-up

AIR1 Rooftop of Hollywood Hotel

AIR2 Rooftop of Building#304 Buzz Light Year

AIR3 Rooftop of Building#609 Central Maintenance Facility

AIR4 Rooftop of Peng Lai Court in Peng Chau (Top)
AIR5 Rooftop of Crestmont Villa Management Office in DB (Bottom)

Annex C

Metals Results

Table C1 Summary of Metals Analysis Results

Sampling Location	Sampling Description	Air Sample Flow (m^3) [(a)]	Metals (Amount in filter sample) (μg)															
			Al	Sb	As	Ba	Cr	Cu	Fe	Pb	Mg	Mn	Hg	Mo	Ni	K	Sr	Ti	Zn
6th May 2005																			
AIR1	Ambient (2 hours)	137	< 2.5	< 0.05	0.06	420	< 0.05	0.67	17	3.0	3.2	0.74	< 0.025	< 0.05	0.20	< 0.50	< 2.5	< 0.5	< 0.5
	Trial (1 hour)	67	260	< 0.05	0.42	290	0.68	0.45	12	0.78	21	0.35	< 0.025	< 0.05	< 0.05	400	3.0	< 0.5	570
AIR2	Ambient (2 hours)	137	210	0.13	0.26	250	< 0.05	0.93	33	2.8	18	0.84	< 0.025	< 0.05	0.16	170	< 2.5	< 0.5	210
	Trial (1 hour)	68	70	< 0.05	< 0.05	100	0.14	0.38	6.0	0.43	1.9	0.20	< 0.025	< 0.05	0.05	42	< 2.5	< 0.5	58
AIR3	Ambient (2 hours)	136	32	< 0.05	0.24	86	0.14	0.72	14	8.5	9.8	0.46	< 0.025	< 0.05	0.09	65	< 2.5	< 0.5	58
	Trial (1 hour)	69	170	0.07	0.30	460	0.36	0.67	13	2.3	21	0.58	< 0.025	< 0.05	< 0.05	220	< 2.5	< 0.5	310
Field Blank (2 hours)		-	100	< 0.05	0.23	130	< 0.05	< 0.05	< 2.5	0.18	14	< 0.05	< 0.025	< 0.05	< 0.05	110	< 2.5	< 0.5	110
7th May 2005																			
AIR1	Ambient (2 hours)	137	24	< 0.05	< 0.05	41	0.82	0.18	11	0.35	13	0.24	0.03	< 0.05	< 0.05	16	< 2.5	< 0.5	35
	Trial (1 hour)	68	92	< 0.05	< 0.05	150	0.06	0.15	< 2.5	0.32	11	0.14	< 0.025	< 0.05	< 0.05	140	< 2.5	< 0.5	190
AIR2	Ambient (2 hours)	137	120	0.05	0.21	270	< 0.05	0.64	7.0	0.42	19	0.37	< 0.025	< 0.05	0.16	100	< 2.5	< 0.5	95
	Trial (1 hour)	67	100	< 0.05	0.16	340	0.46	0.36	5	0.35	17	0.27	< 0.025	0.05	0.26	120	< 2.5	< 0.5	140
AIR3	Ambient (2 hours)	138	130	< 0.05	0.11	310	< 0.05	0.41	6.0	0.49	22	0.28	< 0.025	< 0.05	< 0.05	180	< 2.5	< 0.5	220
	Trial (1 hour)	68	190	11	0.15	460	0.14	5.4	8.0	2.1	47	1.0	< 0.025	< 0.05	< 0.05	490	6	0.6	340
Field Blank (2 hours)		-	290	< 0.05	0.21	570	0.18	< 0.05	3	0.12	21	0.14	< 0.025	< 0.05	< 0.05	390	< 2.5	< 0.5	460

Note:

(a) The air flow has been corrected to at 25°C and 1 atmosphere.

Table C2 Summary of Detection Limit of Metals

Sampling Location	Sampling Description	Air Sample Flow (m^3) [(a)]	Detection Limit of Metals (ng m^{-3}) [(a)]															
			Al	Sb	As	Ba	Cr	Cu	Fe	Pb	Mg	Mn	Hg	Mo	Ni	K	Sr	Ti	Zn
6th May 2005																			
AIR1	Ambient (2 hours)	137	18.25	0.36	0.36	0.36	0.36	0.36	18.25	0.36	3.65	0.36	0.18	0.36	0.36	3.65	18.25	3.65	3.65
	Trial (1 hour)	67	37.31	0.75	0.75	0.75	0.75	0.75	37.31	0.75	7.46	0.75	0.37	0.75	0.75	7.46	37.31	7.46	7.46
AIR2	Ambient (2 hours)	137	18.25	0.36	0.36	0.36	0.36	0.36	18.25	0.36	3.65	0.36	0.18	0.36	0.36	3.65	18.25	3.65	3.65
	Trial (1 hour)	68	36.76	0.74	0.74	0.74	0.74	0.74	36.76	0.74	7.35	0.74	0.37	0.74	0.74	7.35	36.76	7.35	7.35
AIR3	Ambient (2 hours)	136	18.38	0.37	0.37	0.37	0.37	0.37	18.38	0.37	3.68	0.37	0.18	0.37	0.37	3.68	18.38	3.68	3.68
	Trial (1 hour)	69	36.23	0.72	0.72	0.72	0.72	0.72	36.23	0.72	7.25	0.72	0.36	0.72	0.72	7.25	36.23	7.25	7.25
Field Blank (2 hours)		-	2500	50	50	50	50	50	2500	50	500	50	25	50	50	500	2500	500	500
7th May 2005																			
AIR1	Ambient (2 hours)	137	18.25	0.36	0.36	0.36	0.36	0.36	18.25	0.36	3.65	0.36	0.18	0.36	0.36	3.65	18.25	3.65	3.65
	Trial (1 hour)	68	36.76	0.74	0.74	0.74	0.74	0.74	36.76	0.74	7.35	0.74	0.37	0.74	0.74	7.35	36.76	7.35	7.35
AIR2	Ambient (2 hours)	137	18.25	0.36	0.36	0.36	0.36	0.36	18.25	0.36	3.65	0.36	0.18	0.36	0.36	3.65	18.25	3.65	3.65
	Trial (1 hour)	67	37.31	0.75	0.75	0.75	0.75	0.75	37.31	0.75	7.46	0.75	0.37	0.75	0.75	7.46	37.31	7.46	7.46
AIR3	Ambient (2 hours)	138	18.12	0.36	0.36	0.36	0.36	0.36	18.12	0.36	3.62	0.36	0.18	0.36	0.36	3.62	18.12	3.62	3.62
	Trial (1 hour)	68	36.76	0.74	0.74	0.74	0.74	0.74	36.76	0.74	7.35	0.74	0.37	0.74	0.74	7.35	36.76	7.35	7.35
Field Blank (2 hours)		-	2500	50	50	50	50	50	2500	50	500	50	25	50	50	500	2500	500	500

Note:

(a) The air flow has been corrected to at 25°C and 1 atmosphere.

Annex D

Dioxin Concentrations

Table D1 Summary of PCDD/PCDF Concentrations

PCDD/PCDF	PCDD/PCDF Concentrations (pg m^{-3}) [a]													
	AIR1				AIR2				AIR3				Field Blank (pg/sample)	PQL
	Ambient	PQL [c]	Trial Fireworks Displays	PQL	Ambient	PQL	Trial Fireworks Displays	PQL	Ambient	PQL	Trial Fireworks Displays	PQL		
6th May 2005														
2, 3, 7, 8 - TCDF	0.0326	0.0087	0.0512	0.0176	0.1881	0.0093	0.1206	0.0173	0.0172	0.0088	< 0.0174	0.0174	0.260	0.247
1, 2, 3, 7, 8 - PeCDF	0.0262	0.0231	0.0938	0.0463	0.0491	0.0246	0.0785	0.0457	0.0501	0.0233	0.0492	0.0458	< 0.652	0.652
2, 3, 4, 7, 8 - PeCDF	< 0.0303	0.0303	< 0.0609	0.0609	< 0.0324	0.0324	< 0.0601	0.0601	< 0.0306	0.0306	< 0.0602	0.0602	< 0.857	0.857
1, 2, 3, 4, 7, 8 - HxCDF	0.0460	0.0322	0.0896	0.0646	0.0627	0.0343	0.0884	0.0637	< 0.0325	0.0325	< 0.0639	0.0639	< 0.909	0.909
1, 2, 3, 6, 7, 8 - HxCDF	0.0439	0.0286	0.0782	0.0574	0.0423	0.0305	0.0673	0.0567	0.0436	0.0289	0.0984	0.0568	< 0.808	0.808
2, 3, 4, 6, 7, 8 - HxCDF	< 0.0333	0.0333	< 0.0670	0.0670	< 0.0356	0.0356	< 0.0661	0.0661	< 0.0337	0.0337	< 0.0662	0.0662	< 0.942	0.942
1, 2, 3, 7, 8, 9 - HxCDF	< 0.0195	0.0195	< 0.0391	0.0391	< 0.0208	0.0208	< 0.0386	0.0386	< 0.0197	0.0197	< 0.0387	0.0387	< 0.550	0.550
1, 2, 3, 4, 6, 7, 8 - HpCDF	0.1104	0.0283	0.1891	0.0569	0.1375	0.0302	0.2440	0.0561	0.1051	0.0286	0.2249	0.0562	< 0.800	0.800
1, 2, 3, 4, 7, 8, 9 - HpCDF	< 0.0271	0.0271	< 0.0544	0.0544	< 0.0289	0.0289	< 0.0537	0.0537	< 0.0274	0.0274	< 0.0538	0.0538	< 0.766	0.766
OCDF	0.1451	0.0456	0.1222	0.0917	0.1382	0.0487	0.2721	0.0905	0.2145	0.0461	0.2923	0.0907	1.860	1.290
2, 3, 7, 8 - TCDD	< 0.0071	0.0071	0.0185	0.0143	< 0.0076	0.0076	0.0168	0.0141	0.0100	0.0072	< 0.0141	0.0141	< 0.201	0.201
1, 2, 3, 7, 8 -PeCDD	< 0.0319	0.0319	< 0.0641	0.0641	< 0.0341	0.0341	< 0.0633	0.0633	< 0.0322	0.0322	< 0.0634	0.0634	< 0.902	0.902
1, 2, 3, 4, 7, 8 -HxCDD	< 0.0293	0.0293	< 0.0588	0.0588	< 0.0313	0.0313	< 0.0581	0.0581	< 0.0296	0.0296	< 0.0582	0.0582	< 0.828	0.828
1, 2, 3, 6, 7, 8 -HxCDD	< 0.0327	0.0327	< 0.0656	0.0656	< 0.0349	0.0349	< 0.0647	0.0647	< 0.0330	0.0330	< 0.0649	0.0649	< 0.923	0.923
1, 2, 3, 7, 8, 9 -HxCDD	< 0.0336	0.0336	< 0.0675	0.0675	< 0.0359	0.0359	< 0.0666	0.0666	< 0.0340	0.0340	< 0.0668	0.0668	< 0.950	0.950
1, 2, 3, 4, 6, 7, 8 -HpCDD	0.1649	0.0430	0.1834	0.0864	0.1073	0.0459	0.2987	0.0852	0.1194	0.0434	0.2558	0.0854	1.680	1.215
OCDD	0.1663	0.0464	0.2758	0.0931	0.1722	0.0495	0.4250	0.0919	0.2095	0.0468	0.5018	0.0921	3.020	1.310
Air Flow (m^3) [b]	**28.26**		**14.07**		**26.48**		**14.26**		**27.97**		**14.23**			
7th May 2005														
2, 3, 7, 8 - TCDF	0.0307	0.0086	0.0405	0.0172	0.0102	0.0084	0.1863	0.0170	0.0363	0.0083	0.0266	0.0173	5.540	0.247
1, 2, 3, 7, 8 - PeCDF	< 0.0227	0.0227	< 0.0455	0.0455	< 0.0223	0.0223	0.0524	0.0450	0.0625	0.0219	< 0.0456	0.0456	< 0.652	0.652
2, 3, 4, 7, 8 - PeCDF	< 0.0299	0.0299	< 0.0598	0.0598	< 0.0293	0.0293	0.0801	0.0591	0.0699	0.0288	< 0.0599	0.0599	< 0.857	0.857
1, 2, 3, 4, 7, 8 - HxCDF	< 0.0317	0.0317	< 0.0635	0.0635	< 0.0311	0.0311	< 0.0627	0.0627	0.0451	0.0306	< 0.0635	0.0635	< 0.909	0.909
1, 2, 3, 6, 7, 8 - HxCDF	< 0.0282	0.0282	< 0.0564	0.0564	< 0.0276	0.0276	< 0.0558	0.0558	0.0538	0.0272	< 0.0565	0.0565	< 0.808	0.808
2, 3, 4, 6, 7, 8 - HxCDF	< 0.0329	0.0329	< 0.0658	0.0658	< 0.0322	0.0322	< 0.0650	0.0650	0.0572	0.0317	< 0.0658	0.0658	< 0.942	0.942
1, 2, 3, 7, 8, 9 - HxCDF	< 0.0192	0.0192	< 0.0384	0.0384	< 0.0188	0.0188	< 0.0380	0.0380	< 0.0185	0.0185	< 0.0384	0.0384	< 0.550	0.550
1, 2, 3, 4, 6, 7, 8 - HpCDF	0.0370	0.0279	< 0.0559	0.0559	0.0321	0.0273	0.0621	0.0552	0.0827	0.0269	0.0727	0.0559	< 0.800	0.800
1, 2, 3, 4, 7, 8, 9 - HpCDF	< 0.0267	0.0267	< 0.0535	0.0535	< 0.0262	0.0262	0.0529	0.0529	0.0511	0.0258	< 0.0535	0.0535	< 0.766	0.766
OCDF	< 0.0450	0.0450	< 0.0901	0.0901	0.0786	0.0441	< 0.0890	0.0890	0.2118	0.0434	0.3117	0.0901	< 1.290	1.290
2, 3, 7, 8 - TCDD	< 0.0070	0.0070	< 0.0140	0.0140	< 0.0069	0.0069	< 0.0139	0.0139	0.0087	0.0068	< 0.0140	0.0140	< 0.201	0.201
1, 2, 3, 7, 8 -PeCDD	< 0.0315	0.0315	< 0.0630	0.0630	< 0.0308	0.0308	< 0.0622	0.0622	0.0397	0.0303	< 0.0630	0.0630	< 0.902	0.902

PCDD/PCDF	PCDD/PCDF Concentrations (pg m^{-3}) [a]													
	AIR1				AIR2				AIR3				Field Blank (pg/sample)	PQL
	Ambient	PQL [c]	Trial Fireworks Displays	PQL	Ambient	PQL	Trial Fireworks Displays	PQL	Ambient	PQL	Trial Fireworks Displays	PQL		
1, 2, 3, 4, 7, 8 -HxCDD	< 0.0289	0.0289	< 0.0578	0.0578	< 0.0283	0.0283	< 0.0571	0.0571	0.0424	0.0278	< 0.0579	0.0579	< 0.828	0.828
1, 2, 3, 6, 7, 8 -HxCDD	< 0.0322	0.0322	< 0.0645	0.0645	< 0.0315	0.0315	< 0.0637	0.0637	0.0477	0.0310	< 0.0645	0.0645	< 0.923	0.923
1, 2, 3, 7, 8, 9 -HxCDD	< 0.0331	0.0331	< 0.0663	0.0663	< 0.0325	0.0325	< 0.0656	0.0656	0.0525	0.0319	< 0.0664	0.0664	< 0.950	0.950
1, 2, 3, 4, 6, 7, 8 -HpCDD	0.0775	0.0424	0.1564	0.0848	0.0547	0.0415	0.0883	0.0839	0.1311	0.0409	0.1621	0.0849	< 1.215	1.215
OCDD	0.3315	0.0457	0.3268	0.0915	0.1824	0.0448	0.2084	0.0904	0.4116	0.0440	0.2628	0.0915	2.600	1.310
Air Flow (m^3)	**28.66**		**14.32**		**29.27**		**14.49**		**29.74**		**14.31**			

Note:

(a) No blank-corrected.

(b) The air flow has been corrected to at 25°C and 1 atmosphere.

(c) PQL = Practical Quantitation Limit

Table D2 Summary of PCDD/PCDF Sampling Results

PCDD/PCDF		PCDD/PCDF Weight (pg / sample) [a]													
		AIR1				AIR2				AIR3				Field Blank (pg/sample)	PQL
		Ambient		Trial Fireworks Displays		Ambient		Trial Fireworks Displays		Ambient		Trial Fireworks Displays			
	TEF	pg/sample	pg TEQ/ sample [b][c]	pg/sample	pg TEQ/ sample	pg/sample	pg TEQ/ sample	pg/sample	pg TEQ/ sample	pg/sample	pg TEQ/ sample	pg/sample	pg TEQ/ sample		
6th May 2005															
2, 3, 7, 8 - TCDF	0.1	0.920	0.092	0.720	0.072	4.980	0.498	1.720	0.172	0.480	0.048	< 0.247	0.01235	0.260	0.247
1, 2, 3, 7, 8 - PeCDF	0.05	0.740	0.037	1.320	0.066	1.300	0.065	1.120	0.056	1.400	0.07	0.700	0.035	< 0.652	0.652
2, 3, 4, 7, 8 - PeCDF	0.5	< 0.857	0.21425	< 0.857	0.21425	< 0.857	0.21425	< 0.857	0.21425	< 0.857	0.21425	< 0.857	0.21425	< 0.857	0.857
1, 2, 3, 4, 7, 8 - HxCDF	0.1	1.300	0.13	1.260	0.126	1.660	0.166	1.260	0.126	< 0.909	0.04545	< 0.909	0.04545	< 0.909	0.909
1, 2, 3, 6, 7, 8 - HxCDF	0.1	1.240	0.124	1.100	0.11	1.120	0.112	0.960	0.096	1.220	0.122	1.400	0.14	< 0.808	0.808
2, 3, 4, 6, 7, 8 - HxCDF	0.1	< 0.942	0.0471	< 0.942	0.0471	< 0.942	0.0471	< 0.942	0.0471	< 0.942	0.0471	< 0.942	0.0471	< 0.942	0.942
1, 2, 3, 7, 8, 9 - HxCDF	0.1	< 0.550	0.0275	< 0.550	0.0275	< 0.550	0.0275	< 0.550	0.0275	< 0.550	0.0275	< 0.550	0.0275	< 0.550	0.550
1, 2, 3, 4, 6, 7, 8 - HpCDF	0.01	3.120	0.0312	2.660	0.0266	3.640	0.0364	3.480	0.0348	2.940	0.0294	3.200	0.032	< 0.800	0.800
1, 2, 3, 4, 7, 8, 9 - HpCDF	0.01	< 0.766	0.00383	< 0.766	0.00383	< 0.766	0.00383	< 0.766	0.00383	< 0.766	0.00383	< 0.766	0.00383	< 0.766	0.766
OCDF	0.001	4.100	0.0041	1.720	0.00172	3.660	0.00366	3.880	0.00388	6.000	0.006	4.160	0.00416	1.860	1.290
2, 3, 7, 8 - TCDD	1	< 0.201	0.1005	0.260	0.26	< 0.201	0.1005	0.240	0.24	0.280	0.28	< 0.201	0.1005	< 0.201	0.201
1, 2, 3, 7, 8 -PeCDD	0.5	< 0.902	0.2255	< 0.902	0.2255	< 0.902	0.2255	< 0.902	0.2255	< 0.902	0.2255	< 0.902	0.2255	< 0.902	0.902
1, 2, 3, 4, 7, 8 -HxCDD	0.1	< 0.828	0.0414	< 0.828	0.0414	< 0.828	0.0414	< 0.828	0.0414	< 0.828	0.0414	< 0.828	0.0414	< 0.828	0.828
1, 2, 3, 6, 7, 8 -HxCDD	0.1	< 0.923	0.04615	< 0.923	0.04615	< 0.923	0.04615	< 0.923	0.04615	< 0.923	0.04615	< 0.923	0.04615	< 0.923	0.923
1, 2, 3, 7, 8, 9 -HxCDD	0.1	< 0.950	0.0475	< 0.950	0.0475	< 0.950	0.0475	< 0.950	0.0475	< 0.950	0.0475	< 0.950	0.0475	< 0.950	0.950
1, 2, 3, 4, 6, 7, 8 -HpCDD	0.01	4.660	0.0466	2.580	0.0258	2.840	0.0284	4.260	0.0426	3.340	0.0334	3.640	0.0364	1.680	1.215
OCDD	0.001	4.700	0.0047	3.880	0.00388	4.560	0.00456	6.060	0.00606	5.860	0.00586	7.140	0.00714	3.020	1.310
Air Flow (m^3) [d]		**28.26**		**14.07**		**26.48**		**14.26**		**27.97**		**14.23**			
Total PCDD/PCDFs (pg I-TEQ/m^3)		**0.043**		**0.096**		**0.063**		**0.100**		**0.046**		**0.075**			
7th May 2005															
2, 3, 7, 8 - TCDF	0.1	0.880	0.088	0.580	0.058	0.300	0.03	2.700	0.27	1.080	0.108	0.380	0.038	5.540	0.247
1, 2, 3, 7, 8 - PeCDF	0.05	< 0.652	0.0163	< 0.652	0.0163	< 0.652	0.0163	0.760	0.038	1.860	0.093	< 0.652	0.0163	< 0.652	0.652
2, 3, 4, 7, 8 - PeCDF	0.5	< 0.857	0.21425	< 0.857	0.21425	< 0.857	0.21425	1.160	0.58	2.080	1.04	< 0.857	0.21425	< 0.857	0.857
1, 2, 3, 4, 7, 8 - HxCDF	0.1	< 0.909	0.04545	< 0.909	0.04545	< 0.909	0.04545	< 0.909	0.04545	1.340	0.134	< 0.909	0.04545	< 0.909	0.909
1, 2, 3, 6, 7, 8 - HxCDF	0.1	< 0.808	0.0404	< 0.808	0.0404	< 0.808	0.0404	< 0.808	0.0404	1.600	0.16	< 0.808	0.0404	< 0.808	0.808
2, 3, 4, 6, 7, 8 - HxCDF	0.1	< 0.942	0.0471	< 0.942	0.0471	< 0.942	0.0471	< 0.942	0.0471	1.700	0.17	< 0.942	0.0471	< 0.942	0.942
1, 2, 3, 7, 8, 9 - HxCDF	0.1	< 0.550	0.0275	< 0.550	0.0275	< 0.550	0.0275	< 0.550	0.0275	< 0.550	0.0275	< 0.550	0.0275	< 0.550	0.550
1, 2, 3, 4, 6, 7, 8 - HpCDF	0.01	1.060	0.0106	< 0.800	0.004	0.940	0.0094	0.900	0.009	2.460	0.0246	1.040	0.0104	< 0.800	0.800
1, 2, 3, 4, 7, 8, 9 - HpCDF	0.01	< 0.766	0.00383	< 0.766	0.00383	< 0.766	0.00383	< 0.766	0.00383	1.520	0.0152	< 0.766	0.00383	< 0.766	0.766
OCDF	0.001	< 1.290	0.000645	< 1.290	0.000645	2.300	0.0023	< 1.290	0.000645	6.300	0.0063	4.460	0.00446	< 1.290	1.290

PCDD/PCDF		PCDD/PCDF Weight (pg / sample) [a]												Field Blank (pg/sample)	PQL
		AIR1				AIR2				AIR3					
		Ambient		Trial Fireworks Displays		Ambient		Trial Fireworks Displays		Ambient		Trial Fireworks Displays			
	TEF	pg/sample	pg TEQ/ sample [b][c]	pg/sample	pg TEQ/ sample	pg/sample	pg TEQ/ sample	pg/sample	pg TEQ/ sample	pg/sample	pg TEQ/ sample	pg/sample	pg TEQ/ sample		
2, 3, 7, 8 - TCDD	1	< 0.201	0.1005	< 0.201	0.1005	< 0.201	0.1005	< 0.201	0.1005	0.260	0.26	< 0.201	0.1005	< 0.201	0.201
1, 2, 3, 7, 8 -PeCDD	0.5	< 0.902	0.2255	< 0.902	0.2255	< 0.902	0.2255	< 0.902	0.2255	1.180	0.59	< 0.902	0.2255	< 0.902	0.902
1, 2, 3, 4, 7, 8 -HxCDD	0.1	< 0.828	0.0414	< 0.828	0.0414	< 0.828	0.0414	< 0.828	0.0414	1.260	0.126	< 0.828	0.0414	< 0.828	0.828
1, 2, 3, 6, 7, 8 -HxCDD	0.1	< 0.923	0.04615	< 0.923	0.04615	< 0.923	0.04615	< 0.923	0.04615	1.420	0.142	< 0.923	0.04615	< 0.923	0.923
1, 2, 3, 7, 8, 9 -HxCDD	0.1	< 0.950	0.0475	< 0.950	0.0475	< 0.950	0.0475	< 0.950	0.0475	1.560	0.156	< 0.950	0.0475	< 0.950	0.950
1, 2, 3, 4, 6, 7, 8 -HpCDD	0.01	2.220	0.0222	2.240	0.0224	1.600	0.016	1.280	0.0128	3.900	0.039	2.320	0.0232	1.215	1.215
OCDD	0.001	9.500	0.0095	4.680	0.00468	5.340	0.00534	3.020	0.00302	12.240	0.01224	3.760	0.00376	2.600	1.310
Air Flow (Nm^3)		**28.66**		**14.32**		**29.27**		**14.49**		**29.74**		**14.31**			
Total PCDD/PCDFs (pg I-TEQ/m^3)		**0.034**		**0.066**		**0.031**		**0.106**		**0.104**		**0.065**			

Note:

(a) No blank-corrected.

(b) The measured level of each individual in pg TEQ/sample is calculated by multiplying the TEF with the measured level in pg/sample.

(c) If the measured level is below PQL, then the PQL will be halved to calculate its TEQ.

(d) The air flow has been corrected to at 25°C and 1 atmosphere.

Annex E

Calibration Details

Calibration Data For High Volume Sampler (RSP)

Date : 2005/5/5 Temp. : 28 degC Sampler Code : CM-AIR-088

Client : ERM Press. : 1011 mb

Name

Int. Clock : 3227

Operator : KL Poon

Carbon : 3607

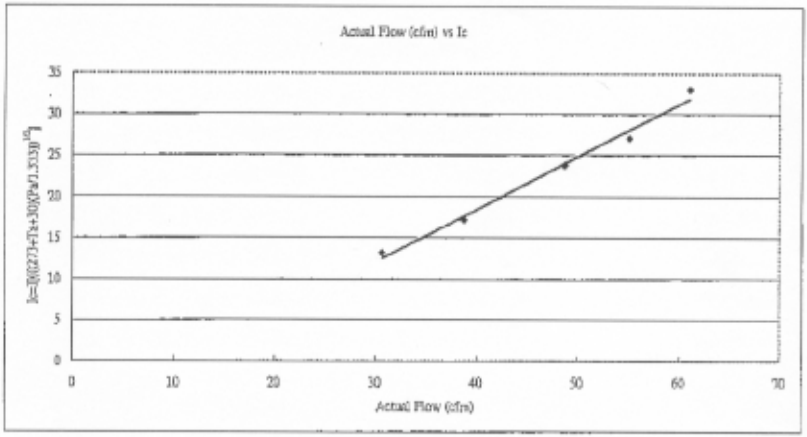
Location : Disney Hollwood Hotel (A3) Brush

Changing time

Type : RSP

Plate No.	Ind (cfm)	TRUE "H_2O	Ic	Actual (cfm)
18	50	12	33	61
13	41	9.8	27	55
10	36	7.7	24	49
7	26	4.9	17	39
5	20	3.1	13	31
Set	28			40

Calibrator : CM-AIR-43



Slope (m) = 0.638321 Y-intercept (b) = -7.057497 Regression (r)= 0.993678 coefficient

1. Linear regression : Actual Flow = Indicated Flow * Slope(m) + intercept(b)
2. Regression coefficient (r)= 0.993678
3. If (r) < 0.99 calibration should be performed again.
4. Ic=continuous flow recorder readings corrected to current Ta and Pa
5. I=indicated flow readings

Calibration Data For High Volume Sampler (RSP)

Date : 2005/5/5 Temp. : 28 degC Sampler Code : CM-AIR-116

Client : ERM Press. : 1011 mb
Name

Int. Clock : 2755

Operator : KL Poon

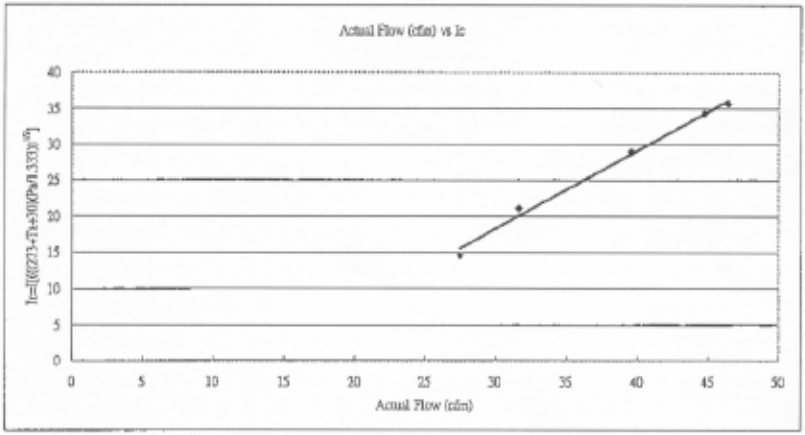
Carbon : 3207

Location : Buzz Light Year (A2) Brush
Changing time

Type : RSP

Plate No.	Ind (cfm)	TRUE "H_2O	Ic	Actual (cfm)
18	54	7	36	46
13	52	6.5	34	45
10	44	5.1	29	40
7	32	3.3	21	32
5	22	2.5	15	27
Set	44			40

Calibrator : CM-AIR-43



Slope (m) = 1.090238 Y-intercept (b) = -14.455528 Regression (r)= 0.996127 coefficient

1. Linear regression : Actual Flow = Indicated Flow * Slope(m) + intercept(b)
2. Regression coefficient:(r)= 0.996127
3. If (r) < 0.99 calibration should be performed again.
4. Ic=continuous flow recorder readings corrected to current Ta and Pa
5. I=indicated flow readings

Calibration Data For High Volume Sampler (RSP)

Date : 2005/5/5 Temp. : 28 degC Sampler Code : CM-AIR-034

Client : ERM Press. : 1011 mb
Name

Int. Clock : 3227

Operator : KL Poon

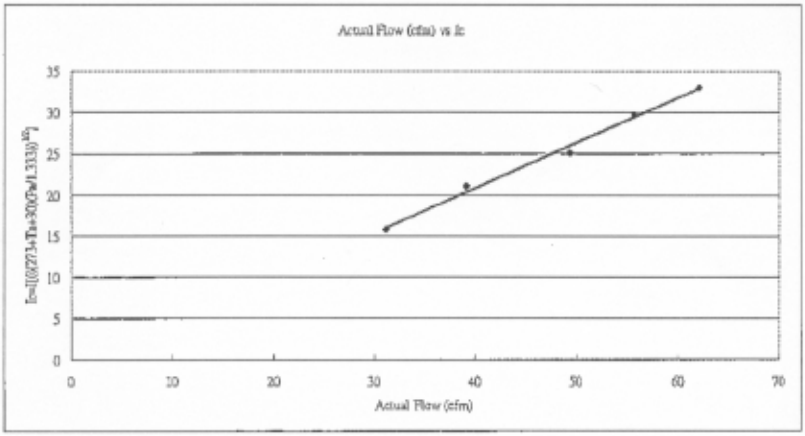
Carbon : 3607

Location : Central Maintenance Facilities (A1) Brush Changing time

Type : RSP

Plate No.	Ind (cfm)	TRUE "H_2O	Ic	Actual (cfm)
18	50	12.4	33	62
13	45	10	30	56
10	38	7.9	25	49
7	32	5	21	39
5	24	3.2	16	31
Set	32			40

Calibrator : CM-AIR-43



Slope (m) = 0.545507 Y-intercept (b) = -0.934976 Regression (r)= 0.995984 coefficient

1. Linear regression : Actual Flow = Indicated Flow * Slope(m) + intercept(b)
2. Regression coefficient:(r)= 0.995984
3. If (r) < 0.99 calibration should be performed again.
4. Ic=continuous flow recorder readings corrected to current Ta and Pa
5. I=indicated flow readings

Calibration Data For High Volume Sampler (RSP)

Date : 2005/4/28

Temp. : 27 degC

Sampler Code : CM-AIR-027

Client : ERM

Name

Press. : 1030 mb

Int. Clock : 987.3

Operator : KL Poon

Carbon : 1487

Location : Peng Chau

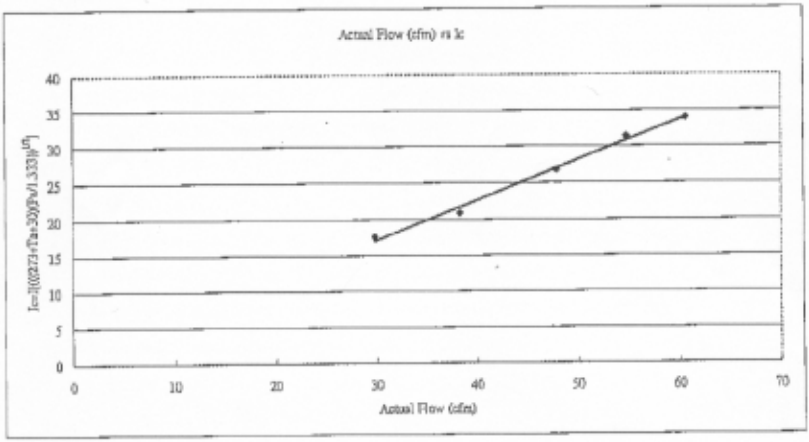
Brush

Changing time

Type : RSP

Plate No.	Ind (cfm)	TRUE "H_2O	Ic	Actual (cfm)
18	52	12.1	34	61
13	48	9.9	31	55
10	41	7.6	27	48
7	32	4.9	21	38
5	27	3	18	30
Set	35			40

Calibrator : CM-AIR-43



Slope (m) = 0.552427 Y-intercept (b) = 0.569488 Regression (r)= 0.996296 coefficient

1. Linear regression : Actual Flow = Indicated Flow * Slope(m) + intercept(b)
2. Regression coefficient (r)= 0.996296
3. If (r) < 0.99 calibration should be performed again.
4. Ic=continuous flow recorder readings corrected to current Ta and Pa
5. I=indicated flow readings

Calibration Data For High Volume Sampler (RSP)

Date : 2005/4/28 Temp. : 27 degC Sampler Code : CM-AIR-030

Client : ERM Press. : 1023 mb
Name

Int. Clock : 2819

Operator : KL Poon

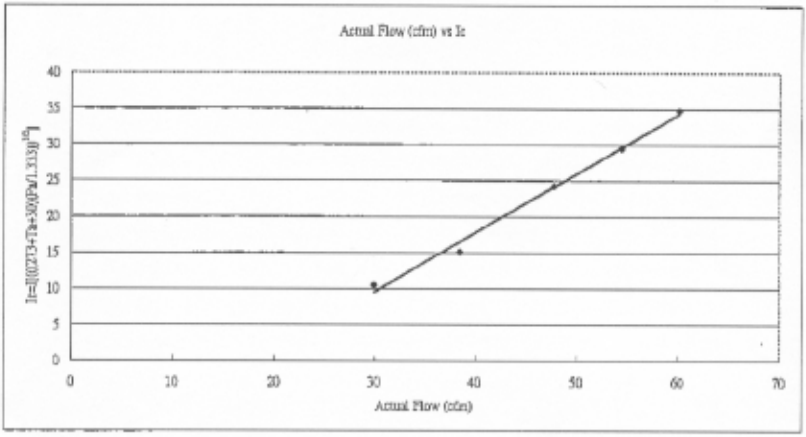
Carbon : 3319

Location : Discovery Bay Brush
Changing time

Type : RSP

Plate No.	Ind (cfm)	TRUE "H_2O	Ic	Actual (cfm)
18	53	11.8	35	60
13	45	9.7	30	54
10	37	7.5	24	48
7	23	4.9	15	38
5	16	3	10	30
Set	27			40

Calibrator : CM-AIR-43



Slope (m) = 0.824015 Y-intercept (b) = -15.182063 Regression (r)= 0.995926 coefficient

1. Linear regression : Actual Flow = Indicated Flow * Slope(m) + intercept(b)
2. Regression coefficient (r)= 0.995926
3. If (r) < 0.99 calibration should be performed again.
4. Ic=continuous flow recorder readings corrected to current Ta and Pa
5. I=indicated flow readings

Calibration Data of PUF Sampler

Date : 5-May-05 Temp. : 28 °C Sampler Code : CM-EMD-036

Client : ERM Press. : 1019 mb

Name

Int. Clock : 1087

Operator : KL Poon

Carbon : 1462

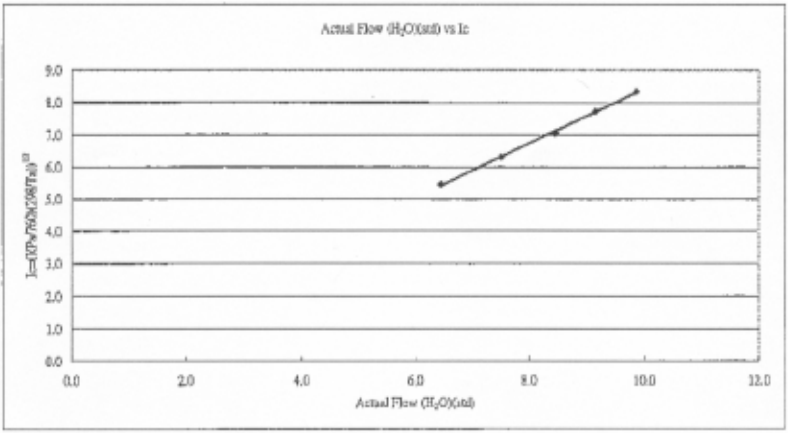
Location : Penny's Bay Brush

Changing time

Type : Disney Hollywood Hotel (A3)

Calibrator : CM-AIR-79

Plate No.	Ind $^{a}H_2O$	TRUE $^{a}H_2O$	Ic	Actual $(H_2O)(std)$
	70	7.2	8.3	9.9
	60	6.2	7.7	9.1
	50	5.3	7.1	8.5
	40	4.2	6.3	7.5
	30	3.1	5.5	6.4
Set	46			8.0



Slope (m) = 0.845960 Y-intercept (b) = -0.025742 Regression (r)=0.999252 coefficient

1. Linear regression : Actual Flow = Indicated Flow * Slope(m) + intercept(b)
2. Regression coefficient (r)= 0.999252
3. If (r) < 0.99 calibration should be performed again.
4. Ic=continuous flow recorder readings corrected to current Ta and Pa
5. I=indicated flow readings

Calibration Data of PUF Sampler

Date : 5-May-05 Temp. : 28 °C Sampler Code : A0110682

Client : ERM Press. : 1012 mb
Name

Int. Clock : 220.5

Operator : KL Poon

Carbon :

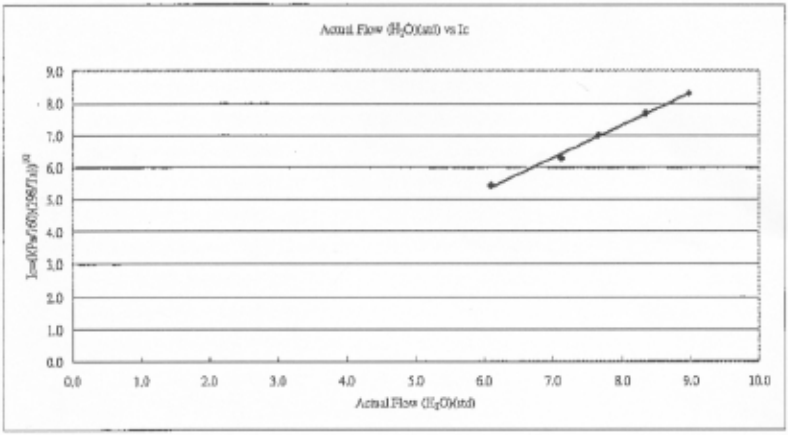
Location : Buzz Light Year (A2) Brush

Changing time

Type : PUF

Plate No.	Ind "H_2O	TRUE "H_2O	Ic	Actual (H_2O)(std)
	70	6	8.3	9.0
	60	5.2	7.7	8.3
	50	4.4	7.0	7.7
	40	3.8	6.3	7.1
	30	2.8	5.4	6.1
Set	54			8.0

Calibrator : CM-AIR-79



Slope (m) = 1.023745 Y-intercept (b) = -0.862057 Regression (r)=0.997518 coefficient

1. Linear regression : Actual Flow = Indicated Flow * Slope(m) + intercept(b)
2. Regression coefficient:(r)= 0.997518
3. If (r) < 0.99 calibration should be performed again.
4. Ic=continuous flow recorder readings corrected to current Ta and Pa
5. I=indicated flow readings

Calibration Data of PUF Sampler

Date : 5-May-05 Temp. : 28 °C Sampler Code : A0110681

Client : ERM Press. : 1012 mb
Name

Int. Clock : 241.4

Operator : KL Poon

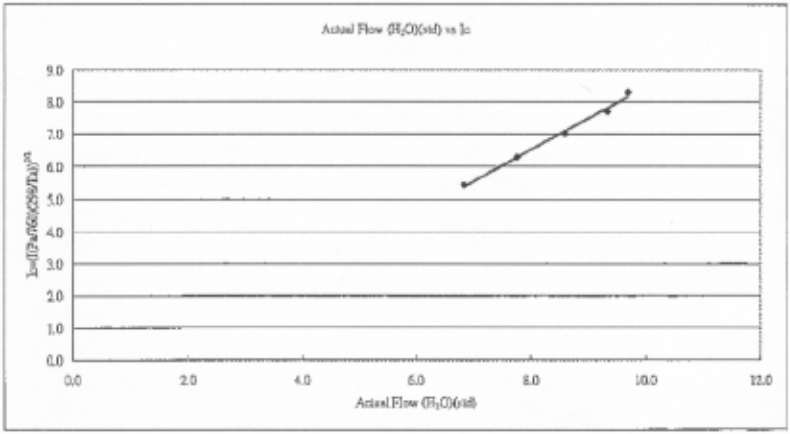
Carbon :

Location : Buzz Light Year (A2) Brush Changing time

Type : PUF

Plate No.	Ind $^{n}H_2O$	TRUE $^{n}H_2O$	Ic	Actual (H_2O)(std)
	70	7	8.3	9.7
	60	6.5	7.7	9.3
	50	5.5	7.0	8.6
	40	4.5	6.3	7.8
	30	3.5	5.4	6.8
Set	43			8.0

Calibrator : CM-AIR-79



Slope (m) = 0.968319 Y-intercept (b) = -1.212161 Regression (r)=0.995718 coefficient

1. Linear regression : Actual Flow = Indicated Flow * Slope(m) + intercept(b)
2. Regression coefficient:(r)= 0.995718
3. If (r) < 0.99 calibration should be performed again.
4. Ic=continuous flow recorder readings corrected to current Ta and Pa
5. I=indicated flow readings

Calibration Data of PUF Sampler

Date : 5-May-05 Temp. : 28 °C Sampler Code : A0011481

Client : ERM Press. : 1011 mb
Name

Int. Clock : 5822

Operator : KL Poon

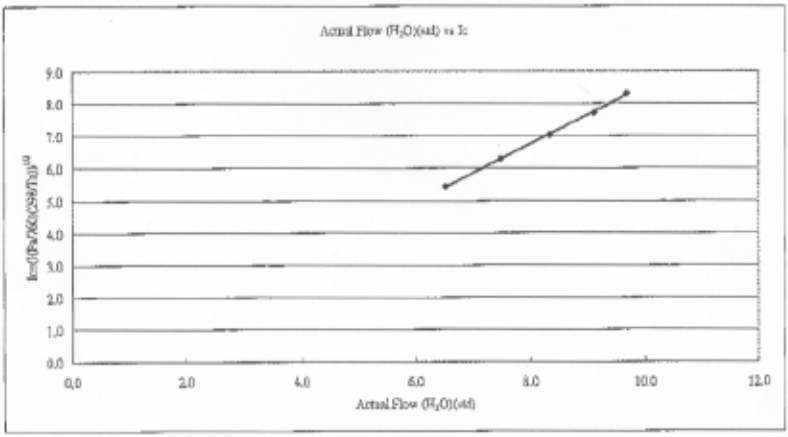
Carbon :

Location : Central Maintenance Facilities (A1) Brush Changing time

Type : PUF

Plate No.	Ind "H_2O	TRUE "H_2O	Ic	Actual (H_2O)(std)
	70	7	8.3	9.7
	60	6.2	7.7	9.1
	50	5.2	7.0	8.3
	40	4.2	6.3	7.5
	30	3.2	5.4	6.5
Set	46			8.0

Calibrator : CM-AIR-79



Slope (m) = 0.898217 Y-intercept (b) = -0.435940 Regression (r)=0.999409 coefficient

1. Linear regression : Actual Flow = Indicated Flow * Slope(m) + intercept(b)
2. Regression coefficient:(r)= 0.999409
3. If (r) < 0.99 calibration should be performed again.
4. Ic=continuous flow recorder readings corrected to current Ta and Pa
5. I=indicated flow readings

"TEOM" Mass Transducer Calibration Verification

Date of verification:		06-May-05
Manufacturer calibration constant	Ko =	9333
Calibration constant verification	Ko =	9261.02
Gravimetric filter mass (grams)	Mf =	0.11248
Frequency without filter (Hz)	F0=	309.779
Frequency with filter (Hz)	F1=	210.509
*Computed Ko difference equals to =		0.77%

Remark * - Value less than 2.5% indicates that the Mass Transducer Calibration is verified OK

Flow Audit Check On site (6 May 2005)

	(lpm)	Acceptable Limit
Total Flow	17.5	16.7 +/- 1 lpm
Main Flow	3.12	3.0+/- 0.2 lpm

Flow audit checked by "BIOS" flow calibrator model: DCL-H S/N: 100635

Please refer to "TEOM" 1400a operating manual section (8) for details

Annex F

QA / QC Results

Parameter	Reagent blank	Blank	Expected QC result	QC-1	QC-2	% recovery	
						QC-1	QC-2
Total VOC (Propane)	--	--	10.8898 ppm	10.9475 ppm	10.0149 ppm	100.53	91.97
H_2S	--	<0.15 ug/ml	3.660 ug/ml	3.687 ug/ml	--	100.74	--
SO_4^{2-}	<0.1 ppm	0.2454 ppm	1 ppm	1.073 ppm	--	107.30	--

Element name	Method blank		Sample blank		Method QC	
	result (ppb)	MDL (ppb)	result (ppb)	MDL (ppb)	result (ppb)	expected (ppb)
Mg	9.1430	10	916.9000	10	478.4570	500 +/- 100
Al	38.4000	50	10600.0000	50	212.3000	200 +/- 40
K	2.4070	10	17960.0000	10	547.5930	500 +/- 100
Ti	0.8536	10	24.5000	10	188.6464	200 +/- 40
Cr	0.2230	1	75.7000	1	25.0770	25 +/- 5
Mn	-0.0330	1	10.2300	1	25.6800	25 +/- 5
Fe	11.3500	50	520.5000	50	190.9500	200 +/- 40
Ni	0.4981	1	7.8080	1	26.2619	25 +/- 5
Cu	0.2599	1	7.7210	1	26.5501	25 +/- 5
Zn	2.9890	10	23690.0000	10	474.4110	400 +/- 50
As	-0.0186	1	23.4100	1	28.3600	25 +/- 5
Sr	0.0000	10	134.4000	10	195.3000	200 +/- 40
Mo	0.1493	1	0.5240	1	25.2407	25 +/- 5
Sb	0.1561	1	4.0580	1	28.5239	25 +/- 5
Ba	0.2993	1	29560.0000	1	27.7907	25 +/- 5
Hg	0.1918	0.5	0.2176	0.5	2.1522	2 +/- 0.4
Pb	0.1492	1	25.3800	1	27.0608	25 +/- 5

TO-14 DUPLICATE TEST RESULTS

1st test ID : AC05050030-1
2nd test ID : AC05050030-2

Compound Name	1st test (ppbv)	2nd test (ppbv)
Freon 12	**1.3**	**1.4**
Chloromethane	**ND (< 0.6)**	**ND (< 0.6)**
Freon 114	**ND (< 0.6)**	**ND (< 0.6)**
Vinyl chloride	**ND (< 0.6)**	**ND (< 0.6)**
1,3-Butadiene	**ND (< 0.6)**	**ND (< 0.6)**
Bromomethane	**1.0**	**1.0**
Chloroethane	**ND (< 0.6)**	**ND (< 0.6)**
Freon 11	**0.81**	**0.83**
1,1-Dichloroethene	**ND (< 0.6)**	**ND (< 0.6)**
Dichloromethane	**41**	**45**
Freon 113	**0.73**	**0.73**
1,1-Dichloroethane	**ND (< 0.6)**	**ND (< 0.6)**
cis-1,2-Dichloroethene	**ND (< 0.6)**	**ND (< 0.6)**
Chloroform	**ND (< 0.6)**	**ND (< 0.6)**
1,2-Dichloroethane	**ND (< 0.6)**	**ND (< 0.6)**
1,1,1-Trichloroethane	**ND (< 0.6)**	**ND (< 0.6)**
Benzene	**1.0**	**1.0**
Carbon tetrachloride	**ND (< 0.6)**	**ND (< 0.6)**
1,2-Dichloropropane	**ND (< 0.6)**	**ND (< 0.6)**
Trichloroethene	**ND (< 0.6)**	**ND (< 0.6)**
cis-1,3-Dichloropropene	**ND (< 0.6)**	**ND (< 0.6)**
trans-1,3-Dichloropropene	**ND (< 0.6)**	**ND (< 0.6)**
1,1,2-Trichloroethane	**ND (< 0.6)**	**ND (< 0.6)**
Toluene	**3.4**	**3.4**
1,2-Dibromoethane	**ND (< 0.6)**	**ND (< 0.6)**
Tetrachloroethene	**ND (< 0.6)**	**ND (< 0.6)**
Chlorobenzene	**ND (< 0.6)**	**ND (< 0.6)**
Ethylbenzene	**0.74**	**0.79**
m,p-Xylene	**1.1**	**1.1**
Styrene	**ND (< 0.6)**	**ND (< 0.6)**
1,1,2,2-tetrachloroethane	**ND (< 0.6)**	**ND (< 0.6)**
o-Xylene	**ND (< 0.6)**	**ND (< 0.6)**
4-Ethyltoluene	**ND (< 0.6)**	**ND (< 0.6)**
1,3,5-Trimethylbenzene	**ND (< 0.6)**	**ND (< 0.6)**
1,2,4-Trimethylbenzene	**ND (< 0.6)**	**ND (< 0.6)**
m-Dichlorobenzene	**ND (< 0.6)**	**ND (< 0.6)**
Benzyl chloride	**ND (< 0.6)**	**ND (< 0.6)**
p-Dichlorobenzene	**ND (< 0.6)**	**ND (< 0.6)**
o-Dichlorobenzene	**ND (< 0.6)**	**ND (< 0.6)**
1,2,4-Trichlorobenzene	**1.6**	**1.5**
Hexachlorobutadiene	**ND (< 0.6)**	**ND (< 0.6)**

Note : (a) ND refers to not detectable (< MDL).

TO-14 TEST RESULTS

Laboratory sample ID : AC05050030-1

Compound Name	PQL (ppbv)	Measured Concentration (ppbv)	Measured Concentration ($\mu g/m^3$)	Flag
Freon 12	2.8	**1.4**	**6.8**	§
Chloromethane	2.8	**ND (< 0.6)**	**ND (< 1.1)**	
Freon 114	2.8	**ND (< 0.6)**	**ND (< 3.9)**	
Vinyl chloride	2.8	**ND (< 0.6)**	**ND (< 1.4)**	
1,3-Butadiene	2.8	**ND (< 0.6)**	**ND (< 1.2)**	
Bromomethane	2.8	**1.0**	**3.9**	§
Chloroethane	2.8	**ND (< 0.6)**	**ND (< 1.5)**	
Freon 11	2.8	**0.83**	**4.7**	§
1,1-Dichloroethene	2.8	**ND (< 0.6)**	**ND (< 2.2)**	
Dichloromethane	2.8	**45**	**160**	
Freon 113	2.8	**0.73**	**5.6**	§
1,1-Dichloroethane	2.8	**ND (< 0.6)**	**ND (< 2.2)**	
cis-1,2-Dichloroethene	2.8	**ND (< 0.6)**	**ND (< 2.2)**	
Chloroform	2.8	**ND (< 0.6)**	**ND (< 2.7)**	
1,2-Dichloroethane	2.8	**ND (< 0.6)**	**ND (< 2.2)**	
1,1,1-Trichloroethane	2.8	**ND (< 0.6)**	**ND (< 3.0)**	
Benzene	2.8	**1.0**	**3.3**	§
Carbon tetrachloride	2.8	**ND (< 0.6)**	**ND (< 3.5)**	
1,2-Dichloropropane	2.8	**ND (< 0.6)**	**ND (< 2.5)**	
Trichloroethene	2.8	**ND (< 0.6)**	**ND (< 3.0)**	
cis-1,3-Dichloropropene	2.8	**ND (< 0.6)**	**ND (< 2.5)**	
trans-1,3-Dichloropropene	2.8	**ND (< 0.6)**	**ND (< 2.5)**	
1,1,2-Trichloroethane	2.8	**ND (< 0.6)**	**ND (< 3.0)**	
Toluene	2.8	**3.4**	**13**	
1,2-Dibromoethane	2.8	**ND (< 0.6)**	**ND (< 4.2)**	
Tetrachloroethene	2.8	**ND (< 0.6)**	**ND (< 3.7)**	
Chlorobenzene	2.8	**ND (< 0.6)**	**ND (< 2.5)**	
Ethylbenzene	2.8	**0.79**	**3.4**	§
m,p-Xylene	2.8	**1.1**	**4.9**	§
Styrene	2.8	**ND (< 0.6)**	**ND (< 2.3)**	
1,1,2,2-tetrachloroethane	2.8	**ND (< 0.6)**	**ND (< 3.8)**	
o-Xylene	2.8	**ND (< 0.6)**	**ND (< 2.4)**	
4-Ethyltoluene	2.8	**ND (< 0.6)**	**ND (< 2.7)**	
1,3,5-Trimethylbenzene	2.8	**ND (< 0.6)**	**ND (< 2.7)**	
1,2,4-Trimethylbenzene	2.8	**ND (< 0.6)**	**ND (< 2.7)**	
m-Dichlorobenzene	2.8	**ND (< 0.6)**	**ND (< 3.3)**	
Benzyl chloride	2.8	**ND (< 0.6)**	**ND (< 2.9)**	
p-Dichlorobenzene	2.8	**ND (< 0.6)**	**ND (< 3.3)**	
o-Dichlorobenzene	2.8	**ND (< 0.6)**	**ND (< 3.3)**	
1,2,4-Trichlorobenzene	2.8	**1.5**	**11**	§
Hexachlorobutadiene	2.8	**ND (< 0.6)**	**ND (< 5.9)**	

Note : (a) The concentration of $\mu g/m^3$ is corrected to 25 ^{0}C and 760 mmHg.

(b) § indicates that the reported value is less than PQL, it is an estimated value and only can be used for reference only.

(c) * indicates that the QC results beyond the acceptable criteria.

(d) ND refers to not detectable (< MDL).

(e) Attachments :

(1) Method Blank Report

(2) Laboratory Quality Control Sample / Duplicate Report

(3) Data Qualifiers & Abbreviations

Sample ID	Laboratory sample ID	before pressurization	after pressurization	
0506-VOC-A1-S1	AC05050027	-9.9inHg	15.1psi	
0506-VOC-A1-S2	AC05050028	-11.9inHg	15.3psi	
0506-VOC-A2-Sb	AC05050029	-28.5inHg	15.0psi	*
0506-VOC-A2-S1	AC05050030	-10.5inHg	14.8psi	
0506-VOC-A2-S2	AC05050031	-10.0inHg	15.1psi	
506-VOC-A2-S2R	AC05050032	-10.9inHg	15.1psi	
0506-VOC-A3-S1	AC05050033	-4.5inHg	14.9psi	
0506-VOC-A3-S2	AC05050034	-10.5inHg	15.2psi	
0507-VOC-A1-S1	AC05050035	-9.7inHg	15.2psi	
0507-VOC-A1-S2	AC05050036	-11.2inHg	15.1psi	
0507-VOC-A2-Sb	AC05050037	-28.5inHg	15.0psi	*
0507-VOC-A2-S1	AC05050038	-10.4inHg	15.1psi	
0507-VOC-A2-S2	AC05050039	-8.9inHg	15.2psi	
0507-VOC-A2-S2R	AC05050040	-9.6inHg	15.2psi	
0507-VOC-A3-S1	AC05050041	-3.8inHg	15.1psi	
0507-VOC-A3-S2	AC05050042	-11.3inHg	15.3psi	

* no dilution factor was calculated

Attachment 2

Test Report No. : A0503788
Date of issue : 12/05/05

TO-14 LAB. QUALITY CONTROL SAMPLE/DUPLICATE REPORT

LCS 1st test ID : QC0505010-1
LCS 2nd test ID : QC0505010-2

	LCS						Acceptable
	Theoretical	1st test	2nd test	% Recovery			% Recovery
Compound Name	Conc. (ppbv	(ppbv)	(ppbv)	1st test	2nd test	%RPD	Limits
Freon 12	19.68	18.57	19.59	94.3	99.6	5.4	70 - 130
Chloromethane	18.94	16.36	15.70	86.4	82.9	4.1	70 - 130
Freon 114	19.49	18.74	19.18	96.1	98.4	2.3	70 - 130
Vinyl chloride	18.94	17.78	18.60	93.8	98.2	4.5	70 - 130
Bromomethane	19.13	19.11	20.55	99.9	107.4	7.3	70 - 130
Chloroethane	18.94	17.88	19.29	94.4	101.8	7.6	70 - 130
Freon 11	18.94	18.30	20.23	96.6	106.8	10.0	70 - 130
1,1-Dichloroethene	18.76	18.67	20.36	99.5	108.5	8.7	70 - 130
Dichloromethane	18.94	19.36	19.47	102.2	102.8	0.6	70 - 130
Freon 113	18.94	19.35	20.92	102.2	110.5	7.8	70 - 130
1,1-Dichloroethane	18.94	18.16	18.70	95.9	98.7	2.9	70 - 130
cis-1,2-Dichloroethene	18.76	17.84	17.75	95.1	94.6	0.5	70 - 130
Chloroform	18.94	18.38	19.43	97.0	102.6	5.6	70 - 130
1,2-Dichloroethane	18.94	18.41	18.54	97.2	97.9	0.7	70 - 130
1,1,1-Trichloroethane	18.94	18.21	19.25	96.1	101.6	5.6	70 - 130
Benzene	18.94	18.23	17.58	96.2	92.8	3.6	70 - 130
Carbon tetrachloride	19.13	19.25	19.07	100.7	99.7	1.0	70 - 130
1,2-Dichloropropane	18.94	17.32	17.21	91.4	90.8	0.6	70 - 130
Trichloroethene	18.57	18.39	19.00	99.0	102.3	3.3	70 - 130
cis-1,3-Dichloropropene	18.57	16.70	17.94	89.9	96.6	7.2	70 - 130
trans-1,3-Dichloropropene	18.02	17.76	16.19	98.5	89.8	9.2	70 - 130
1,1,2-Trichloroethane	19.13	18.19	17.35	95.1	90.7	4.7	70 - 130
Toluene	18.94	18.16	17.05	95.8	90.0	6.3	70 - 130
1,2-Dibromoethane	18.94	17.91	17.12	94.6	90.4	4.5	70 - 130
Tetrachloroethene	18.94	18.29	17.46	96.6	92.2	4.7	70 - 130
Chlorobenzene	18.94	17.68	17.92	93.3	94.6	1.3	70 - 130
Ethylbenzene	18.94	17.12	17.77	90.4	93.8	3.7	70 - 130
m,p-Xylene	37.88	35.22	36.71	93.0	96.9	4.1	70 - 130
Styrene	18.76	18.36	16.25	97.9	86.6	12.2	70 - 130
1,1,2,2-tetrachloroethane	18.76	17.52	16.45	93.4	87.7	6.3	70 - 130
o-Xylene	18.76	17.02	17.99	90.7	95.9	5.6	70 - 130
1,3,5-Trimethylbenzene	18.94	17.48	16.67	92.3	88.0	4.8	70 - 130
1,2,4-Trimethylbenzene	18.57	15.17	16.17	81.7	87.0	6.3	70 - 130
m-Dichlorobenzene	18.76	15.24	16.31	81.3	86.9	6.8	70 - 130
p-Dichlorobenzene	18.76	14.73	15.11	78.5	80.5	2.5	70 - 130
o-Dichlorobenzene	18.39	14.73	16.01	80.1	87.0	8.3	70 - 130
1,2,4-Trichlorobenzene	18.21	16.56	16.63	91.0	91.3	0.4	70 - 130
Hexachlorobutadiene	18.39	16.55	17.46	90.0	94.9	5.3	70 - 130

Sample ID: MB050511 (Method blank)
Final volume (μl): 20

Test Compound	Test Concentration (pg/sample)	Method Detection Limit (pg/sample)
2,3,7,8-TeCDF	ND	0.247
1,2,3,7,8-PeCDF	ND	0.652
2,3,4,7,8-PeCDF	ND	0.857
1,2,3,4,7,8-HxCDF	ND	0.909
1,2,3,6,7,8-HxCDF	ND	0.808
2,3,4,6,7,8-HxCDF	ND	0.942
1,2,3,7,8,9-HxCDF	ND	0.550
1,2,3,4,6,7,8,-HpCDF	ND	0.800
1,2,3,4,7,8,9-HpCDF	ND	0.766
OCDF	1.160	1.290
2,3,7,8-TeCDD	0.100	0.201
1,2,3,7,8-PeCDD	0.080	0.902
1,2,3,4,7,8-HxCDD	ND	0.828
1,2,3,6,7,8-HxCDD	ND	0.923
1,2,3,7,8,9-HxCDD	ND	0.950
1,2,3,4,6,7,8-HpCDD	ND	1.215
OCDD	0.960	1.310

Labelled Compound	Recovery (%)	Control Limit (%)
SS $^{37}Cl_4$-2,3,7,8-TeCDD	--	70 ~ 130
SS $^{13}C_{12}$-2,3,4,7,8-PeCDF	--	70 ~ 130
SS $^{13}C_{12}$-1,2,3,4,7,8-HxCDI	--	70 ~ 130
SS $^{13}C_{12}$-1,2,3,4,7,8-HxCDI	--	70 ~ 130
SS $^{13}C_{12}$-1,2,3,4,7,8,9-HpCI	--	70 ~ 130
IS $^{13}C_{12}$-2,3,7,8-TeCDF	81	40 ~ 130
IS $^{13}C_{12}$-1,2,3,7,8-PeCDF	95	40 ~ 130
IS $^{13}C_{12}$-1,2,3,6,7,8-HxCDF	102	40 ~ 130
IS $^{13}C_{12}$-1,2,3,4,6,7,8-HpCI	118	25 ~ 130
IS $^{13}C_{12}$-2,3,7,8-TeCDD	85	40 ~ 130
IS $^{13}C_{12}$-1,2,3,7,8-PeCDD	100	40 ~ 130
IS $^{13}C_{12}$-1,2,3,6,7,8-HxCDI	99	40 ~ 130
IS $^{13}C_{12}$-1,2,3,4,6,7,8-HpCI	105	25 ~ 130
IS $^{13}C_{12}$-OCDD	104	25 ~ 130

Annex G

Duplicate TVOC, Speciated VOCs and Dioxins Results

Table G1 Duplicate TVOC Results

TVOC	Duplicate TVOC Concentration (ppmv)	
	Sampling Result	**PQL**
6th May 2005	ND	2.5
7th May 2005	ND	2.5

Notes:
(a) ND = Not Detectable
(b) PQL = Practical Quantitation Limit

Table G2 Duplicate Speciated VOC Results

VOC	Duplicate Speciated VOCs Concentration (ppbv)			
	6th May 2005		**7th May 2005**	
	Duplicate	**PQL**	**Duplicate**	**PQL**
Freon 12	1.4	3.2	1.3	3.0
Chloromethane	ND (< 0.6)	3.2	ND (< 0.6)	3.0
Freon 114	ND (< 0.6)	3.2	ND (< 0.6)	3.0
Vinyl chloride	ND (< 0.6)	3.2	ND (< 0.6)	3.0
1,3-Butadiene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
Bromomethane	0.82	3.2	ND (< 0.6)	3.0
Chloroethane	ND (< 0.6)	3.2	ND (< 0.6)	3.0
Freon 11	0.83	3.2	0.63	3.0
1,1-Dichloroethene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
Dichloromethane	10	3.2	4	3.0
Freon 113	0.72	3.2	ND (< 0.6)	3.0
1,1-Dichloroethane	ND (< 0.6)	3.2	ND (< 0.6)	3.0
cis-1,2-Dichloroethene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
Chloroform	ND (< 0.6)	3.2	ND (< 0.6)	3.0
1,2-Dichloroethane	ND (< 0.6)	3.2	ND (< 0.6)	3.0
1,1,1-Trichloroethane	ND (< 0.6)	3.2	ND (< 0.6)	3.0
Benzene	1.0	3.2	0.87	3.0
Carbon tetrachloride	ND (< 0.6)	3.2	ND (< 0.6)	3.0
1,2-Dichloropropane	ND (< 0.6)	3.2	ND (< 0.6)	3.0
Trichloroethene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
cis-1,3-Dichloropropene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
trans-1,3-Dichloropropene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
1,1,2-Trichloroethane	ND (< 0.6)	3.2	ND (< 0.6)	3.0
Toluene	7.4	3.2	2.8	3.0
1,2-Dibromoethane	ND (< 0.6)	3.2	ND (< 0.6)	3.0
Tetrachloroethene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
Chlorobenzene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
Ethylbenzene	1.8	3.2	0.96	3.0
m,p-Xylene	3.7	3.2	1.3	3.0
Styrene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
1,1,2,2-tetrachloroethane	ND (< 0.6)	3.2	ND (< 0.6)	3.0
o-Xylene	1.2	3.2	ND (< 0.6)	3.0
4-Ethyltoluene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
1,3,5-Trimethylbenzene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
1,2,4-Trimethylbenzene	0.91	3.2	0.83	3.0
m-Dichlorobenzene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
Benzyl chloride	ND (< 0.6)	3.2	ND (< 0.6)	3.0
p-Dichlorobenzene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
o-Dichlorobenzene	ND (< 0.6)	3.2	ND (< 0.6)	3.0
1,2,4-Trichlorobenzene	0.99	3.2	1.3	3.0
Hexachlorobutadiene	ND (< 0.6)	3.2	ND (< 0.6)	3.0

VOC	Duplicate Speciated VOCs Concentration (ppbv)			
	6th May 2005		7th May 2005	
	Duplicate	PQL	Duplicate	PQL

Notes:

(a) ND = not detected which is below Method Detection Limit (MDL)

(b) PQL = Practical Quantitation Limit

Table G3 Duplicate Dioxin Results

PCDD/PCDF	Duplicate Dioxin Concentration (μgm^{-3})	
	pg/sample	pg TEQ/sample
6th May 2005		
2, 3, 7, 8 - TCDF	3.840	0.384
1, 2, 3, 7, 8 - PeCDF	1.220	0.061
2, 3, 4, 7, 8 - PeCDF	< 0.857	0.21425
1, 2, 3, 4, 7, 8 - HxCDF	0.960	0.096
1, 2, 3, 6, 7, 8 - HxCDF	< 0.808	0.0404
2, 3, 4, 6, 7, 8 - HxCDF	< 0.942	0.0471
1, 2, 3, 7, 8, 9 - HxCDF	< 0.550	0.0275
1, 2, 3, 4, 6, 7, 8 - HpCDF	2.660	0.0266
1, 2, 3, 4, 7, 8, 9 - HpCDF	< 0.766	0.00383
OCDF	1.720	0.00172
2, 3, 7, 8 - TCDD	< 0.201	0.1005
1, 2, 3, 7, 8 -PeCDD	< 0.902	0.2255
1, 2, 3, 4, 7, 8 -HxCDD	< 0.828	0.0414
1, 2, 3, 6, 7, 8 -HxCDD	< 0.923	0.04615
1, 2, 3, 7, 8, 9 -HxCDD	< 0.950	0.0475
1, 2, 3, 4, 6, 7, 8 -HpCDD	3.140	0.0314
OCDD	4.900	0.0049
Air Flow (m^3) (d)	**12.92**	
Total PCDD/PCDFs (pg I-TEQ/m^3)	**0.108**	
7th May 2005		
2, 3, 7, 8 - TCDF	11.080	1.108
1, 2, 3, 7, 8 - PeCDF	< 0.652	0.0163
2, 3, 4, 7, 8 - PeCDF	< 0.857	0.21425
1, 2, 3, 4, 7, 8 - HxCDF	< 0.909	0.04545
1, 2, 3, 6, 7, 8 - HxCDF	< 0.808	0.0404
2, 3, 4, 6, 7, 8 - HxCDF	< 0.942	0.0471
1, 2, 3, 7, 8, 9 - HxCDF	< 0.550	0.0275
1, 2, 3, 4, 6, 7, 8 - HpCDF	< 0.800	0.004
1, 2, 3, 4, 7, 8, 9 - HpCDF	< 0.766	0.00383
OCDF	< 1.290	0.000645
2, 3, 7, 8 - TCDD	< 0.201	0.1005
1, 2, 3, 7, 8 -PeCDD	< 0.902	0.2255
1, 2, 3, 4, 7, 8 -HxCDD	< 0.828	0.0414
1, 2, 3, 6, 7, 8 -HxCDD	< 0.923	0.04615
1, 2, 3, 7, 8, 9 -HxCDD	< 0.950	0.0475
1, 2, 3, 4, 6, 7, 8 -HpCDD	< 1.215	0.006075
OCDD	3.520	0.00352
Air Flow (m^3) (d)	**13.26**	
Total PCDD/PCDFs (pg I-TEQ/m^3)	**0.149**	

Annex H

HKDL Noise Monitoring Methodology

HKDL Noise Monitoring Methodology

The following is a technical narrative on the broad principles that shall be used to record, analyze, and report noise compliance in regards to the Hong Kong Disneyland (HKDL) Fireworks Program during the trial test.

Ambient Noise Measurement-

Two Leq_{A15min} ambient measurements shall be taken at each of the required locations, Discovery Bay and Peng Chau. The first Leq_{A15min} ambient measurement shall be taken immediately prior to the Fireworks show and the second immediately following the show. These two ambient measurements shall be averaged together to form the "average ambient sound pressure level". This average will be called the Background Noise Level (BNL) and will be calculated using the following calculation:

$$BNL=10 \times \log[(10^{(\text{ambient before}/10)} + 10^{(\text{ambient after}/10)})/2]$$

Show Monitoring-

A Leq_{A15min} measurement shall be taken for the 15 minutes timeframe during the fireworks show that will include all fireworks noise. During monitoring, the technician will log any non-fireworks noise events. An editing will be made where appropriate to allow for any significant influence on the measured firework noise level (such as significant noise created by aircraft, boat engines, boat horn, etc.), in accordance with standard acoustical principles and practices[1]. The result of this edited measurement will be the Measured Noise Level (MNL).

Show Analysis-

Based on the MNL, the Corrected Noise Level (CNL) will be calculated using the following calculation:

$$CNL = 10 \times \log(10^{(MNL/10)}-10^{(BNL/10)}).$$

The CNL will be the noise level created by the Fireworks Show at HKDL, which will then be compared against the Acceptable Noise Levels (ANL) as stipulated in the EM&A Manual.

Report-

Five measured noise levels will be reported in the environmental monitoring and audit report:

1. The two ambient noise measurements recorded closely before and after the show
2. The BNL
3. The MNL
4. The CNL

The log that documents any extraneous noise recorded during the show monitoring as well as the raw data will be kept as supporting documentation which shall be submitted to EPD for reference.

[1] A possible scenario for editing would be to "pause" the noise meter until the extraneous non-fireworks noise, which is significantly above the firework noise level, has subsided, at which time the meter will be returned to the "measurement" mode. Examples of these types of noises are helicopters, boat engines, etc. Should the non-fireworks noise event be an instantaneously loud noise, such as a boat horn, the technician will, after pausing the meter, remove the data contained in the previous seconds that contain the noise, and then resume monitoring until the 15 minute monitoring period has elapsed. Should there be too many editing of extraneous noise, at levels significantly exceeding the firework noise, during the measurement, the firework measurement shall be deemed to be invalid and a replacement monitoring should be arranged at the next available opportunity.

A temporary meteorological monitoring station will be set up near the fireworks launch sites. Wind speed and wind direction will be measured during the noise monitoring period.

Monitoring Locations

Based on the noise sensitive receivers identified and stated within the EIA report, representative noise monitoring locations have been identified. The locations are listed below in Table 1.

Table 1 Proposed Noise Monitoring Locations

NSR No	Proposed Location
NM1	Refuse Transfer Station (Peng Chau)
NM2	Rooftop of Cherish Court (Discovery Bay)

The monitoring station will be positioned at a point 1 m from an external building façade as close to the noise sensitive receivers as practicable, having the least obstructed view to HKDL and free of extraneous noise disturbance as far as possible, to reflect the worst case noise impact in accordance with standard acoustical practices.

Alternative Monitoring Locations

Should there be difficulties in obtaining site access to the above locations or should the above locations become inappropriate (i.e. due to there being no direct line-of-sight to HKDL or nearby obstructive noise etc.), alternative locations will be proposed for EPD's agreement.

The selection of these alternative monitoring locations would be based on the following criteria:

- The locations should reflect the worst case noise impact
- The locations should be as close to the NSRs as practicable
- Depending on the worst case noise impact, the location should have the least obstructed view to HKDL.