AIR QUALITY
IN HONG KONG 2004

Air Science Group

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Environmental Protection Department

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The Government of the Hong Kong
Special Administrative Region

A report on the results from the Air Quality Monitoring Network (2004) (AQMN)

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Summary

This report summarises the 2004 air quality monitoring data collected by the Environmental Protection Department's monitoring network.

During 2004, Hong Kong was adversely affected by the exceptionally frequent regional air pollution events happened under calm and sunny weather conditions that hindered dispersion of air pollutants and favoured photochemical smog formation. As a result, the air quality in 2004 was poorer than that in 2003. All of the monitoring stations recorded increases in the annual average concentrations of respirable suspended particulates, resulting in a significant drop in the overall compliance rate with long-term Air Quality Objectives. Ozone concentrations have been in a rising trend over the past decade, indicating a deterioration in regional air quality. On this front, the Hong Kong Special Administrative Region Government and the Guangdong Provisional Government are implementing a Regional Air Quality Management Plan to improve air quality in the Pearl River Delta Region.

As in previous years, concentrations of sulphur dioxide, carbon monoxide and lead remained at levels well below their respective Air Quality Objectives limits in 2004.

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1. Introduction

The Environmental Protection Department (EPD) operates a network of 14 air quality monitoring stations for measuring concentrations of major air pollutants. It consists of 11 general stations for monitoring ambient air quality and 3 roadside stations for measuring street level air quality. Please refer to Table B1 in Appendix B for details of the monitoring stations.

Additional monitoring facilities specifically designed for collecting Toxic Air Pollutants (TAPs) samples have been installed at the Tsuen Wan and Central/Western monitoring stations since 1997 to measure ambient levels of potentially important TAPs in Hong Kong.

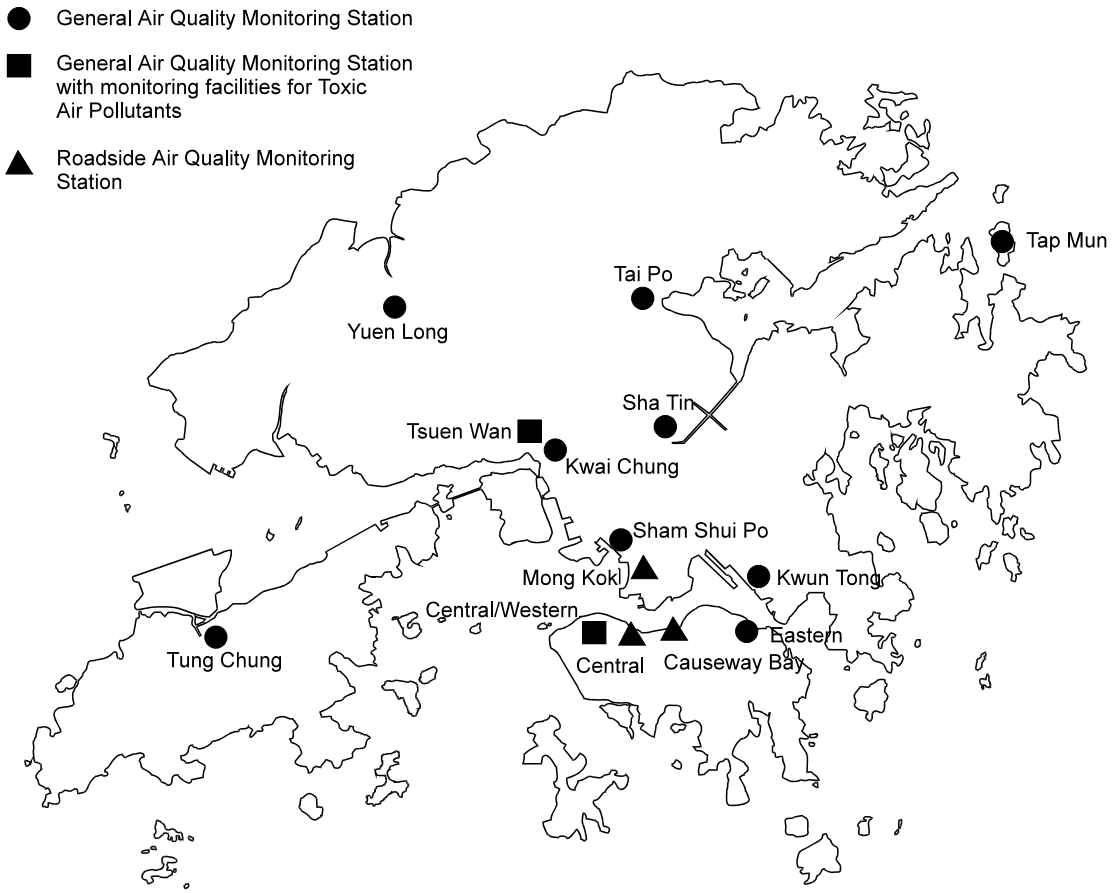


Figure 1: Location of EPD's Air Quality Monitoring Stations (2004)

Apart from EPD's network, the Hongkong Electric Co. Ltd. (HEC) and the CLP Power Hong Kong Limited (CLP) also operate a number of monitoring stations to assess the ambient levels of sulphur dioxide and nitrogen dioxide in the vicinity of their power generating stations. The locations of these monitoring stations and the relevant monitoring results in 2004 are at Appendix D.

2. Gaseous Pollutants

2.1 Sulphur Dioxide (SO_2)

Sulphur dioxide (SO_2) is formed primarily from combustion of sulphur-containing fossil fuels. In Hong Kong, power stations are the major source of SO_2, followed by fuel combustion, marine vessels and vehicles.

Exposure to high levels of SO_2 may cause impairment of respiratory function and aggravate existing respiratory and cardiac illnesses. Prolonged exposure at lower levels may also increase the risk of developing chronic respiratory diseases.

Figure 2a: Sulphur Dioxide Monitoring 2004
(1-Hour Average Statistics)

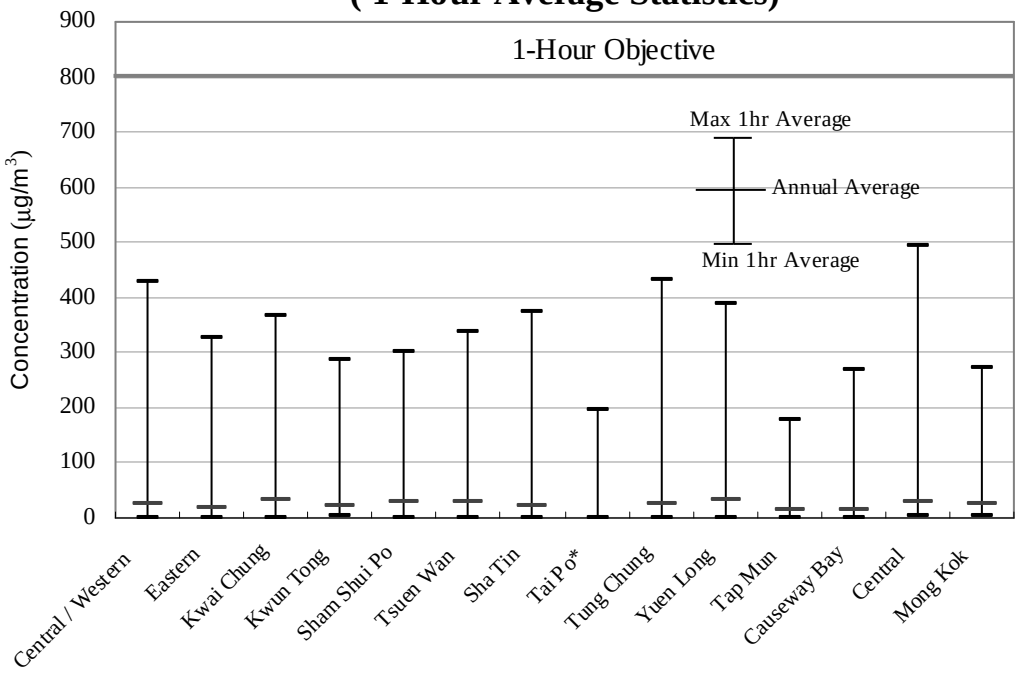
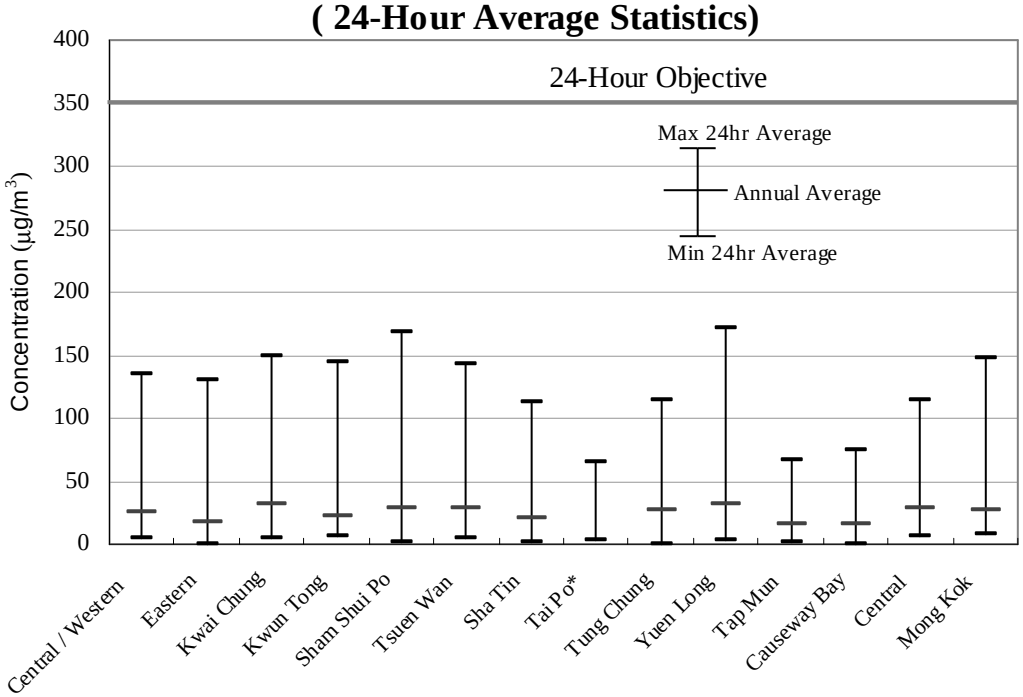
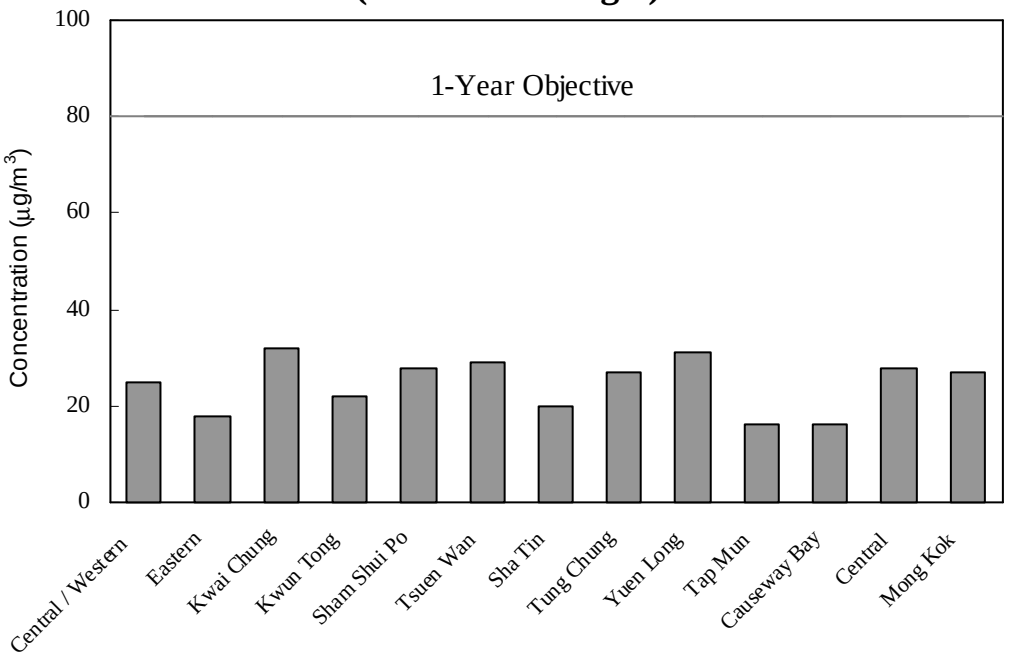


Figure 2b: Sulphur Dioxide Monitoring 2004
(24-Hour Average Statistics)



Note: The asterisked station did not have sufficient data for the calculation of annual average in the year.

Figure 2c: Sulphur Dioxide Monitoring 2004
(Annual Average)



Sulphur dioxide was continuously measured at all 14 stations in the monitoring network during 2004. As in previous years, concentrations of SO_2 in Hong Kong remained very low in 2004. All of the 14 stations complied with all relevant AQOs for SO_2 during the year. The highest 1-hour average (494 $\mu g/m^3$) was recorded at Central roadside station and the highest 24-hour average (171 $\mu g/m^3$) was recorded at Yuen Long station. The highest annual average (32 $\mu g/m^3$) was recorded at Kwai Chung station. All these readings were well below their respective AQO limits.

2.2 Nitrogen Oxides (NO_x) and Nitrogen Dioxide (NO_2)

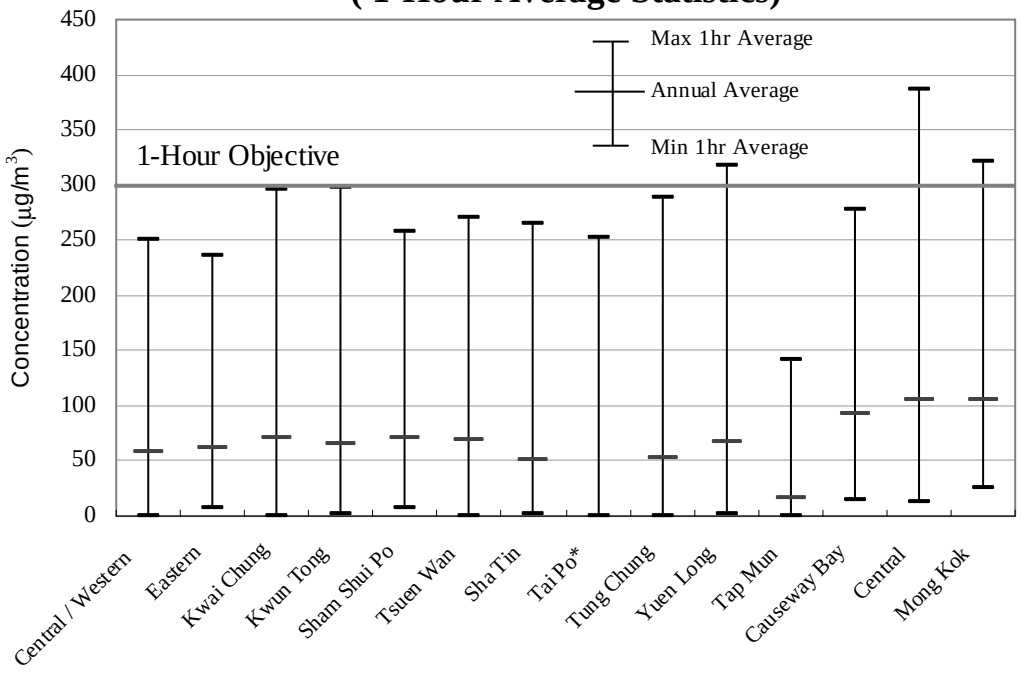
The various chemical species of the oxides of nitrogen are collectively termed as nitrogen oxides. From an air pollution standpoint, the most important nitrogen oxides in the atmosphere are nitric oxide (NO) and nitrogen dioxide (NO_2). These two gases, which are often mentioned jointly in the air pollution literature as NO_x, usually enter the atmosphere as a result of combustion processes. Emissions from power stations and motor vehicles (diesel vehicles in particular) are the two major sources of NO_x in Hong Kong. NO_x emissions from motor vehicles are of greater concern due to their dominant impact on the roadside air quality.

Nitrogen dioxide (NO_2) is formed from oxidation of nitric oxide (NO) emitted from fuel combustion. Long-term exposure to NO_2 can lower a person's resistance to respiratory infections and aggravate existing chronic respiratory diseases.

Nitrogen dioxide was continuously measured at all 14 stations in the monitoring network during 2004. In 2004, both the highest 1-hour average (386 $\mu g/m^3$) and the highest 24-hr average (203 $\mu g/m^3$) were recorded at Central roadside station.

As in previous year, all general stations complied with the annual AQO for NO_2 while non-compliance was still observed at the roadside stations in 2004. The highest annual average (105 $\mu g/m^3$) was recorded at both Central and Mong Kok roadside stations.

Figure 3a: Nitrogen Dioxide Monitoring 2004
(1-Hour Average Statistics)



Note: The asterisked station did not have sufficient data for the calculation of annual average in the year.

Figure 3b: Nitrogen Dioxide Monitoring 2004
(24-Hour Average Statistics)

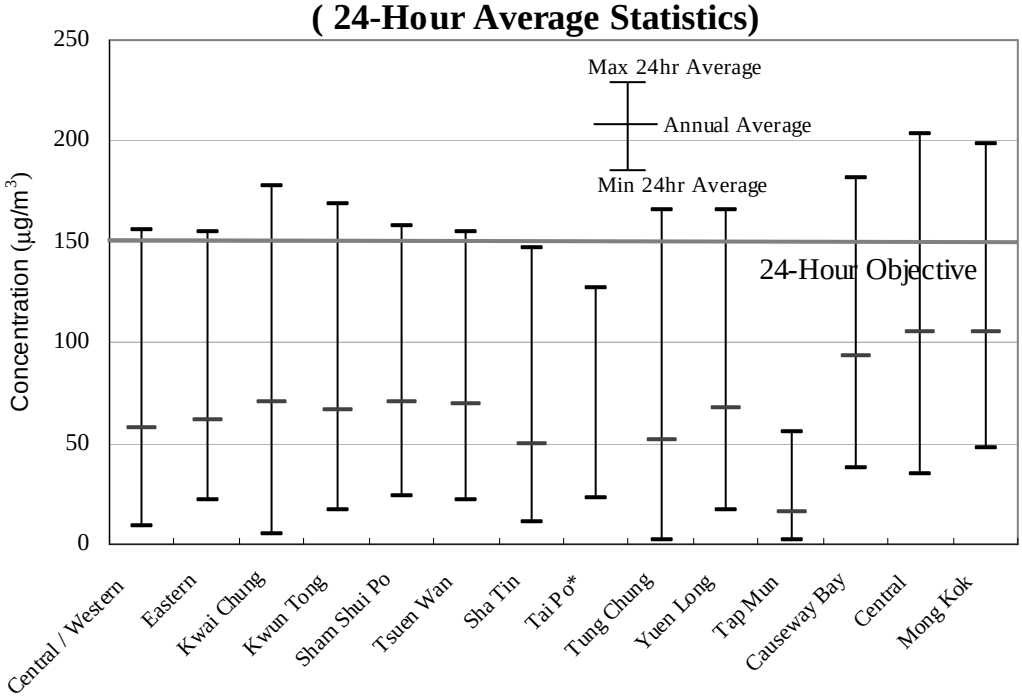
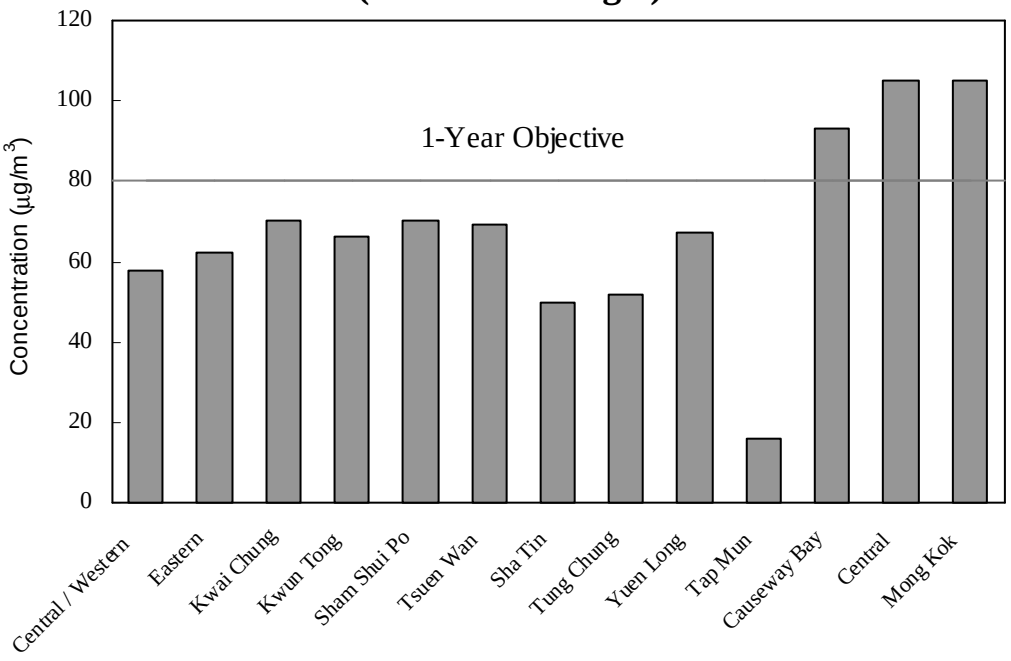


Figure 3c: Nitrogen Dioxide Monitoring 2004
(Annual Average)



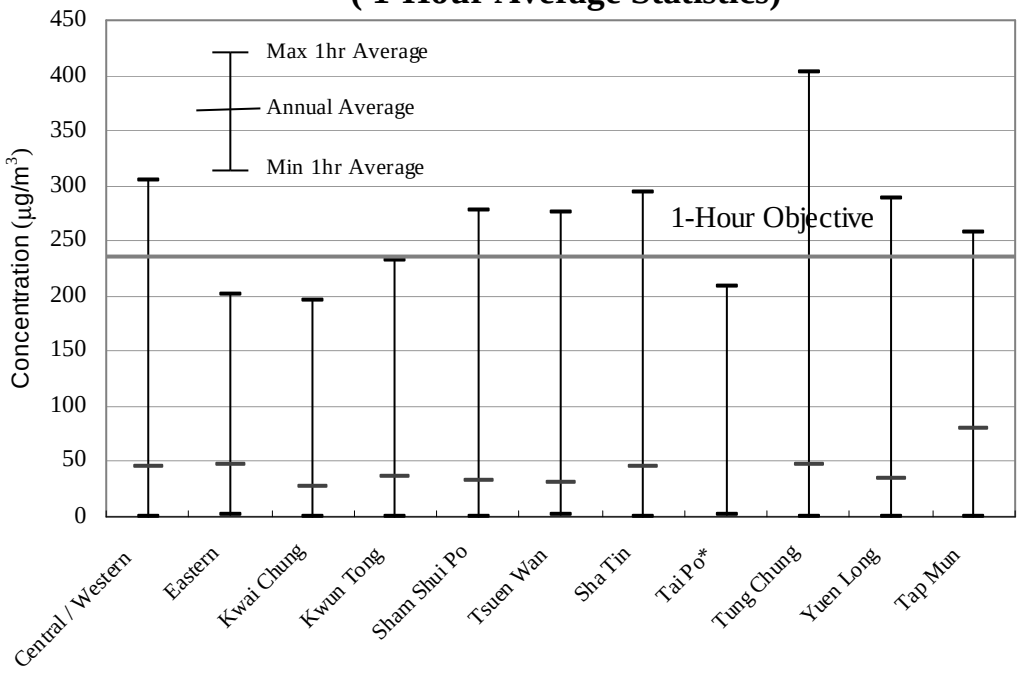
2.3 Ozone (O_3)

Ozone (O_3), a major constituent of photochemical smog, is formed by a series of complicated photochemical reactions of oxygen, nitrogen oxides and volatile organic compounds in the presence of sunlight and warm temperature. Being a strong oxidant, ozone can cause irritation to the eye, nose and throat even at low concentrations. At elevated levels, it can increase a person's susceptibility to respiratory infections and aggravate pre-existing respiratory illnesses such as asthma.

Ozone was measured at all the 11 general monitoring stations during 2004.

Compared with previous years, 2004 saw a lot more days with calm, dry and sunny weather conditions which favoured the photochemical formation of ozone in Hong Kong and the neighbouring region. In 2004, 7 stations recorded exceedance of the AQO limit for ozone, compared with 4 stations in 2003. Tung Chung Station recorded the highest 1-hr average of 403 $\mu g/m^3$ in 2004.

Figure 4a: Ozone Monitoring 2004
(1-Hour Average Statistics)



Note: The asterisked station did not have sufficient data for the calculation of annual average in the year.

2.4 Carbon Monoxide (CO)

Carbon monoxide (CO) comes mainly from vehicular emissions although small amount of which may also come from incomplete combustion of fuels from factories and power stations. When it enters the bloodstream, CO can reduce oxygen delivery to the body's organs and tissues. Typical symptoms of CO poisoning include shortness of breath, chest pain, headaches, and loss of co-ordination. The health threat from CO is more severe for those who suffer from heart disease.

Carbon monoxide was continuously monitored at 7 stations including 3 roadside stations and 4 general stations during 2004. Similar to previous years, both the ambient and roadside CO concentrations remained very low in 2004. During the year, all of the 7 stations complied with the 1-hour and 8-hour AQO. In 2004, the highest 1-hour average (4830 µg/m^3) was recorded at Central roadside station and the highest 8-hour average (3423 µg/m^3) was recorded at Mong Kok roadside station, these values were around one sixth and one third of the respective AQO limits.

Figure 5a: Carbon Monoxide Monitoring 2004
(1-Hour Average Statistics)

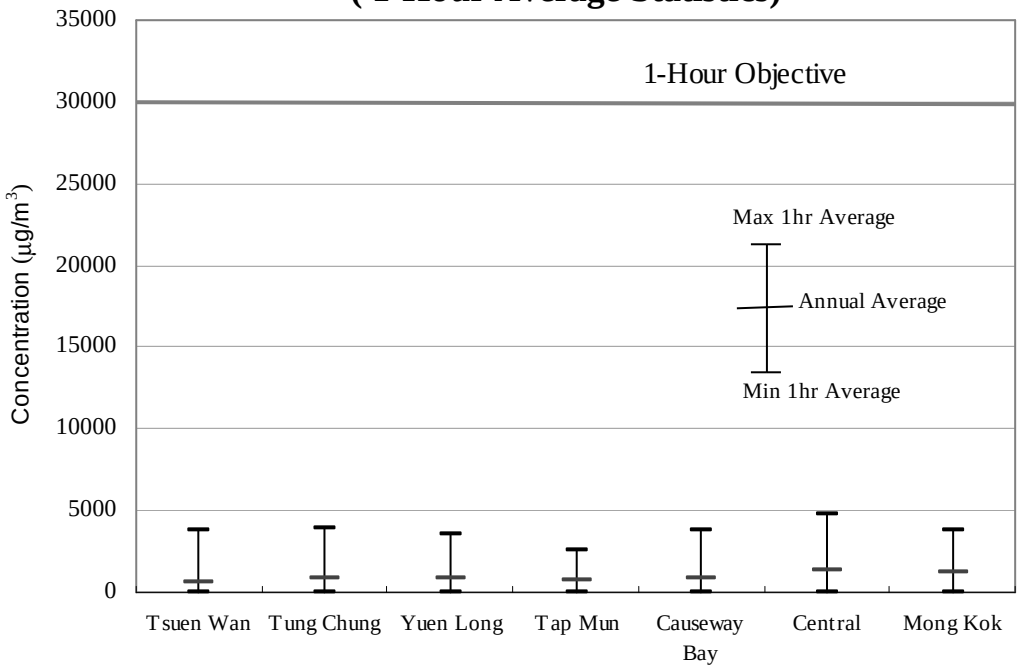
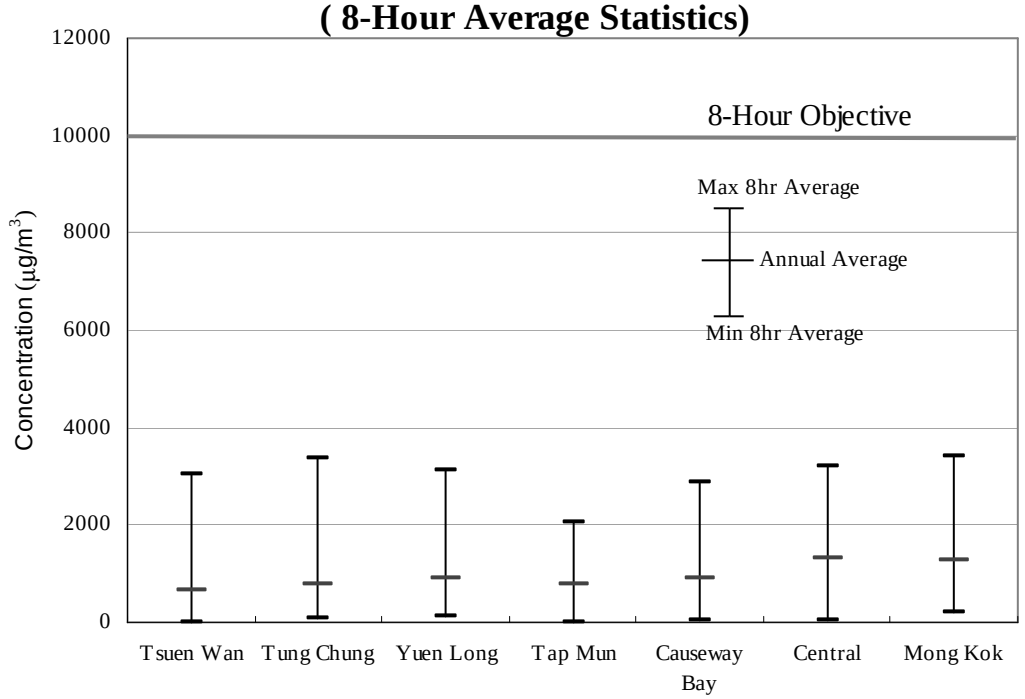


Figure 5b: Carbon Monoxide Monitoring 2004
(8-Hour Average Statistics)



3. Suspended Particulates

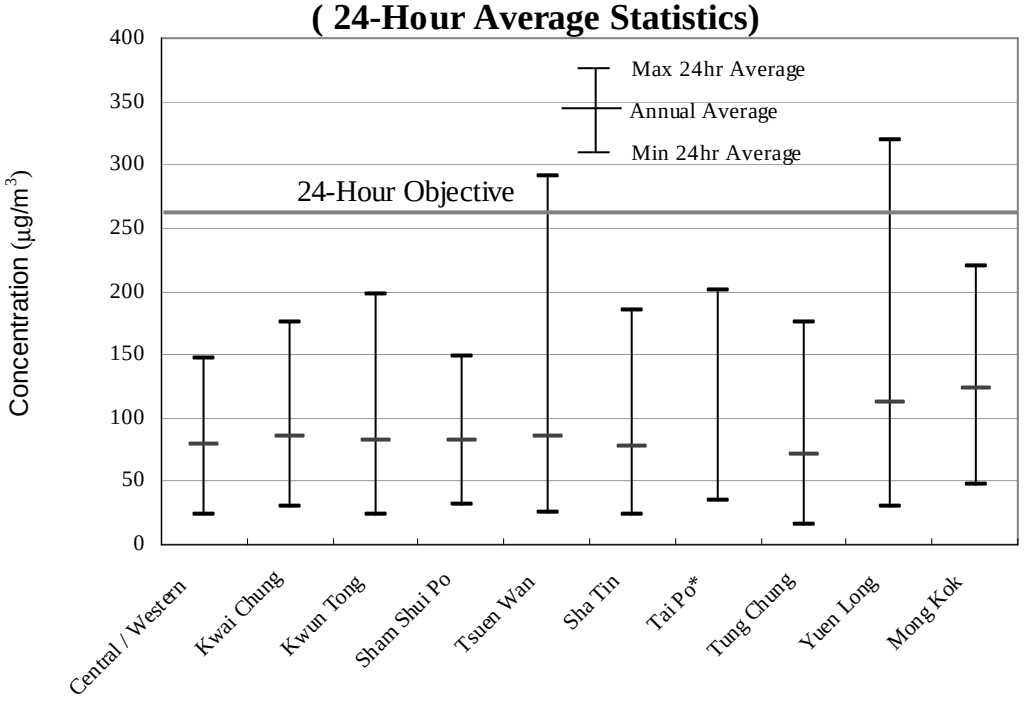
3.1 Total Suspended Particulates (TSP)

Total suspended particulates (TSP) are small airborne particulates such as dust, fume and smoke with diameters less than 100 micrometres. Major sources of TSP include power stations, construction activities and vehicle exhausts. TSP can be broadly divided into two major types. Suspended particulates with a nominal aerodynamic diameter of 10 micrometres or less are called respirable suspended particulates (RSP), or PM10 for short, and are usually of much greater health concern (see Section 3.2 below). On the other hand, suspended particulates that are larger than 10 micrometres in diameter mainly cause soiling and dust nuisance.

TSP measurement was conducted by sampling using High-volume samplers at 9 general and 1 roadside stations during 2004.

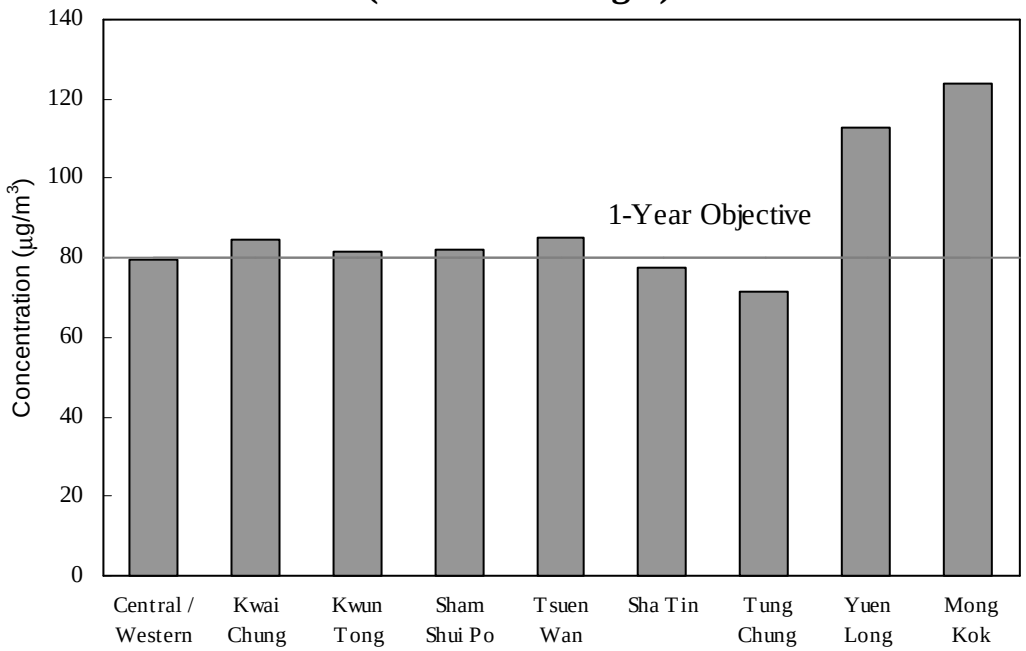
In 2004, the highest 24-hr average (320 μg/m^3) was recorded at Yuen Long station. Exceedance of the annual AQO value of 80 μg/m^3 for TSP was observed at the Mong Kok roadside station and 5 other general stations. The highest annual average (124 μg/m^3) was recorded at Mong Kok roadside station.

Figure 6a: TSP Monitoring 2004
(24-Hour Average Statistics)



Note: The asterisked station did not have sufficient data for the calculation of annual average in the year.

Figure 6b: TSP Monitoring 2004
(Annual Average)



3.2 Respirable Suspended Particulates (RSP)

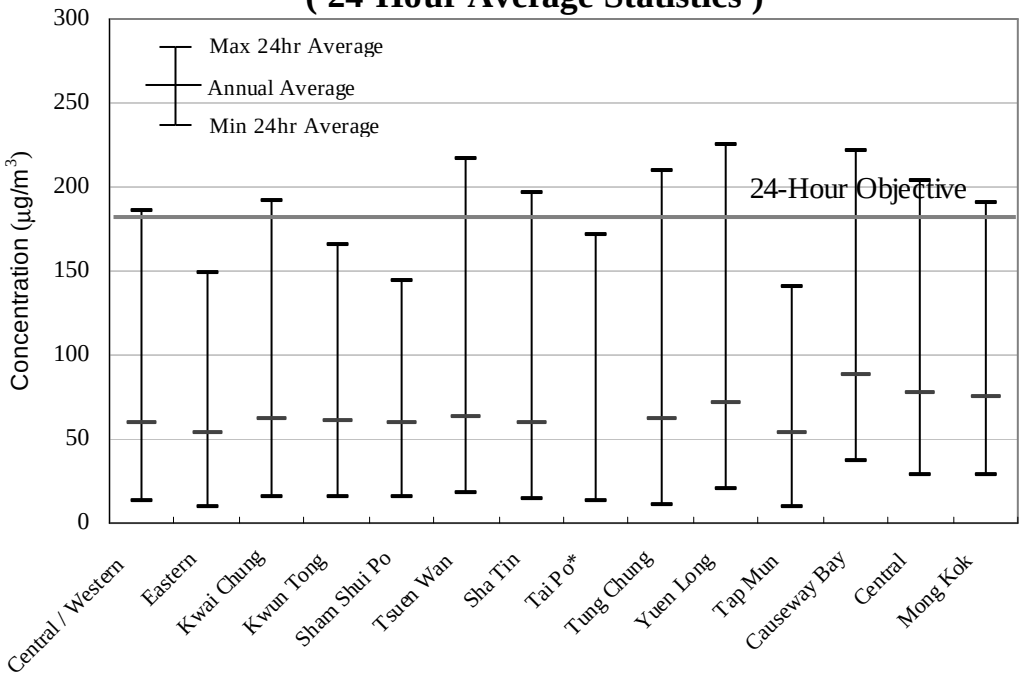
Respirable suspended particulates (RSP) refer to those suspended particulates with nominal aerodynamic diameters of 10 micrometres or less. Combustion sources, in particular diesel vehicle exhaust and emissions from power plants, are the major sources of RSP. Besides, RSP can be formed by atmospheric oxidation of sulphur dioxide and nitrogen oxides. Although to a lesser extent, crustal derived dust and marine aerosols are significant sources of RSP as well.

RSP at high levels may cause chronic and acute effects on human health, particularly the pulmonary function, as they can penetrate deep into the lungs and cause respiratory problems. These effects are enhanced if high RSP levels are associated with higher levels of other pollutants, such as SO_2. The smaller particulates in RSP also have a major impact on visibility.

RSP was measured at all the 14 stations in the monitoring network in 2004. Most of these stations were also equipped with high-volume sampler to collect particulate samples for chemical analysis.

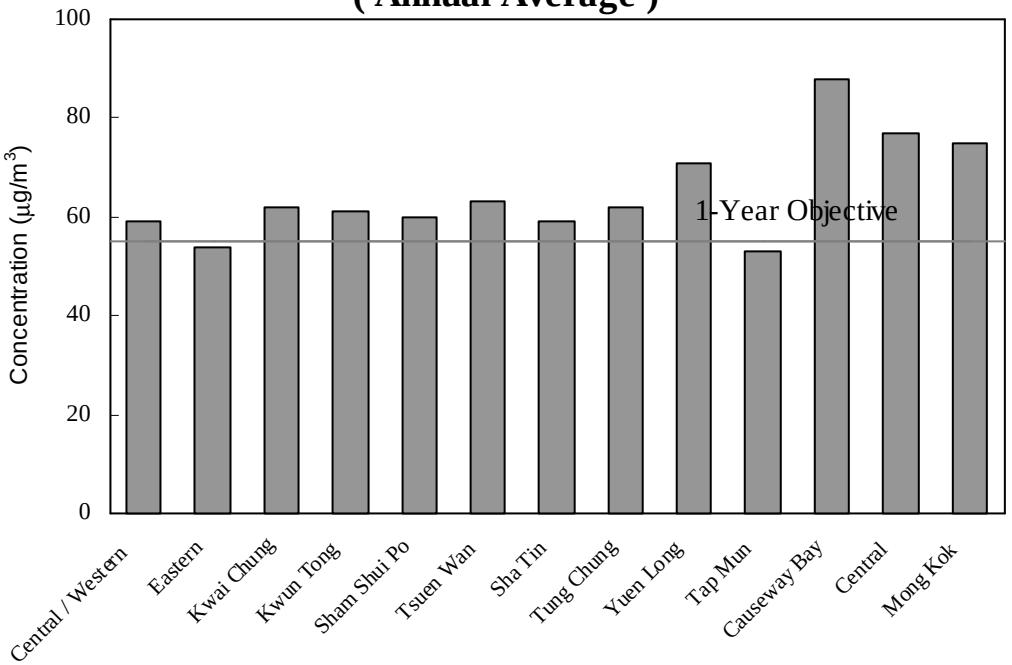
Due to the exceptionally frequent regional air pollution events happened under calm weather conditions, the annual average concentrations of RSP increased across the whole territory in 2004, resulting in non-compliance with the annual AQO for RSP at most of the stations. Exceedances of the annual AQO value of of 55 $\mu g/m^3$ for RSP were recorded at 3 roadside stations and 8 general stations. In 2004, the highest annual average (88 $\mu g/m^3$) was recorded at Causeway Bay roadside station, while Yuen Long station recorded the highest 24-hr average of 225 $\mu g/m^3$.

Figure 7a: RSP Monitoring 2004
(24-Hour Average Statistics)



Note: The asterisked station did not have sufficient data for the calculation of annual average in the year.

Figure 7b: RSP Monitoring 2004
(Annual Average)



3.3 Lead (Pb)

Lead is the only one criteria pollutant included in the AQO that is also a toxic air pollutant. In Hong Kong, the sale and supply of leaded petrol, which is a known major source of lead, was banned from 1 April 1999. As in previous years, the ambient lead concentrations continued to linger at very low levels during 2004. The overall 3-month averages ranged from 39 ng/m^3 (second quarter) to 322 ng/m^3 (fourth quarter) and were well within the AQO limit of 1,500 ng/m^3.

4. Toxic Air Pollutants (TAPs)

Two groups of toxic air pollutants (TAPs), viz. heavy metals and organic substances, were regularly monitored at the Central/Western and Tsuen Wan stations since mid 1997. Among the various TAPs monitored in 2004, 8 of them are considered more important in terms of their health impacts and their annual averages are summarised in Table C8. Detailed description of the TAPs monitoring operation is given in Appendix B.4. The monitoring data collected so far indicate that the levels of toxic air pollutants in Hong Kong are comparable to those observed in other major cities.

5. Variation of Air Pollution Levels over Time

The concentrations of air pollutants in the atmosphere can change over a day, over the months of a year and in the period of several years.

5.1 Over a Day

The concentrations of most air pollutants generally follow the diurnal pattern of traffic. For instance, higher levels of NO_2 and RSP are usually observed in the early morning and the evening rush hours when there are more traffic and human activities. Likewise, the lowest concentrations often occur from midnight to dawn when the traffic is at its minimum. To no surprise, this type of traffic induced diurnal patterns is much more distinct for pollutant levels at roadside.

Figure 8: 2004 Diurnal variations of NO_2

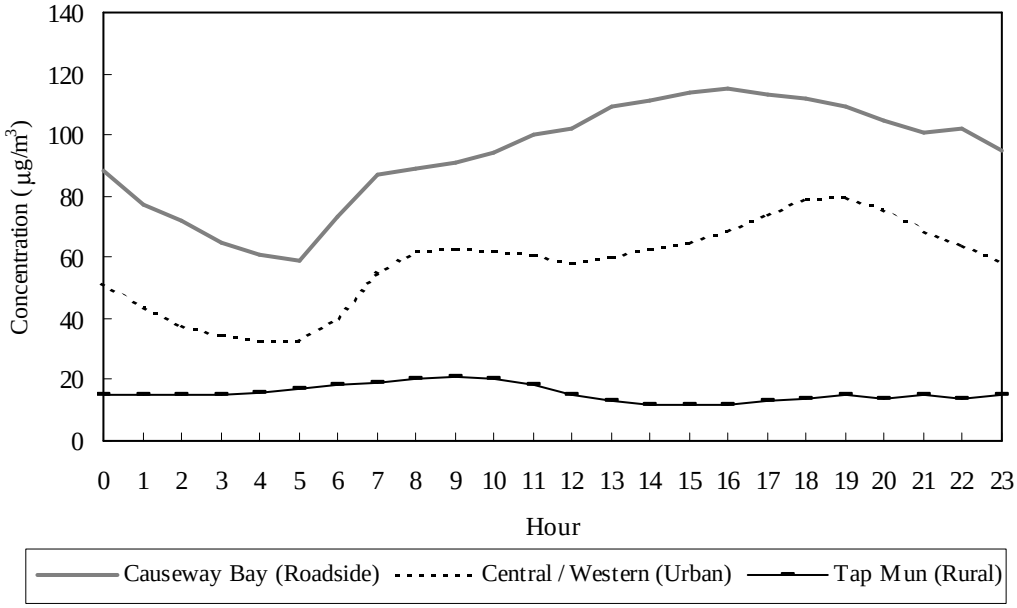
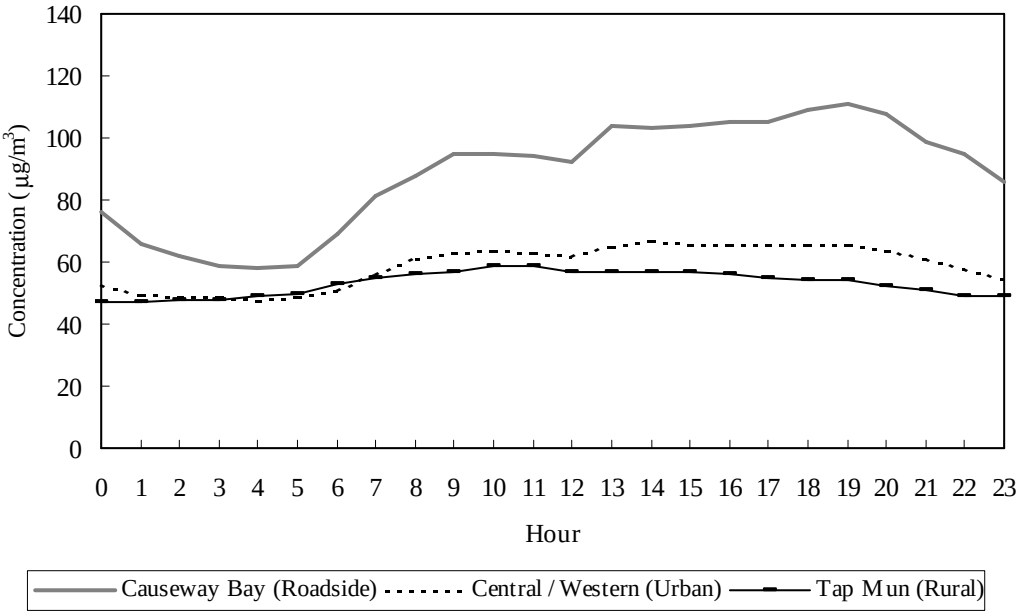
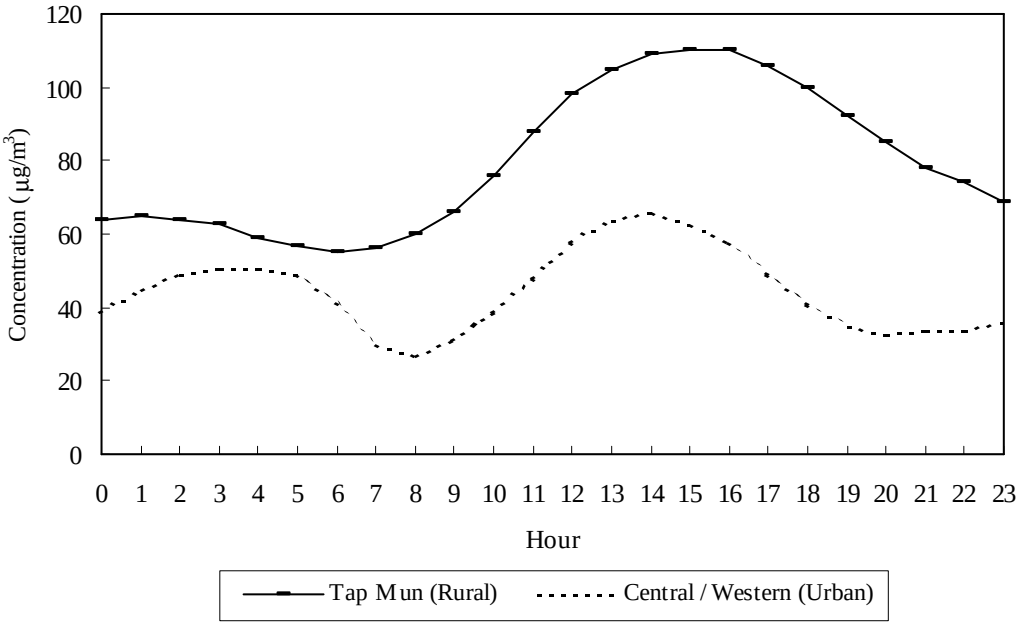


Figure 9: 2004 Diurnal variations of RSP



The diurnal pattern of ozone is different from that of NO_2 and RSP. Ozone is formed by photochemical reactions of its precursor pollutants such as NO_2 and volatile organic compounds (VOCs) under sunlight. Outside urban centres the ambient ozone levels start to build up before noon and peak in the afternoon, when precursor pollutants are accumulated and sunlight is strong. In urban areas, the lowest ozone concentrations are often observed during the rush hours. This is because a large amount of nitric oxide from the rush-hour traffic acts as an efficient scavenger of ozone, and sunlight is not strong enough for photochemical reactions to take place.

Figure 10: 2004 Diurnal variations of O_3



5.2 Over a Year

Concentrations of NO_2, RSP and O_3 are substantially lower in summer months (June to August) due to a number of reasons. The higher temperatures in summer months induce larger mixing heights, which favours the dispersion of pollutants. The rains in summer help to wash out pollutants more frequently. The south-westerly prevailing wind in summer also helps to replenish the region with cleaner oceanic air.

Figure 11: Monthly variations of NO_2 and RSP at Central / Western in 2004

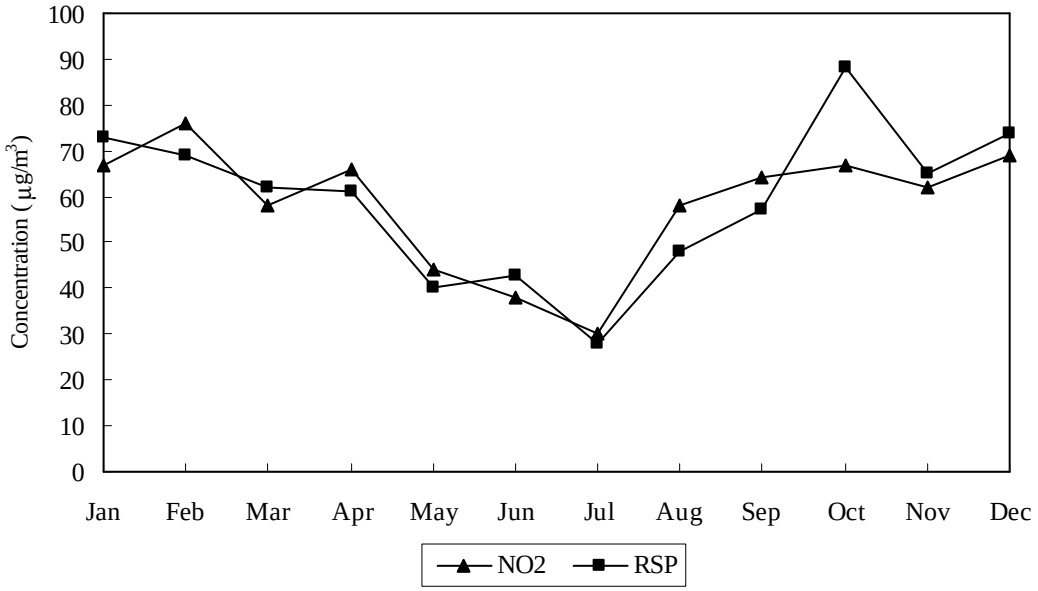
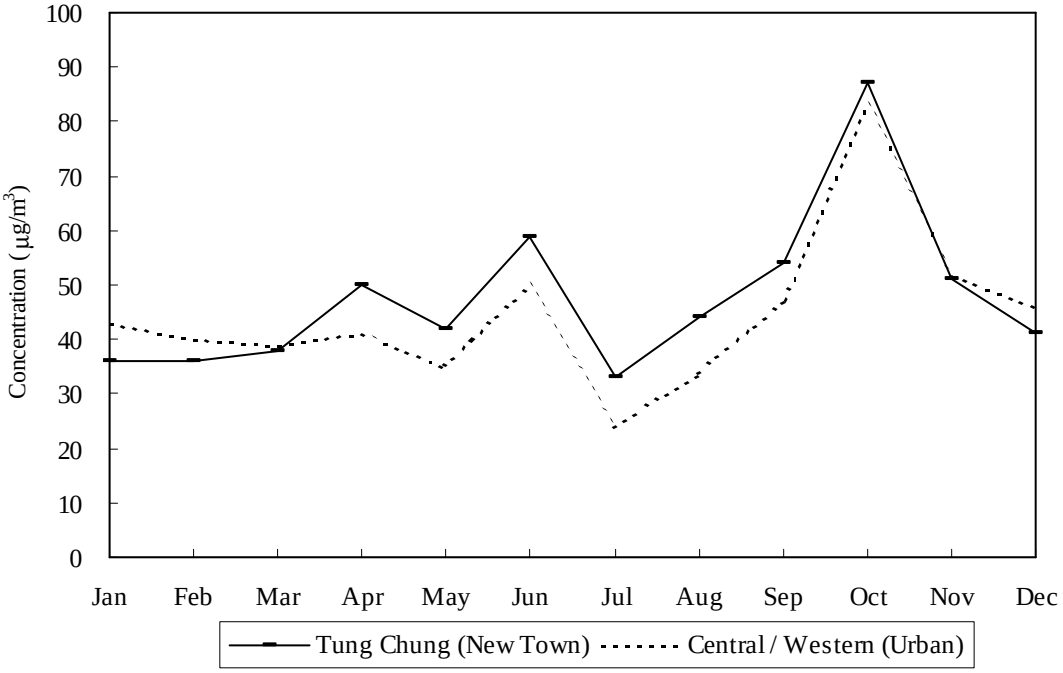


Figure 12: Monthly variations of O_3 in 2004



5.3 Long Term Trends

The long-term trends for various air pollutants presented in this section are based on annual average concentrations of pollutants recorded from various air quality monitoring stations categorised into 4 groups of land use types, namely Urban, New Town, Rural and Roadside as defined in Table 1 below.

Table 1: Classification of Air Monitoring Stations by Land Use Types

Land Use Type	Land Use Characteristics	Station
Urban	Densely populated residential areas mixed with some commercial and/or industrial areas.	Central/Western, Eastern, Kwai Chung, Kwun Tong, Sham Shui Po and Tsuen Wan
New Town	Mainly residential areas.	Sha Tin, Tai Po, Tung Chung and Yuen Long
Rural	Rural areas.	Tap Mun (background station)
Roadside[1]	Urban roadside in mixed residential/ commercial area with heavy traffic and surrounded by many tall buildings.	Causeway Bay and Central

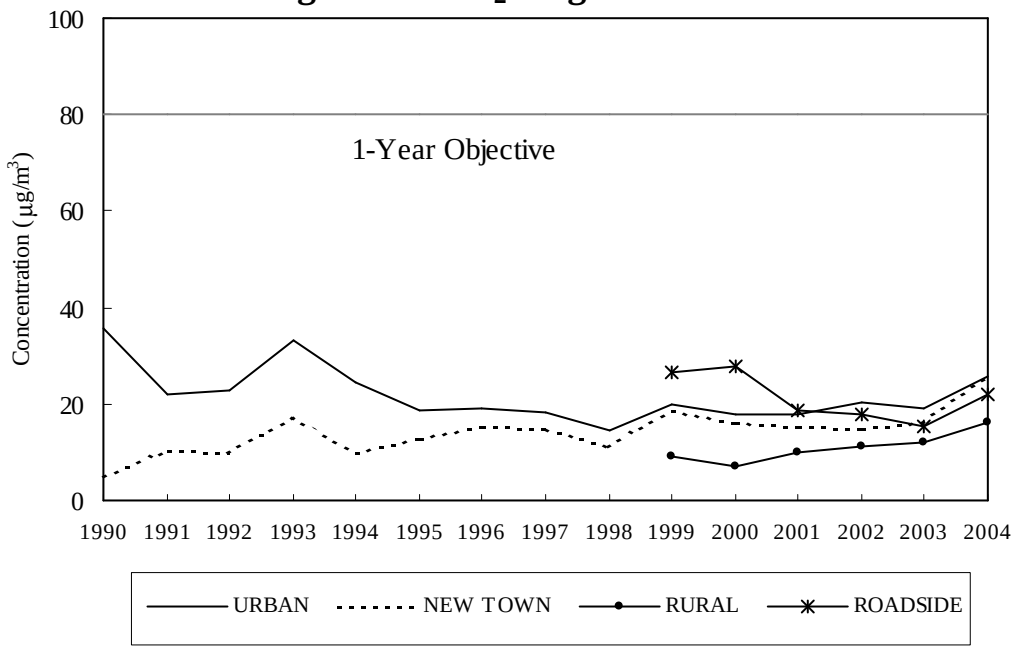
5.3.1 Sulphur Dioxide (SO_2)

Since the implementation of the Air Pollution Control (Fuel Restriction) Regulations in 1990 for cutting sulphur content of industrial fuels and the Air Pollution Control (Motor Vehicle Fuel) Regulations in 1995 for controlling motor vehicle fuel quality, SO_2 concentrations in Hong Kong have reduced and remained at levels well below the annual AQO limit of 80 $\mu g/m^3$. However, SO_2 concentrations in the ambient stations have shown gentle rising trends over the past 2 years.

As a result of the introduction of ultra low sulphur diesel for vehicle fleet in late 2000, the average SO_2 concentration at roadside in 2004 (22 $\mu g/m^3$) dropped by 21% compared with the 2000 value (28 $\mu g/m^3$).

[1] The current Mong Kok roadside station was commissioned in 2001. The station is not included in the trend analysis due to its relatively short history of measurement as compared with other stations. Therefore, the long-term trends for roadside stations are only based on data from the remaining 2 roadside stations, namely Causeway Bay and Central roadside stations.

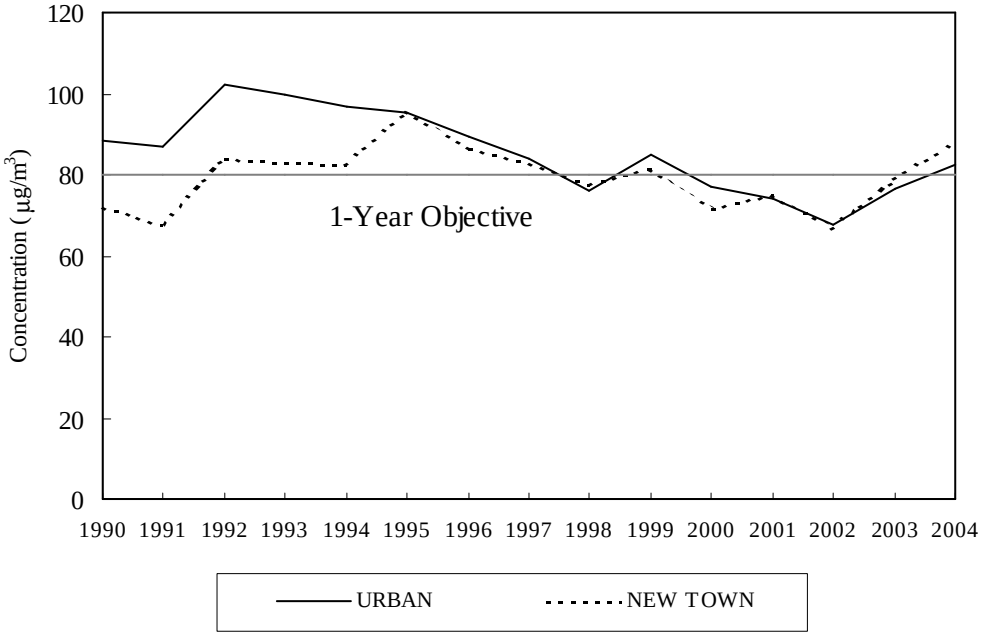
Figure 13: SO_2 long term trend



5.3.2 Total Suspended Particulates (TSP)

After exhibiting primarily declining trends for a decade, the TSP concentrations in the territory have rebounded since 2002. The territory-wide increases in TSP concentrations over the past two years could be attributed mainly to the rises in regional background TSP levels.

Figure 14: TSP long term trend

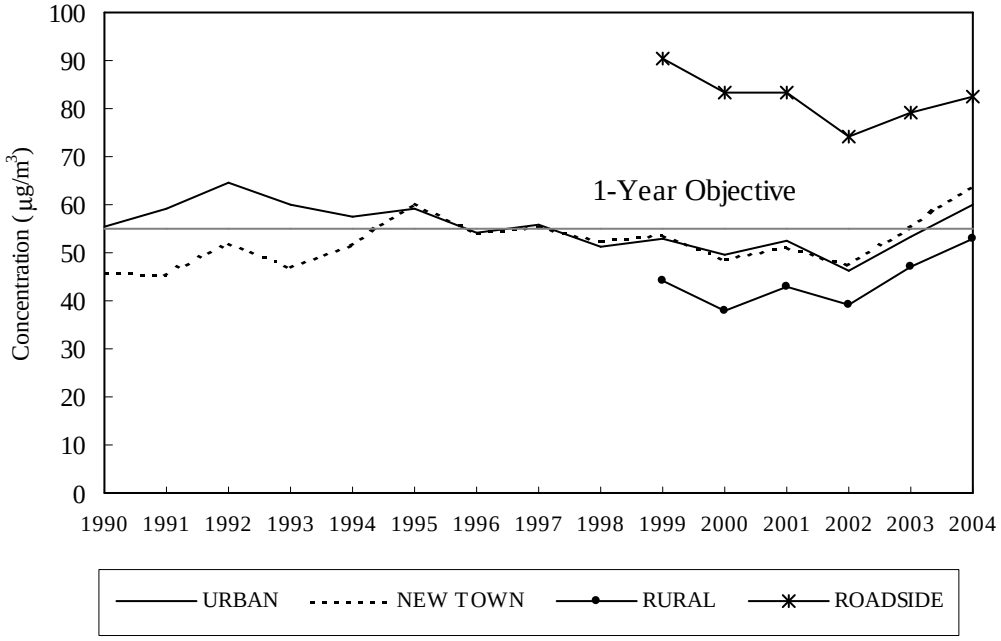


5.3.3 Respirable Suspended Particulates (RSP)

The RSP concentrations in urban and new town areas showed a primarily downward trend between 1995 and 2002 but rebounded afterwards. The rural station also recorded a similar upward trend in RSP concentrations over the past two years. Such territory-wide rise in RSP concentrations generally reflects an increase in regional background RSP levels in recent years.

Despite an increase in background RSP levels in recent years, the annual average of RSP at roadside in 2004 has reduced by 9% compared with 1999, thanks to the effects of various vehicle emission control measures over the past few years.

Figure 15: RSP long term trend



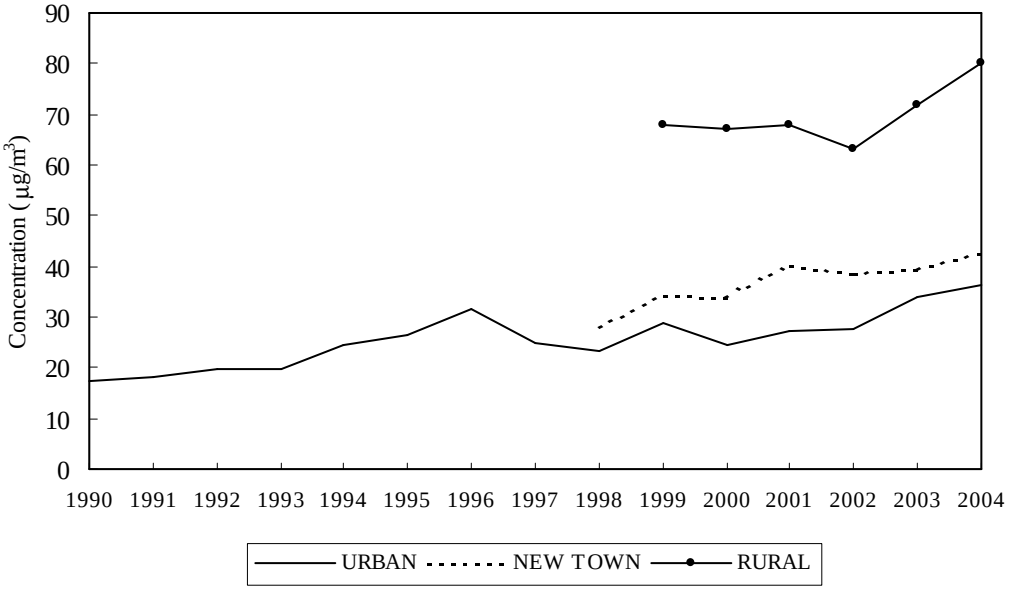
5.3.4 Ozone (O_3)

As nitric oxide emissions from motor vehicles can react with and remove ozone in the air, areas with heavy traffic flow normally have lower ozone levels than areas with low traffic flow. Hence, Tap Mun rural station has steadily recorded more than twice the ozone levels measured in urban areas since 1999.

During the past 10 years, ozone levels in the territory showed a rising trend. The annual average of ozone for urban stations in 2004 (37 $\mu g/m^3$) was 48% higher than the 1994 value (25 $\mu g/m^3$).

Ozone is a regional air pollution issue. The rising trend of ozone generally reflects deterioration in air quality on a regional scale over the past decade. The Hong Kong Special Administrative Region Government and Guangdong Provincial Government have formulated a regional air quality management plan to improve air quality in the Pearl River Delta region.

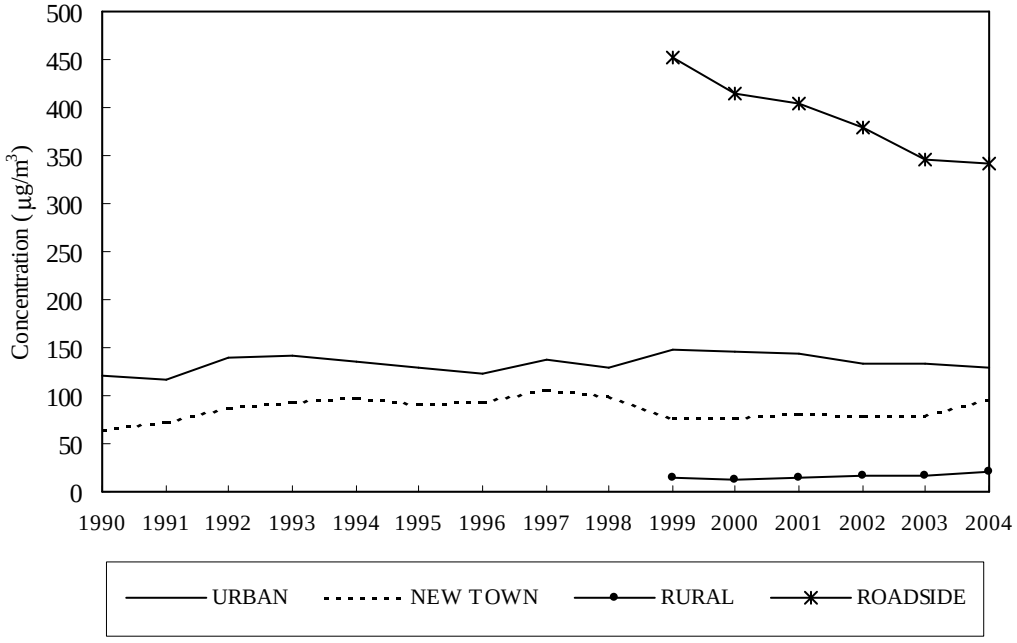
Figure 16: O_3 long term trend



5.3.5 Nitrogen Oxides (NO_x) and Nitrogen Dioxide (NO_2)

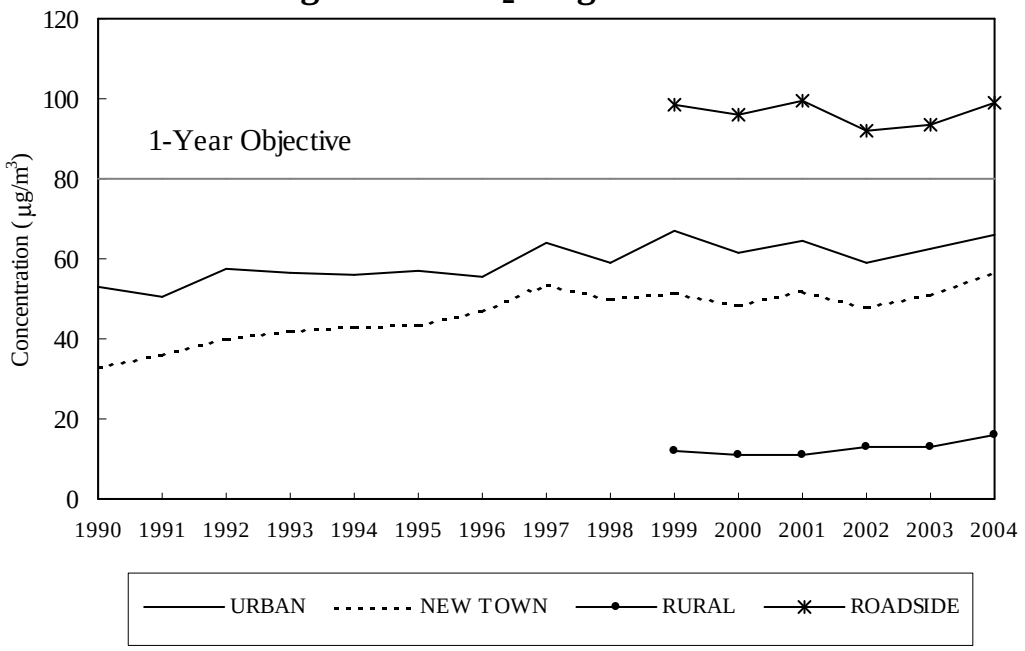
The annual average of NO_x in urban areas has remained quite constant over the past decade. The annual average of NO_x at roadside in 2004 reduced by 24% compared with 1999, which reflects a reduction in emission levels as a result of vehicle emission control measures implemented in recent years.

Figure 17: NOx long term trend



NO_2 is mainly formed from the oxidation of nitric oxide, a major component of NO_x. The concentrations of NO_2 are dependent on the levels of NO_x as well as the concentrations of ozone in the ambient air which promotes the conversion of nitric oxide to NO_2. Since 1990, the NO_2 levels in urban and new town areas have exhibited slow rising trends in line with the trends of ozone.

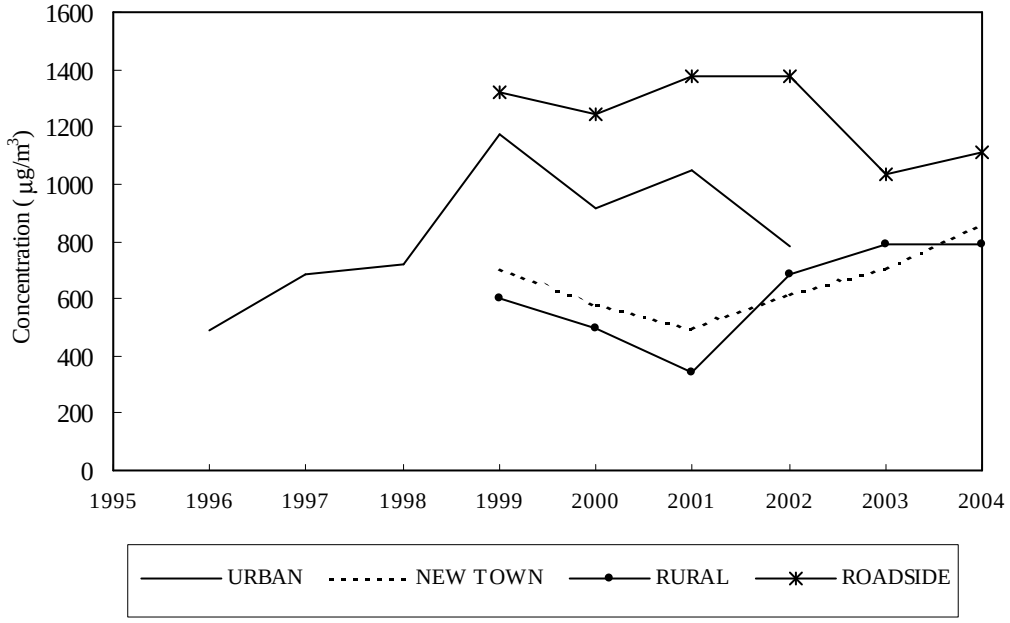
Figure 18: NO_2 long term trend



5.3.6 Carbon Monoxide (CO)

CO concentrations in Hong Kong remained very low in the past several years. Even at the roadside close to the vehicular emission sources, the CO levels were well within the relevant AQOs.

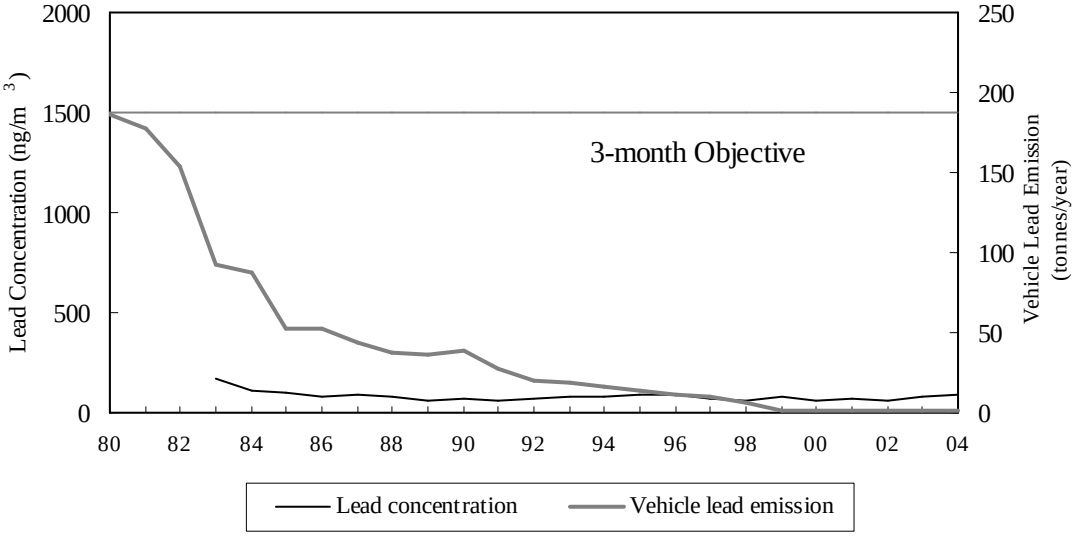
Figure 19: CO long term trend



5.3.7 Lead (Pb)

The ambient lead concentrations have been lingering at very low levels since the oil companies took voluntary action in reducing the lead content of petrol in the early eighties. Lead emissions from vehicles were further reduced as a result of the introduction of unleaded petrol in April 1992 and completely eliminated when the sale and supply of leaded petrol was banned in April 1999.

Figure 20 : Vehicle lead emission and lead concentration



5.4 Air Pollution Episodes

The concentrations of air pollutants occasionally rise to levels much higher than normal under very calm weather conditions. These incidents are called air pollution episodes.

In Hong Kong, RSP and NO_2 episodes are often associated with stagnating high pressure systems in winter which bring subsiding air over the South China region hindering dispersion of pollutants. Serious photochemical smog incidents are mostly associated with calm, sunny and hot weather conditions which favour the formation and accumulation of ozone and fine particulates in Hong Kong and the neighbouring region. Such weather conditions are more prevalent in summer and autumn, especially when Hong Kong and the neighbouring areas are affected by subsiding air induced by a tropical cyclone hovering in the Western Pacific Ocean near Taiwan. In 2004, this type of tropical cyclone induced unfavourable weather events happened more frequently than in previous years, resulting in more elevated ozone and particulates episodes in the year.

Appendix A

Air Quality Objectives and their Compliance Status

Established in 1987, the Hong Kong Air Quality Objectives (AQO) for seven major air pollutants was set at levels to protect public health. The compliance status of the AQO has been used as the indicator of air quality in different districts in Hong Kong.

Table A1: Hong Kong Air Quality Objectives (AQO)

Concentration in micrograms per cubic metre [1]

Pollutant	Averaging Time				
	1 hour[2]	**8 hours[3]**	**24 hours[3]**	**3 months[4]**	**1 year[4]**
Sulphur dioxide (SO_2)	800		350		80
Total suspended particulates (TSP)			260		80
Respirable suspended particulates (RSP) [5]			180		55
Nitrogen dioxide (NO_2)	300		150		80
Carbon monoxide (CO)	30000	10000			
Photochemical oxidants (as ozone (O_3) [6])	240				
Lead (Pb)				1.5	

[1] Measured at 298K (25°C) and 101.325 kPa (one atmosphere).
[2] Not to be exceeded more than three times per year.
[3] Not to be exceeded more than once per year.
[4] Arithmetic means.
[5] Respirable suspended particulates mean suspended particulates in air with a nominal aerodynamic diameter of 10 micrometres or smaller.
[6] Photochemical oxidants are determined by measurement of ozone only.

Table A2: Percentage Time in compliance with Short-Term Air Quality Objectives in 2004

Station		O_3	NO_2		TSP	RSP	SO_2		CO	
		1-hr	**1-hr**	**24-hr**	**24-hr**	**24-hr**	**1-hr**	**24-hr**	**1-hr**	**8-hr**
General Station	Central/Western	99.86	100	99.72	100	99.73	100	100	--	--
	Eastern	100	100	99.72	--	100	100	100	--	--
	Kwai Chung	100	100	98.90	100	99.45	100	100	--	--
	Kwun Tong	100	100	99.17	100	100	100	100	--	--
	Sham Shui Po	99.97	100	99.66	100	100	100	100	--	--
	Tsuen Wan	99.96	100	99.45	98.33	99.45	100	100	100	100
	Sha Tin	99.87	100	100	100	99.73	100	100	--	--
	Tai Po	100	100	100	100	100	100	100	--	--
	Tung Chung	99.10	100	99.71	100	99.17	100	100	100	100
	Yuen Long	99.89	99.98	99.18	96.67	99.16	100	100	100	100
	Tap Mun	99.91	100	100	--	100	100	100	100	100
Roadside Station	Causeway Bay	--	100	97.23	--	99.44	100	100	100	100
	Central	--	99.86	92.05	--	99.45	100	100	100	100
	Mong Kok	--	99.92	91.67	100	99.45	100	100	100	100

Notes: "--" Not measured

Compliance with the short-term AQO

Table A2 shows the percentage time of compliance with the short-term AQO (i.e. 1-hr and 24-hr AQO) recorded at each of the monitoring stations in 2004. For NO_2, the compliance percentages of 24-hr AQO were between 91% and 100% at all stations; its 1-hr AQO compliance rates were above 99% at all stations. Regarding RSP, the compliance percentages for 24-hr AQO were above 99% at all stations. The compliance levels for 1-hr AQO for O_3 were over 99% at all monitoring stations. For TSP, the compliance percentage of its 24-hr AQO were between 96% and 100% at all stations. The compliance rates for the short-term AQO for both SO_2 and CO achieved 100% at all monitoring stations.

Compliance with the long-term AQO

Table A3 shows the compliance status of various stations with the long-term (annual) AQO in 2004. For those stations with sufficient data, sulphur dioxide and lead all complied with the long-term AQO. Compliance with the annual AQO for NO_2 was recorded at 10 out of 13 stations. For RSP, only 2 out of 13 stations complied with the annual AQO. The compliance rate for TSP was also low, with only 3 out of 9 stations meeting the annual AQO. The low compliance rates for TSP and RSP were caused by a combination of high regional background particulates levels and exceptionally frequent calm and sunny weather events happened in the year that favoured photochemical smog activities.

As a result of the low compliance rate for RSP, the overall compliance rate with long-term AQO for all pollutants in 2004 was recorded at only 2 out of 13[@] stations, compared with 8 out of 13* stations in 2003.

Notes: [@] *Tai Po station did not have sufficient data for the assessment of annual AQO compliance in 2004. As a result, there were only 13 stations which had adequate data for assessing long-term AQO compliance in the year.*

* *Tsuen Wan station did not have sufficient data for the assessment of annual AQO compliance in 2003. As a result, there were only 13 stations which had adequate data for assessing long-term AQO compliance in the year.*

Table A3: Compliance Status of Long-Term (Annual) Air Quality Objectives in 2004

Station		NO_2	TSP	RSP	SO_2	Lead
		1-year	1-year	1-year	1-year	3-months
General Station	Central/Western	ü	ü	û	ü	ü
	Eastern	ü	--	ü	ü	--
	Kwai Chung	ü	û	û	ü	ü
	Kwun Tong	ü	û	û	ü	ü
	Sham Shui Po	ü	û	û	ü	--
	Tsuen Wan	ü	û	û	ü	ü
	Sha Tin	ü	ü	û	ü	--
	Tai Po	~	~	~	~	--
	Tung Chung	ü	ü	û	ü	ü
	Yuen Long	ü	û	û	ü	ü
	Tap Mun	ü	--	ü	ü	--
Roadside Station	Causeway Bay	û	--	û	ü	--
	Central	û	--	û	ü	--
	Mong Kok	û	û	û	ü	ü

Notes: "ü" *Complied with the AQO* "û" *Violated the AQO* "--" *Not measured*
"~" *Number of data collected is below the minimum required*

Appendix B

AIR QUALITY MONITORING OPERATION

B.1 Network Operation

The air quality monitoring network of 14 monitoring stations is operated by the Air Science Group of the Environmental Protection Department. The measurement of ambient concentrations of total suspended particulates (TSP), respirable suspended particulates (RSP), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3) and carbon monoxide (CO) have been accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) since August 1995.

In order to provide good representation of the air quality in areas of high population density, the locations of the 14 monitoring stations were carefully chosen by referencing to the United States Environmental Protection Agency's (USEPA) guidelines with practical consideration of the unique congested high-rise development of Hong Kong.

The details for the parameters monitored at each monitoring station and a list of equipment employed for measuring the air pollutants are summarised in Tables B2 and B3 respectively. In general, the concentration of gaseous pollutants and RSP are determined continuously by automatic analysers. Manually operated high volume samplers using the gravimetric methods are also used regularly to measure the TSP and RSP. In addition, meteorological parameters, including temperature and solar radiation, wind speed and direction, are also recorded continuously at each station as appropriate.

Wet and dry deposition samples are collected at 3 stations: Central/Western, Kwun Tong and Yuen Long. The parameters measured for all wet and dry samples include: pH, Na^+, K^+, NH_4^+, NO_3^-, SO_4^{2-}, Cl^-, F^-, Ca^{2+}, Mg^{2+}, formate and acetate in the filtrate.

B.2 Data Processing and Dissemination

At each monitoring station, signals from the continuous analysers and the meteorological instruments are first stored in a data logger and then sent back to the Data Processing Unit of the Air Science Group via dedicated telephone lines for further processing. After careful checking and validation, the monitoring data are disseminated to the public in the following manner:-

- Monthly release of the monitoring data recorded at the Mong Kok, Kwai Chung and Central/Western stations (up to June 1998)
- Monthly release of the Air Pollution Index (API) summary for all monitoring stations (since July 1998)
- Daily API reporting and forecast for three categories of land-use areas, viz., urban, industrial, and new development (from 6 June 1995 to 14 June 1998)
- Daily API reporting and forecast for individual station (from 15 June 1998 to 30 June 1999)
- Hourly API reporting for individual station (since 1 July 1999)
- Reporting of monitoring data in the annual reports "*Air Quality in Hong Kong"* and "*Environment Hong Kong"*

- Ad hoc provision of air quality data to the public, academics and environmental consultants upon request for the purposes of research and air quality assessment

- Establishment of the Environmental Protection Interactive Centre (EPIC) for the public to download air quality monitoring data (since March 2004)
  (http://www.epd.gov.hk/epd/epic/english/epichome.html)

The reporting and forecast of API will help the public (particularly susceptible groups such as the elderly, children and people with heart or respiratory illness) to decide on taking precautionary measures when necessary. The monitoring results are also regularly used to assist the formulation of air quality management plans and the evaluation on the effectiveness of the current air pollution control programmes.

B.3 Quality Control and Assurance

A quality policy is adopted to ensure that ambient air quality monitoring results from the monitoring stations attain a high degree of accuracy and precision. A quality system has been established in accordance with the HOKLAS criteria.

The accuracy of the monitoring network is assessed by performance audits. Similar to overseas standards, control limits of ±15% and ±10% are adopted for the gaseous pollutants and particulates respectively. In 2004, 426 audit checks were carried out on the stations' analysers and samplers. As shown in Figure B1 and based on the 95% probability limits, the accuracy of the network was within the specified control limits.

The precision, a measure of the repeatability, of the measurements is checked in accordance with EPD's quality manuals. In 2004, 1750 precision checks were carried out on the analysers and samplers. As shown in Figure B2 and based on the 95% probability limits, the precision of the network varied between -9.4% and 7.4%, which was again within target limits.

In addition to the above operation, a system audit to review the quality assurance activities is carried out on an annual basis on the monitoring network. A report outlining the deficiencies and corrective actions is compiled at the end of the audit.

B.4 Toxic Air Pollutants Monitoring Operation

The Air Science Group has installed in July 1997 additional monitoring facilities at the Tsuen Wan and Central/Western stations to measure regularly the levels of Toxic Air Pollutants (TAPs) in Hong Kong. The TAPs being monitored can be broadly classified as volatile organic compounds (e.g. benzene, perchloroethylene and 1,3-butadiene), dioxins and furans (e.g. 2,3,7,8-TCDF and 2,3,7,8-TCDD), carbonyl compounds (e.g. formaldehyde), polycyclic aromatic hydrocarbons (e.g. benzo(a)pyrene), and hexavalent chromium. Five distinct methods were used to analyse the collected samples for target TAPs (please refer to Table B4 for details). All these methods have stringent QA/QC criteria to ensure the data quality. Sampling media used include stainless steel canisters, Sep-Pak cartridges, polyurethane foams and bicarbonate impregnated filters. TAP samples are analysed by the Government Laboratory.

Table B1. Fixed Network Monitoring Stations: Site Information

Monitoring Station	Address	Area Type	Sampling Height (Above P.D.H.K.)	Above Ground	Date Start Operation
Central/Western (Upper Level Police Station)	1 High Street, Sai Ying Pun	Urban : Mixed residential/commercial	78m	18m (4 floors)	Nov 83
Eastern (Sai Wan Ho Fire Station)	20 Wai Hang Street, Sai Wan Ho	Urban : Residential	28m	15m (4 floors)	Jan 99
Kwai Chung (Kwai Chung Police Station)	999 Kwai Chung Road, Kwai Chung	Urban : Mixed residential/ commercial/industrial	19m	13m (2 floors)	Jan 99
Kwun Tong (City District Office)	6 Tung Yan Street, Kwun Tong	Urban : Mixed residential/ commercial/industrial	34m	25m (6 floors)	Jul 83
Sham Shui Po (Police Station)	37A Yen Chow Street, Sham Shui Po	Urban : Mixed residential/commercial	21m	17m (4 floors)	Jul 84
Tsuen Wan (Princess Alexandra Community Centre)	60 Tai Ho Road, Tsuen Wan	Urban : Mixed residential/ commercial/industrial	21m	17m (4 floors)	Aug 88
Sha Tin (Sha Tin Govt. Secondary School)	11-17 Man Lai Road, Tai Wai, Sha Tin	New Town : Residential	27m	21m (5 floors)	Jul 91
Tai Po (Tai Po Govt. Office Bldg.)	1 Ting Kok Road, Tai Po	New Town : Residential	31m	25m (6 floors)	Feb 90
Tung Chung (Tung Chung Health Centre)	6 Fu Tung Street, Tung Chung	New Town : Residential	28m	21m (4 floors)	Apr 99
Yuen Long (Yuen Long District Branch Offices Bldg.)	269 Castle Peak Road Yuen Long	New Town : Residential	31m	25m (6 floors)	July 95
Tap Mun (Tap Mun Police Station)	Tap Mun	Background : Rural	26m	11m (3 floors)	Apr 98
Causeway Bay	1 Yee Woo Street, Causeway Bay	Urban Roadside : Busy commercial/residential area surrounded by many tall buildings	6.5m	3m	Jan 98
Central	Junction of Des Voeux Road Central and Chater Road, Central	Urban Roadside : Busy commercial/financial area surrounded by many tall buildings	8.5m	4.5m	Oct 98
Mong Kok	Junction of Nathan Road and Lai Chi Kok Road	Urban Roadside : Busy commercial/residential area surrounded by many tall buildings	8.5m	3m	Jan 01

Note: P.D. = Principal Datum

Table B2. Summary of the Parameters Monitored in the Network (2004)

	PARAMETERS									
STATIONS	SO_2	NO_x	NO	NO_2	CO	O_3	RSP		TSP	MET[3]
							Cont [1]	Hi-Vol[2]		
Central/Western	ü	ü	ü	ü		ü	ü	ü	ü	ü
Eastern	ü			ü		ü	ü			ü
Kwai Chung	ü	ü	ü	ü		ü	ü		ü	ü
Kwun Tong	ü	ü	ü	ü		ü	ü	ü	ü	ü
Sham Shui Po	ü	ü	ü	ü		ü	ü	ü	ü	ü
Tsuen Wan	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
Sha Tin	ü	ü	ü	ü		ü	ü		ü	ü
Tai Po	ü			ü		ü	ü		ü	ü
Tung Chung	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
Yuen Long	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
Tap Mun	ü	ü	ü	ü	ü	ü	ü			
Causeway Bay	ü	ü	ü	ü	ü		ü			
Central	ü	ü	ü	ü	ü		ü			
Mong Kok	ü	ü	ü	ü	ü		ü	ü	ü	ü

Note:

[1] "Cont" denotes continuous monitoring.

[2] "Hi-Vol" denotes high-volume sampling.

[3] "MET" denotes meteorological parameters such as temperature, wind speed, wind direction, etc.

Table B3 List of Equipment Used in Measuring Air Pollutant Concentration

Pollutants	**Measurement Principle**	**Commercial Instrument**
SO_2	UV fluorescence	TECO 43A
NO, NO_2, NO_x	Chemiluminescence	API 200A Monitor Laboratories 8840
O_3	UV absorption	API 400, API 400A
SO_2, NO_2, O_3	Differential Optical Absorption Spectroscopy	Opsis AR 500 System
CO	Non-dispersive infra-red absorption with gas filter correlation	TECO 48C, API 300
TSP	Gravimetric	General Metals 2310
RSP	a) Gravimetric b) Oscillating microbalance	Graseby Andersen PM10 R&P TEOM Series 1400a-AB-PM10

Table B4 Sampling and Analysis Methods Used in Measuring Toxic Air Pollutants

Toxic Air Pollutants	Sampling and Analysis method	Sampling Instrument	Sampling Media	Sampling Schedule	Sampling Period
Benzene	USEPA Method TO-14A	Xontech 910A / RM 910A	Canister	Twice per month	24 hours
Perchloroethylene	USEPA Method TO-14A	Xontech 910A / RM 910A	Canister	Twice per month	24 hours
1,3-Butadiene	USEPA Method TO-14A	Xontech 910A / RM 910A	Canister	Twice per month	24 hours
Formaldehyde	USEPA Method TO-11A	Xontech 925 / RM 925	DNPH coated silica gel cartridge	Once per month	24 hours
Benzo(a)pyrene	USEPA Method TO-13	Graseby GPS1 / Tisch TE-1000	Polyurethane Foam and XAD-2 resin	Once per month	24 hours
Dioxin	USEPA Method TO-9A	Graseby GPS1 / Tisch TE-1000	Polyurethane Foam	Once per month	24 hours
Hexavalent Chromium	CARB SOP MLD 039	Xontech 920	Bicarbonate Impregnated Filter	Once per month	24 hours

Figure B1: Accuracy of Air Quality Monitoring Network, 2004

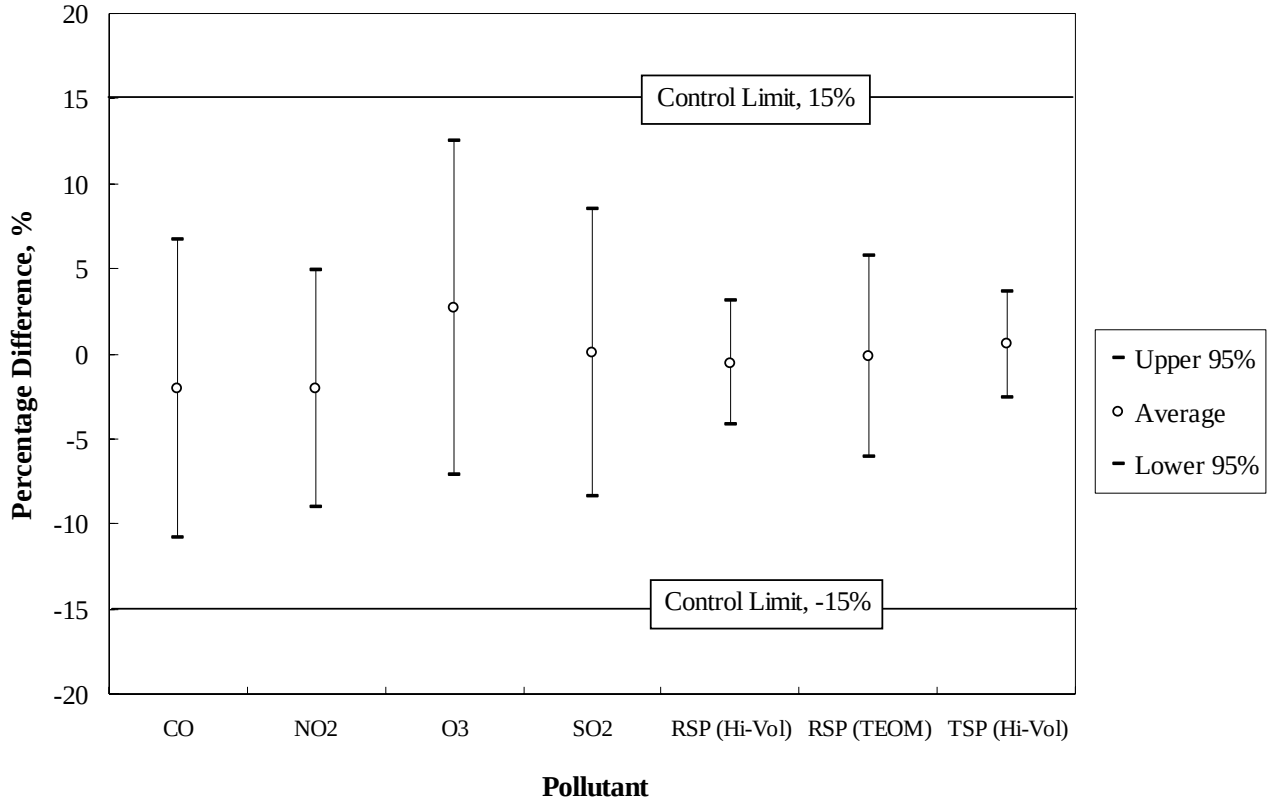
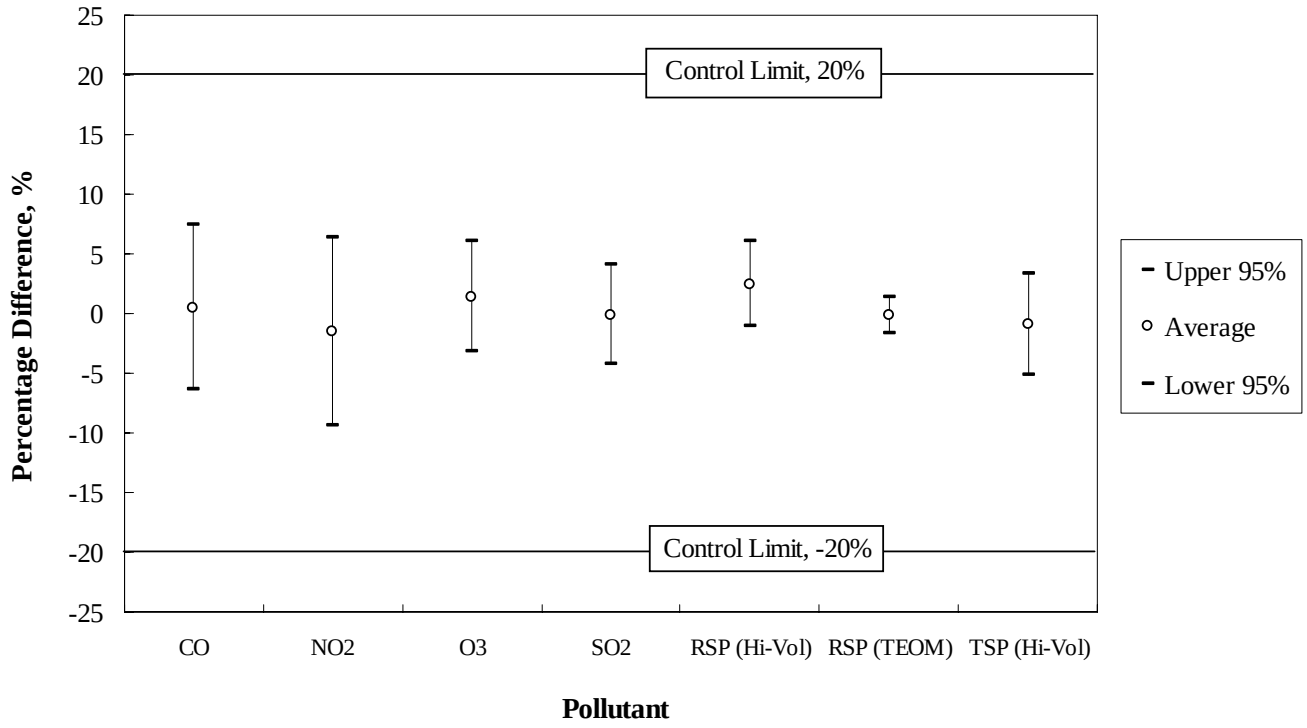


Figure B2: Precision of Air Quality Monitoring Network, 2004



Note: The Control Limits for RSP and TSP are ±10% for both Accuracy and Precision.

Appendix C

Tables of Air Quality Data

TABLE C1: THE HIGHEST 4 HOURLY POLLUTANT CONCENTRATIONS MEASURED IN 2004

Pollutant: Sulphur Dioxide *
(1-hour AQO = 800)

Station	1st High	2nd High	3rd High	4th High
Central / Western	427	393	326	299
Eastern	327	325	291	257
Kwai Chung	365	326	287	285
Kwun Tong	285	281	254	240
Sham Shui Po	303	280	266	259
Tsuen Wan	336	275	264	264
Sha Tin	374	343	277	249
Tai Po	195	188	165	165
Tung Chung	432	327	307	301
Yuen Long	387	366	302	300
Tap Mun	177	174	158	148
Causeway Bay	270	203	190	178
Central	494	365	346	343
Mong Kok	271	245	244	241

Pollutant: Nitrogen Oxides

Station	1st High	2nd High	3rd High	4th High
Central / Western	886	876	869	857
Kwai Chung	1409	926	896	893
Kwun Tong	1144	1126	1073	1029
Sham Shui Po	914	863	790	720
Tsuen Wan	743	741	724	715
Sha Tin	660	638	608	585
Tung Chung	472	456	450	442
Yuen Long	819	733	713	709
Tap Mun	208	199	179	169
Causeway Bay	1318	1216	1185	1117
Central	2070	1891	1809	1801
Mong Kok	1603	1555	1319	1192

Pollutant: Nitric Oxide

Station	1st High	2nd High	3rd High	4th High
Central / Western	460	457	443	442
Kwai Chung	767	507	486	465
Kwun Tong	603	549	507	497
Sham Shui Po	501	479	436	383
Tsuen Wan	388	383	373	371
Sha Tin	341	333	327	311
Tung Chung	216	211	198	189
Yuen Long	422	407	392	373
Tap Mun	67	64	57	56
Causeway Bay	724	665	647	619
Central	1179	1045	1029	981
Mong Kok	852	816	664	628

Note: 1. All concentration units are in micrograms per cubic metre.
2. Shaded 1-hour averages are above their respective AQO.
3. Only the asterisked pollutants have hourly AQO.

Pollutant: Nitrogen Dioxide *
(1-hour AQO = 300)

Station	1st High	2nd High	3rd High	4th High
Central / Western	251	250	248	245
Eastern	236	236	228	225
Kwai Chung	296	294	286	284
Kwun Tong	297	287	286	282
Sham Shui Po	257	255	236	236
Tsuen Wan	271	270	267	264
Sha Tin	265	251	248	242
Tai Po	252	233	229	224
Tung Chung	289	281	280	279
Yuen Long	317	307	280	253
Tap Mun	142	106	102	102
Causeway Bay	278	274	269	269
Central	386	338	321	318
Mong Kok	322	318	308	305

Pollutant: Carbon Monoxide *
(1-hour AQO = 30000)

Station	1st High	2nd High	3rd High	4th High
Tsuen Wan	3790	3680	3560	3450
Tung Chung	3940	3920	3730	3620
Yuen Long	3610	3510	3360	3240
Tap Mun	2520	2480	2200	2090
Causeway Bay	3790	3560	3340	3220
Central	4830	4490	4490	4260
Mong Kok	3790	3680	3680	3680

Pollutant: Ozone *
(1-hour AQO = 240)

Station	1st High	2nd High	3rd High	4th High
Central / Western	305	272	264	259
Eastern	201	199	197	196
Kwai Chung	196	196	170	163
Kwun Tong	233	223	221	218
Sham Shui Po	277	259	238	227
Tsuen Wan	275	257	241	226
Sha Tin	294	288	284	274
Tai Po	209	181	172	172
Tung Chung	403	395	372	371
Yuen Long	289	273	272	272
Tap Mun	257	253	246	245

Pollutant: Respirable Suspended Particulates

Station	1st High	2nd High	3rd High	4th High
Central / Western	307	287	278	275
Eastern	235	220	218	208
Kwai Chung	335	284	264	260
Kwun Tong	286	258	242	238
Sham Shui Po	231	229	222	221
Tsuen Wan	452	414	328	325
Sha Tin	346	329	319	304
Tai Po	282	274	267	259
Tung Chung	389	346	321	316
Yuen Long	366	362	313	309
Tap Mun	216	200	199	195
Causeway Bay	341	326	322	311
Central	347	336	328	324
Mong Kok	314	282	279	273

TABLE C2: THE HIGHEST 2 DAILY POLLUTANT CONCENTRATIONS MEASURED IN 2004

Pollutant: Sulphur Dioxide *
(24-hour AQO = 350)

Station	1st High	2nd High
Central / Western	135	123
Eastern	130	116
Kwai Chung	149	143
Kwun Tong	144	128
Sham Shui Po	169	157
Tsuen Wan	143	125
Sha Tin	112	111
Tai Po	65	65
Tung Chung	115	104
Yuen Long	171	131
Tap Mun	67	44
Causeway Bay	74	70
Central	114	112
Mong Kok	147	142

Pollutant: Nitrogen Dioxide *
(24-hour AQO = 150)

Station	1st High	2nd High
Central / Western	156	147
Eastern	155	127
Kwai Chung	178	177
Kwun Tong	169	161
Sham Shui Po	158	136
Tsuen Wan	155	153
Sha Tin	147	138
Tai Po	127	119
Tung Chung	166	148
Yuen Long	166	157
Tap Mun	56	50
Causeway Bay	182	182
Central	203	202
Mong Kok	198	193

Pollutant: Respirable Suspended Particulates *
(24-hour AQO = 180)

Station	1st High	2nd High
Central / Western	186	165
Eastern	149	147
Kwai Chung	192	182
Kwun Tong	166	154
Sham Shui Po	144	140
Tsuen Wan	217	203
Sha Tin	196	154
Tai Po	172	148
Tung Chung	209	208
Yuen Long	225	205
Tap Mun	141	132
Causeway Bay	222	185
Central	203	192
Mong Kok	191	182

Pollutant: Nitrogen Oxides

Station	1st High	2nd High
Central / Western	336	323
Kwai Chung	537	440
Kwun Tong	472	397
Sham Shui Po	338	337
Tsuen Wan	410	361
Sha Tin	291	273
Tung Chung	292	261
Yuen Long	364	355
Tap Mun	74	72
Causeway Bay	690	688
Central	867	768
Mong Kok	688	531

Pollutant: Nitric Oxide

Station	1st High	2nd High
Central / Western	139	136
Kwai Chung	254	183
Kwun Tong	198	163
Sham Shui Po	164	154
Tsuen Wan	174	155
Sha Tin	126	115
Tung Chung	98	83
Yuen Long	147	137
Tap Mun	24	20
Causeway Bay	353	333
Central	436	396
Mong Kok	321	262

Pollutant: Total Suspended Particulates *
(24-hour AQO = 260)

Station	1st High	2nd High
Central / Western	147	142
Kwai Chung	175	162
Kwun Tong	197	195
Sham Shui Po	148	146
Tsuen Wan	291	192
Sha Tin	185	157
Tai Po	201	193
Tung Chung	176	172
Yuen Long	320	288
Mong Kok	220	211

Pollutant: Ozone

Station	1st High	2nd High
Central / Western	146	130
Eastern	128	100
Kwai Chung	104	95
Kwun Tong	117	110
Sham Shui Po	114	91
Tsuen Wan	94	90
Sha Tin	136	126
Tai Po	97	95
Tung Chung	138	138
Yuen Long	102	100
Tap Mun	160	154

Pollutant: Carbon Monoxide *
(8-hour AQO = 10000)

Station	1st High	2nd High
Tsuen Wan	3031	3031
Tung Chung	3385	3379
Yuen Long	3116	3110
Tap Mun	2060	2033
Causeway Bay	2860	2845
Central	3205	3163
Mong Kok	3423	3395

Note: 1. *All concentration units are in micrograms per cubic metre.*
2. *Values for Carbon Monoxide are 8-hour averages.*
3. *Shaded 24-hour averages are above their respective AQO.*
4. *Only the asterisked pollutants have either 8-hour or 24-hour AQO.*
5. *Data are preliminary for Nov and Dec.*

TABLE C3: 2004 MONTHLY AND ANNUAL AVERAGES OF GASEOUS POLLUTANTS

Pollutant: Sulphur Dioxide (Annual AQO = 80)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	18	25	17	24	29	23	22	48	33	24	16	17	25
Eastern	13	18	11	19	18	12	23	40	20	17	12	13	18
Kwai Chung	21	28	24	40	40	29	36	61	36	27	19	26	32
Kwun Tong	18	24	16	28	24	17	21	43	24	18	14	16	22
Sham Shui Po			17	30	34	25	26	56	33	18	15	22	28
Tsuen Wan	26	30	25	35	39	26	22	49	30	25	17	21	29
Sha Tin	15	16	12	19	22	18	19	39	21	18	12	21	20
Tai Po	14	19	18	14 *					25	21	14 *		NA *
Tung Chung	34	38	23	17	19	18	10	31	38	30	29	40	27
Yuen Long	28	35	27	26	32	23	26	48	33	30	24	34	31
Tap Mun	17	17	15	14	14	7			17 *	19	18	22	16
Causeway Bay	19	21	13	21	11	6	9	25	20	17	13	17	16
Central	18	24	19	27	30	24	27	50	40	32	19	22	28
Mong Kok	22	31	19	28	34	26	27	40	29	23	20	22	27

Pollutant: Nitrogen Oxides

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	105	140	94	117	80	58	59	98	96	78	81	90	91
Kwai Chung	162	203	165	183	158	139	150	180	157	156	131	150	161
Kwun Tong	141	175	128	146	126	106	119	162	139	122	131	138	136
Sham Shui Po			158	160	126	108	102	142	127	113	126	128	128
Tsuen Wan	147	172	142	148	123	103	104	147	111	103	110	123	128
Sha Tin	87	123	80	92	89	62	61	102	93	108	89	108	91
Tung Chung	98	109	85	65	57	38	33	63	82	80	90	109	76
Yuen Long	147	174	126	113	112	98	95	129	110	107	117	149	123
Tap Mun	21	26	23	18	21	11			19 *	21	23	26	21
Causeway Bay	344	383	300	316	317	290	290	368	339	295	290	351	323
Central	373	463	371	387	346	317	303	385	368	326	339	353	360
Mong Kok	342	376	331	334	333	304	339	362	352	354	349	329	342

Pollutant: Nitric Oxide

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	25	42	24	33	24	13	19	26	21	8	13	13	22
Kwai Chung	55	73	58	69	67	52	73	79	61	42	39	48	60
Kwun Tong	44	61	42	50	46	37	52	61	48	29	37	41	46
Sham Shui Po			52	51	41	32	40	48	38	19	33	33	38
Tsuen Wan	46	56	46	48	42	30	41	51	31	16	25	31	39
Sha Tin	21	40	21	25	28	15	21	33	30	26	24	33	27
Tung Chung	21	27	22	14	13	7	9	14	17	9	18	24	16
Yuen Long	43	56	37	32	35	29	36	41	31	24	32	45	37
Tap Mun	3	3	5	3	3	2			3 *	4	4	4	4
Causeway Bay	159	181	137	145	154	135	151	186	159	113	126	161	151
Central	171	222	174	181	166	148	156	190	170	127	148	153	167
Mong Kok	153	170	152	149	159	139	178	175	158	135	152	141	155

Pollutant: Nitrogen Dioxide (Annual AQO = 80)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	67	76	58	66	44	38	30	58	64	67	62	69	58
Eastern	68	81	64	69	53	45	44	61	60	69	61	65	62
Kwai Chung	78	91	76	78	56	59	38	58	65	92	71	77	70
Kwun Tong	73	82	64	70	55	50	40	69	65	77	74	76	66
Sham Shui Po			79	83	64	60	41	69	69	85	76	77	70
Tsuen Wan	77	86	72	74	59	57	42	69	64	78	72	75	69
Sha Tin	54	61	48	53	46	38	28	52	48	68	52	57	50
Tai Po	48	61	47	49 *					63	72	49 *		NA *
Tung Chung	67	69	52	43	38	28	19	42	56	66	63	73	52
Yuen Long	82	88	69	65	59	53	39	66	64	70	68	80	67
Tap Mun	16	20	15	13	16	9			14 *	16	16	19	16
Causeway Bay	101	107	90	93	81	84	60	84	96	122	97	106	93
Central	111	124	104	111	92	91	65	94	109	131	113	118	105
Mong Kok	108	117	99	106	89	91	68	95	111	147	117	113	105

Pollutant: Carbon Monoxide

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Tsuen Wan	1040	870	730	670	540	680	420	500	410	530	810	740	661
Tung Chung	920	920	600	480	790	610	730	580	870	870	1010	1210	799
Yuen Long	860	1130	1260	900	990	760	550	700	690	950	900	1300	917
Tap Mun	950	860	700	860	750	690			570 *	710	950	720	787
Causeway Bay	830	1150	1040	890	980	870	840	1020	870	700	930	860	914
Central	920	970	1480	1420	1400	1160	1000	1290	1370	1690	1350	1560	1304
Mong Kok	1720	1460	1670	1750	1650	1410	1090	940	1110	750	960	900	1283

Pollutant: Ozone

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	43	40	39	41	35	50	24	34	47	83	52	46	45
Eastern	52	52	50	55	46	47	32	40	44	71	50	39	48
Kwai Chung	36	26	25	28	20	28	12	12	24	52	35	32	27
Kwun Tong	41	40	38	41	29	37	15	19	34	66	46	44	37
Sham Shui Po			22	31	25	34	16	23	35	62	34	35	32
Tsuen Wan	29	24	26	29	23	29	13	17	32	64	35	34	30
Sha Tin	48	43	48	53	34	50	24	28	41	71	53	51	45
Tai Po	53	48	47	43 *						58	49 *		NA *
Tung Chung	36	36	38	50	42	59	33	44	54	87	51	41	48
Yuen Long	27	26	27	36	28	41	20	29	41	67	36	34	35
Tap Mun	77	78	74	89	60	61			83 *	114	82	79	80

Notes:

1. All units are in micrograms per cubic metre.

2. Asterisked values are below their respective minimum data requirement of 66% for number of data within the period.

3. Shaded monthly averages are below the minimum data requirements for number of data within a quarter.

4. Shaded annual averages are above their respective AQO.

5. NA - insufficient data for calculation of annual average values.

TABLE C4: 2004 MONTHLY AND ANNUAL AVERAGES OF PARTICULATE POLLUTANTS

Pollutant: Total Suspended Particulates (Annual AQO = 80)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	104	84	95	79	54	49	41	72	70	115	94	96	79
Kwai Chung	83	106	86	88	69	80	47	59	84	108	108	103	85
Kwun Tong	94	94	95	66	60	74	45	98	57	107	86	112	82
Sham Shui Po			87	87	59	60	54	79	74	117	99	107	82
Tsuen Wan	118	99	103	72	62	66	39	76	101	92	94	106	85
Sha Tin	87	86	77	74	45	46	46	62	64	130	89	114	78
Tai Po	119	75	83	75				38	62	136	90	193	NA *
Tung Chung	81	97	76	63	51	55	25	40	71	106	96	102	72
Yuen Long	179	100	107	73	87	66	49	74	101	195	141	175	113
Mong Kok	135	144	138	131	85	85	86	91	106	173	146	160	124

Pollutant: Respirable Suspended Particulates (Annual AQO = 55)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Central / Western	73	69	62	61	40	43	28	48	57	88	65	74	59
Eastern	64	62	55	58	38	41	27	44	49	80	64	70	54
Kwai Chung	75	66	59	62	46	50	39	59	60	87	67	76	62
Kwun Tong	68	68	63	66	45	48	34	54	55	86	68	74	61
Sham Shui Po			57	63	44	50	35	54	59	88	70	76	60
Tsuen Wan	78	67	61	59	46	50	36	58	60	89	68	79	63
Sha Tin	72	65	58	58	42	46	32	53	56	86	65	76	59
Tai Po	71	61	57	52 *					60	90	59 *		NA *
Tung Chung	79	70	67	51	40	45	27	49	59	93	72	90	62
Yuen Long	87	77	72	60	49	52	38	61	71	106	81	97	71
Tap Mun	63	58	53	55	36	39	25	42	47	81	65	73	53
Causeway Bay	96	87	90	93	76	81	60	75	84	117	98	102	88
Central	86	89	83	86	64	66	52	66	71	94	82	87	77
Mong Kok	82	82	76	78	58	65	50	70	71	100	82	88	75

Notes:

1. All units are in micrograms per cubic metre.

2. Asterisked values are below their respective minimum data requirement of 66% for number of data within the period.

3. Shaded monthly averages are below the minimum data requirements for number of data within a quater.

4. Shaded annual averages are above their respective AQO.

TABLE C5: 2004 HOURLY STATISTICS OF MAJOR AIR POLLUTANTS

Pollutant: Sulphur Dioxide

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8641	98.6	5	8	13	25	58	90	139	173	15	25	427	135
Eastern	8467	96.7	3	6	11	17	35	65	109	148	11	18	327	130
Kwai Chung	8619	98.4	7	11	18	38	81	111	148	176	20	32	365	149
Kwun Tong	8637	98.6	7	10	14	20	43	77	119	151	16	22	285	144
Sham Shui Po	7084	80.9	7	10	15	26	69	105	153	187	18	28	303	169
Tsuen Wan	8497	97.0	10	13	18	31	62	92	132	154	21	29	336	143
Sha Tin	8701	99.3	4	7	11	21	44	67	101	123	12	20	374	112
Tai Po	4201	48.0	7	9	13	19	32	51	89	116	14	NA	195	65
Tung Chung	8559	97.7	2	7	16	32	65	99	143	173	15	27	432	115
Yuen Long	8576	97.9	9	13	21	35	59	92	142	178	22	31	387	171
Tap Mun	6611	75.5	5	7	11	20	34	41	53	63	12	16	177	67
Causeway Bay	8530	97.4	4	8	12	18	30	47	72	91	12	16	270	74
Central	8644	98.7	8	12	18	30	57	84	126	154	20	28	494	114
Mong Kok	8539	97.5	10	13	18	26	53	85	124	156	20	27	271	147

Pollutant: Nitrogen Oxides

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8558	97.7	26	45	71	113	172	223	313	405	70	91	886	336
Kwai Chung	8587	98.0	47	88	138	208	298	365	471	543	128	161	1409	537
Kwun Tong	8644	98.7	41	79	121	174	238	290	365	429	111	136	1144	472
Sham Shui Po	7084	80.9	42	80	120	162	208	251	321	381	108	128	914	338
Tsuen Wan	8594	98.1	42	77	114	156	218	273	367	437	106	128	743	410
Sha Tin	8697	99.3	20	33	64	118	200	270	353	413	63	91	660	291
Tung Chung	8294	94.7	15	32	60	107	162	194	232	267	54	76	472	292
Yuen Long	8574	97.9	49	71	103	153	222	278	357	421	103	123	819	364
Tap Mun	6664	76.1	7	10	14	25	46	60	78	92	16	21	208	74
Causeway Bay	8545	97.5	137	215	304	409	521	605	726	797	286	323	1318	690
Central	8637	98.6	124	205	336	476	622	722	843	976	303	360	2070	867
Mong Kok	8578	97.9	162	262	344	419	491	546	608	668	316	342	1603	688

Pollutant: Nitric Oxide

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8558	97.7	2	3	9	24	55	82	127	178	10	22	460	139
Kwai Chung	8587	98.0	7	20	43	83	130	167	218	260	37	60	767	254
Kwun Tong	8644	98.7	7	17	34	61	96	125	168	201	30	46	603	198
Sham Shui Po	7084	80.9	4	14	30	50	78	102	137	171	25	38	501	164
Tsuen Wan	8597	98.1	5	12	28	51	82	110	158	202	24	39	388	174
Sha Tin	8697	99.3	2	3	9	32	77	110	158	193	11	27	341	126
Tung Chung	8294	94.7	1	3	7	21	45	61	84	102	9	16	216	98
Yuen Long	8574	97.9	6	11	25	48	83	111	151	191	23	37	422	147
Tap Mun	6664	76.1	1	2	3	4	6	9	17	26	3	4	67	24
Causeway Bay	8545	97.5	47	83	135	201	271	322	388	426	123	151	724	353
Central	8637	98.6	38	78	148	233	316	373	442	518	126	167	1179	436
Mong Kok	8578	97.9	59	105	152	199	244	273	313	352	136	155	852	321

Pollutant: Nitrogen Dioxide

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8558	97.7	19	32	53	76	105	123	150	170	47	58	251	156
Eastern	8467	96.7	29	41	59	77	95	109	130	147	56	62	236	155
Kwai Chung	8587	98.0	25	41	63	89	122	149	183	209	59	70	296	178
Kwun Tong	8644	98.7	26	41	63	84	107	126	160	190	57	66	297	169
Sham Shui Po	7084	80.9	30	42	67	92	114	130	152	173	62	70	257	158
Tsuen Wan	8594	98.1	29	42	64	88	114	136	163	186	60	69	271	155
Sha Tin	8697	99.3	16	25	41	67	97	119	146	167	40	50	265	147
Tai Po	4201	48.0	22	33	49	75	100	118	141	159	48	NA	252	127
Tung Chung	8294	94.7	11	24	44	72	102	121	148	163	38	52	289	166
Yuen Long	8574	97.9	30	42	60	84	112	133	158	177	59	67	317	166
Tap Mun	6664	76.1	4	6	10	20	36	45	59	69	11	16	142	56
Causeway Bay	8545	97.5	50	67	90	115	138	158	182	202	86	93	278	182
Central	8637	98.6	51	70	100	133	165	188	221	243	95	105	386	203
Mong Kok	8578	97.9	56	72	101	131	160	180	206	230	97	105	322	198

Pollutant: Carbon Monoxide

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 8 hour
Tsuen Wan	8575	97.9	230	460	580	800	1030	1270	1490	1830	581	661	3790	3031
Tung Chung	8558	97.7	350	510	740	990	1280	1550	1890	2200	705	799	3940	3385
Yuen Long	8571	97.8	430	620	860	1140	1460	1700	1990	2250	821	917	3610	3116
Tap Mun	6646	75.9	470	600	750	920	1160	1320	1510	1570	742	787	2520	2060
Causeway Bay	8375	95.6	460	690	800	1150	1380	1610	1960	2180	835	914	3790	2860
Central	8603	98.2	580	920	1270	1610	1960	2180	2530	2760	1182	1304	4830	3205
Mong Kok	8633	98.6	690	920	1270	1610	1960	2180	2410	2640	1166	1283	3790	3423

Pollutant: Ozone

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8558	97.7	5	14	35	67	95	114	138	165	29	45	305	146
Eastern	8467	96.7	20	29	44	64	82	95	107	120	42	48	201	128
Kwai Chung	8443	96.4	3	6	17	42	68	83	98	109	15	27	196	104
Kwun Tong	8528	97.4	5	12	30	57	80	93	108	119	24	37	233	117
Sham Shui Po	7075	80.8	5	9	22	45	74	92	117	140	20	32	277	114
Tsuen Wan	8504	97.1	5	7	19	43	70	86	108	130	18	30	275	94
Sha Tin	8679	99.1	3	7	30	76	110	129	151	171	24	45	294	136
Tai Po	3418	39.0	8	18	45	78	99	112	130	140	34	NA	209	97
Tung Chung	8471	96.7	3	11	37	69	104	135	192	236	27	48	403	138
Yuen Long	8523	97.3	4	7	21	50	82	108	145	171	21	35	289	102
Tap Mun	6591	75.2	21	44	79	112	137	153	172	186	64	80	257	160

Pollutant: Respirable Suspended Particulates (Continuous monitoring)

Station	No. of hours	Data capture rate %	<----------Percentiles----------> 10	25	50	75	90	95	98	99	Geometric mean	Arithmetic mean	Highest 1 hour	Highest 24 hour
Central / Western	8667	98.9	18	32	54	79	104	122	152	182	48	59	307	186
Eastern	8585	98.0	17	29	51	74	95	110	131	152	45	54	235	149
Kwai Chung	8665	98.9	24	38	55	80	107	126	156	182	53	62	335	192
Kwun Tong	8502	97.1	23	36	55	79	102	119	143	167	52	61	286	166
Sham Shui Po	7090	80.9	23	35	54	80	102	118	139	157	51	60	231	144
Tsuen Wan	8633	98.6	24	36	55	81	109	128	160	187	53	63	452	217
Sha Tin	8706	99.4	21	33	53	77	104	121	146	170	50	59	346	196
Tai Po	4208	48.0	27	41	59	84	114	131	162	180	57	NA	282	172
Tung Chung	8582	98.0	17	30	53	83	118	142	173	203	49	62	389	209
Yuen Long	8459	96.6	26	39	61	93	128	152	182	208	59	71	366	225
Tap Mun	8494	97.0	17	28	49	72	95	109	125	138	44	53	216	141
Causeway Bay	8503	97.1	43	62	85	111	136	152	176	198	80	88	341	222
Central	8465	96.6	36	50	72	97	124	144	170	194	69	77	347	203
Mong Kok	8628	98.5	34	49	70	95	120	138	167	195	67	75	314	191

Note:

1. All concentration units are in micrograms per cubic metre.

2. Annual averages calculated from less than 8 representative months are not published.

3. NA - insufficient data for calculation of annual average values.

TABLE C6: 2004 TOTAL WET AND DRY DEPOSITION

(a) WET DEPOSITION

	Monitoring Station	Central / Western	Kwun Tong	Yuen Long
	WET DEPOSITION (TON/HA)	16667	16989	13217
	WEIGHTED MEAN pH (based on volume-weighted mean hydrogen ion concentrations ($[H^+]$))	4.39	4.48	4.29
	WEIGHTED MEAN pH (based on volume-weighted mean pH)	4.66	4.76	4.51
	NO. OF SAMPLES	83	87	80
Filtrate (Kg/Ha)	**NH_4^+**	6.40	6.80	7.47
	NO_3^-	20.89	19.67	25.30
	$SO_4^=$	36.54	33.04	35.32
	Cl^-	19.55	22.98	10.45
	F-	0.69	0.56	0.59
	Na^+	10.09	11.69	5.09
	K^+	4.18	4.29	3.28
	Formate	4.53	4.78	3.75
	Acetate	3.52	3.61	2.71
	Ca^{++}	3.23	2.94	3.47
	Mg^{++}	1.36	1.53	0.73

** Note: The weighted mean PH is calculated from the PH values measured by the Government Laboratory.*

(b) DRY DEPOSITION

	Monitoring Station	Central / Western	Kwun Tong	Yuen Long
	NO. OF SAMPLES	25	25	25
Filtrate (Kg/Ha)	**NH_4^+**	0.53	0.40	0.90
	NO_3^-	12.54	14.20	11.25
	$SO_4^=$	13.55	11.79	14.49
	Cl^-	15.45	12.85	5.99
	F-	0.218	0.190	0.389
	Na^+	9.67	7.58	3.15
	K^+	0.80	0.85	0.76
	Formate	0.20	0.20	0.20
	Acetate	0.20	0.20	0.20
	Ca^{++}	8.57	8.84	10.01
	Mg^{++}	1.38	1.11	0.70

TABLE C7: 2004 DIURNAL VARIATIONS OF AIR POLLUTANT

Pollutant: Sulphur Dioxide

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Central / Western	20	19	19	22	20	18	20	24	27	29	30	32	28	28	27	29	27	27	26	27	27	25	22	20
Eastern	13	14	15	14	14	15	16	20	22	21	21	21	21	20	20	19	19	19	18	19	20	19	16	13
Kwai Chung	26	26	25	22	21	22	22	26	32	35	38	38	40	41	41	42	42	42	41	38	33	30	28	26
Kwun Tong	17	18	18	18	17	17	20	22	25	27	27	27	25	26	24	25	25	26	24	22	21	19	19	18
Sham Shui Po	23	24	23	23	24	24	25	27	28	28	31	30	32	34	32	31	32	31	31	30	30	27	25	25
Tsuen Wan	23	23	23	21	20	21	22	24	29	31	32	34	37	36	36	37	37	37	34	31	29	27	26	25
Sha Tin	15	15	15	14	13	14	14	17	20	21	21	22	22	23	22	23	27	28	26	23	21	19	19	17
Tai Po	16	16	15	14	14	15	17	20	22	22	21	21	19	18	16	16	19	22	22	22	21	19	17	16
Tung Chung	22	20	20	20	19	18	18	21	27	32	35	38	40	40	40	37	33	30	26	24	25	25	24	23
Yuen Long	23	22	21	21	21	21	23	27	34	39	41	40	37	36	37	38	37	36	33	32	30	30	28	25
Tap Mun	13	13	14	15	15	15	16	18	21	23	24	22	18	17	15	14	14	14	13	14	13	13	13	13
Causeway Bay	13	13	13	13	13	13	15	18	20	21	20	19	18	19	19	18	17	17	16	15	14	14	14	13
Central	20	20	20	22	20	19	22	27	38	35	36	36	34	33	31	33	31	29	29	28	27	26	24	22
Mong Kok	23	23	23	22	22	22	23	25	27	29	30	30	31	32	30	30	31	31	30	29	28	26	25	23

Pollutant: Nitrogen Oxides

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Central / Western	81	66	57	53	50	49	62	97	124	122	110	102	90	89	90	92	95	102	113	122	116	106	102	93
Kwai Chung	134	93	73	61	60	74	132	197	228	214	186	172	164	166	178	188	194	207	226	216	190	176	168	159
Kwun Tong	119	81	67	59	56	68	126	180	197	185	160	145	133	132	139	145	161	180	187	177	146	140	142	138
Sham Shui Po	113	81	69	63	62	69	108	151	169	163	148	139	134	137	140	143	150	161	166	159	147	139	137	130
Tsuen Wan	110	71	58	50	48	57	101	148	176	167	150	142	136	138	141	141	151	168	180	169	148	139	139	136
Sha Tin	109	82	71	61	57	60	97	137	126	94	76	65	58	58	60	65	75	89	107	124	130	130	132	123
Tung Chung	84	63	49	44	45	49	72	86	87	81	81	80	78	76	75	72	75	80	91	94	96	92	90	89
Yuen Long	131	107	89	73	70	81	130	174	156	127	111	103	96	98	103	112	125	139	152	159	152	151	150	147
Tap Mun	19	19	20	20	22	22	24	26	29	30	28	25	21	19	17	16	17	17	18	19	18	19	19	20
Causeway Bay	298	235	208	180	167	160	256	384	396	378	360	351	338	354	347	364	367	373	394	384	376	364	386	348
Central	271	206	178	149	149	150	230	361	521	502	449	437	399	399	412	426	423	465	495	473	443	399	378	341
Mong Kok	335	228	207	181	170	164	303	409	424	406	365	336	336	354	378	378	407	438	442	391	356	372	413	412

Pollutant: Nitric Oxide

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Central / Western	19	15	12	11	11	10	14	28	41	39	32	27	21	19	18	18	17	18	23	28	27	24	25	22
Kwai Chung	48	29	21	16	16	23	52	86	103	93	75	65	59	57	60	63	65	72	84	80	70	64	63	61
Kwun Tong	38	23	18	15	14	19	44	73	82	75	61	51	44	41	43	44	50	58	61	58	45	44	47	46
Sham Shui Po	32	21	17	15	15	18	33	54	64	60	51	44	39	39	39	39	40	45	46	44	41	39	40	38
Tsuen Wan	31	15	12	10	9	12	30	54	69	63	53	47	42	40	40	37	41	48	54	51	42	40	42	42
Sha Tin	37	24	20	16	15	16	34	55	47	29	20	16	13	12	12	12	14	17	25	34	40	42	45	43
Tung Chung	22	13	9	7	7	9	20	26	25	21	20	18	15	13	12	11	11	12	15	17	20	20	21	23
Yuen Long	44	33	26	19	18	23	49	72	59	41	31	26	22	22	22	24	28	33	40	46	46	48	50	51
Tap Mun	3	3	3	3	3	3	4	5	5	6	6	5	4	4	3	3	3	3	3	3	3	3	3	3
Causeway Bay	138	103	89	75	69	66	120	194	201	188	174	164	154	160	154	164	165	171	184	180	177	172	186	166
Central	119	86	71	57	57	58	100	174	267	253	218	205	181	178	184	192	191	218	237	226	212	188	178	159
Mong Kok	156	97	86	72	66	63	142	204	212	197	169	148	144	151	162	162	179	199	203	177	159	171	198	199

Pollutant: Nitrogen Dioxide

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Central / Western	52	44	38	35	33	33	40	54	62	63	62	61	58	60	63	65	69	74	79	80	76	69	64	59
Eastern	58	49	42	38	36	39	53	66	68	65	62	61	61	62	65	69	74	78	79	77	74	71	66	63
Kwai Chung	60	48	41	37	36	39	53	65	71	72	72	73	74	79	87	92	95	97	98	93	84	77	72	66
Kwun Tong	61	46	39	35	34	39	58	69	71	70	67	66	66	69	74	78	84	91	93	88	78	73	71	68
Sham Shui Po	64	50	43	40	39	41	57	67	71	71	71	72	74	77	80	84	88	92	95	91	85	79	76	72
Tsuen Wan	62	47	40	35	34	39	55	65	70	70	69	70	72	77	81	84	89	95	97	92	83	77	75	71
Sha Tin	52	45	40	36	34	36	45	53	54	49	45	41	38	40	42	46	54	62	69	72	69	66	62	58
Tai Po	59	51	44	40	38	42	54	65	65	54	47	41	39	38	40	46	57	74	87	88	79	74	70	66
Tung Chung	51	43	36	34	33	35	42	46	48	49	51	53	55	55	56	55	58	62	68	68	65	61	57	54
Yuen Long	63	56	50	44	42	45	55	65	66	65	63	63	62	65	69	75	82	88	91	89	82	78	74	69
Tap Mun	15	15	15	15	16	17	18	19	20	21	20	18	15	13	12	12	12	13	14	15	14	15	14	15
Causeway Bay	88	77	72	65	61	59	73	87	89	91	94	100	102	109	111	114	115	113	112	109	105	101	102	95
Central	88	75	69	61	62	62	77	95	113	115	117	124	122	126	130	133	132	133	133	129	119	112	106	98
Mong Kok	97	80	76	70	69	68	85	97	101	105	107	109	116	122	129	131	133	134	132	121	114	111	110	107

Pollutant: Carbon Monoxide

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Tsuen Wan	640	590	560	540	540	550	610	670	720	700	680	650	640	650	660	660	680	710	750	770	760	740	730	690
Tung Chung	780	760	740	730	740	740	760	790	810	800	810	820	840	840	840	820	800	800	820	840	840	840	820	800
Yuen Long	950	890	870	810	790	800	850	960	980	930	900	870	880	860	860	860	880	920	980	1020	1040	1030	1030	1010
Tap Mun	760	760	770	770	780	790	810	820	830	820	820	820	810	800	790	780	770	770	770	770	770	770	770	770
Causeway Bay	1020	1060	980	890	790	710	610	690	780	880	960	930	900	950	930	960	940	950	1030	1060	1040	1000	960	910
Central	1230	1110	990	930	900	880	940	1050	1240	1420	1450	1390	1350	1440	1440	1430	1410	1510	1600	1550	1650	1590	1470	1350
Mong Kok	1260	1280	1230	1160	1200	1200	1250	1220	1250	1260	1230	1280	1260	1290	1320	1340	1360	1340	1370	1380	1350	1340	1340	1290

Pollutant: Ozone

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Central / Western	39	45	49	51	51	49	41	30	27	31	39	48	58	64	66	63	58	49	41	35	33	34	34	36
Eastern	43	48	51	52	53	50	40	34	35	40	46	53	59	62	63	62	56	51	48	45	43	42	43	42
Kwai Chung	22	32	36	39	38	35	24	17	16	20	27	33	38	39	38	35	30	24	19	18	19	20	20	21
Kwun Tong	33	44	48	49	49	42	27	21	22	27	35	43	50	53	51	49	42	33	28	27	31	31	30	30
Sham Shui Po	25	36	40	42	42	38	24	17	18	24	32	39	45	49	49	46	39	31	24	21	21	21	21	22
Tsuen Wan	21	34	37	40	40	35	21	16	17	23	31	37	43	47	48	45	38	28	21	18	19	19	18	18
Sha Tin	31	35	37	38	39	35	27	24	29	40	54	66	76	80	81	77	69	56	44	35	32	29	29	30
Tai Po	39	43	46	46	46	42	32	25	32	47	59	71	79	86	86	82	72	57	42	37	39	38	36	35
Tung Chung	32	36	40	41	39	35	29	28	32	39	47	57	70	82	91	91	81	67	49	38	33	32	32	32
Yuen Long	20	23	25	28	28	26	19	16	21	29	42	55	67	72	71	64	53	40	30	24	22	20	20	19
Tap Mun	64	65	64	63	59	57	55	56	60	66	76	88	98	105	109	110	110	106	100	92	85	78	74	69

Pollutant: Respirable Suspended Particulates (Continuous Monitoring)

Station	Hr00	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23
Central / Western	53	50	49	49	48	49	51	56	61	63	64	63	62	65	67	66	66	66	66	66	64	61	58	55
Eastern	49	48	47	46	46	47	49	53	56	57	57	58	60	59	60	60	61	60	60	59	57	55	53	50
Kwai Chung	53	51	49	48	49	51	55	60	63	62	62	63	64	67	68	72	75	76	77	75	70	66	61	57
Kwun Tong	53	51	50	49	49	50	55	60	64	66	65	64	64	65	67	68	69	69	69	68	64	60	58	56
Sham Shui Po	52	50	49	48	48	49	52	56	59	62	63	64	64	66	68	67	68	69	71	70	66	60	58	55
Tsuen Wan	55	52	50	49	49	50	53	58	62	64	65	67	66	71	72	73	74	75	74	73	69	65	61	59
Sha Tin	56	52	51	50	50	50	54	58	59	59	59	58	58	61	62	64	66	66	67	67	66	64	61	58
Tai Po	63	61	59	57	58	59	63	68	69	68	66	66	65	66	65	66	68	72	74	76	73	71	68	65
Tung Chung	55	53	51	50	50	51	53	56	58	62	66	69	70	75	79	76	74	70	68	65	63	62	60	57
Yuen Long	62	59	57	56	56	57	62	70	75	76	76	77	77	78	80	80	80	81	81	80	76	73	69	65
Tap Mun	47	47	48	48	49	50	53	55	56	57	59	59	57	57	57	57	56	55	54	54	52	51	49	49
Causeway Bay	76	66	62	59	58	59	69	81	88	95	95	94	92	104	103	104	105	105	109	111	108	99	95	86
Central	64	59	57	56	57	59	66	75	89	89	85	84	80	84	87	89	90	90	91	90	86	80	76	72
Mong Kok	64	58	55	53	54	55	63	73	78	80	82	81	80	84	85	85	87	90	90	90	85	80	76	71

Note: All concentration units are in micrograms per cubic metre.

TABLE C8: 2004 AMBIENT LEVELS OF TOXIC AIR POLLUTANTS

Toxic Air Pollutants	Concentration Unit	Annual Averages [1]	
		Tsuen Wan	Central/Western
Heavy Metals [2]			
Hexavalent chromium	ng/m^3	0.19	0.21
Lead	ng/m^3	86	78
Organic Substances			
Benzene	$\mu g/m^3$	3.12	2.22
Benzo[a]pyrene	ng/m^3	0.24	0.21
1,3-Butadiene	$\mu g/m^3$	0.23	0.18
Formaldehyde	$\mu g/m^3$	6.29	5.78
Perchloroethylene	$\mu g/m^3$	0.87	1.61
Dioxins [3]	pgI-TEQ/m^3	0.055	0.073

Note:

[1] For TAP concentrations that are lower than the method detection limit (MDL), one half of the MDL is used in calculating the annual averages.

[2] For lead the reported figures are the respective 2004 annual average concentrations in the elemental analysis of total suspended particulates.

[3] The ambient level of dioxins is expressed here as toxic equivalent (I-TEQ) concentration of 2,3,7,8-Tetrachlorodibenzodioxin (TCDD) based on the International Toxic Equivalent Factors (I-TEF) of the North Atlantic Treaty Organisation (NATO/CCMS), 1988.

Appendix D

Monitoring Results of Sulphur Dioxide and Nitrogen Dioxide by HEC and CLP

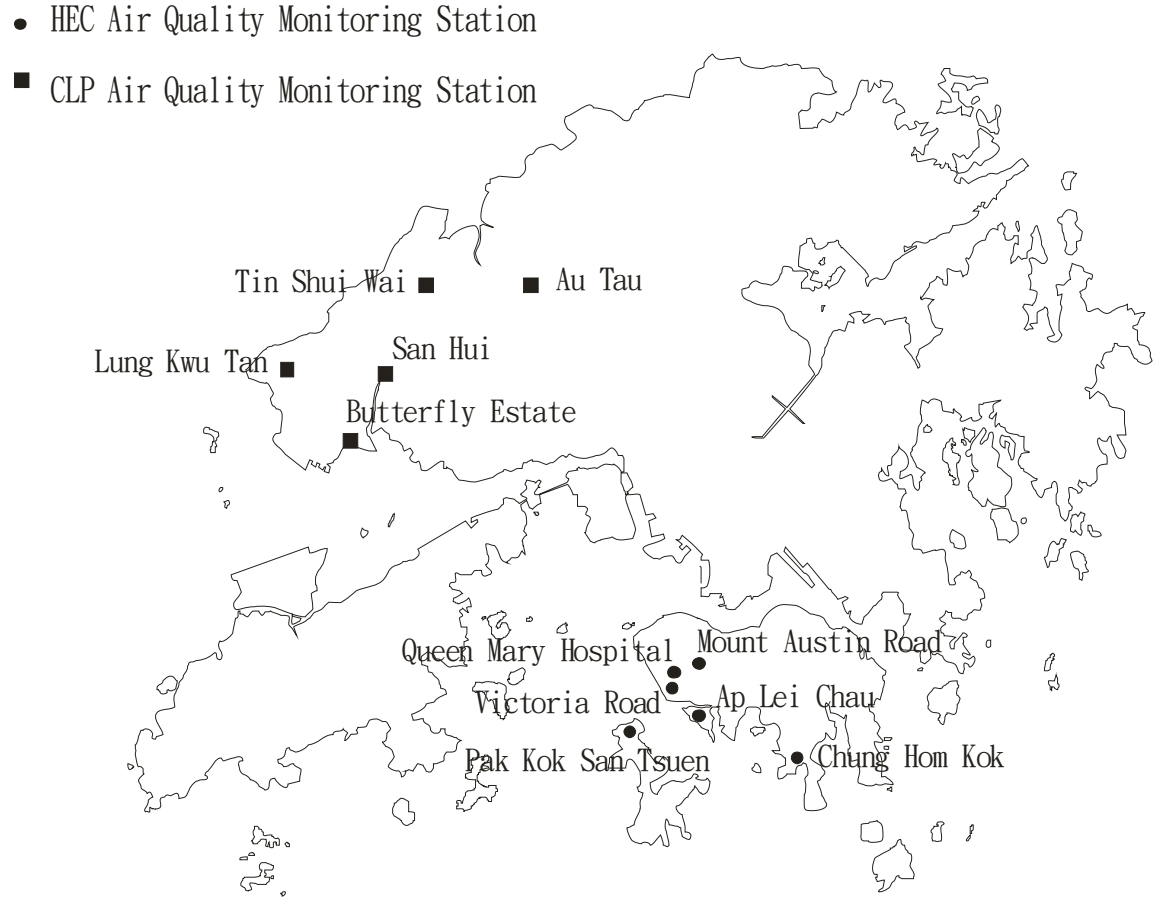


Figure D1 LOCATION OF HEC & CLP AIR QUALITY MONITORING STATIONS FOR SULPHUR DIOXIDE AND NITROGEN DIOXIDE

D.1 The Hongkong Electric Co. Ltd.

Air Quality Monitoring Stations	Annual Mean Concentration [1]	Range of Monthly Mean Concentration
Sulphur Dioxide (SO_2)		
Mount Austin Road [2]	23	12 - 54
Chung Hom Kok	11	2 - 30
Victoria Road	20	13 - 33
Queen Mary Hospital	17	11 - 32
Ap Lei Chau	11	3 - 30
Pak Kok San Tsuen	15	9 - 20
Nitrogen Dioxide (NO_2)		
Mount Austin Road	27	11 - 37
Chung Hom Kok	21	8 - 39
Victoria Road	35	12 - 57
Queen Mary Hospital [3]	33	13 - 50
Ap Lei Chau	20	6 - 35
Pak Kok San Tsuen	27	12 - 42

D.2 CLP Power Hong Kong Limited.

Air Quality Monitoring Station	Annual Mean Concentration [1]	Range of Monthly Mean Concentration
Sulphur Dioxide (SO_2)		
San Hui	69	39 - 123
Tin Shui Wai	17	1 - 33
Au Tau	30	5 - 71
Butterfly Estate	22	10 - 28
Lung Kwu Tan [4]	---	1 - 28
Nitrogen Dioxide (NO_2)		
San Hui	55	27 - 83
Tin Shui Wai	28	6 - 40
Butterfly Estate	43	12 - 71
Lung Kwu Tan [4]	---	19 - 58

Notes:

[1] All pollutant units are in micrograms per cubic metre on hourly average.

[2] Mount Austin Road recorded 2 counts of exceedance of 1-hr AQO limit for sulphur dioxide.

[3] Queen Mary Hospital recorded 1 count of exceedance of 1-hr AQO limit for nitrogen dioxide.

[4] Lung Kwu Tan monitoring station has been in operation since May 2004, data not sufficient for the calculation of annual average in the year.