

The Ambient Air Quality Monitoring Network in the Auckland Region 2013

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The Ambient Air Quality Monitoring Network in the Auckland Region 2013

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1.0 Introduction

This report summarises the Auckland Council ambient air quality monitoring network as at December 2013, with an overview of where, what and how air pollutants are monitored. It is an updated version of an earlier technical publication *The ambient air quality monitoring network in the Auckland Region* prepared by the Auckland Regional Council in 2006 (ARC, 2006). Metadata such as site description, surrounding area characteristics and local sources of air pollution are included for both current and discontinued monitoring sites.

Auckland Council is required to monitor air quality under the Resource Management Act 1991 and the National Environmental Standards for Air Quality 2012. We need good quality data so that we can find out whether the levels of air pollution exceed guidelines and standards, and whether air pollution is improving or getting worse over time. We measure different pollutants depending on the sources of the pollutants (which for Auckland are predominantly transport, domestic heating and industry) and their potential effects. This helps us to decide what the best policies are to reduce pollution and to see whether those strategies are working for us.

Continuous instrumental ambient air quality monitoring has been undertaken in the Auckland region for several decades. The Auckland Council (AC) has data from 1964, which marks the commencement of total suspended particulate (TSP) and lead (Pb) monitoring by the former Department of Health (DoH). This dataset is now the longest continuous air quality dataset in New Zealand. In addition to providing information for local and national bodies, in the past, three sites in Auckland have contributed data to the World Health Organisation (WHO) Global Environmental Monitoring (GEMS) programme since 1977. There have also been numerous short survey and passive monitoring programmes including monitoring undertaken by other organisations for research purposes, although they are not covered in this report. Some metadata from monitoring undertaken by the New Zealand Transport Agency (NZTA)¹ or industry is also included for the reader's information.

¹The NZTA undertakes monitoring prior to or following construction of major roading infrastructure (such as Victoria Park tunnel, State Highway 20 (SH20) Mt Roskill and the Waterview connection projects). Some of this monitoring includes long records of air quality data, particularly for the Waterview connection. NZTA have also undertaken some survey monitoring. Refer to the NZTA website: www.nzta.govt.nz

Early ambient air quality monitoring by the DoH was from two sites (Mt Albert and Penrose) measuring TSP as a weekly average and lead as a monthly average. The addition of sulphur dioxide (SO₂) and smoke in 1975, and oxides of nitrogen (NO_x) in 1987 further expanded the monitoring programme. In 1991 the Resource Management Act (RMA 1991) repealed the Clean Air Act of 1972, and handed responsibility of air quality management to regional councils. By June 1993 the Auckland Regional Council (ARC) had taken over the majority of ambient air quality monitoring in the region.

1.1 The current network

The current Auckland Council network for continuous monitoring of ambient air quality comprises 13 permanent and two mobile sites for pollutant monitoring, and three sites that measure meteorological parameters only. Carbon monoxide (CO) is measured at seven sites, oxides of nitrogen (NO_x) at nine sites; particulates at 13 sites; ozone (O₃) at four sites; lead at one site and sulphur dioxide at two sites. Continuous monitoring of benzene and 1,3 butadiene is also undertaken at Khyber Pass Rd.

The network extends from Patumahoe to the Whangaparaoa Peninsula and from Glen Eden to Botany Downs. Sites range in their scope; some monitor a single parameter, while others measure a suite of pollutants on a continuous basis, have co-located meteorological equipment and house the analysing equipment in air conditioned sheds. Meteorological monitoring is now undertaken at all continuous sites because information on local meteorology is essential for understanding pollutant sources, short-term events, chemical reactions, the trends in data and why exceedences have occurred.

The sites are funded by the Auckland Council with the data collection and equipment maintenance mainly performed by contractors², specifically the Laboratory Services – Air Quality Department of Watercare Services Limited (WSL) (from 2000) with earlier contracts held by the National Institute of Water and Atmospheric Research Ltd (NIWA) (until mid-2012), and the Institute of Environmental Science and Research Limited (ESR) (to the end of 1999). Equipment and standard methods have also changed and improved over the years, leading to the associated improvement in data quality and reliability.

The longest running still-current site is at Takapuna, in the grounds of Westlake Girls High School on the North Shore. This site has been operating since 1995, with meteorological parameters measured here since 1994. The most recent addition to the network is the mobile trailer at the waterfront which commenced monitoring in February 2011.

²The 10 metre meteorological masts are operated by Auckland Council staff and Kumeu is partly operated by Auckland Council staff.

1.2 Changes to the monitoring network

Over the years since the commencement of air monitoring, the nature of monitoring and overall objectives have changed. This reflects international trends in monitoring, including increasing concern with smaller particles and hazardous air pollutants, improved reliability, detection limits and automation of instrumentation, and an improved understanding of air quality in Auckland. The main changes that have affected the monitoring network over the past 20 years include³:

- *Shift to monitoring smaller particles.* Initially particulate monitoring was comprised solely of total suspended particulates (TSP) monitoring as the main concern was soiling from dust as opposed to health impacts from finer inhalable or respirable dust. In 1994, the first PM₁₀ (particles less than 10 microns in size) monitor was installed in Penrose so that compliance with the 1994 Ambient Air Quality Guidelines could be monitored. The Ministry for the Environment (MfE) set the PM₁₀ guideline on the basis of international standards that were promulgated with the recognition that PM₁₀ concentrations were a better measure of particles associated with adverse health effects than TSP. With the increasing concern overseas and nationally about smaller particles in the PM_{2.5} range (particles less than 2.5 microns in size), the Auckland Regional Council also initiated monitoring of PM_{2.5} at Mt Eden (Kelly St) in 1997 (now decommissioned). PM_{2.5} is now monitored at Queen Street, Khyber Pass, Auckland Waterfront and Beachlands and has been monitored at Mt Eden, Kingsland, Pukekohe, Warkworth, Helensville, Waiheke Island and Waiuku.
- *Change in focus for gaseous pollutants.* Long-term monitoring of sulphur dioxide commenced in Penrose⁴ in 1975 due to the concern about potential levels of sulphur dioxide produced by industries using coal and heavy fuel oil in the local area. Over the years sulphur dioxide (SO₂) levels have decreased, except for a period when diesel vehicle use increased (leading to elevated concentrations of SO₂) and prior to the introduction of lower sulphur fuel in Auckland. The SO₂ concentrations in Penrose are now generally low and within existing Ministry for the Environment guidelines.

In 2005 the WHO recommended new (lower) guidelines for SO₂ which prompted the ARC to undertake an SO₂ passive sampling survey in 2007 (WSL, 2007) to check that the Penrose site continued to be sufficiently conservative to represent exposure to SO₂ in the Auckland region (i.e. that there were no other locations where concentrations

³For more information readers should also refer to ARC (1997) TP88: Ambient Air Quality: Monitoring Results for the Auckland Region 1964 to 1995 and BW Graham and H Narsey (1993) Air Pollution Monitoring in New Zealand 1960 – 1992,

⁴Note: short-term monitoring had also been undertaken at other locations prior to that (refer to report by BW Graham and H Narsey, 1993).

could be higher). The sampling survey showed that for the most part Penrose is sufficiently representative and conservative for the region, but that higher concentrations could be measured near the waterfront possibly due to shipping activities. Therefore, the concentrations of SO₂ near the waterfront are being further investigated using the mobile air quality monitoring trailer (and other methods such as source apportionment e.g. in Queen Street). In addition, a 'watching brief' is being held of SO₂ concentrations at Penrose to ensure that they are within the WHO guidelines and that they do not increase as they did in the mid-1990s due to the influx of diesel vehicles.

Long-term carbon monoxide (CO) monitoring commenced in Queen St in 1991. Due to the number of exceedences of the eight-hour guidelines at that site (and subsequent sites) the network of carbon monoxide monitors increased over the years. Carbon monoxide concentrations have also generally fallen in recent years (with improved vehicle technologies) and, although monitoring of carbon monoxide will continue because there is still the potential for exceedences to occur or guidelines to change, it is likely that this part of the network will be reduced as instruments are retired.

Long-term NO_x monitoring for the Ministry of Health (MoH) commenced in Penrose⁵ in 1987 with initial concern about contribution to photochemical smog. Following overseas trends and concerns about the effects of nitrogen dioxide (NO₂) directly on human health, the number of NO_x monitoring sites has slowly increased across the region. Takapuna and Henderson were selected for monitoring NO_x because they were located near to major sources such as vehicles and industry (and they lie within the sea breeze circulation zone which can have additional contributions of pollutants generated by other parts of the city). Peak monitoring sites were also installed at Khyber Pass and Queen St and these sites have frequently exceeded guidelines and standards. NO_x levels continue to be of concern because international (and New Zealand) research has shown that more stringent vehicle emissions standards have not lead to the expected "real world" reductions in emissions and consequent improvements in air quality for NO₂ (Kuschel *et al.*, 2012).

Some gaseous hazardous air pollutants (HAPs) have been monitored in Auckland, but they have not received as much attention as the other pollutants discussed above. Aside from lead (in particles), the HAPs that have been measured mainly include benzene, toluene, ethyl benzene and xylene (BTEX) and 1,3 butadiene. Benzene emissions from vehicles were raised as a concern following the switch to unleaded petrol in the mid-1990s. The benzene and aromatic content in petrol has been reduced

⁵Monitoring was also undertaken from 1978 to 1993 at the ESR offices at Fenton St, Mt Eden, although the Council does not hold this data. Other short-term studies had also been taken prior to that (refer report by BW Graham and H Narsey, 1993).

over the years through legislation and this has also reduced benzene concentrations in air (Smith *et al.*, 2009). BTEX has been measured using passive sampling in several locations, both by the ARC and by the Ministry for the Environment. Continuous monitoring of benzene and 1,3 butadiene commenced at Khyber Pass Road in 2005. In 2009, BTEX passive sampling was undertaken to check how the Khyber Pass Road site compared against other locations in Auckland. Higher average concentrations were measured at Crowhurst St and therefore passive sampling is now undertaken both at Khyber Pass Road (next to the long-term continuous monitor) and Crowhurst St (as a peak site). Some preliminary survey monitoring of polyaromatic hydrocarbons (PAHs) has been undertaken by research organisations, but most of the other HAPs listed in the Ministry for the Environment ambient air quality guidelines have not been measured in Auckland.

- *Concern about photochemical smog.* Early monitoring of ozone was undertaken in the 1970s mainly by the New Zealand Electricity Department to determine the effects of NO_x emissions from proposed new gas fired power stations. The results of this monitoring indicated that elevated ozone concentrations do occur in the Auckland region due to photochemical reactions. Permanent continuous monitoring commenced with the installation of an ozone analyser at the Mangere Wastewater Treatment Plant in 1995 (this coincided with monitoring of the boundary layer using the acoustic sounder at the treatment plant). This site was moved to Musick Pt because prevailing winds (synoptic south-westerlies and sea breezes) push rush hour air pollutants past that location and then frequently return them later on in the day, allowing sufficient time for photochemical pollutants to form. Elevated ozone concentrations had also been measured at Musick Pt in the 1980s, further strengthening the case for selecting that site. NO_x is monitored at Musick Pt so that the effects of photochemical reactions can be monitored (this site provides background information on NO_x). Urban airshed modelling indicated that sites further from Auckland were likely to be affected by elevated ozone and hence the ozone monitoring sites at Pukekohe and Whangaparaoa were installed.

Results from the current monitoring sites show that there is continuing evidence of photochemistry occurring in the Auckland region and that elevated levels of ozone can occur during summer. Two eight-hour exceedences have been recorded at one site (MusickPt) during 2002 and in the past all of the current sites have recorded peaks that are over 90% of the guidelines (for either or both of the 1-hr or 8-hr guidelines). There have been no further exceedences of ozone since 2002.

- *Move to more frequent and continuous monitoring.* Early sampling of TSP, PM₁₀ and PM_{2.5} was initially undertaken on a one in six day regime when concerns were primarily for nuisance effects. This monitoring was consistent with United States Environmental Protection Agency (USEPA) procedures, but there was concern that the sampling was

too infrequent to give a reliable annual average and that a lot of the peaks may have been missed. The frequency of monitoring therefore changed from one in six day to one in three day sampling in early 2001 with growing concern for fine dust impacts on human health. Continuous sampling is necessary when considering human health risk so instruments were developed accordingly. The ARC further upgraded the monitoring network so that most of the PM₁₀ and PM_{2.5} monitoring sites are now continuously monitoring using Beta Gauge technology. Additional reasons for upgrading PM₁₀ and PM_{2.5} sites to Beta Gauges are that more information can be obtained about daily trends (and hence the effect of different sources) and because continuous monitors are more cost effective to operate and less prone to operator error than gravimetric sampling. Gravimetric sampling will continue in future for survey sampling (e.g. prior to setting up a new monitoring site), to co-locate with Beta Gauges at new sites (because the gravimetric Partisol sampling more closely matches the USEPA Federal Reference Method) and for speciation sampling.

Continuous monitoring has been undertaken for gaseous pollutants for many years, although earlier 24-hour data of SO₂ and NO_x (collected for the Ministry of Health) is from wet chemistry methods.

- *Changes in air quality guidelines and standards.* International air quality standards for particulate matter and nitrogen dioxide have become more stringent because health studies have shown that the previous standards were not sufficient to protect the health of sensitive populations. The New Zealand ambient air quality guidelines for these pollutants were also reduced in 2002 to be consistent with these changes. Even with the lower limit of 50 µg/m³ for PM₁₀ (averaged over a 24-hr period), it is recognised that there are still likely to be health effects at concentrations below this and a 'no adverse effect level' has not yet been established internationally. WHO have determined adverse effects at 5µg/m³ and have been using 7.5µg/m³ as a start point for calculating health impacts and associated cost benefit analysis (Kunzli *et al.*, 2000). A greater level of health effects are produced by diesel particulate matter so speciation of particles is becoming more important. The MfE have recommended that if PM₁₀ levels are within guideline levels, "*efforts should be made to maintain, and where possible, further reduce levels*" (MfE, 2002).

Overseas and New Zealand studies have also recently highlighted the relative exposure of populations to the chronic effects of long-term exposure to lower peaks but higher average background concentrations, particularly for PM₁₀. This was recognised in the Ministry for the Environment's 2002 amendment to the ambient air quality guidelines, when the recommended maximum annual concentration was reduced from 40 µg/m³ to 20 µg/m³. Some monitoring sites in Auckland have been established so

that the long-term exposure to PM₁₀ (and PM_{2.5}) at locations with lower peaks but typically higher long-term averages can be further investigated.

In 2005, the Ministry for the Environment promulgated the National Environmental Standards for Air Quality. These standards require regional councils to monitor in areas where the standard is likely to be breached (MfE, 2004). Based on data from recent years, the standards for NO₂ and for PM₁₀ could be breached in future in the Auckland airshed. There also is the potential for ozone standards to be exceeded. Therefore Auckland Council will continue to monitor these parameters in the region.

- *Understanding sources of air pollution.* To be able to manage poor air quality requires an understanding of the pollution sources and their contributions, so that the most significant air pollution sources are identified and managed. It is also important to understand how much of the particulate is from sources the Council cannot control (e.g. natural background) so that the level of management is identified. In addition, the effectiveness of the resulting policies or regulatory approaches for the differing sources needs to be measured. To achieve these goals source apportionment of material collected on filters at air quality monitoring sites is undertaken for a number of sites in Auckland. Source apportionment has been carried out in Auckland since the mid/late 1990s, initially through short-term projects by research organisations and work funded by Council. Since 2004 the Council has invested in an on-going source apportionment programme which has resolved many questions about the primary sources of particles, how they vary over time and what sources are the main contributors when high pollution levels are measured. In addition, the programme has allowed Council to identify issues not known before (e.g. arsenic levels due to burning treated timber, contribution of shipping to sulphate levels).

In the past, two long-term sites at Penrose Great South Road (1964-2004) and Mt Eden Kelly Street. (1982-2005) have been decommissioned. The loss of the long-term sites is regrettable, as it represents the closure of an extended dataset, which can be invaluable for observation of long-term trends in ambient air quality. New sites can be difficult to procure, as they must be carefully selected in order to attain the multiple goals of long-term tenure, site security and accessibility, whilst also being representative of the area to be monitored. The site must be as far as possible compliant with AS/NZ 3580.1.1:2007–2007 Australian New Zealand Standard *Methods for sampling and analysis of ambient air – guide for the siting of air monitoring equipment* (AS/NZS, 2007). Furthermore, the planning process can mean that a considerable period of time elapses between selection of a suitable location that meets all the criteria, and the commencement of monitoring.

1.3 Structure of this report and source material

The report contains tables presenting a summary of ambient air quality and meteorological sites, followed by a site inventory. Current site profiles form the main part of the document, with discontinued sites in the appendix. Explanation of terms used in the metadata can also be found in the appendix.

The content of this report is sourced primarily from technical publications (TPs) of ambient air quality data, the ARC metadata files, the monthly, quarterly and annual monitoring reports prepared for the ARC by NIWA and WSL, and the GEMS reports. In some instances specific site visits were made to clarify detail. Not all site information was available for past sites and in these cases the information was therefore left blank.

The precise number of sites that have been operated in the region depends on how sites are classified. Where a site has been relocated in a minor way, but has essentially retained similar characteristics (e.g. Queen St, which has had several locations within a few city blocks) the data has been treated as continuous. Therefore while this metadata report details 48 sites, the monitoring data will record fewer.

2.0 Summary tables

This section provides summary tables of ambient air quality and meteorological sites.

Table 2-1 presents the current ambient air quality monitoring at sites in the Auckland region and the meteorological parameters measured on site. Tables 2-2 and 2-3 contains past sites with non-regulatory, survey methods of monitoring ambient air quality and those with regulatory methods, respectively. Sites with 10m met masts only (no pollutant monitoring) and non-Auckland Council air quality monitoring sites of significance are listed in Tables 2-4 and 2-5, respectively.

Table 2-1 Current ambient air quality monitoring at sites in the Auckland region and the meteorological parameters measured on site (table continues over page). Start date is for the site only and may vary for individual pollutant monitoring

Site name	NZTM Easting	NZTM Northing	Area	From	Pollutants monitored in 2013 (method)	Meteorological parameters measured (mast height above ground)
Auckland Waterfront – Mobile Trailer	1757638	5921040	Central Auckland	26.04.12	CO NOx PM ₁₀ (Beta Gauge) PM _{2.5} (Beta Gauge) SO ₂	Wind speed, wind direction, ambient temperature, relative humidity, rainfall, solar radiation (6 m)
Botany Downs	1771363	5912351	Manukau	01.10.03	PM ₁₀ (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity, rainfall, solar radiation (6 m)
Glen Eden (Ceramco Park)	1747144	5912490	Waitakere	01.12.05	CO NOx PM ₁₀ (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity, rainfall, solar radiation (6m)
Henderson I (A) (Lincoln Rd)	1745140	5918533	Waitakere	15.12.93	CO NOx PM ₁₀ (Beta Gauge, Partisol)	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation (6m)
Khyber Pass I	1757874	5918488	Central Auckland	29.10.96	CO NOx Benzene 1,3 Butadiene	Nil*
Khyber Pass II	1757826	5918507	Central Auckland	02.03.98	PM ₁₀ (Beta Gauge) PM ₁₀ (Partisol) PM _{2.5} (Partisol)	Nil (see Table 1.4 for Khyber Pass met site)
Kumeu	1738997	5928799	Rodney	03.06.06	PM ₁₀ (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity, rainfall, solar radiation (6m)
MusickPt II (Telecom Building)	1769523	5920383	Manukau	04.02.99	NOx Ozone	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation (17m)

Table 2-1 (continued)

Site name	NZTM Easting	NZTM Northing	Area	From	Pollutants monitored in 2013 (method)	Meteorological parameters measured (mast height above ground)
Orewa	1751285	5949888	Rodney	16.05.07	PM ₁₀ (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation (6m)
Pakuranga	1768407	5913944	Manukau	26.06.98	CO PM ₁₀ (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity, rainfall, solar radiation (6m)
Patumahoe	1765441	5880820	Pukekohe	21.10.96	Ozone PM ₁₀ (Beta Gauge) PM _{2.5} (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation, rainfall* (10m)
Penrose II (B) (Gavin St Substation)	1761751	5914176	Central Auckland	01.11.00	NOx PM ₁₀ (Beta Gauge, HiVol) PM ₁ , PM _{2.5} , PM ₁₀ (Grimm) TSP/Lead (HD med Vol) Speciation Sampling (Partisol) SO ₂	Wind speed, wind direction, ambient temperature, relative humidity, rainfall, solar radiation (6m)
Queen St II (CML Building)	1757414	5920573	Central Auckland	22.12.82	CO NOx PM ₁₀ (Sequential Partisol) PM _{2.5} (Partisol).	Nil
Takapuna I (Westlake)	1756059	5928077	North Shore	31.05.95	CO NOx PM ₁₀ (Beta Gauge, Partisol) PM _{2.5} (Beta Gauge) Speciation Sampling (RAAS)	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation (10m)

Table 2-1 (continued)

Site name	NZTM Easting	NZTM Northing	Area	From	Pollutants monitored in 2013 (method)	Meteorological parameters measured (mast height above ground)
Whangaparaoa	1762823	5947227	Rodney	09.04.98	Ozone	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation** (10m)

*Note: Patumahoe meteorological data is owned by NIWA

**Note: Whangaparaoa meteorological parameters are not measured on site but can be obtained from a MetService site approximately 1.5km to the northeast. The meteorological data is owned by NIWA

Table 2-2 Past sites with non-regulatory, survey methods of monitoring ambient air quality (meteorological parameters not measured).

Site name	NZTM Easting	NZTM Northing	Area	From	To	Pollutants monitored (method)
Beach Haven	1751851	5927391	North Shore	16.06.03	17.09.03	PM ₁₀ (MicroVol)
Glen Eden II (Glen Eden Intermediate)	1747187	5912361	Waitakere	03.01.01	31.12.05	PM ₁₀ (MiniVol)
Glenfield	1753009	5928435	North Shore	16.06.03	31.12.05	PM ₁₀ (MiniVol)
Henderson I (B)	1745010	5918588	Waitakere	17.09.00	29.12.05	PM ₁₀ (MiniVol)
Highbury (Bank St)	1754067	5925628	North Shore	16.06.03	07.06.07	PM ₁₀ (MicroVol)
Manurewa II (Manurewa South Primary School)	1768599	5899827	Manukau	28.08.01	31.12.05	PM ₁₀ (MiniVol)
Manurewa III (Manurewa West Primary School)	1767863	5900689	Manukau	28.08.01	31.12.05	PM ₁₀ (MiniVol)
Takapuna II (Lake Rd)	1758067	5927171	North Shore	16.06.03	30.06.07	PM ₁₀ (MicroVol)

Table 2-3 Past ambient air quality monitoring sites in the Auckland region and the meteorological parameters measured on site (continues over page). Start /finish dates are for the site only and may vary for individual pollutant monitoring.

Site name	NZTM Easting	NZTM Northing	Area	From	To	Pollutants monitored (method)	Meteorological parameters measured (mast height)
Beachlands (Mobile Trailer)	1778070	5916297	Franklin	24.05.11	30.04.12	PM ₁₀ (Beta Gauge) PM _{2.5} (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation, rainfall 6m
Dominion Road I (Metropolitan Rentals)	1755966	5917151	Central Auckland	01.01.94	11.02.96	CO NOx	Nil
Dominion Road II (Veg Market)	1756071	5917343	Central Auckland	06.12.01	27.06.02	CO NOx	Nil
East Tamaki	1766483	5907649	Manukau	01.07.98	13.08.02	CO PM ₁₀ (Grimm Particulate Sampler)	Nil
Helensville (Mobile Trailer)	1729323	5940115	Rodney	22.01.10	31.12.10	NOx PM ₁₀ (Beta Gauge) PM _{2.5} (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation 6m
Hobson Street	1756787	5919905	Central Auckland	05.09.96	31.03.00	CO	Nil
Kingsland (Kowhai)	1755691	5917772	Central Auckland	02.04.04	07.09.05	NOx PM ₁₀ (Beta Gauge, Partisol) PM _{2.5} (Partisol), TSP/ Lead Ozone	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation (6m)
Mangere (Mangere Bridge)	1757853	5907384	Manukau	15.08.95	15.05.96	Ozone	Vertical Wind Profile Mixing Height (Acoustic sounder)

Table 2-3 (continued)

Site name	NZTM Easting	NZTM Northing	Area	From	To	Pollutants monitored (method)	Meteorological parameters measured (mast height)
Manurewa I (Post Office)	1768721	5901000	Manukau	04.03.96	21.03.97	CO	Nil
Mt Albert	1753860	5915893	Central Auckland	31.01.64	17.01.96	TSP (HD MedVol)	Nil
Manurewa I (Post Office)	1768721	5901000	Manukau	04.03.96	21.03.97	CO	Nil
Mt Albert	1753860	5915893	Central Auckland	31.01.64	17.01.96	TSP (HD MedVol)	Nil
Mt Eden I (Fenton St)	1756578	5918264	Central Auckland	06.03.75	31.12.83	TSP (HD Med Vol) Lead	Nil
Mt Eden II (B) (Kelly St Shed)*	1756895	5918020	Central Auckland	06.02.01	17.01.06	NOx PM ₁₀ (Beta Gauge, Partisol) PM _{2.5} (Partisol)	Wind speed, wind direction, ambient temperature, relative humidity (6m)
Musick Point (Gardener's Shed)	1769506	5919367	Manukau	17.01.96	07.01.99	Ozone NOx	Wind speed, wind direction (6m)
Newton (Canada St Mobile)	1756842	5919298	Central Auckland	03.07.02	07.03.	CO NOx PM ₁₀ (Sequential Partisol)	Nil
Northcote	1756513	5926270	North Shore	24.08.83	05.04.02	TSP (HD MedVol, Partisol) Lead	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation
One Tree Hill	1758130	5914091	Central Auckland	12.02.96	04.05.96	NOx	Nil
Penrose I (Great South Rd) Clinic Roof	1761872	5913547	Central Auckland	31.01.64	03.07.02	PM ₁₀ (HiVol, Partisol) PM _{2.5} (Partisol) NOx TSP/Lead (HD MedVol) SO ₂ (Wet Chem.) Smoke	Nil

Table 2-3 (continued)

Site name	NZTM Easting	NZTM Northing	Area	From	To	Pollutants monitored (method)	Meteorological parameters measured (mast height)
Penrose II (A) (Gavin Street Caravan)	1761730	5914177	Central Auckland	1989	Oct 2000	NOx	Nil
Penrose III (A) (ACI Trailer, Great South Rd)	1761847	5913542	Central Auckland	17.11.00	28.08.01	NOx SO ₂ (Fluorescence) Smoke	Nil
Penrose IV (Gavin St Mobile)	A 1761741 B 1761713 C 1761744 D 1761666	5914109 5914132 5914201 5914111	Central Auckland	05.03.04 16.06.04 08.10.04 09.03.05	16.06.04 07.10.04 09.03.05 17.10.05	CO NOx PM ₁₀ (Beta Gauge)	Wind Speed, Wind Direction, Ambient Temperature, Relative Humidity, Solar Radiation (6m)
Penrose III (B) (ACI Shed, Great South Rd)	1761847	5913542	Central Auckland	31.08.01	31.05.04	NOx PM ₁₀ (Partisol and TEOM) PM _{2.5} (Partisol) TSP/Lead (HD MedVol) SO ₂ (Fluorescence)	Wind Speed, Wind Direction, Ambient Temperature, Relative Humidity, Solar Radiation (6m)
Queen St I (Cruickshank and Miller)	1757325	5920228	Central Auckland	25.09.75	22.12.82	TSP (HD MedVol)	Nil
Queen St III (Tisdalls)	1757429	5920516	Central Auckland	01.01.91	30.06.00	CO	Nil
Sky Tower*	1757110	5920502	Central Auckland	03.04.98	29.03.04	Ozone	Wind Speed, Wind Direction, Temperature (318m above MSL)
Waiheke Island	1780993	5926297	Central Auckland	16.02.09	21.12.10	NOx PM ₁₀ (Beta Gauge) PM _{2.5} (Beta Gauge) Ozone	Wind speed, wind direction, standard deviation of wind direction, solar radiation, relative humidity, rainfall and ambient temperature. (6m)
Waiuku	1753480	5875495	Franklin	17.02.09	17.01.10	NOx PM ₁₀ (Beta Gauge) PM _{2.5} (Beta Gauge) Ozone	Wind speed, wind direction, standard deviation of wind direction, solar radiation, relative humidity, rainfall and ambient temperature. (6m)

*Note: Sky Tower met data is owned by NIWA

Table 2-4 Sites with 10m met masts only (no pollutant monitoring).

Site name	NZTMEasting	NZTMNorthing	Area	From	Meteorological parameters measured
Henderson TePai Park	1745468	5919216	Waitakere	15.11.94	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation
Khyber Pass III	1757818	5918505	Central Auckland	29.10.96	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation
Onehunga	1760436	5911538	Central Auckland	18.08.94	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation
Wiri	1766415	5904322	Manukau	26.05.95	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation

Table 2-5 Non-Auckland Council air quality monitoring sites of significance

Site name	NZTM Easting	NZTM Northing	Area	From	To	Pollutants monitored (method)	Meteorological parameters measured (mast height)
Central Connector Project (formerly Central Transit Corridor project- CTC)	1757629	5919122	Central Auckland	09.08.10	16.09.11	NO ₂ PM ₁₀ (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity (6m)
Johnstone's Hill Tunnel Project	1750343	5955528	Puhoi	30.03.10	13.07.10	CO NO _x PM ₁₀ (e-Beta Gauge)	Nil
Manukau Harbour Crossing Project	1759546	5910086	Mangere Bridge	27.10.06	04.01.08	CO NO _x PM ₁₀ (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity (6m)
Mt Roskill Extension Project	1753349	5914435	Mt Roskill	26.09.07	22.11.07	CO NO _x PM ₁₀ (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity (6m)
	1753354	5914428	Mt Roskill	06.10.09	19.11.09	CO NO _x PM ₁₀ (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity (6m)
Victoria Park Tunnel Project	1756171	5920855	Central Auckland	12.12.05	31.12.06	CO NO _x PM ₁₀ (Hi-Vol)	Wind speed, wind direction, ambient temperature, relative humidity (6m)
Waterview Connection Project	1752787	5914884	Mt Albert	13.06.06 01.06.10	30.09.06 31.12.10	CO NO _x PM ₁₀ (Beta Gauge) PM _{2.5} (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity (6m)
	1751891	5917669	Mt Albert	01.08.07	31.12.10	CO NO _x PM ₁₀ (Beta Gauge) PM _{2.5} (Beta Gauge)	Wind speed, wind direction, ambient temperature, relative humidity (6m)

Table 2-5 (continued)

Site name	NZTM Easting	NZTM Northing	Area	From	To	Pollutants monitored (method)	Meteorological parameters measured (mast height)
NZ Steel:							
1. Training Centre	1753823	5881670	Waiuku	16.09.08		PM ₁₀ (Beta Gauge)	Wind Speed, Wind Direction, Ambient Temperature, Relative Humidity (6m)
2. Glenbrook Beach Rd	1754274	5881997	Waiuku	12.02.08		PM ₁₀ (Beta Gauge)	
3. Glenbrook School	1755389	5881003	Waiuku	15.02.07		PM ₁₀ (Beta Gauge)	
4. Boundary Rd	1751127	5880129	Waiuku	09.09.08		PM ₁₀ (Beta Gauge)	
5. Sandspit	1753274	5877839	Waiuku	14.06.07		PM ₁₀ (Beta Gauge)	

3.0 Current site inventory

This section describes metadata such as site description, surrounding area characteristics and local sources of air pollution for each operative site in the alphabetic order.

3.1 Auckland Waterfront (Mobile Trailer)

Site name

Auckland Waterfront (Mobile Trailer)

Address

Ports of Auckland Limited
88-89 Quay Street
Auckland City

Easting	Northing	Elevation (m)
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These vary – see table on next page

General site characteristics

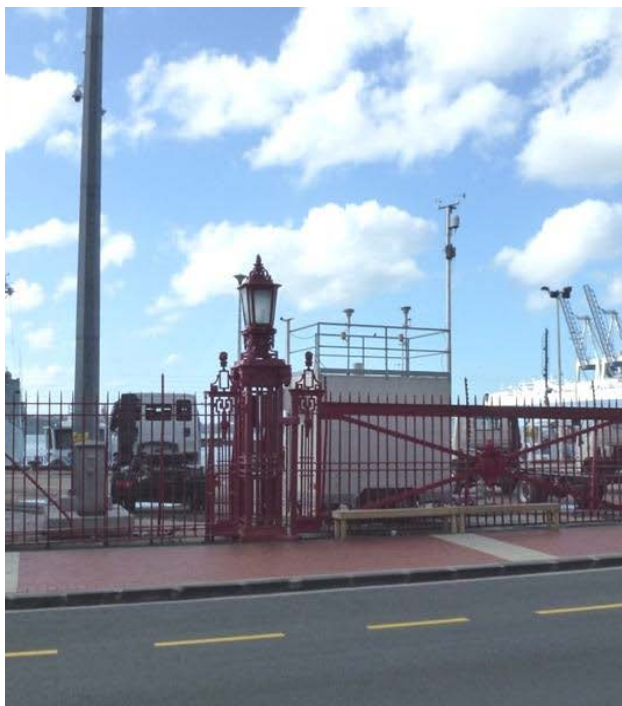
Urban

Topography

The site is located between Queens and Captain Cooks wharves, on a flat area.

Micro met characteristics

Well exposed to winds from all directions; slight sheltering from houses, fence and trees to the north.



Site - view from the south west.

Site description and area characteristics

This relocated site is located between Queens and Captain Cooks wharves inside Ports of Auckland grounds. It is located beside Queens Wharf on the city/south end. This is a flat area 8m north from Quay Street, 73m east from the Queen and Quay Street intersection, and 30m northwest from the Quay and Commerce Street intersection. High rise buildings are located 28m south from the shed

Air Quality Management Area

Urban

Predominant sources

Vehicles and port activities

Distance from road and other major sources

Approximately 4m to nearest road, 8m north from Quay Street, 73m east from the Queen and Quay Street intersection, and 30m northwest from the Quay and Commerce Street intersection.

Vehicle counts

N/a

Any nearby features that could affect measurements?

Nearest vertical supporting structure is ~5m west of the shed, and the nearest tree is 16m south from the shed. High rise buildings are located 28m south from the shed.

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

21.02.11

Monitoring ceased

On-going

Pollutants monitored (current)

CO: 21.02.11 to date

NO_x: 21.02.11 to date

PM₁₀ (Beta Gauge): 21.02.11 to date

PM_{2.5} (Beta Gauge): 21.02.11 to date

SO₂: 22.02.11 to date

Pollutants monitored (past)

Nil

Inlet height (m)

4

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation, rainfall.

Mast height (m)

6

Data owner

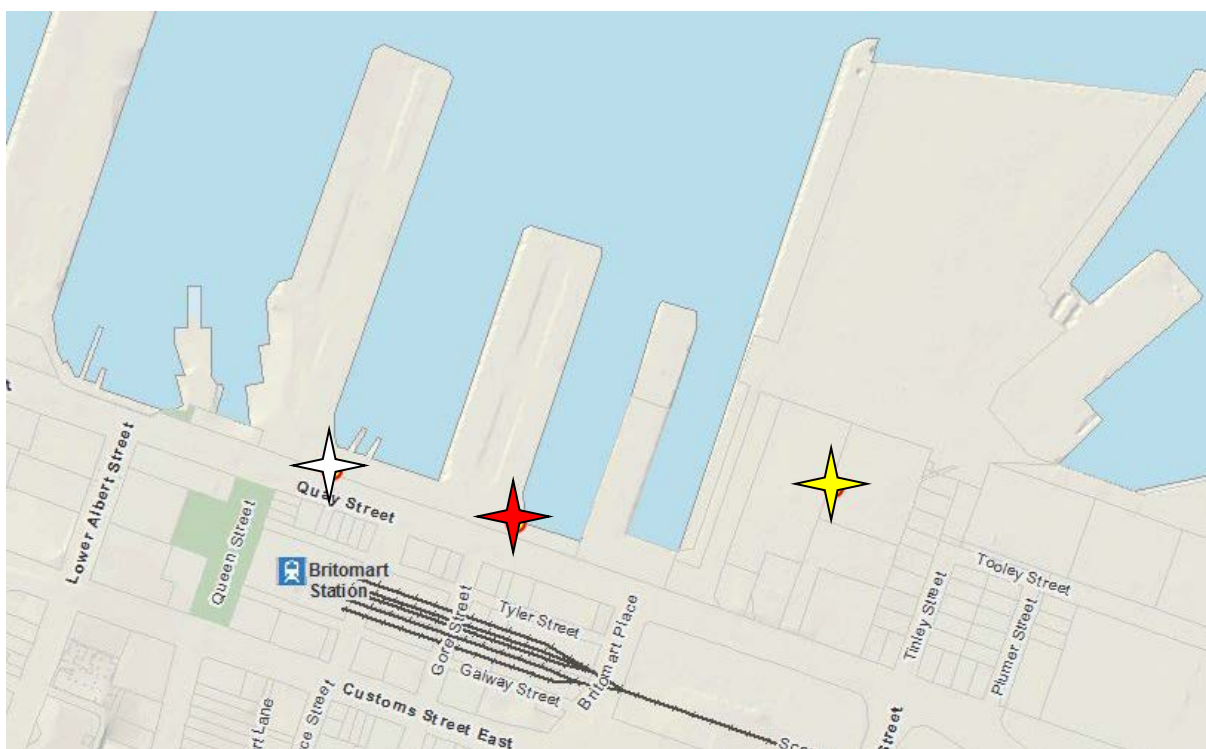
Auckland Council



Aerial view of site.

Source: Auckland Council GIS Viewer (extracted April 2013).

Site	NZMG		NZTM		Elevation (m)	Distance from road (m)	Start	Finish
	Easting	Northing	Easting	Northing				
A	2668244	6482698	1757808	5921001	2	20	21.02.11	17.08.11
B	2668523	6482735	1758086	5921039	2	150	19.08.11	25.04.12
C	2668075	6482737	1757638	5921040	2	8	26.04.12	on-going



Location map: location 1 – red star; location 2 yellow star; location 3 (current location) - white star.

Source: Auckland Council GIS Viewer, extracted May 2013

3.2 Botany Downs

Site name

Botany Downs

Address

Our Lady Star of the Sea School
14 Oakridge Way
Howick, Manukau

	Easting	Northing	Elevation (m)
NZMG	2681783	6474020	40
NZTM	1771363	5912351	

General site characteristics

Urban

Topography

Undulating with a general slope down towards the west.

Micro met characteristics

Well exposed to winds from all directions; slight sheltering from houses, fence and trees to the north.



Site - view from the west.

Site description and area characteristics

Air conditioned shed at the NW corner of playing fields at the school, next to a fence. Most houses in the area are <15 years old; large houses on medium sized (approximate average size -700m²) sites; approximately 10% with chimneys. During the period May 2004-May 2005, for a circle of 1.5km radius around the site, 25 permits granted for new domestic fires. Few large trees in the area.

Air Quality Management Area

Urban

Predominant sources

Vehicle and residential (during winter)

Distance from road and other major sources

Approximately 10m W to school parking; 50m W to bus pickup/drop-off; approximately 80m W to Oakridge Way and 50m NE to Crescent Hills Court (residential streets).

Vehicle counts

N/a

Any nearby features that could affect measurements?

Tree ~5m high, 5m from shed.

AS/NZS 3580.1.1:2007 compliant?

No; 10m tree ~5m to SE, 7m tree ~7m to NE

Monitoring commenced

01.10.03

Monitoring ceased

On-going

Pollutants monitored (current)

PM₁₀ (Beta Gauge): 19.03.05 to date

Pollutants monitored (past)

CO: 01.10.03 – 31.01.05

TSP, PM₁₀ and PM_{2.5} (Grimm particulate sampler): 01.10.03 - 31.01.05

Inlet height (m)

3-3.5

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation, rainfall.

Mast height (m)

6 (up to end of Jan 2005 mast height was 8m).

Data owner

Auckland Council

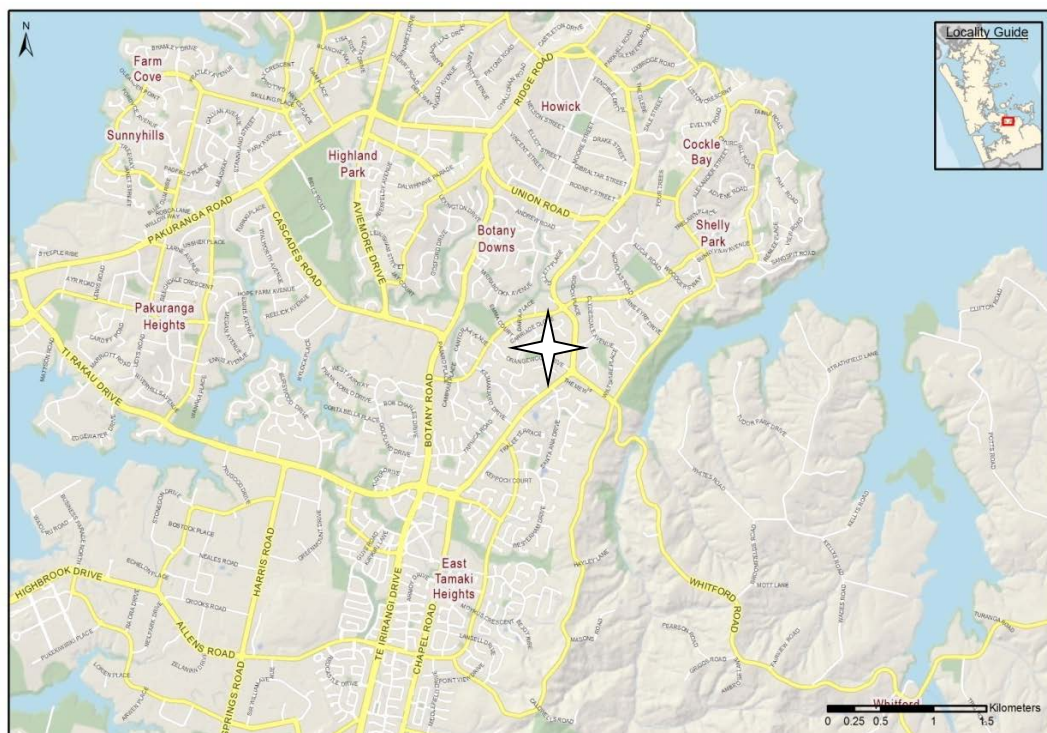


Site - view from the east.



Aerial view of site.

Source: Auckland Council GIS Viewer extracted September 2010



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006.

3.3 Glen Eden

Site name

Glen Eden
(Ceramco Park)

Address

Adjacent to 50 and 52 Meadowvale Rise
Ceramco Park
Glen Eden, Waitakere

	Easting	Northing	Elevation (m)
NZMG	2657563	6474207	40
NZTM	1747144	5912490	

General site characteristics

Urban

Topography

Undulating

Micro met characteristics

Hills to NE may influence wind flows from this direction.



Site viewed from the south.

Site description and area characteristics

Air conditioned shed at SE corner of park, 5m from house and 20m from road. Most houses in the area 1980s and newer (medium-sized sections, few chimneys), but Glen Eden to the N has a lot of older houses (1960s); larger sections, approximately 75% with chimneys.

Air Quality Management Area

Urban

Predominant sources

Residential home heating (during winter) and some vehicle emissions

Distance from road and other major sources

20m S to Meadowvale Rise (residential street, aligned SW-NE)

Vehicle counts

N/a

Any nearby features that could affect measurements?

Sheltering from housing to the north-east

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

01.12.05

Monitoring ceased

On-going

Pollutants monitored (current)

CO: 01.12.05 to date

NO_x: 01.12.05 to date

PM₁₀ (Beta Gauge): 01.12.05 to date

Pollutants monitored (past)

Nil

Inlet height (m)

3.8 gas

4.0 particulate

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

Mast height (m)

6

Data owner

Auckland Council

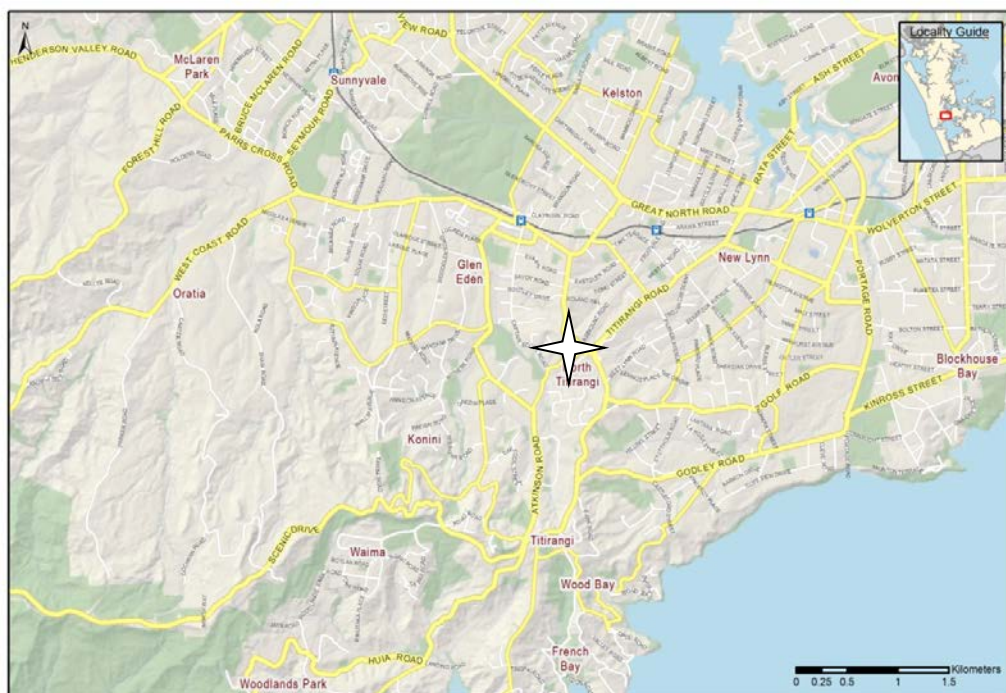


Site viewed from north, Meadowvale Rise beyond.



Aerial view of site

Source: Auckland Council GIS Viewer, extracted September 2010



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006.

3.4 Henderson I (A)

Site name

Henderson I (A)
(Lincoln Road)

Address

Henderson Intermediate School
70 Lincoln Rd
Henderson, Waitakere

	Easting	Northing	Elevation (m)
NZMG	2655570	6480255	29.9
NZTM	1745140	5918533	

General site characteristics

Urban

Topography

Surrounding area is flat.

Micro met characteristics

Site is exposed to winds from all directions.



Site viewed from the south.

Site description and area characteristics

Air conditioned shed at the front of the Henderson Intermediate School grounds, approximately 10m from the western side of Lincoln Rd. Henderson commercial district <1km N; Houses in area 1960s onward; approximately 50% with chimneys. Note: PM₁₀Minivol (03.01.01 – 29.12.05) located approximately 150m NW of shed, in self-contained housing attached to school building and facing north over playing fields.

Air Quality Management Area

Urban

Predominant sources

Vehicle and residential (during winter)

Distance from road and other major sources

10 m E to Lincoln Rd (arterial road, aligned N-S)

Vehicle counts

Lincoln Rd 13,300 7 day ADT 1999.

Any nearby features that could affect measurements?

There are a number of trees (~ 8m tall, canopy ~6m diameter) to the west of the shed in the school grounds. There is a school incinerator > 20m W of the site. Parking for 25 cars within 50m of shed, plus parking for 6 cars (school drop off point) on access road adjacent to Lincoln Rd. Lighted pedestrian crossing 10m SE of site on Lincoln Rd.

AS/NZS 3580.1.1:2007 compliant?

No; 12m tree ~5m to SW, 13m tree ~10m to N

Monitoring commenced

15.12.93

Monitoring ceased

On-going

Pollutants monitored (current)

CO: 12.06.98 to date

NOx: 11.04.03 to date

PM₁₀ (Beta Gauge): 01.01.03 to date

PM₁₀ (Partisol): 18.07.98 to date

Pollutants monitored (past)

TSP (HD Med Vol): 15.12.93 - 24.12.97

Lead: 15.12.93 - 31.12.97

PM₁₀ (MiniVol (non regulatory method)):

01.01.03 – 31.12.05

Inlet height (m)

3.0 gas

3.5 particulate

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

Mast height (m)

6

Data owner

Auckland Council

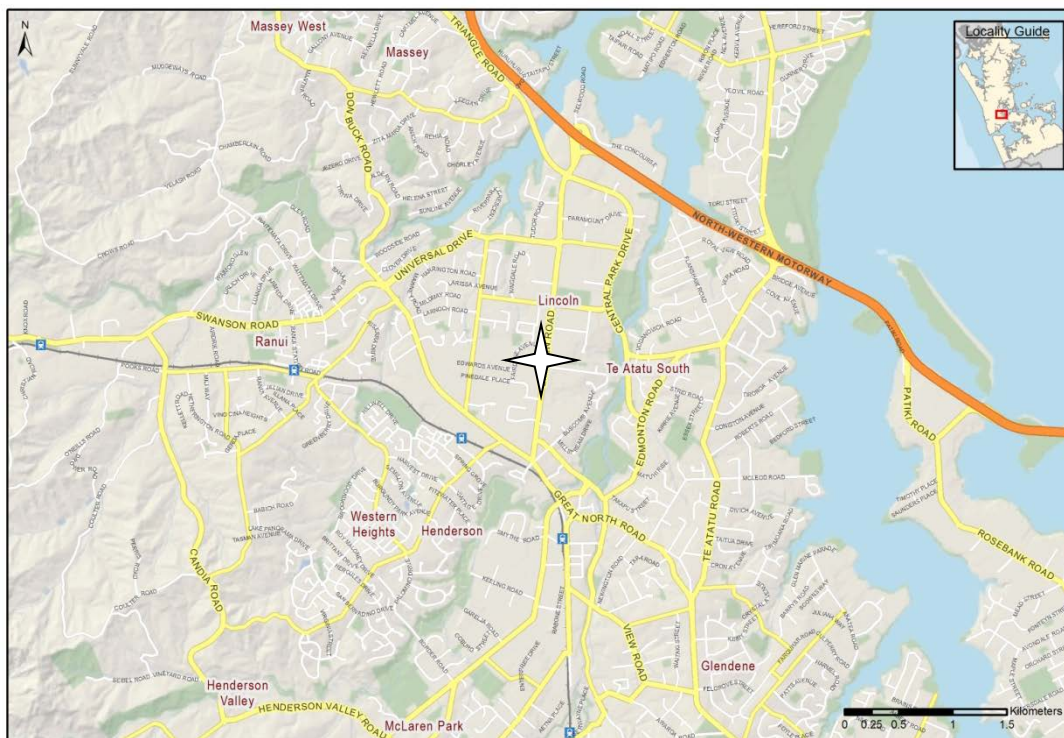


Site viewed from east side of Lincoln Rd.



Aerial view of site

Source: Auckland Council GIS Viewer, extracted September 2010



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006.

3.5 Henderson (Met)

Site name

Henderson (Met)

Address

TePai Park
Lincoln Rd
Henderson, Waitakere

	Easting	Northing	Elevation (m)
NZMG	2655900	6480937	23
NZTM	1745468	5919216	

General site characteristics

Urban

Topography

Surrounding area is flat

Micro met characteristics

Site is exposed to winds from all directions.

Site description and area characteristics

In TePai Park, adjacent to netball courts and car park.

Monitoring commenced

15.11.94

Mast height (m)

10

Meteorological parameters measured

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

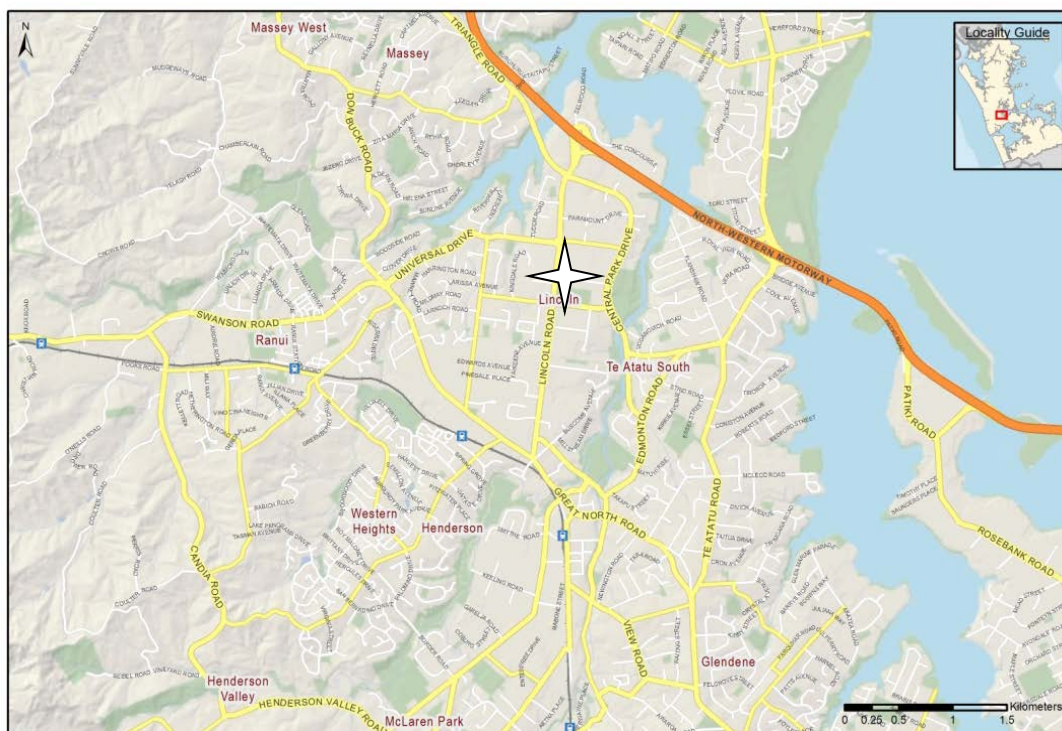


Mast – view from the east.



Aerial view of site.

Source: Auckland Council GIS Viewer, extracted September 2010



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006.

3.6 Khyber Pass I (Gas)

Site name

Khyber Pass I (Gas)⁶

Address

269 Khyber Pass Rd
Newmarket, Auckland

	Easting	Northing	Elevation (m)
NZMG	266830517	6480185	81
NZTM	57874	5918488	

General site characteristics

Urban

Topography

Khyber Pass slopes down gently W-E; Mountain Rd dips at the junction with Khyber Pass.

Micro met characteristics

Buildings on the southern side of Khyber Pass will shield the intakes from southern flow. The buildings on the southern side and the valley nature of the road may result in some canyon effect.

Site description and area characteristics

SE corner of Khyber Pass and Mountain Rd intersection. Khyber Pass slopes down to the east and Newmarket shopping centre (700m E). The Southern Motorway is approximately 250m W-SW from the site. Mixed residential to NW, (older houses -approximately 60% with chimneys)/commercial/light industry. Newmarket shopping precinct <1km E; Auckland Domain is 250m to N. Lion Nathan brewery is located across the road to N but is in the process of relocating. The site is to become a retail-residential mixed development that could take up to 10 years to complete. In 2008 the site was moved 20m SE along Khyber Pass Rd, coinciding with the relocation of the NIWA offices. The new site records CO, NO_x, Benzene and 1,3 Butadiene only.

Air Quality Management Area

Urban

Predominant sources

Vehicle

Distance from road and other major sources

Gas inlet 3.9m S of Khyber Pass Rd (arterial, aligned WNW-ESE) and 28m from intersection. Traffic frequently queues beyond the position of the inlet. 250m W to Southern Motorway (aligned NW-SE).



View east along Khyber Pass Rd towards Newmarket.

⁶Note: This report now lists the Khyber Pass site as three separate stations (Khyber Pass I – gases; Khyber Pass II - Partisol and Khyber Pass III – Met). However, data recorded in 2010 is still regarded as a continuation of the 2009 data despite the change of location. Khyber Pass II and III are listed separately sections 3.7 and 3.8 respectively.

Vehicle counts

194,501 AADT (2011) State Highway 1, west of Mountain Rd, 2011 (Source: NZTA Spatial Viewer)
28,547; 7 day average; Khyber Pass Rd, west of Mountain Rd (19/03/2007)
27,027; 7 day average; Khyber Pass Rd, west of Mountain Rd (19/02/2006)

Any nearby features that could affect measurements?

The lighted intersection and sloping topography of Mountain Rd (dipping at the intersection) and Khyber Pass Rd will increase average vehicle emissions. Railway line 70m to NW.

AS/NZS 3580.1.1:2007 compliant?

No: but not deemed necessary as site purpose is to monitor peak pollutant levels.

Monitoring commenced

29.10.96

Monitoring ceased

On-going

Pollutants monitored (current)

CO: 29.10.96 to date
NOx: 15.04.98 to date
Benzene and 1,3 Butadiene:
September 2005 to date

Pollutants monitored (past)

Non-Methane Hydrocarbons:
17.07.96 - 31.10.01

Inlet height (m)

4.05

Meteorological parameters measured on site

Nil

Mast height (m)

N/a

Data owner

Auckland Council (originally Auckland Regional Council)

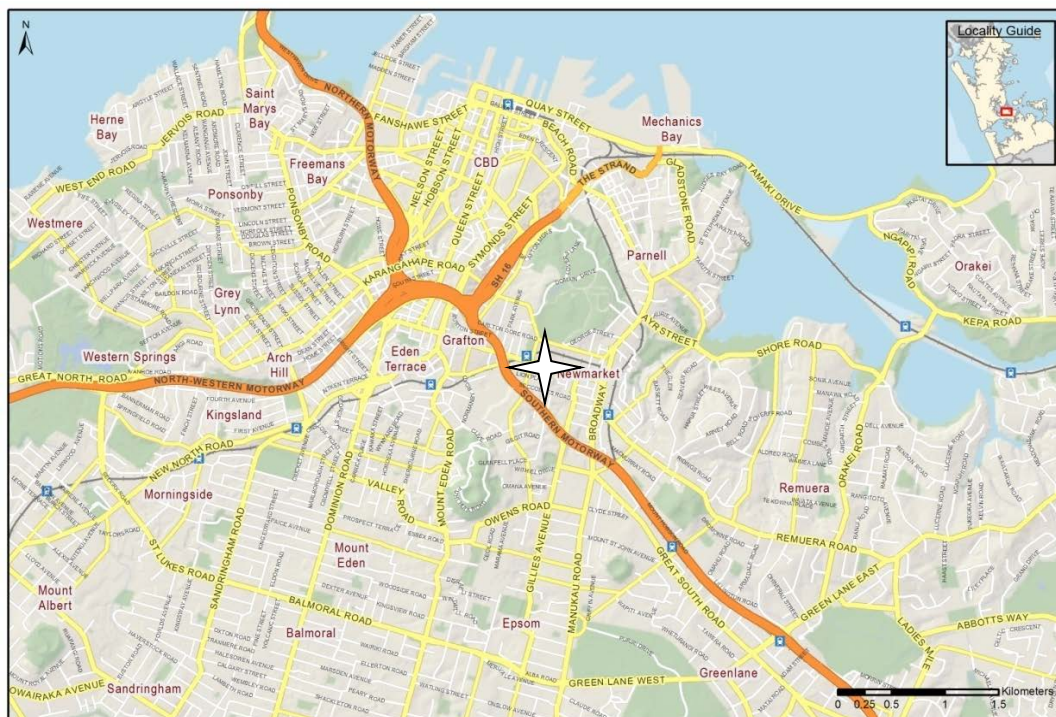


Site looking W – Khyber Pass Rd and Mountain Rd Intersection at right



Aerial view of site.

Source: Auckland Council GIS Viewer, extracted September 2010.



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006.

3.7 Khyber Pass II (Partisol)

Site name

Khyber Pass II (Partisol)

Address

Cnr Mountain Rd and Khyber Pass Rd
269 Khyber Pass Rd
Newmarket, Auckland

	Easting	Northing	Elevation (m)
NZMG	2668250	6480201	81
NZTM	1757818	5918505	

General site characteristics

Urban

Topography

Khyber Pass slopes down gently W-E; Mountain Rd dips at the junction with Khyber Pass.

Micro met characteristics

Buildings on the eastern side of Mountain Rd will shield the intakes from eastern flow. The buildings on the eastern side and the newly-constructed St Peter's College recreation complex on the western side may result in an increased canyon effect.

Site description and area characteristics

Attached to power pole at SE corner of Khyber Pass and Mountain Rd intersection. Mountain Rd slopes down to the north and is north-east of the St Peter's College playing grounds. The Southern Motorway is approximately 250m W-SW from the site. Mixed residential to NW, (older houses - approximately 60% with chimneys)/commercial/light industry. Auckland Domain is 250m to N.

Air Quality Management Area

Urban

Predominant sources

Vehicle

Distance from road and other major sources

Particulate inlet 1.5m E of Mountain Rd and 8m from intersection. Khyber Pass Rd 5m to the N. Traffic frequently queues beyond the position of the inlet, especially around school finishing time (Auckland Grammar School and St Peter's College both located on Mountain Rd). 250m W to Southern Motorway (aligned NW-SE); nearest tree 15m to the W; nearest building 1m to the E.

Vehicle counts

194,501 AADT (2011) State Highway 1, west of Mountain Rd, 2011 (Source: NZTA Spatial Viewer)
28,547; 7 day average; Khyber Pass Rd, west of Mountain Rd (19/03/2007)
27,027; 7 day average; Khyber Pass Rd, west of Mountain Rd (19/02/2006)

Any nearby features that could affect measurements?

The lighted intersection and sloping topography of Mountain Rd (dipping at the intersection) and Khyber Pass Rd will increase average vehicle emissions. Railway line 70m to NW.



View east along Khyber Pass Rd towards Newmarket.

AS/NZS 3580.1.1:2007 compliant?

No: but not deemed necessary as site purpose is to monitor peak pollutant levels.

Monitoring commenced

02.03.98

Monitoring ceased

On-going

Pollutants monitored (current)

PM₁₀ (Partisol): 02.03.98 to date

PM_{2.5} (Partisol): 03.10.02 to date

Pollutants monitored (past)

Nil

Inlet height (m)

2.5

Meteorological parameters measured on site

Nil

Mast height (m)

N/a

Data owner

Auckland Council

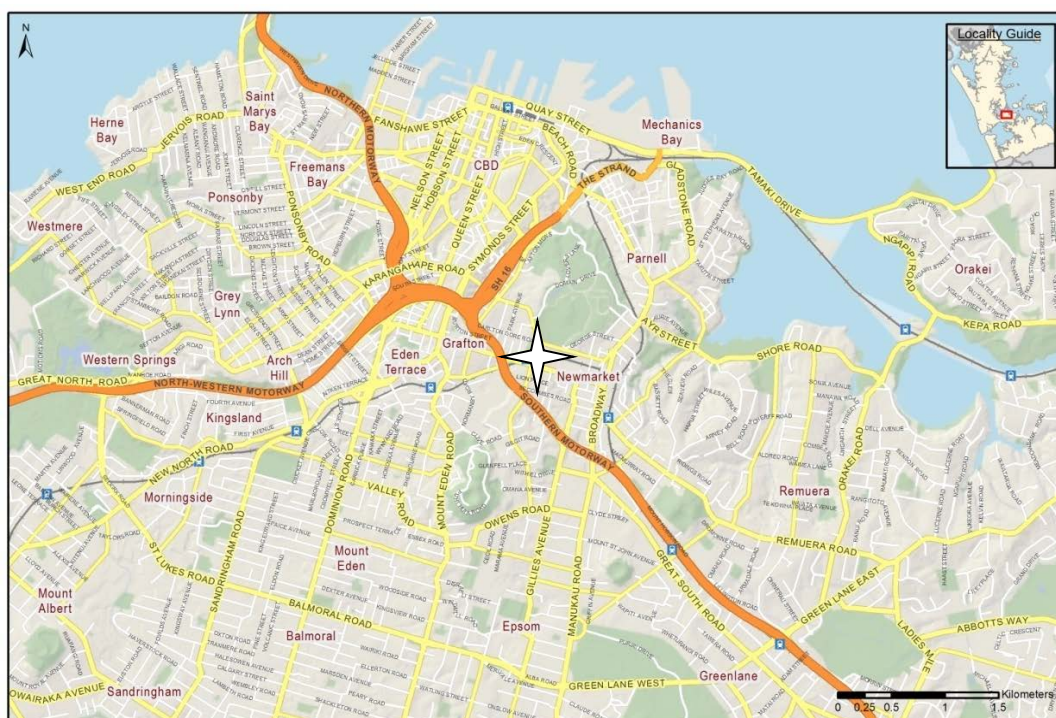


View from west side of Mountain Rd. Partisol inlet attached to power pole.



Aerial view of site.

Source: Auckland Council GIS Viewer, extracted September 2010.



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006.

3.8 Khyber Pass (Met)

Site name

Khyber Pass (Met)

Address

269 Khyber Pass Rd
Newmarket, Auckland

	Easting	Northing	Elevation (m)
NZMG	2668258	6480203	12.8
NZTM	1757826	5918507	

General site characteristics

Urban

Topography

Khyber Pass slopes down gently W-E; Mountain Rd dips at the junction with Khyber Pass.

Micro met characteristics

Site is open to winds from all directions.

Site description and area characteristics

Site is located on the roof of former NIWA building on Khyber Pass Rd (building is currently unoccupied).

Monitoring commenced

29.10.96

Mast height (m)

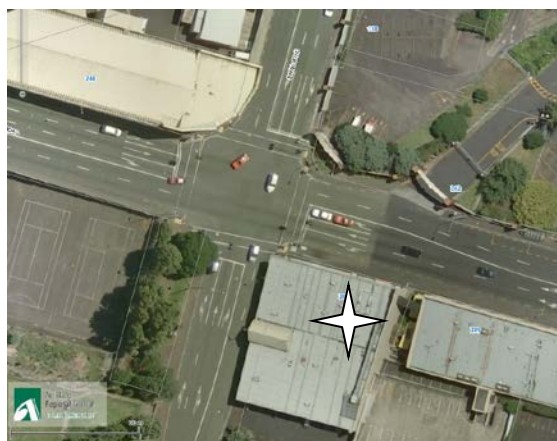
12.8

Meteorological parameters measured

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

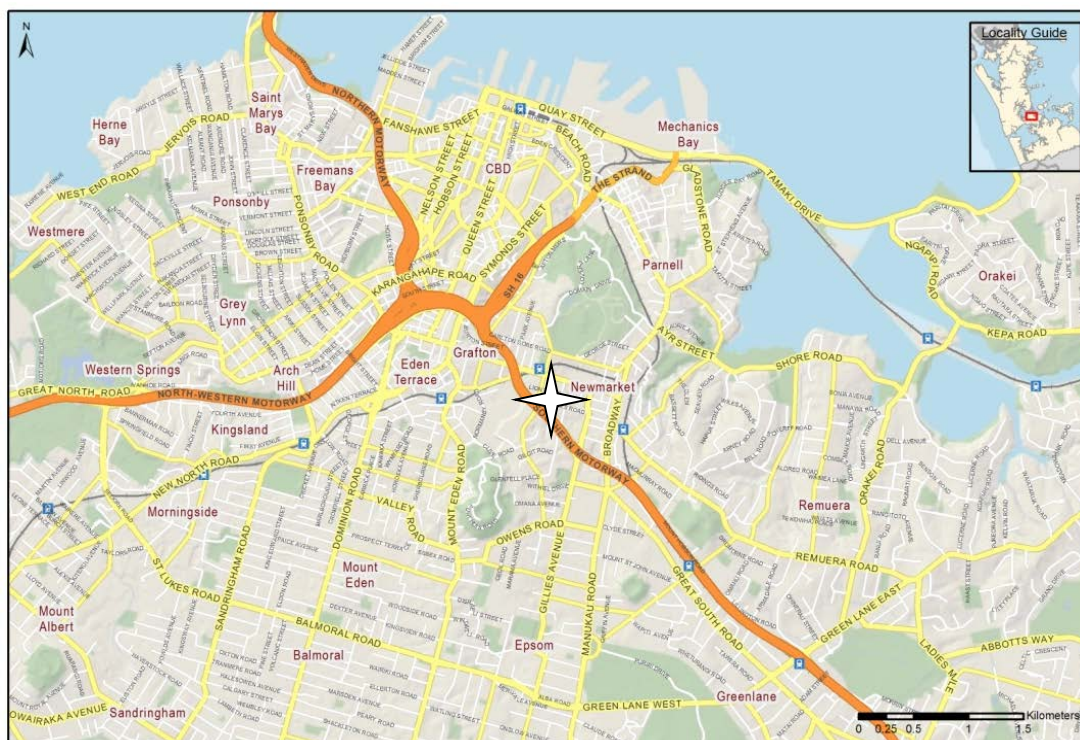


Mast –viewed from south east



Aerial view of site.

Source: Auckland Council GIS Viewer, extracted September 2010.



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006.

3.9 Kumeu

Site name

Kumeu

Address

Masonic Lodge
74 Main Rd
SH 16, Kumeu

	Easting	Northing	Elevation (m)
NZMG	2649448	6490535	16
NZTM	1738997	5928799	

General site characteristics

Industrial

Topography

Located in a shallow valley with undulating terrain.

Micro met characteristics

Although low buildings are nearby; meteorological instruments are all located at the top of the 6m mast. At this height, any significant obstructions are unlikely.

Site description and area characteristics

Air conditioned shed located to the east-southeast of the Masonic Lodge building which at its closest is 9m away with a height of 3m with the main roof line at 6m. At ground level, the site has the adjacent 5m high shops 2m to the NW. The height of the shop drops to 3m some 5m north of the shed.

Air Quality Management Area

Industrial

Predominant sources

Vehicle and industrial

Distance from road and other major sources

Car park and minor roadway for the shops in front of the shed; the 4 lane wide Main Rd of SH16 is 19m SW of the site. The main western districts railway line is further to the west of the highway but is clearly visible from the site.

Vehicle counts

N/a



Site viewed from the north.

Any nearby features that could affect measurements?

The Masonic Lodge has two fire places in which they burn wood between April and October on several days each week which may have a bearing on the particulate data; emissions from industrial building 50m south-southeast of measuring site may also influence particulate data. Parking within 5m of shed on minor roadway adjacent to Main Rd.

AS/NZS 3580.1.1:2007 compliant?

Yes.

Monitoring commenced

03.06.06

Monitoring ceased

20/03/2013

Pollutants monitored (current)

PM₁₀ (Beta Gauge): 03.06.06 to 20/03/2013

Pollutants monitored (past)

Nil

Inlet height (m)

4.5

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

Mast height (m)

6

Data owner

Auckland Council

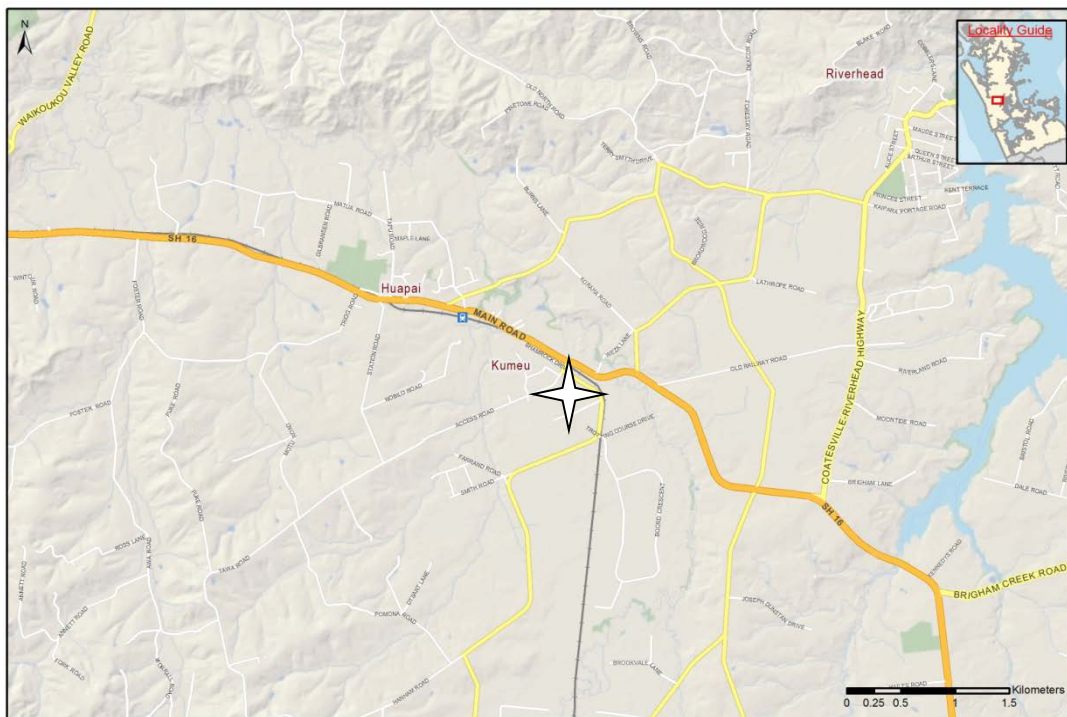


Site viewed from west side of Masonic Lodge.



Aerial view of site.

Source: Auckland Council GIS Viewer, extracted September 2010.



Location map

Source: Auckland Council GIS Viewer, extracted September 2010.

3.10 Musick Point II

Site name

Musick Point II
(Telecom Building)

Address

Howick Golf Course
Musick Pt
Bucklands Beach, Manukau

	Easting	Northing	Elevation (m)
NZMG	2679959	6482056	45
NZTM	1769523	5920383	

General site characteristics

Urban

Topography

The peninsula is undulating; bounded by steep cliffs that drop approximately 20m to harbour below.

Micro met characteristics

The site is well exposed to 'urban plume' emission from central Auckland City (12km W).



Site on top of tower- view from the south.

Site description and area characteristics

Located on the roof of the Telecom building near the tip of the Musick Point peninsular that extends N into the Hauraki Gulf. Many mature trees <8m on the golf course which takes up the northern end of the peninsula. Houses at the southern end and in neighbouring Bucklands Beach range from approximately 80 to <5 years old; low to medium density with a range of section sizes. About 30% of houses have chimneys. During the period May 2004-May 2005, for a circle of 1.5km radius around the site, 5 permits granted for new domestic fires.

Air Quality Management Area

Urban

Predominant sources

Urban plume (predominantly industrial and vehicle emissions). Potentially affected by emissions associated with groundskeepers' vehicles.

Distance from road and other major sources

50m from car park; 1km from Musick Point Rd (residential street)

Vehicle counts

N/a

Any nearby features that could affect measurements?

Nil

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

04.02.99

Monitoring ceased

On-going

Pollutants monitored (current)

NOx: 04.02.99 to date

Ozone: 04.02.99 to date

Pollutants monitored (past)

Non-Methane Hydrocarbons:
20.02.02 - 07.11.02.

Inlet height (m)

15

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

Mast height (m)

17

Data owner

Auckland Council



Gas inlet.



Met mast.



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006.

3.11 Onehunga (Met)

Site name

Onehunga (Met)

Address

Waikaraka Park
Captain Springs Rd
Onehunga

	Easting	Northing	Elevation (m)
NZMG	2670854	6473229	5
NZTM	1760436	5911538	

General site characteristics

Industrial

Topography

Surrounding area is flat. A small embankment (approximately 3m high) to S.

Micro met characteristics

Site is well exposed to winds from all directions.

Site description and area characteristics

Adjacent to Waikaraka Park off Captain Springs Rd. Approximately 300m north of Manukau Harbour (Mangere Inlet).

Monitoring commenced

18.08.94

Mast height (m)

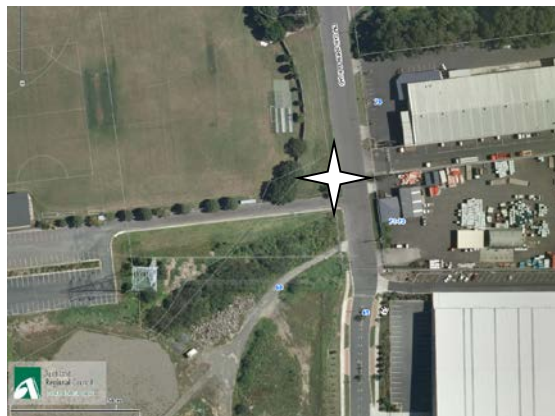
10

Meteorological parameters measured

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

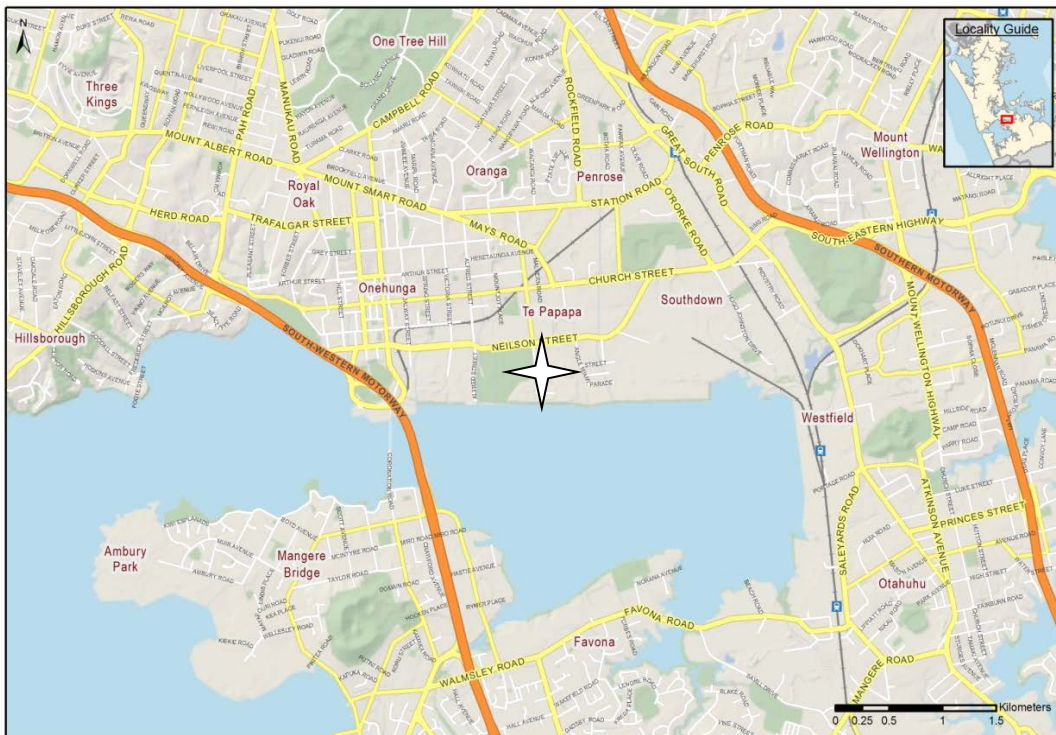


Mast –viewed from the southwest.



Aerial view of site.

Source: Auckland Council GIS Viewer, extracted September 2010.



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006.

3.12 Orewa

Site name

Orewa

Address

Seventh Day Adventist Church
123 Centreway Rd
Orewa, Rodney

	Easting	Northing	Elevation (m)
NZMG	2661781	6511601	5
NZTM	1751285	5949888	

General site characteristics

Residential

Topography

The surrounding land predominantly flat.

Micro met characteristics

Exposed on all sides except north with small housing <5m from site possibly influencing wind flows and turbulence. Direct exposure to roadside pollutants.



Site – view from south-west.

Site description and area characteristics

Air conditioned shed at the NW corner of the Seventh Day Adventist Church property, because it is located in central Orewa and meets siting criteria (away from large buildings and trees, nearby power supply and no major emissions sources nearby). The site is located in the older part of town (where there might be wood burning for home heating) and close to the main business area (where we expect there to be higher traffic levels).

Air Quality Management Area

Urban

Predominant sources

Residential home heating and vehicle traffic.

Distance from road and other major sources

4m from Centreway Rd; 6m to house next door.

Vehicle counts

17,620 AADT (2009) Centreway Rd, Orewa, SH16 Nth of Access Rd

Any nearby features that could affect measurements?

Large tree approximately 20m from inlet.

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

16.05.07

Monitoring ceased

On-going

Pollutants monitored (current)

PM₁₀ (Beta Gauge): 16.05.07 to date

Pollutants monitored (past)

Nil

Inlet height (m)

3

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

Mast height (m)

6

Data owner

Auckland Council

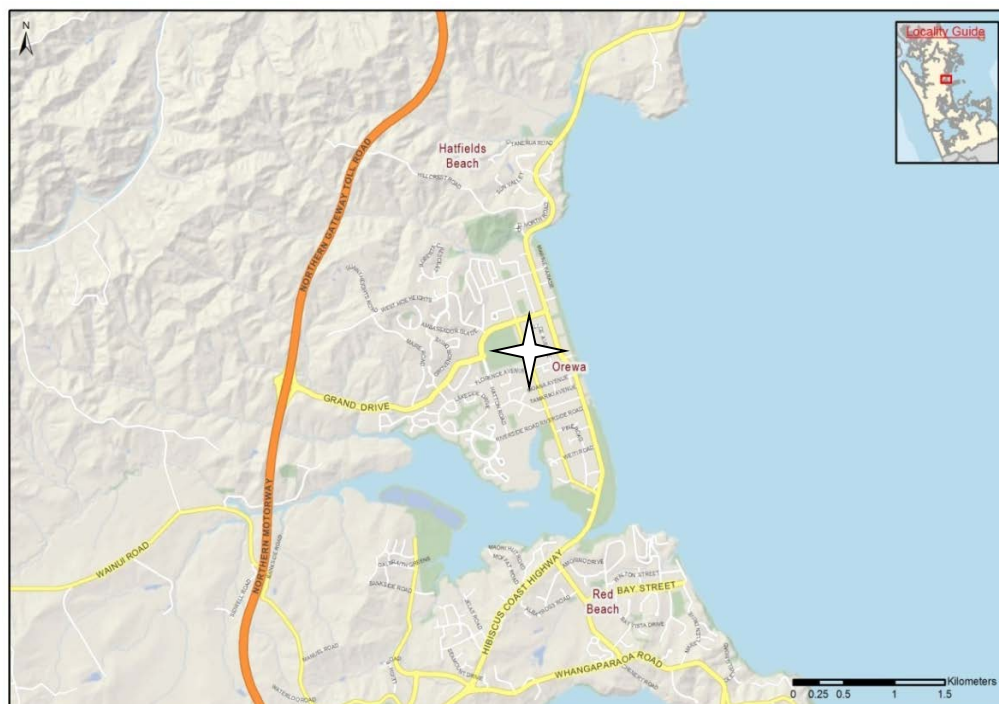


View of site looking east.



Aerial view of site.

Source: Auckland Council GIS Viewer, extracted September 2010.



Location map.

Source: Auckland Council GIS Viewer, extracted September 2010.

3.13 Pakuranga

Site name

Pakuranga

Address

Bell Reserve
Adjacent to 262A Pakuranga Rd
Pakuranga, Manukau

	Easting	Northing	Elevation (m)
NZMG	2678830	6475619	16
NZTM	1768407	5913944	

General site characteristics

Urban

Topography

The surrounding land is undulating; the reserve extends N from a dip in Pakuranga Highway, which is aligned SW-NE.

Micro met characteristics

Exposed to north of shed - no containment north/south. At the base of a valley in Pakuranga Rd- containment east/west.



Shed (looking north towards Bell Reserve).

Site description and area characteristics

Air conditioned shed at the SW corner of Bell Reserve about 7.5m from Pakuranga Rd. Houses in the area are of mixed age - from 1960s to <5 years old, mostly on medium sized sites. About 50% of houses have chimneys. During the period May 2004-May 2005, for a circle of 1.5km radius around the site, 45 permits were granted for new domestic fires.

Air Quality Management Area

Urban

Predominant sources

Vehicle and residential home heating (during winter)

Distance from road and other major sources

7.5m SE to Pakuranga Highway (arterial road, aligned SW-NE)

Vehicle counts

42,420 ADT (2003) Pakuranga Rd between Bells and Fortune, <1km to north

Any nearby features that could affect measurements?

Small tree approximately 2m from inlet - other large trees more than 10m N of inlet - not in sampling path.

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

26.06.98

Monitoring ceased

On-going

Pollutants monitored (current)

CO: 26.06.98 to date

PM₁₀ (Beta Gauge): 07.03.05 to date

Pollutants monitored (past)

Nil

Inlet height (m)

3

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

Mast height (m)

6

Data owner

Auckland Council

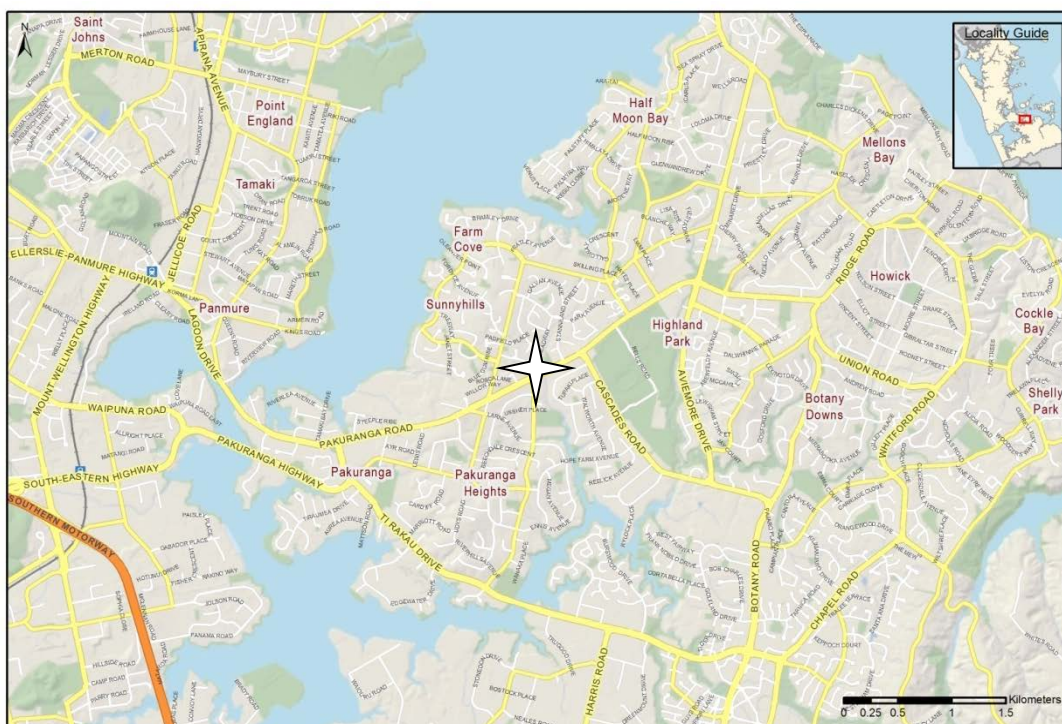


Shed and Pakuranga Rd looking west.



Aerial view of site.

Source: Auckland Council GIS Viewer, extracted September 2010.



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006

3.14 Patumahoe

Site name

Patumahoe

Address

Crop and Food Research Station
Cronin Rd, Patumahoe
Pukekohe, Franklin

	Easting	Northing	Elevation (m)
NZMG	2675800	6442500	89
NZTM	1765441	5880820	

General site characteristics

Rural

Topography

The wider area is undulating; the land immediately to the west of the shed is flat, with a gentle slope from the shed down to the east, north and south.

Micro met characteristics

Surrounding structures are unlikely to significantly influence the ozone concentrations measured. However, the site is quite well protected- there are greenhouses and sheds plus hedges that may influence air flow.



Site, with adjacent met station behind.

Site description and area characteristics

Air conditioned shed located within the Crop and Food Research Station, Pukekohe. The site is located approximately 2.5km west of the Pukekohe urban area. There are greenhouses and sheds 8m to N and 20m from W to SW; a 4m hedge 30m to the S, an 8m hedge 40m to the E and an 8m hedge 50m to the N. Surrounding area is used for horticulture and agriculture.

Air Quality Management Area

Rural

Predominant sources

Rural activities

Distance from road and other major sources

100m from Cronin Rd (rural road).

Vehicle counts

N/a

Any nearby features that could affect measurements?

Surrounding structures are unlikely to significantly influence the ozone concentrations measured.

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

21.10.96

Monitoring ceased

On-going

Pollutants monitored (current)

Ozone: 21.10.96 to date

PM₁₀ (Beta Gauge): 01.04.05 to date

Inlet height (m)

3

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation, rainfall.

Mast height (m)

10

Data owner

Auckland Council

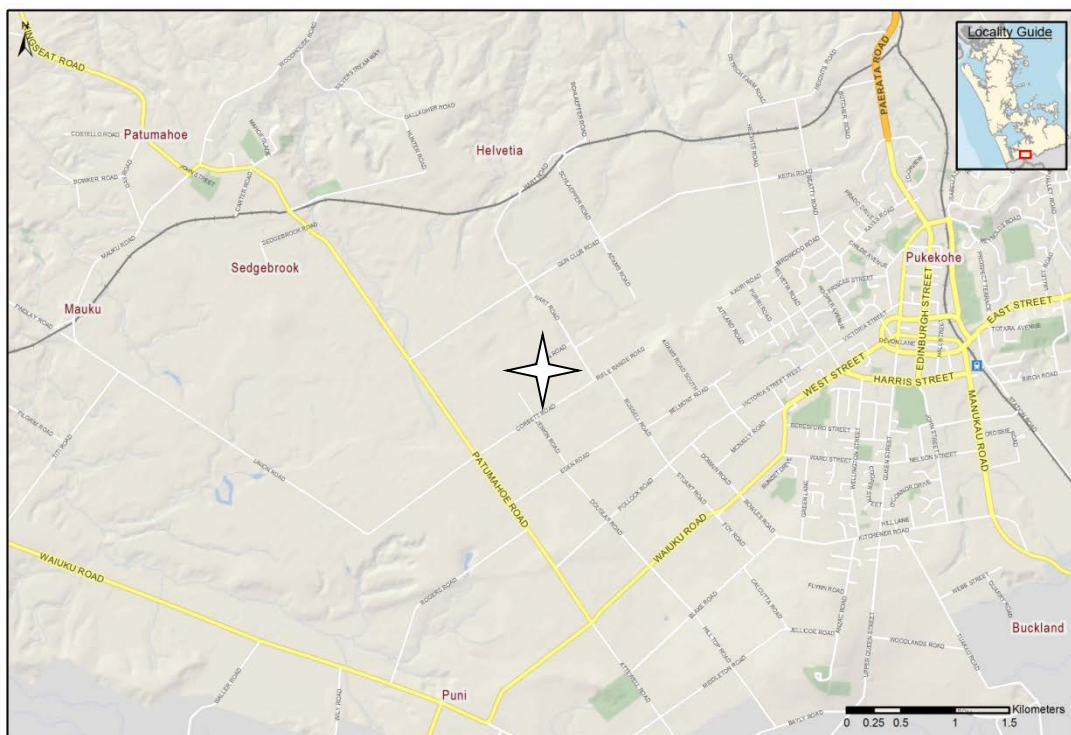
Met data owned by NIWA



View south from site to shelter belt.



View west from site to met station and greenhouses.



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006

3.15 Penrose II (B)

Site name

Penrose II (B)
(Gavin St Substation)

Address

19 Gavin St
Penrose, Auckland

	Easting	Northing	Elevation (m)
NZMG	2672174	6475864	40
NZTM	1761751	5914176	

General site characteristics

Industrial

Topography

Flat

Micro met characteristics

Surrounding structures will both shield the monitor and introduce more turbulence into the flow.

Site description and area characteristics

Air conditioned shed within the Gavin St substation, approximately 106m NE of the Southern Motorway. The motorway is approximately 2m lower than the ground level at the monitoring site. There is also a mobile trailer here (exact location varies). From NW-S and to the NE are industrial premises; residential to the N and SW. Houses date from 1930s onward; about 50% with chimneys.

Air Quality Management Area

Industrial

Predominant sources

Vehicle and industry

Distance from road and other major sources

106m SW to Southern Motorway (aligned N-S)

Vehicle counts

130,161 AADT (2011) SH1 EllersliePanmure Hwy (Source: NZTA Spatial Viewer)
142,110 AADT (2009) SH1 EllersliePanmure Hwy to South Eastern Hwy
140,380 AADT (2005) SH1 EllersliePanmure Hwy to South Eastern Hwy

Any nearby features that could affect measurements?

Substation structures and buildings near to shed - NE; Three stacks (300m S) at ACI Glass.

AS/NZS 3580.1.1:2007 compliant?

Yes



Site, viewed from north west.

Monitoring commenced

November 2000

Monitoring ceased

On-going

Pollutants monitored (current)

NO_x: November 2000 to date

PM₁₀ (Beta Gauge): 22.05.03 to date

PM₁₀ (HiVol): 20.05.03 to date

Speciation Sampling: 18.10.05 to date

TSP: 17.05.04 to date

SO₂: 01.04.03 to date

Lead (HD Med Vol): 01.06.04 to date

Pollutants monitored (past)

PM₁₀ (TEOM) 19.04.00 - 02.02.03

Inlet height (m)

2.5 NO_x, SO₂ and Beta Gauge

1.8 HiVol and RAAS

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

Mast height (m)

6

Data owner

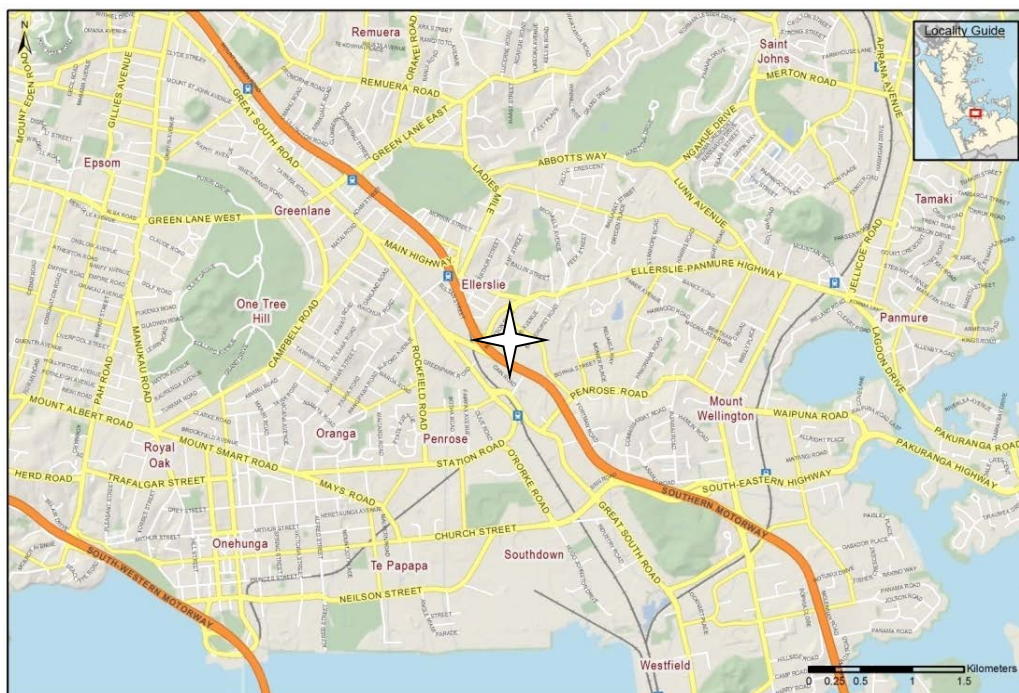
Auckland Council owns the particulate data. Ministry for the Environment own the NO_x and SO₂ data



RAAS and Beta Gauge adjacent to shed.



Site viewed from the south.



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006

3.16 Queen St II

Site name

Queen St II
(CML Building)

Address

155 Queen St
Auckland

	Easting	Northing	Elevation (m)
NZMG	2667850	6482270	15
NZTM	1757414	5920573	

General site characteristics

Urban

Topography

Queen St slopes gently down to the N; Wyndham St and Victoria St both slope steeply towards Queen St.

Micro met characteristics

Pollutants are likely to be entrained within the urban canyon formed by the tall buildings on either side of Queen St during calm conditions. Wind flows are also likely to be channelled along this corridor.

Site description and area characteristics

Western side of Queen St between Wyndham St and Victoria in Auckland's CBD. Both of these intersections have traffic lights. Queen St is located within a valley. The monitors are located to the front of the CML building, close to the junction with Wyndham St. All instruments are located at 1st floor height (i.e. above the veranda).

Air Quality Management Area

Urban

Predominant sources

Vehicle

Distance from road and other major sources

3m to Queen St

Vehicle counts

11,216 7-day average (2010) Queen St between Wellesley St and Victoria St
20,738 7-day average (2004) Queen St north of Wellesley St

Any nearby features that could affect measurements?

Within 2 metres of street parking, and <20m S of traffic-signal controlled intersection of Wyndham St and Queen St.

AS/NZS 3580.1.1:2007 compliant?

No; but not deemed necessary as site purpose is to monitor peak pollutant levels.



Site viewed from eastern side of Queen St.

Monitoring commenced

22.12.82 (relocated from 296 Queen St)

Monitoring ceased

On-going

Pollutants monitored (current)

CO: 06.10.98 to date

NO_x: 04.02.04 to date

PM₁₀ (Sequential Partisol): 27.12.98 to date

PM_{2.5} (Partisol): 26.06.02 to date

Pollutants monitored (past)

TSP (HD Med Vol): 22.12.82 - 03.04.02

TSP ((Partisol) (sat)): 03.12.97 - 20.04.02

Lead: 01.01.83 - 30.06.99

Inlet height (m)

3.5 gas

3.0 particulate

Meteorological parameters measured on site

Nil

Mast height (m)

N/a

Data owner

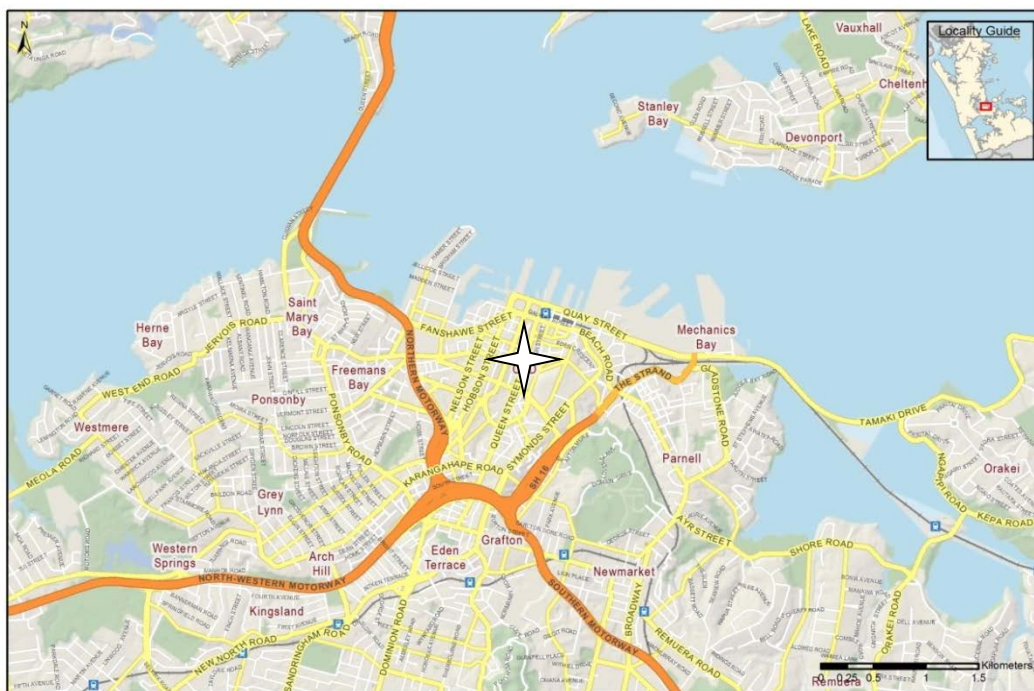
Auckland Council



Partisol inlets on awning.



Inlets from above.



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006

3.17 Takapuna I

Site name

Takapuna I
(Westlake)

Address

Westlake Girls High School
2 Wairau Rd
Takapuna, North Shore City

	Easting	Northing	Elevation (m)
NZMG	2666510	6489778	21
NZTM	1756059	5928077	

General site characteristics

Urban

Topography

Flat to the W and S, hilly to the N.

Micro met characteristics

This site is relatively well exposed to winds from all directions. However the hills to the N will influence flow condition from this direction and channel N and S wind flows.

Site description and area characteristics

Air conditioned shed in N corner of the Westlake Girls High School playing fields, 6m from Wairau Culvert. Bounded to the E by Wairau Rd (20m NE). The W side is bounded by the Southern Motorway (60 SW) which is about 3m above the level of the site. Houses in area are of mixed age from 1960s onward; about 75% with chimneys. During the period May 2004-May 2005, for a circle of 1.5km radius around the site, 9 permits were granted for new domestic fires.

Air Quality Management Area

Urban

Predominant sources

Vehicle (and some home heating)

Distance from road and other major sources

30m N to Wairau Rd (arterial road aligned NW-SE); 60m W to Northern Motorway (aligned NNW-SSE)

Vehicle counts

115,545 AADT (2011) SH1 north and south bound traffic plus Northern Busway (Source: NZTA Spatial Viewer)
114,423 AADT (2009) SH1 Tristram Ave to Northcote Rd; Wairau Rd, Tristram Ave to Archers Rd:
25496- 7-day ADT – 04.07.10;
109,680 AADT (2005) SH1 Tristram Ave to Northcote Rd; Wairau Rd: 24000- 7-day ADT – 1996.



View of site from south; Northern Motorway beyond.



Site from south west –Wairau Rd beyond.

Any nearby features that could affect measurements?

Lighted intersection of Wairau Rd and Forrest Hill Rd about 90m E of site. Head office (and working yard) of Atlas Concrete approximately 100m to E. Wairau commercial/industrial park extends W and NW from 200m (W).

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

31.05.95

Monitoring ceased

On-going

Pollutants monitored (current)

CO: 27.07.95 to date

NOx: 13.06.01 to date

PM₁₀ (Beta Gauge): 10.02.04 to date

PM₁₀ (Partisol): 13.04.02 to date

Pollutants monitored (past)

PM₁₀ (Hi Vol): 01.11.96 – 29.12.01

PM₁₀ (TEOM): 31.05.95 – 31.08.99

PM_{2.5} (TEOM): 22.03.96 – 23.10.96

Non-Methane Hydrocarbons:

08.11.02 – 25.02.03

Inlet height (m)

3

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

Mast height (m)

10

Data owner

Auckland Council

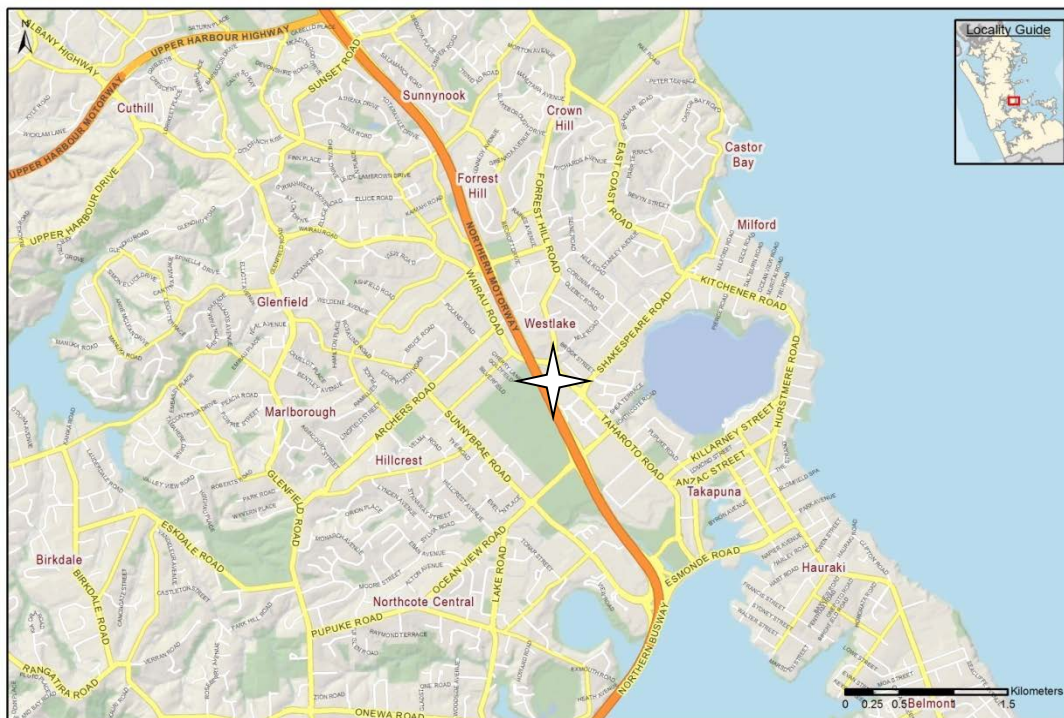


View south east from site towards school.



Aerial view of site.

Source: Auckland Council GIS Viewer, extracted September 2010



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006.

3.18 Whangaparaoa

Site name

Whangaparaoa

Address

Shakespear Regional Park
Whangaparaoa, Rodney

	Easting	Northing	Elevation (m)
NZMG	2673315	6508915	83
NZTM	1762823	5947227	

General site characteristics

Rural

Topography

Undulating to hilly

Micro met characteristics

Wind flows from the E to SE are likely to be influenced by the tanks, shed, tower and trees located near the site. These structures may shield the site, scavenge O₃ and introduce turbulence. However, site is relatively well exposed to 'urban plume'.

Site description and area characteristics

Air conditioned shed located below the summit of a hill within the Shakespear Regional Park. Surrounding area is undulating to hilly, with grassy paddocks and native vegetation (mainly in gullies). Residential suburbs approximately 1.2km to W (houses of mixed age, ranging from 1930s to <5 years old); Hauraki Gulf 1-1.5km to N, S and E.

Air Quality Management Area

Rural

Predominant sources

Urban plume (predominantly industrial and vehicle emissions). Some emission associated with groundskeepers' vehicles.

Distance from road and other major sources

200m W to park access road, 900m NW to Whangaparaoa Rd.

Vehicle counts

740 ADT (06.08.10) Whangaparaoa Rd 100m E of Everard Ave

Any nearby features that could affect measurements?

Two metres E of the shed is another shed (1.8m(l)x1.8m(w)x2.1m(h)). Another two metres E is a tower, 6m high with a diameter of 1.8m. Three metres SE of the monitoring shed is a row of 3 water storage tanks. Behind these tanks are another 2 tanks. Each tank is 2.8m high with a diameter of 3.5m. Behind the tank are several large trees and an access road (rangers' vehicles only).

AS/NZS 3580.1.1:2007 compliant?

Yes



Site, looking west towards the mainland.

Monitoring commenced

09.04.98

Monitoring ceased

On-going

Pollutants monitored (current)

Ozone: 09.04.98 to date

Inlet height (m)

3.1

Meteorological parameters measured⁷

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

Mast height (m)

10

Data owner

Auckland Council



Site on hill as viewed from the north west.



Site from the north, monitoring shed at right.

⁷Whangaparaoa met data is available from a Met service mast approximately 1.5km north east of the air quality monitoring station. NIWA CliFlo Agent No. 1400; Network No. A64683



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006, Crown Copyright Reserved.

3.19 Wiri (met)

Site name

Wiri (met)

Address

Behind K Mart Manukau
55 Lambie Drive
Manukau

	Easting	Northing	Elevation (m)
NZMG	2676819	6466001	18
NZTM	1766415	5904322	

General site characteristics

Industrial

Topography

Flat

Micro met characteristics

The site is open to the N, S and W, with sheltering from large commercial premises (approximately 6m high) <50m to the E of 10m mast; 15m from 5m mast and shed.

Site description and area characteristics

Site is located on the west bank of Puhinui Stream (orientation NW-SE) behind K Mart.

Monitoring commenced

26.05.95

Mast height (m)

10

Meteorological parameters measured

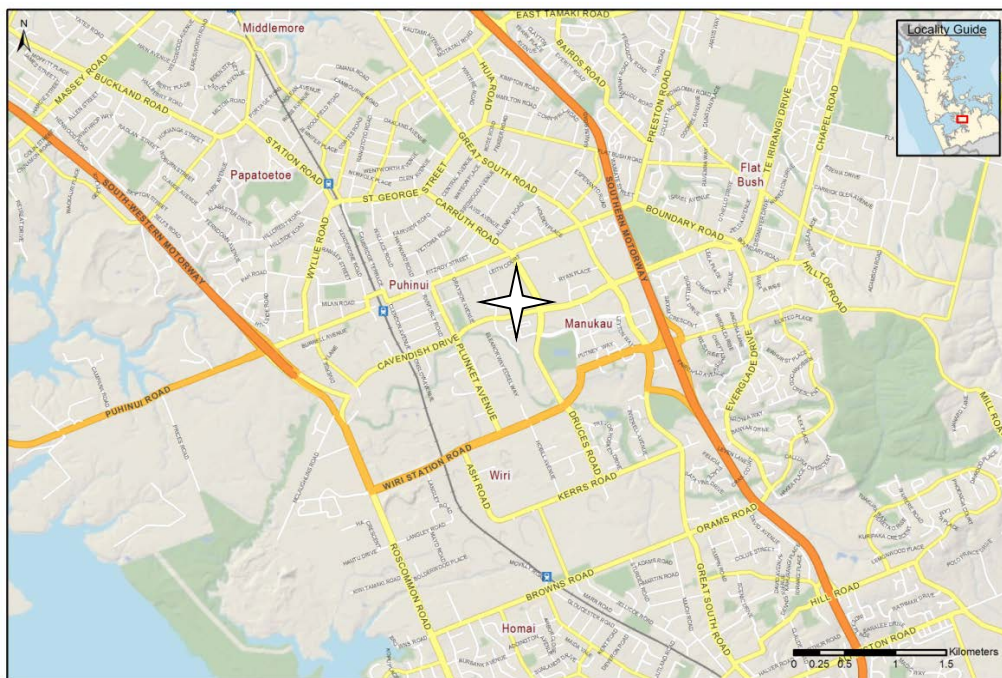
Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.



Mast –viewed from north west



Mast top.



Location map.

Source: Auckland Council GIS Viewer, extracted January 2006

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5.0 Glossary

Term	Description
AADT	Annual average daily traffic – the total volume of vehicle traffic on a highway or road for the year divided by 365 days.
Airshed	An area designated by regional council (and gazetted by the Ministry for the Environment) for the purposes of managing air quality under the national environmental standards
AQMA	Air quality management areas in the Auckland region as defined by the Auckland Council Regional Plan: Air, Land and Water
BTEX	Benzene, toluene, ethyl-benzene and xylene
CO	Carbon monoxide
HAPs	Hazardous air pollutants
Inhalable/respirable dust	Breathable dust particles that can deposit in the upper airways, deep in the lungs or may even enter the bloodstream depending upon their size.
NES-AQ	National environmental standards for air quality
NO _x	Oxides of nitrogen
O ₃	Ozone
PAHs	Polycyclic aromatic hydrocarbons
Pb	Lead
Photochemical smog	A dense brown haze caused by the reaction of sunlight on complex chemical gases. Ozone formed at ground level is one of the main components of photochemical smog.
PM ₁₀	Particles less than 10 micrometres in diameter
PM _{2.5}	Particles less than 2.5 micrometres in diameter
SO ₂	Sulphur dioxide – a colourless pungent acidic gas largely produced by industrial processes but also by diesel vehicles.
TSP	Total suspended particulates
VOCs	Volatile organic compounds

Appendix 1: Discontinued site inventory

This section describes metadata such as site description, surrounding area characteristics and local sources of air pollution for each discontinued site in the alphabetical order.

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Beach Haven

Site name

Beach Haven

Address

Beach Haven Road
Beach Haven, North Shore City

	Easting	Northing	Elevation (m)
NZMG	2662300	6489100	<20
NZTM	1751851	5927391	

No photo available

General site characteristics

Urban

Topography

Hilly

Micro met characteristics

Site is near a tidal creek that flows SW into the upper Waitemata harbour and bordered by hills rising steeply to N, E, and S.

Site description and area characteristics

Monitor in self-contained stainless steel housing located within grounds of private residence. Surrounding area mostly residential except some light industrial/ commercial premises along N side of Beach Haven Rd; houses date mostly from 1960s -1980s, (originally on med-large sized sections; now a lot of infill housing) approximately 50% with chimneys

Air Quality Management Area

Urban

Predominant sources

Vehicle and residential (in winter)

Distance from road and other major sources

Less than 3 metres to Beach Haven Road

Vehicle counts

N/a

Any nearby features that could affect measurements?

AS/NZS 3580.1.1:2007 compliant?

Monitoring commenced

16.06.03

Monitoring ceased

17.09.03

Pollutants monitored

PM₁₀MicroVol (non-regulatory method)

Inlet height (m)

Meteorological parameters measured on site

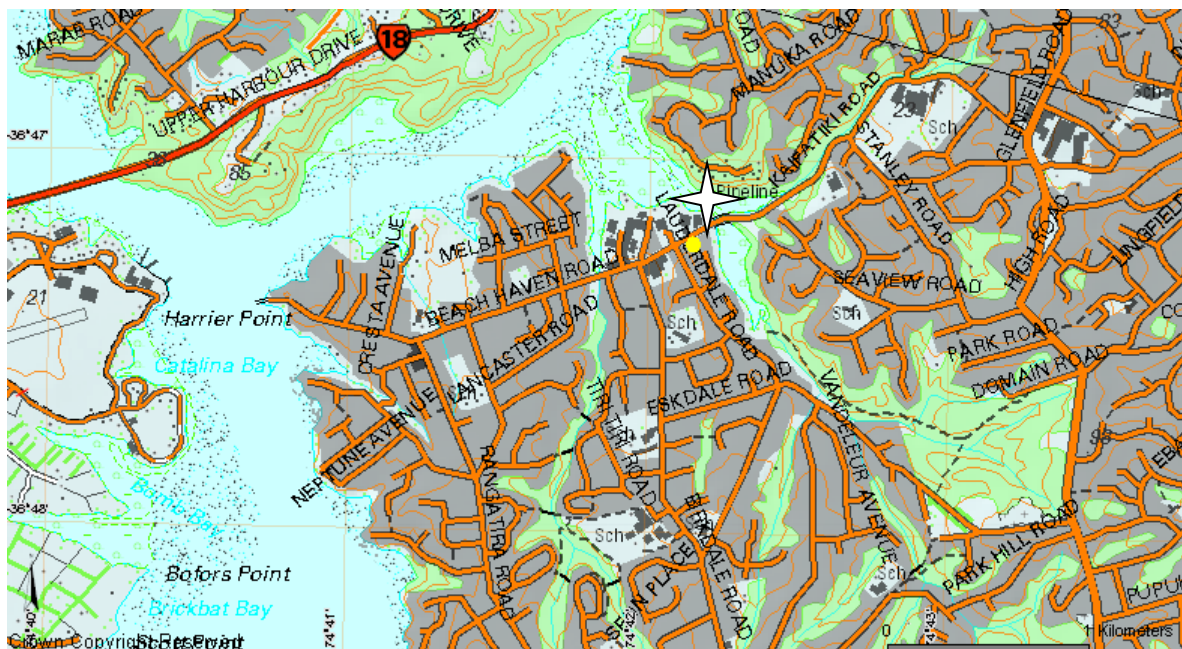
Nil

Mast height (m)

N/a

Data owner

Auckland Council



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved

Beachlands (Mobile Trailer)

Site name

Beachlands (Mobile Trailer)

Address

46 Third View Ave
Beachlands

	Easting	Northing	Elevation (m)
NZMG	2688498	6477952	17
NZTM	1778070	5916297	

General site characteristics

Rural town, predominantly residential.

Topography

This is a flat area with a gentle slope towards the coastline.



Site - viewed from the north.

Micro met characteristics

Site description and area characteristics

The site is located on the grounds of the Beachlands Chartered Club. It is located on Third View Avenue, 60m east from the intersection of Third View Avenue and Wakelin Road.

Air Quality Management Area

Urban

Predominant sources

Adjacent road, nearby residential home heating in winter, sea spray

Distance from road and other major sources

Nearest major road is 5m S and 60m east from the intersection of Third View Avenue and Wakelin Road.

Vehicle counts

N/a

Any nearby features that could affect measurements?

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

24.05.11

Monitoring ceased

30.04.12

Pollutants monitored

PM₁₀ (Beta Gauge): 21.05.11 – 30.04.12

PM_{2.5} (Beta Gauge): 21.05.11 – 30.04.12

Inlet height (m)

4

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation, rainfall

Mast height (m)

6

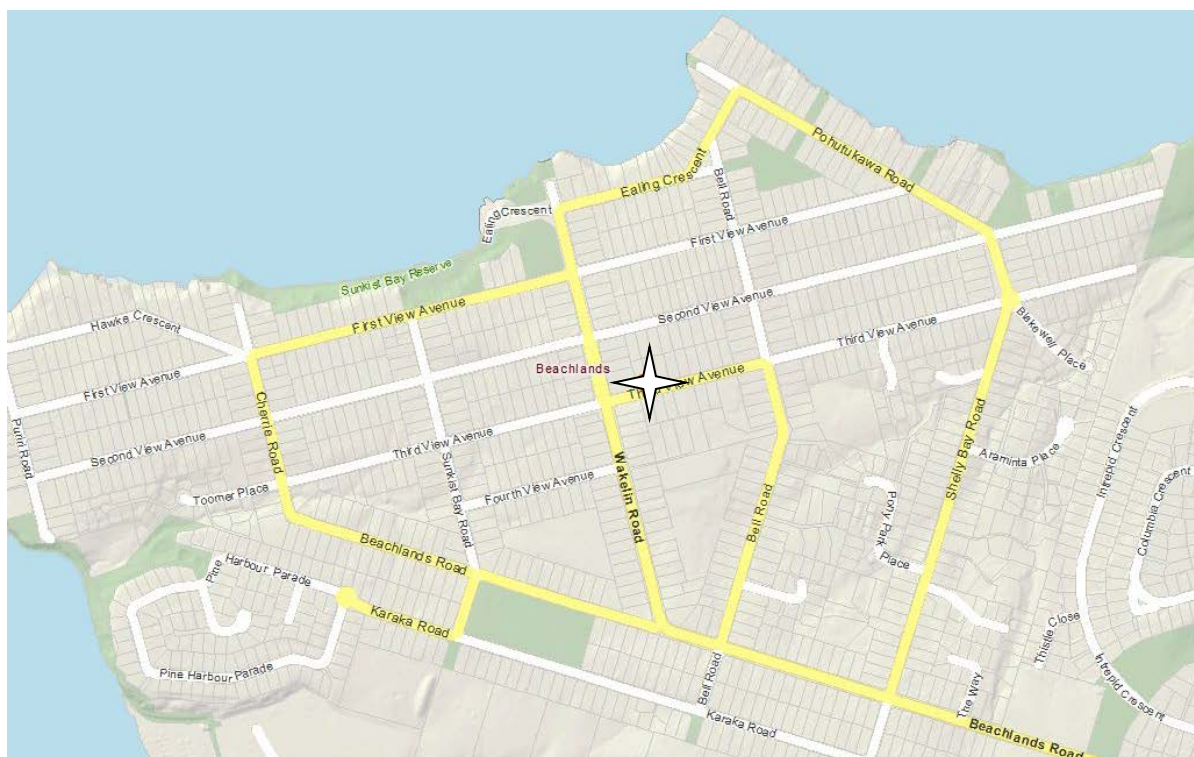
Data owner

Auckland Council



Aerial view of site.

Source: Auckland Council GIS Viewer, extracted April 2013.



Location map

Source: Auckland Council GIS Viewer, extracted May 2013

Dominion Road I

Site name

Dominion Road I
(Metropolitan Rentals)

Address

Metropolitan Rentals
321 Dominion Road
Mt Eden, Auckland

	Easting	Northing	Elevation (m)
NZMG	2666395	6478851	60
NZTM	1755966	5917151	

General site characteristics

Urban

Topography

Flat

Micro met characteristics

Site description and area characteristics

Adjacent to 321 Dominion Road (Metropolitan Rentals) in narrow alley way between two buildings - about 3-3.5m from road side, 300m south of Valley Road intersection and 50m north of Burnley Terrace. Analysers housed in mobile trailer. Area mostly residential with the exception of commercial strip along Dominion Rd itself. Houses from 1920s onward. Med sized sites, with infill housing of newer vintage.

Air Quality Management Area

Urban

Predominant sources

Vehicle and some home heating in winter

Distance from road and other major sources

3m W to Dominion Road (arterial road, aligned N-S)

Vehicle counts

11400 - 7-day ADT (1993) Dominion Rd

Any nearby features that could affect measurements?

Small caravan parked between two buildings - inlet at building edge - effectively equivalent to a wall mounted inlet.



Site - inlet attached to downpipe.

AS/NZS 3580.1.1:2007 compliant?

Monitoring commenced

01.01.94

Monitoring ceased

11.02.96

Pollutants monitored

CO: 01.01.94 – 11.02.96

NOx: 01.01.94 – 11.02.96

Inlet height (m)

2-2.5

Meteorological parameters measured on site

Nil

Mast height (m)

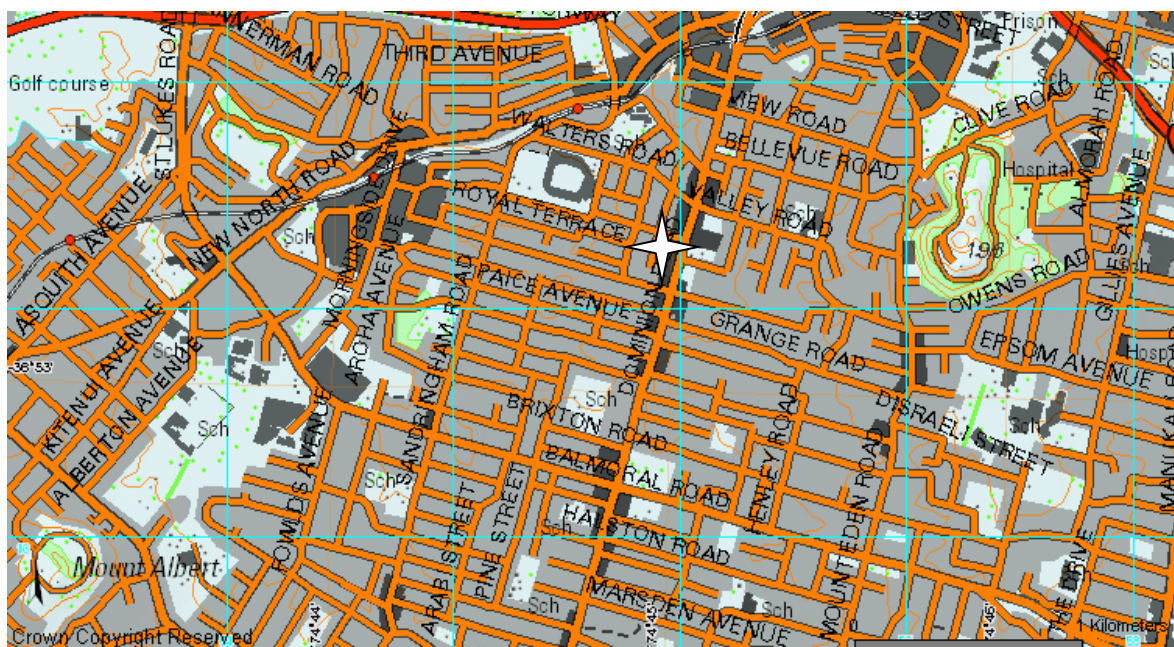
N/a

Data owner

Auckland Council



Inlet



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Dominion Road II

Site name

Dominion Road II
(Veg Market)

Address

Growers Vegetable Market
270 Dominion Road
Mt Eden, Auckland

	Easting	Northing	Elevation (m)
NZMG	2666500	6479043	60
NZTM	1756071	5917343	

General site characteristics

Urban

Topography

Flat

Micro met characteristics

Site description and area characteristics

In the carpark of Growers Vege Market. Area mostly residential with the exception of commercial strip along Dominion Rd itself. Houses from 1920s onward. Medium sized sites, with infill housing of newer vintage.

Air Quality Management Area

Urban

Predominant sources

Vehicle and some home heating

Distance from road and other major sources

Vehicle counts

Any nearby features that could affect measurements?

Building adjacent to mobile trailer will affect wind flow



Mobile trailer in rear car-park off Dominion Road.

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

06.12.01

Monitoring ceased

27.06.02

Pollutants monitored

CO: 06.12.01 – 27.06.02

NOx: 08.12.01 – 27.06.02

Inlet height (m)

Meteorological parameters measured on site

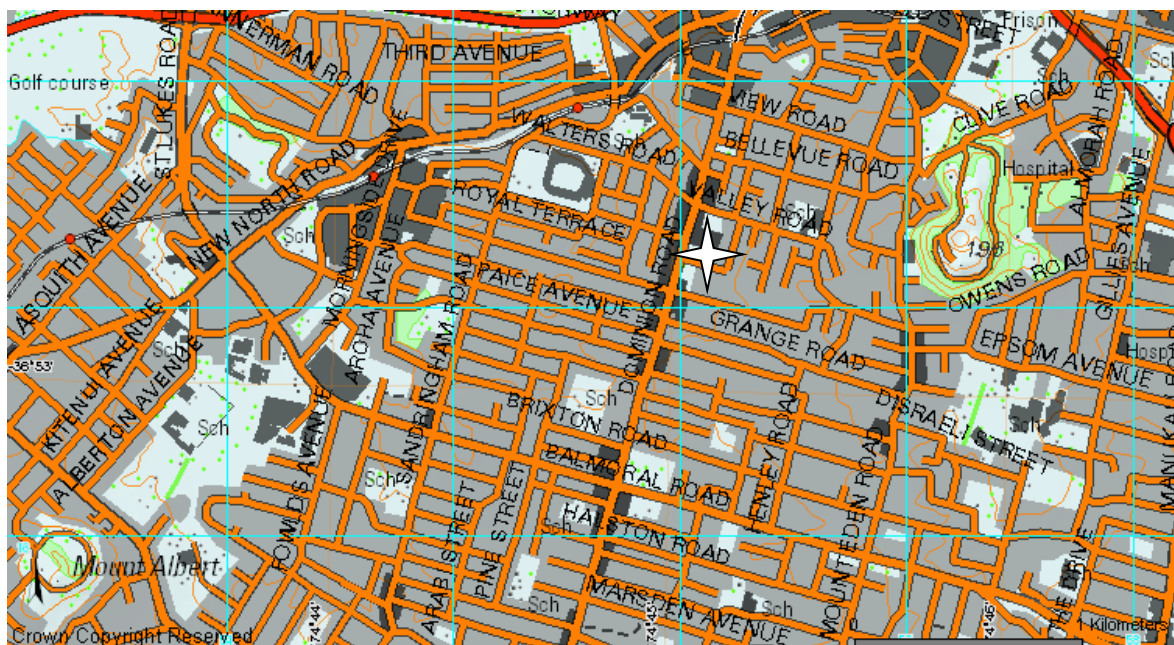
Nil

Mast height (m)

N/a

Data owner

Auckland Council



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

East Tamaki

Site name

East Tamaki

Address

Manukau Institute of Technology
East Tamaki Rd
Otara, Manukau

	Easting	Northing	Elevation (m)
NZMG	2676893	6469328	10
NZTM	1766483	5907649	

General site characteristics

Urban

Topography

Flat

Micro met characteristics

The large building behind the monitor will shelter the inlet from northerly wind flows.



Site viewed from the west.

Site description and area characteristics

Monitors located within an air conditioned portable monitoring shed located within the Manukau Institute of Technology. Sampling inlet extends out of the roof.

Air Quality Management Area

Urban

Predominant sources

Vehicle

Distance from road and other major sources

10m S to East Tamaki Rd (arterial road, aligned W-E); 100 W to Otara Rd; 50m E to Newbury St

Vehicle counts

25,970 7-day ADT (2003 estimate) East Tamaki Road between Otara Rd and Fulton Cres

Any nearby features that could affect measurements?

Directly behind the monitor are the large two storey buildings of the institute. On the south side of East Tamaki Road are residential houses.

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

01.07.98

Monitoring ceased

13.08.02

Pollutants monitored

CO: 01.07.98 – 13.08.02

PM₁₀ (Grimm Particulate Sampler):

01.07.98 – 12.08.02

Inlet height (m)

3-3.5



Site viewed from the south.

Meteorological parameters measured on site

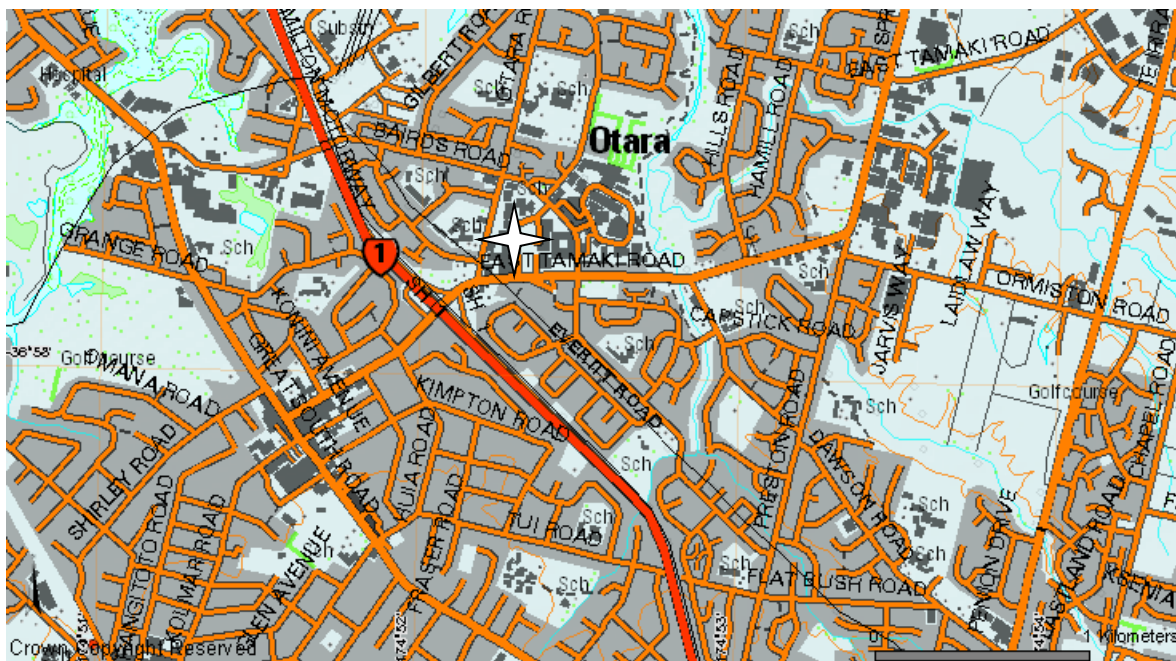
Wind speed, wind direction, ambient temperature, relative humidity.

Mast height (m)

8

Data owner

Auckland Council



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Glenfield

Site name

Glenfield

Address

51 Easton Park Parade
Glenfield, North Shore City

	Easting	Northing	Elevation (m)
NZMG	2663460	6490142	40
NZTM	1753009	5928435	

General site characteristics

Urban

Topography

Hilly

Micro met characteristics

Site is the side of a hill; the land slopes fairly steeply down to the SSE/up to the NNW.



Monitor in self-contained housing.

Site description and area characteristics

Monitor on a platform in the front garden of a private residence, situated adjacent to hedge and child's playhouse. Surrounding area is residential, medium sized sections; most houses single storey 1960s-1990s; approximately 75% with chimneys. Mature stand of trees behind houses, 30m to W and 50m to E.

Air Quality Management Area

Urban

Predominant sources

Vehicle and home heating (winter)

Distance from road and other major sources

4m E to Easton Park Parade (suburban route, aligned NNW-SSE)

Vehicle counts

N/a

Any nearby features that could affect measurements?

Monitor is <1m from shrubs bordering the property to E (these were level with inlet on site visit 26/07/05); 2m from 2m high hedge to the N. Approximately 6m to house (chimney at the front of house).

AS/NZS 3580.1.1:2007 compliant?

No; inlet <2m from ground, ~2m N to 2m high hedge.

Monitoring commenced

16.06.03

Monitoring ceased

31.12.05

Pollutants monitored

PM₁₀MiniVol (non regulatory method)

Inlet height (m)

1.5

Meteorological parameters measured on site

Nil

Mast height (m)

N/a

Data owner

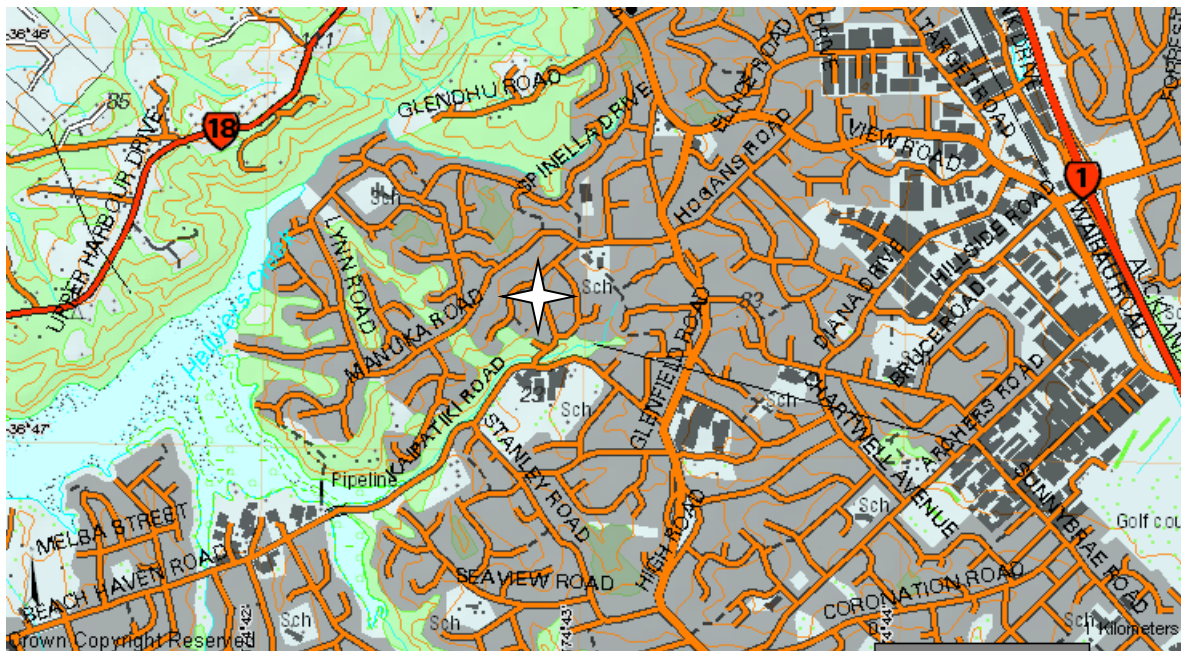
Auckland Council



View south down Easton Park Parade.



View north up Easton Park Parade.



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved

Glen Eden II

Site name

Glen Eden II
(Glen Eden Intermediate)

Address

Glen Eden Intermediate School
23 Kaurilands Rd
Titirangi, Waitakere

	Easting	Northing	Elevation (m)
NZMG	2657605	6474078	40
NZTM	1747187	5912361	

General site characteristics

Urban

Topography

Undulating

Micro met characteristics

Site fairly well exposed to all directions; hills to NE may influence wind flows from this direction.



Site description and area characteristics

Monitor attached to pole in school grounds.

Monitor is attached to a power pole at western end of playing fields. Most houses in the area 1980s and newer (medium-sized sections, no chimneys), but Glen Eden to N has a lot of older houses (1960s); larger sections, approximately 75% with chimneys.

Air Quality Management Area

Urban

Predominant sources

Vehicle and home heating

Distance from road and other major sources

100m W to Meadowvale Rise (residential street, aligned SSW-NNE); 225m SW to Kaurilands Rd (aligned NW-SE)

Vehicle counts

N/a

Any nearby features that could affect measurements?

Eucalyptus tree (6m) <5m W of inlet. School buildings 1-2 storeys ~30m to S. Residential houses ~30m W-NE

AS/NZS 3580.1.1:2007 compliant?

No; ~6m tree <5m W of inlet.

Monitoring commenced

03.01.01

Monitoring ceased

31.12.05

Pollutants monitored

PM₁₀MiniVol (non regulatory method)

Inlet height (m)

2.5

Meteorological parameters measured on site

Nil

Mast height (m)

N/a

Data owner

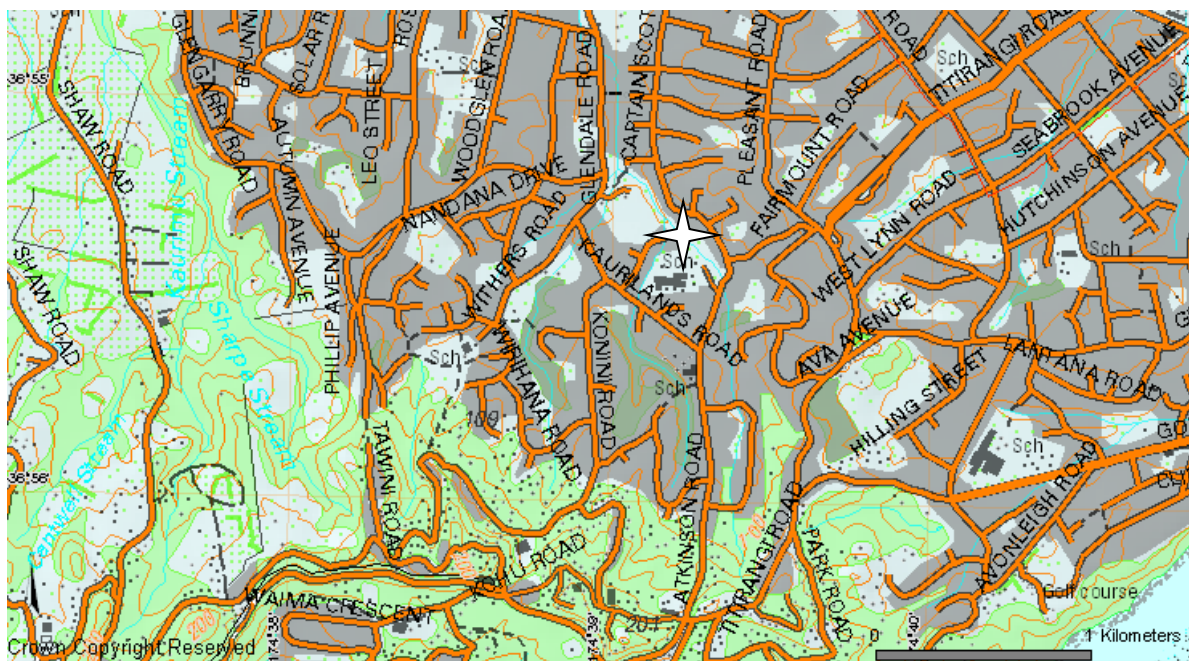
Auckland Council



View south from site towards school buildings.



View west from site towards residential area.



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Helensville (Mobile Trailer)

Site name

Helensville (Mobile Trailer)

Address

10 Porter Crescent,
Helensville, Rodney

	Easting	Northing	Elevation (m)
NZMG	2639794	6501873	15
NZTM	1729323	5940115	

General site characteristics

Urban

Topography

Flat in immediate area, with undulating surrounding terrain.

Micro met characteristics

Mostly exposed but trees lining the eastern side may partially shelter site from wind flows.



Site - viewed from the north.

Site description and area characteristics

Air conditioned shed is located in a car park behind the Helensville Public Library and War Memorial Hall buildings. The site is 10m away from the Howard Pengelly Memorial Scout Den building and the public library northwest of the site. There is a Woolworths supermarket building south to the site and a children's playground 25m north from the site. The monitoring site is 60m east from Kaipara River. It is in a flat area in the centre of the Helensville city and the midst of residential housing.

Air Quality Management Area

Urban

Predominant sources

Vehicle and residential home heating.

Distance from road and other major sources

70m E to Commercial Rd and 55m W to Porter Rd

Vehicle counts

N/a

Any nearby features that could affect measurements?

A row of medium sized trees is situated ~10m to the east; sheltering from the Pengelly Memorial Scout Den building ~5m south-east.

AS/NZS 3580.1.1:2007 compliant?

Yes.

Monitoring commenced

22.01.10

Monitoring ceased

31.12.10

Pollutants monitored

NOx: 22.01.10 - 31.12.10

PM₁₀ (Beta Gauge): 22.01.10 - 31.12.10

PM_{2.5} (Beta Gauge): 22.01.10 – 31.12.10

Inlet height (m)

5

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

Mast height (m)

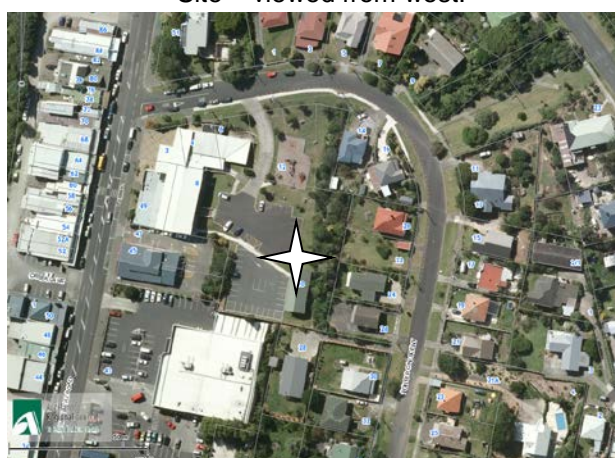
6

Data owner

Auckland Council

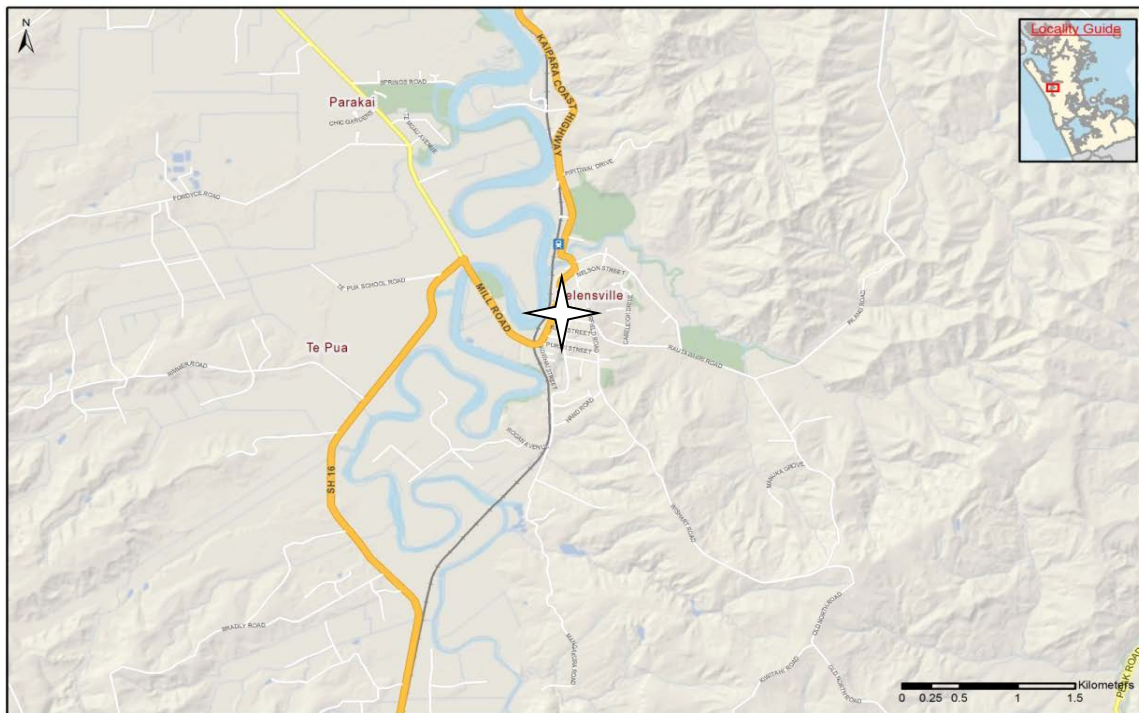


Site – viewed from west.



Aerial view of site.

Source: Auckland CouncilGIS Viewer, extracted September 2010.



Location map

Source: Auckland Council GIS Viewer, extracted September 2010

Henderson I (B)

Site name

Henderson I (B)
(Lincoln Rd)

Address

Henderson Intermediate School
70 Lincoln Rd,
Henderson, Waitakere

	Easting	Northing	Elevation (m)
NZMG	2645440	6480310	29.9
NZTM	1745010	5918588	

General site characteristics

Urban

Topography

Surrounding area is flat



Monitor in self-contained housing attached to the school building.

Micro met characteristics

Site is exposed to winds from the north as surrounding school buildings (SE, SW and S) may shelter winds from these directions.

Site description and area characteristics

Monitor is in a self-contained, air conditioned shed attached to school building and faces north over playing fields. Site surrounded by buildings 180° east, south and west. Note: Current Henderson site located approximately 150m SE of shed, in self-contained housing at the front of the school grounds.

Air Quality Management Area

Urban

Predominant sources

Vehicle and residential (during winter)

Distance from road and other major sources

Approximately 100 m E to Lincoln Road (arterial road, aligned N-S) 150 – 200 m from northern residential boundary and 30 m from western residential boundary.

Vehicle counts

Lincoln Road 13,300 7 day ADT 1999.

Any nearby features that could affect measurements?

Site situated within 5m of a large 6m tall tree. Internal school access road within 10m of monitoring site.

AS/NZS 3580.1.1:2007 compliant?

No; Site is attached to a building and the sampling inlet is not less than 1m above roof height. A large tree (approximately 6m in height) is 5m NW from monitor.

Monitoring commenced

17.09.00

Monitoring ceased

29.12.05

Pollutants monitored

PM₁₀ MiniVol (non regulatory method)

Inlet height (m)

3.1



Site view looking west

Meteorological parameters measured on site

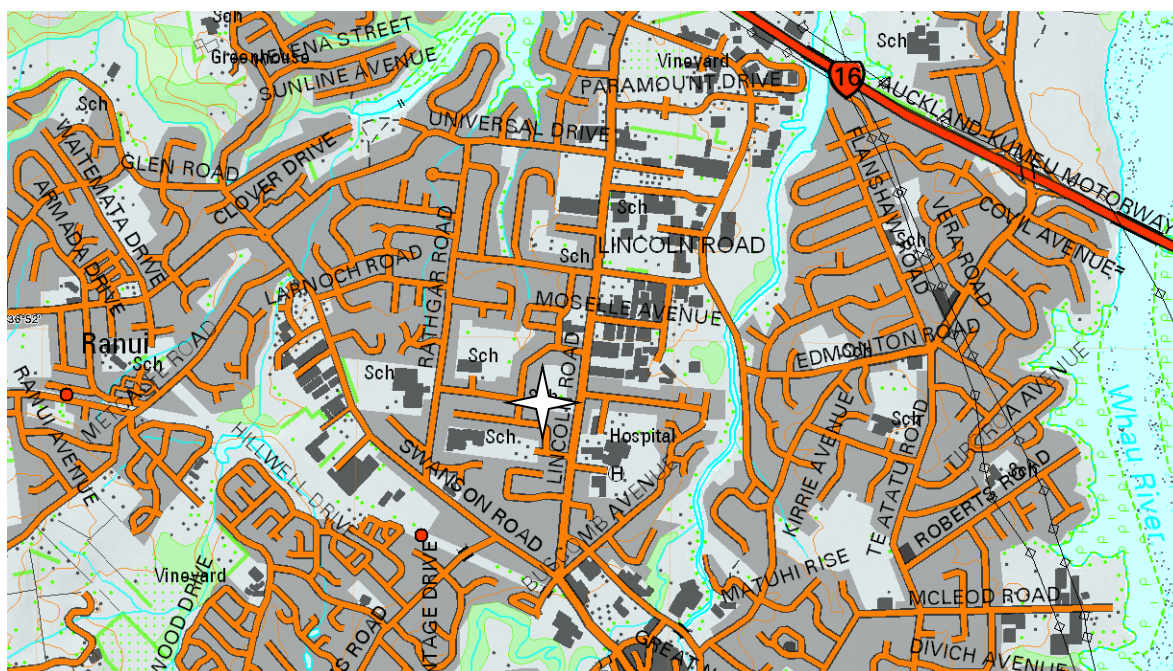
Nil

Mast height (m)

Nil

Data owner

Auckland Council



Location map.

Source: NZTopoOnline, extracted May 2006, Crown Copyright Reserved.

Highbury

Site name

Highbury (Bank St)

Address

3 Bank Street
Birkenhead, North Shore City

	Easting	Northing	Elevation (m)
NZMG	2664513	6487333	80
NZTM	1754067	5925628	

General site characteristics

Urban

Topography

Hilly

Micro met characteristics

Site is protected from NW and SW airflow by houses. Relatively exposed to other directions. Surrounding area slopes down to E.

Site description and area characteristics

Monitor is attached to a fence at the end of a driveway of a private residence. 5m W to house; 8m SW to house next door. Steep slope down to N of site. Residential, large sections, houses mostly older (1900s-1960s); approximately 75% with chimneys.

Air Quality Management Area

Urban

Predominant sources

Vehicle and home heating

Distance from road and other major sources

25m W to Bank St (residential street, aligned NNW to SSE); 75m S to Pupuke Rd (suburban route, aligned WSW to ENE).

Vehicle counts

N/a

Any nearby features that could affect measurements?

Monitor is at end of driveway and adjacent to two-car carport. Slope of surrounding area means that inlet is approximately level with access road and approximately 1.5m below Bank St. Vigorous vine (jasmine) covering fence and encroaching on inlet. Stand of native vegetation in gully 20m to NE.

AS/NZS 3580.1.1:2007 compliant?

No; two storey house with chimney 5m to NNW, carport 4m to SW.



Monitor attached to fence.

Monitoring commenced

16.06.03

Monitoring ceased

30.06.07

Pollutants monitored

PM₁₀MicroVol (non regulatory method)

Inlet height (m)

2

Meteorological parameters measured on site

Nil

Mast height (m)

N/a

Data owner

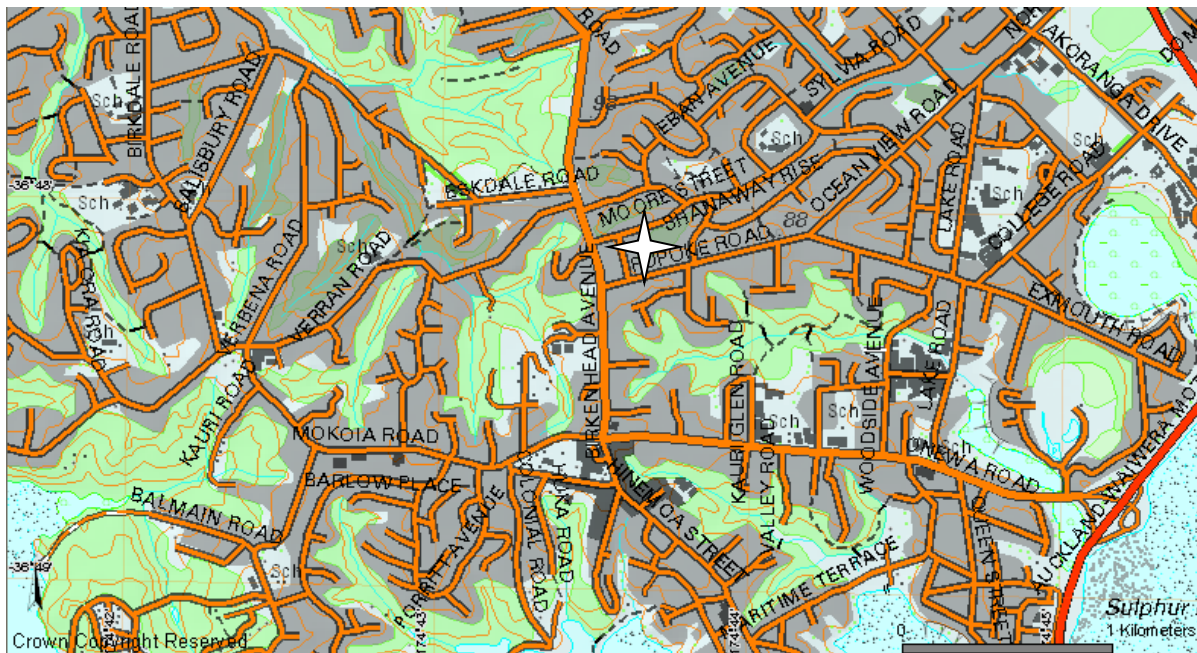
Auckland Council



Site viewed from west.



Site viewed from south west.



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Hobson Street

Site name

Hobson Street

Address

240 Hobson St
City, Auckland

	Easting	Northing	Elevation (m)
NZMG	2667221	6481604	40
NZTM	1756787	5919905	



Site - looking south.

General site characteristics

Urban

Topography

Hilly

Micro met characteristics

Wide road - so no significant urban canyon effect.

Site description and area characteristics

Located on the second story of the five story former ARC Rideline offices, Hobson St - 25m N of the traffic lighted intersection of Union St and Hobson St. CBD to N and E. Analysers situated in lunch room.

Air Quality Management Area

Urban

Predominant sources

Vehicle

Distance from road and other major sources

2m N to Hobson St (arterial road, aligned W-E); 25m S to Union St (arterial road, aligned N-S); 200m SW to Southern Motorway.

Vehicle counts

28,000 7-day ADT(1998) Hobson St

Any nearby features that could affect measurements?

On the adjacent side of Hobson St to the sampling tube intake tube is a 4 storey building. To the north of this building is a 2 storey building.

AS/NZS 3580.1.1:2007 compliant?

No: but site intended to monitor peak levels

Monitoring commenced

05.09.96

Monitoring ceased

31.03.00

Pollutants monitored

CO

Inlet height (m)

2.5

Meteorological parameters measured on site

Nil

Mast height (m)

N/a

Data owner

Auckland Council



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Kingsland

Site name

Kingsland
(Kowhai)

Address

Kowhai Intermediate School
26 Onslow Rd
Mt Eden, Auckland

	Easting	Northing	Elevation (m)
NZMG	2666121	6479473	60
NZTM	1755691	5917772	

General site characteristics

Urban

Topography

Undulating to hilly. Mt Eden (summit 196m) 1.5km to ESE.

Micro met characteristics

Site is relatively well exposed to winds from all directions with the exception of SW - house and tree belt (5m tall, 30m from shed) may shelter from this direction.

Site description and area characteristics

Within the grounds of Kowhai Intermediate School, at the western end of playing fields, adjacent to outdoor pool enclosure. Residential to W, S and E (mostly larger older houses dating from 1920s with small sections, some later additions); commercial premises to N-NE. Mt Eden rugby stadium 120m to SW.

Air Quality Management Area

Urban

Predominant sources

Vehicle and residential home heating (during winter)

Distance from road and other major sources

100m N to New North Rd (arterial road, aligned NW-SE); approximately 50m W to Sandringham Rd (arterial road, aligned NW-SE)

Vehicle counts

23,958; 5-day average (23/03/2005) Sandringham Rd S of New North Rd

Any nearby features that could affect measurements?

Railway line and Kingsland station 140m to NW.

AS/NZS 3580.1.1:2007 compliant?

Yes



Site viewed from south west.

Monitoring commenced

02.04.04

Monitoring ceased

07.09.05

Pollutants monitored

NOx: 02.04.04 to 07.09.05

PM₁₀ (Beta Gauge): 08.04.04 to 07.09.05

PM₁₀ (Partisol): 23.04.04 to 07.09.05

PM_{2.5} (Partisol): 22.04.04 to 07.09.05

TSP: 12.05.04 to 07.09.05

Lead: 01.06.04 to 07.09.05

Ozone: 20.05.04 to 07.09.05



View west from site to Sandringham Road.

Inlet height (m)

3

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation

Mast height (m)

6

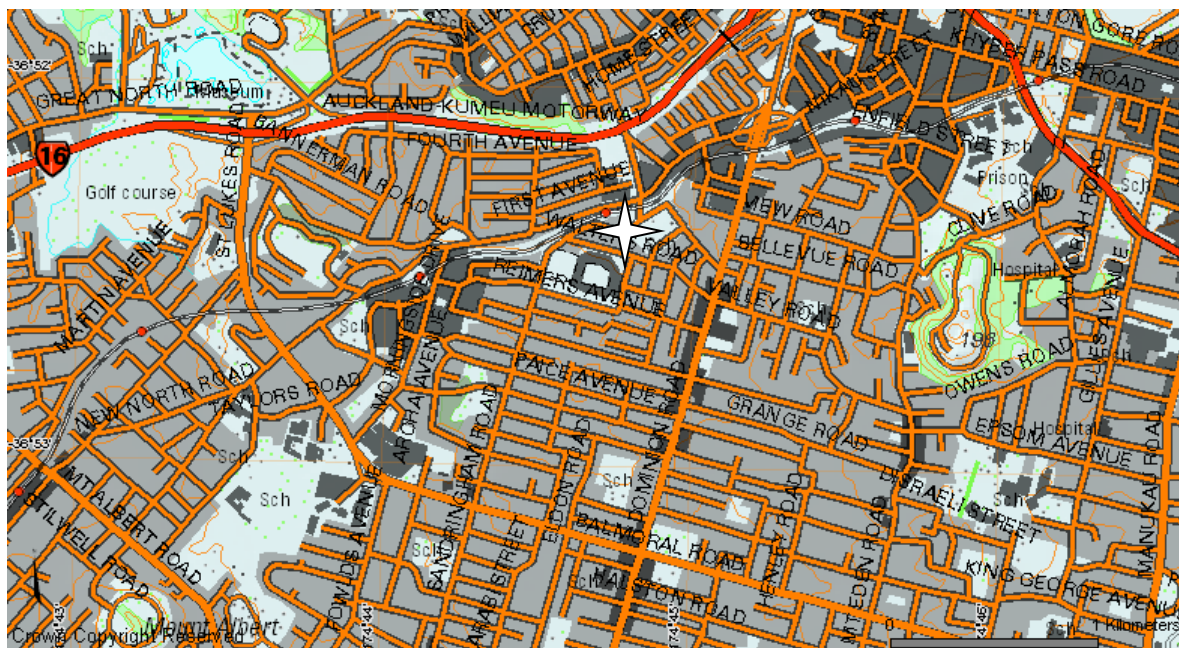
Data owner

Auckland Council own NOx, particulate and ozone data;

Ministry for the Environment own TSP and lead data



View south from site.



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Mangere

Site name

Mangere

Address

Mangere Wastewater Treatment Plant
Mangere Bridge
Manukau

	Easting	Northing	Elevation (m)
NZMG	2668262	6469080	<10
NZTM	1757853	5907384	

General site characteristics

Urban

Topography

Undulating, Mount Mangere 1.5km to NE.

Micro met characteristics

Well exposed from all directions

Site description and area characteristics

Located within the grounds of the Wastewater treatment plant. Townships of Mangere and Favona 3km N-SE mostly older houses (1960s) on large sections, ~75% with chimneys. To W-SW is rolling pastureland, and Manukau Harbour. Auckland International Airport is 5km S.

Air Quality Management Area

Urban

Predominant sources

Distance from road and other major sources

Vehicle counts

Any nearby features that could affect measurements?

AS/NZS 3580.1.1:2007 compliant?

Yes



Inlet attached to building roof.

Monitoring commenced

15.08.95

Monitoring ceased

15.05.96

Pollutants monitored

Ozone

Inlet height (m)**Meteorological parameters measured on site**

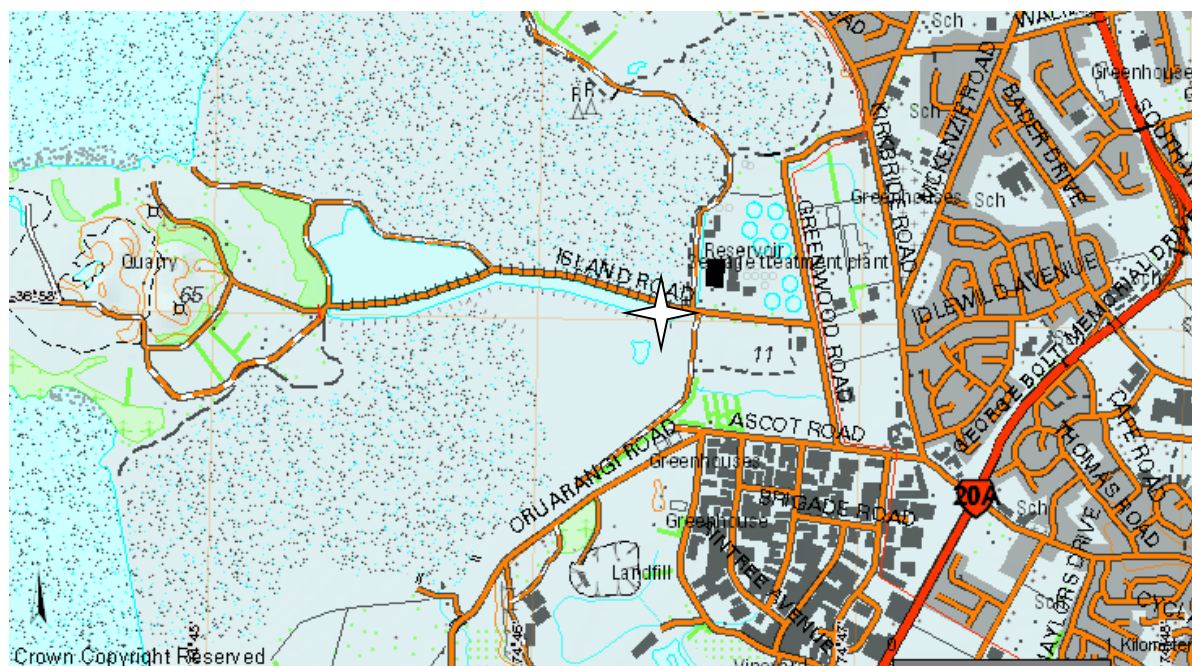
Vertical wind profile, mixing height (acoustic sounder).

Mast height (m)

N/a

Data owner

Auckland Council



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Manurewa I

Site name

Manurewa I
(Post Office)

Address

181-183 Great South Road
Manurewa, Manukau

	Easting	Northing	Elevation (m)
NZMG	2679118	6462674	<20
NZTM	1768721	5901000	

General site characteristics

Urban

Topography

Micro met characteristics

Site description and area characteristics

Located on an awning over the footpath in shopping/business precinct.

Air Quality Management Area

Urban

Predominant sources

Vehicles

Distance from road and other major sources

<5 m

Vehicle counts

16,251 7-Day ADT (2004) Great South Road between Hill Road and Halver Road

Any nearby features that could affect measurements?

Buildings near inlet

AS/NZS 3580.1.1:2007 compliant?



Site

Monitoring commenced

04.03.96

Monitoring ceased

21.03.97

Pollutants monitored

CO

Inlet height (m)

Meteorological parameters measured on site

Nil

Mast height (m)

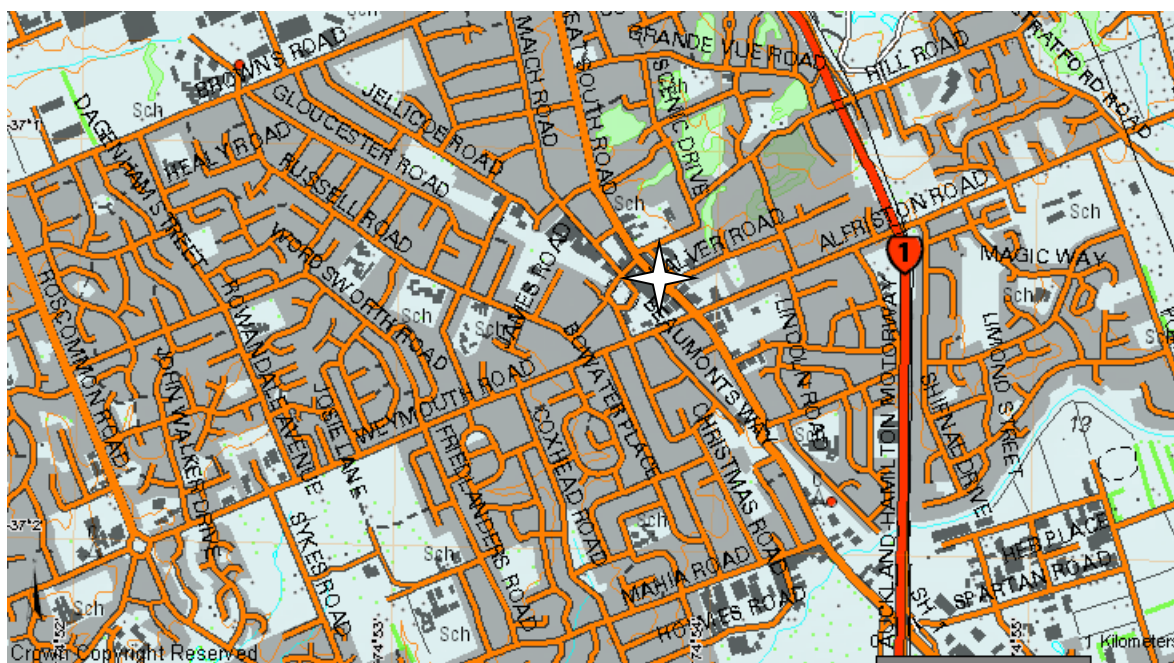
N/a

Data owner

Auckland Council



Inside the monitor housing



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Manurewa II

Site name

Manurewa II
(Manurewa South Primary)

Address

Manurewa South Primary School
39 Tawa Crescent
Manurewa, Manukau

	Easting	Northing	Elevation (m)
NZMG	2678994	6461501	25
NZTM	1768599	5899827	

General site characteristics

Urban

Topography

The site is on the summit of a small rise, the land to the east is relatively flat; undulating to the west.

Micro met characteristics

The site is well exposed to winds from all directions.

Site description and area characteristics

Monitor attached to roof of school building, about 10 from road. Several mature trees >10m within 100m of site and several in the surrounding area. Most houses in the area are 1960s to 1970s era; predominantly on full sites with large yards. Approximately 75-80% of houses have chimneys. During the period May 2004-May 2005, for a circle of 1.5km radius around the site, 32 permits were granted for new domestic fires (note that this number will include some overlap with the count from Manurewa West Primary).

Air Quality Management Area

Urban

Predominant sources

Vehicle and residential (during winter)

Distance from road and other major sources

10m from Tawa Crescent (residential street, aligned NNW-SSE).

Vehicle counts

N/a

Any nearby features that could affect measurements?

Parking for 9 cars and a car 'drop off lane' immediately adjacent to the building where the monitor is located. School crossing <50m away. School incinerator <50m to SE.

AS/NZS 3580.1.1:2007 compliant?

No; ~4m tree, <5m to W, school incinerator <50m to SE.



Monitor attached to school building.

28.08.01

31.12.05

PM₁₀MiniVol (non regulatory method)

3

Nil

N/a

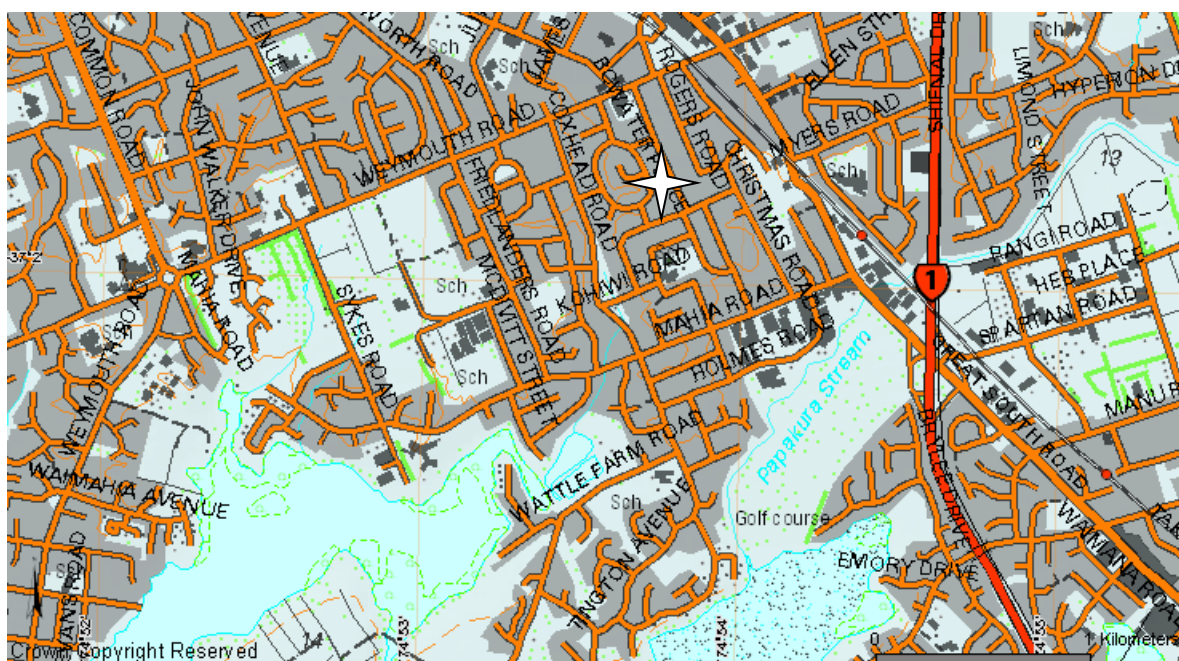
Auckland Council



View south from site to Tawa Crescent.



View west from site to Tawa Crescent.



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved

Manurewa III

Site name

Manurewa III
(Manurewa West Primary)

Address

Manurewa West Primary School
31 McKean Ave
Manurewa, Manukau

	Easting	Northing	Elevation (m)
NZMG	2678260	6462365	25
NZTM	1767863	5900689	

General site characteristics

Urban

Topography

Flat

Micro met characteristics

Surrounding buildings and trees may affect micro met characteristics. Houses immediately to the E and SE of the school (from 20m away) are slightly elevated, so that the monitor is about level with the top of the fence, and below their roof line. This may provide sheltering from winds from this direction.



Monitor attached to reading room/library building.

Site description and area characteristics

Monitor is mounted on (old) library fascia in playground, in S corner of school grounds. Most houses in the immediate area are 1960s to 1970s era, although there are several new subdivisions on the western fringes of the suburb. Houses predominantly on full sites with large yards. Approximately 75-80% of houses have chimneys. During the period May 2004-May 2005, for a circle of 1.5km radius around the site, 40 permits were granted for new domestic fires (note that this number will include some overlap with the count from Manurewa South Primary).

Air Quality Management Area

Urban

Predominant sources

Vehicle and residential (during winter)

Distance from road and other major sources

60m SE to Clendon Place (suburban cul-de-sac) and 90m SW to McKean Ave (residential street).

Vehicle counts

N/a

Any nearby features that could affect measurements?

Two large deciduous trees <20m to NE of inlet.

AS/NZS 3580.1.1:2007 compliant?

No; Two large trees <20m to NE of inlet.

Monitoring commenced

28.08.01

Monitoring ceased

31.12.05

Pollutants monitored

PM₁₀MiniVol (non regulatory method)

Inlet height (m)

3

Meteorological parameters measured on site

Nil

Mast height (m)

N/a

Data owner

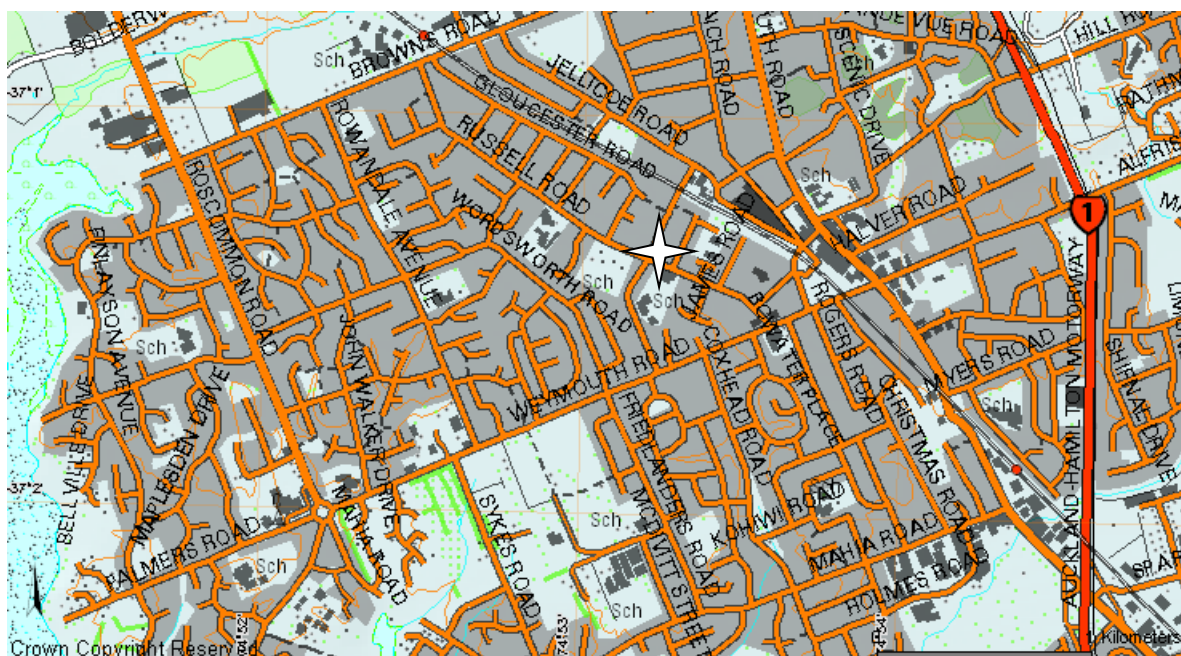
Auckland Council



Site viewed from the west.



View south west from site to school buildings
<10m away.



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved

Mt Albert

Site name

Mt Albert

Address

DSIR
Mt Albert Road
Mt Albert, Auckland

	Easting	Northing	Elevation (m)
NZMG	2664286	6477597	40
NZTM	1753860	5915893	



Aerial photo of site (photo 1959)

General site characteristics

Urban

Topography

Overall the surrounding area is undulating, with the steep volcanic cone of Mt Albert (summit 135m, approx 500m W) the exception. There is a small ridge slightly higher and just SW of the DSIR complex from where the land slopes down to the S and W. Immediately N of the DSIR site the land slopes down to the N.

Micro met characteristics

Prevailing wind from the SW; Mt Albert (135m) approximately 500m W may have influence.

Site description and area characteristics

Inlet on the top of a pole mounted on a concrete pad, about 70m NE (downhill) of multi-storey science centre building. In the early 1990s the site relocated 20m NW; site characteristics remained similar. Surrounding area mostly residential, many large older houses (1920s-1960s) on large sites, with some newer, infill housing, approximately 75% with chimneys. Commercial/light industrial area 1km to S. Mt Albert Grammar School Farm (c. 14ha) <1km N.

Air Quality Management Area

Urban

Predominant sources

Vehicle and residential (during winter)

Distance from road and other major sources

Original site 190m WSW to Mt Albert Rd (arterial road, aligned NNW-SSE); Subsequent site 165m WSW to Mt Albert Rd.

Vehicle counts

10,000 vehicles per day Mt Albert Rd (1981).

Any nearby features that could affect measurements?

AS/NZS 3580.1.1:2007 compliant?

Monitoring commenced

31.01.64

Monitoring ceased

17.01.96

Pollutants monitored

TSP (HD MedVol): 31.01.64 – 17.01.96

Lead (HD MedVol): 01.01.64 – 17.01.96

Inlet height (m)

2

Meteorological parameters measured on site

Nil

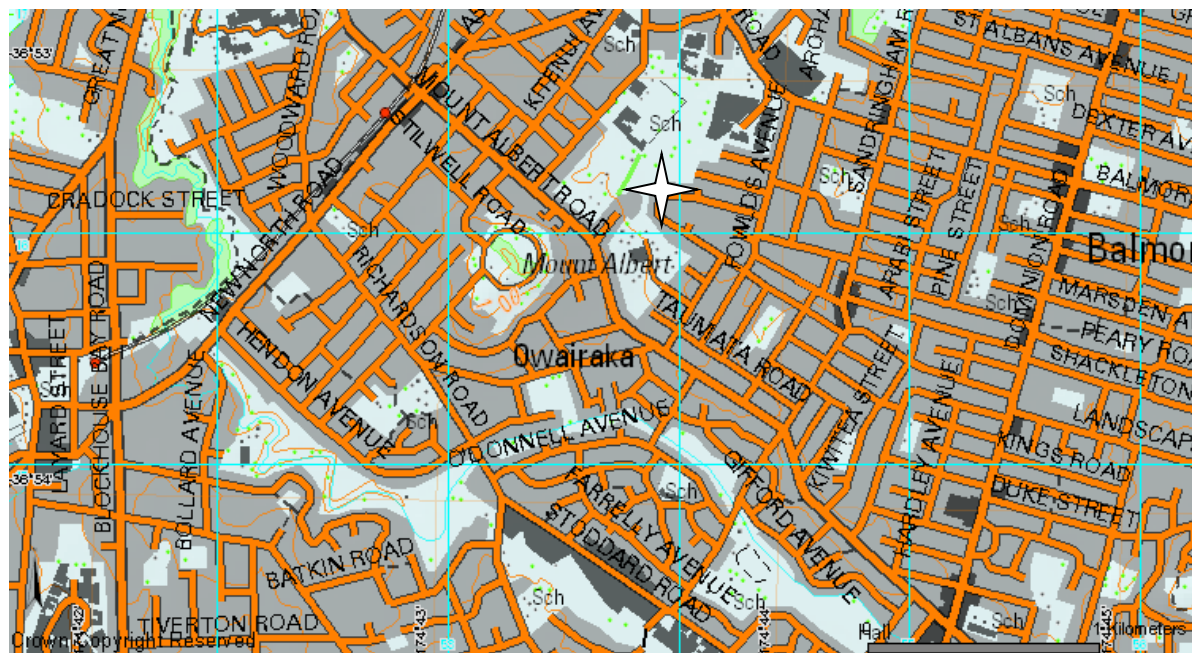
Mast height (m)

N/a

Data owner

Auckland Council own TSP and Lead datapost
1993

Ministry of Health own TSP and lead data prior to
1993



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Mt Eden I

Site name

Mt Eden I
(Fenton St)

Address

3 Fenton St
Mt Eden, Auckland

	Easting	Northing	Elevation (m)
NZMG	2667009	6479963	70
NZTM	1756578	5918264	

No photo available

General site characteristics

Urban

Topography

Micro met characteristics

Building will affect air flows

Site description and area characteristics

On the roof of a three storey building.

Air Quality Management Area

Urban

Predominant sources

Distance from road and other major sources

<30m N to Fenton St (aligned E-W); <30m W to Wynyard St (aligned E-W); 250m W to Dominion Rd (arterial, aligned N-S); 120m N to New North Rd (arterial, aligned SW-NE); 30m N to Railway, aligned E-W.

Vehicle counts

Dominion Rd 15,500 v/day; Wynyard Rd 3,000 v/day; New North Rd 19,000 v/day (1981)

Any nearby features that could affect measurements?

Train track immediately north of site.

AS/NZS 3580.1.1:2007 compliant?

Monitoring commenced

06.03.75

Monitoring ceased

31.12.83

Pollutants monitored

TSP (HD MedVol): 06.03.75 – 31.12.83

Lead (HD MedVol): 06.03.75 – 31.12.83

Inlet height (m)

Meteorological parameters measured on site

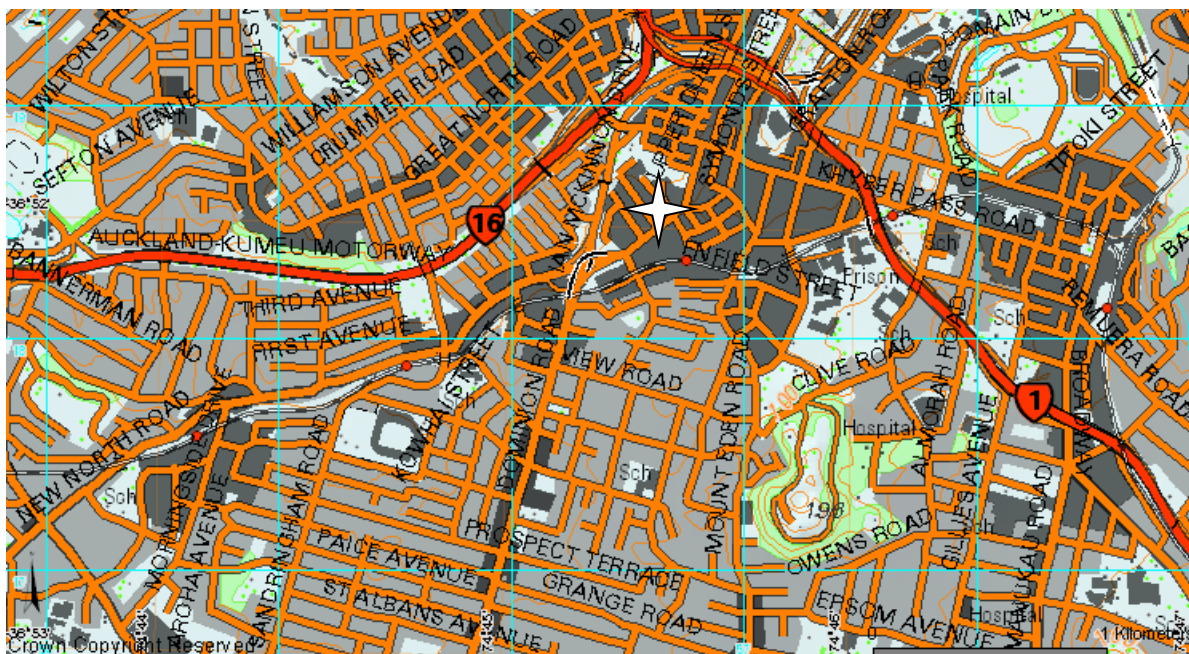
Wind speed and velocity

Mast height (m)

N/a

Data owner

Ministry of Health



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Mt Eden II (A)

Site name

Mt Eden II (A)
(Kelly St - ESR Building)

Address

17 Kelly St
Mt Eden, Auckland

	Easting	Northing	Elevation (m)
NZMG	2667273	6479731	86
NZTM	1756842	5918033	

General site characteristics

Urban



NOx inlets and passive sampler on roof of ESR building.

Topography

Flat in immediate area, undulating to hilly beyond. Mt Eden (summit 196m) approximately 0.8km to SSE.

Micro met characteristics

Residential house and the ESR centre will influence flow characteristics and may partly shield the intake tube and induce more turbulence into the flow. Wake effects from Mt Eden may also influence flow characteristics in the area.

Site description and area characteristics

Inlets on the roof of the ESR building, 40m SW of Mt Eden Rd. On the W side of Mt Eden Rd residential premises surround the ESR Science Centre. On the E side of Mt Eden Rd are commercial premises. Mt Eden summit (196m) is about 0.8km SSE. A railway track (aligned E-W) is about 200m to the north Residential to W (mostly larger older houses dating from 1920s with small sections, plus some later additions), commercial to E and N.

Air Quality Management Area

Urban

Predominant sources

Motor vehicles

Distance from road and other major sources

20m E to Mt Eden Rd (arterial road, aligned N-S); 200m (approximately) N to railway track (aligned E-W).

Vehicle counts

15,000 7-day ADT (1999)

Any nearby features that could affect measurements?

Street parking for shops on both sides of Kelly St and Mt Eden Rd.

AS/NZS 3580.1.1:2007 compliant?

Monitoring commenced

29.12.82

Monitoring ceased

31.01.01

Pollutants monitored

NO_x: 01.01.91 – 31.01.01

PM₁₀ (Partisol): 16.02.97 – 21.01.01

PM_{2.5}: 30.08.97 – 23.01.01

TSP: 29.12.82 – 24.01.01

Lead: 01.01.83 – 30.09.00



Partisol units on roof.

Inlet height (m)

5.0 NO_x

6.5 Particulate

Meteorological parameters measured on site

Nil – mast for instantaneous readings only – no records kept.

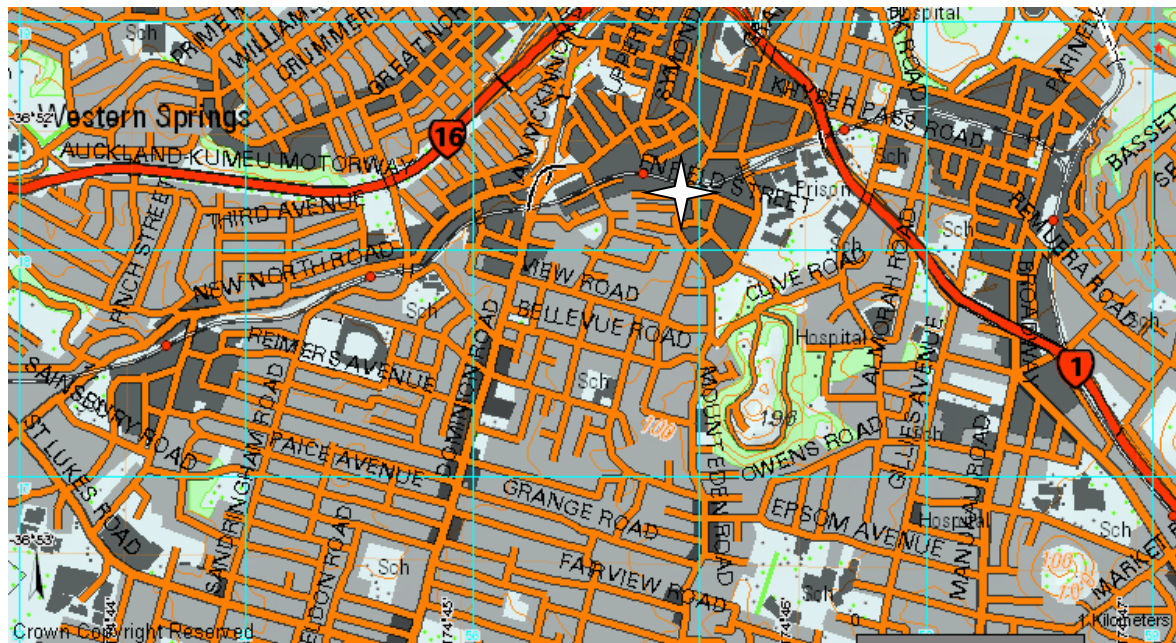
Mast height (m)

N/a

Data owner

Auckland Council own PM₁₀ and PM_{2.5} data

Ministry for the Environment own NO_x, TSP and lead data



Location map.

Source: NZ TopoOnline, extracted January 2006, Crown Copyright Reserved.

Mt Eden II (B)

Site name

Mt Eden II (B)
(Kelly St shed)

Address

17 Kelly St
Mt Eden, Auckland

	Easting	Northing	Elevation (m)
NZMG	2667325	6479718	86
NZTM	1756895	5918020	

General site characteristics

Urban

Topography

Flat in immediate area, undulating to hilly beyond. Mt Eden (summit 196m) approximately 700m to SSE.

Micro met characteristics

Surrounding buildings and tall trees may cause localised turbulence.

Site description and area characteristics

Air conditioned shed 40m SW of Mt Eden Rd in the grounds of ESR Science Centre (buildings demolished 2004). On the W side of Mt Eden Rd and to the S are residential premises (mostly larger older houses dating from 1920s with small sections, plus some later additions). On the E side of Mt Eden Rd and to the N are commercial premises. Mt Eden summit (196m) is about 0.7km SSE. A railway track (aligned E-W) is about 200m to the north.

Air Quality Management Area

Urban

Predominant sources

Vehicle

Distance from road and other major sources

20m E to Mt Eden Rd (arterial road, aligned N-S); 200m (approximately) N to railway track (aligned E-W)

Vehicle counts

15,000 7-day ADT (1999)

Any nearby features that could affect measurements?

Street parking for shops on both sides of Kelly St and Mt Eden Rd

AS/NZS 3580.1.1:2007 compliant?

No; trees taller than meteorological mast may influence parameters being monitored.



Site in grounds of former ESR Science Centre.

Monitoring commenced

06.02.01 (relocated from ESR building)

Monitoring ceased

17.01.06

Pollutants monitored

NO_x: 06.02.01 – 18.01.06

PM₁₀ (Beta Gauge): 17.07.02 – 18.01.06

PM₁₀ (Partisol): 08.02.01 – 20.12.05

PM_{2.5} (Partisol (sat)): 16.02.01 – 19.12.05

TSP (Partisol (sat)): 21.02.01 - 05.04.02

TSP/Pb (HD Med Vol): 14.02.01 - 27.10.04

Inlet height (m)

3 (gas)

3.5 (particulate)

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity.

Mast height (m)

6

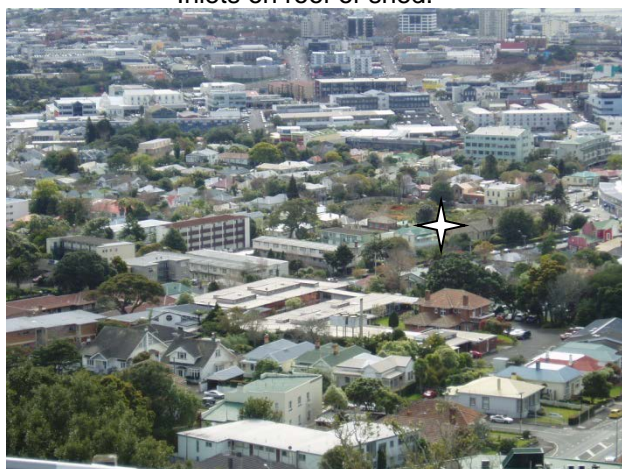
Data owner

Ministry for the Environment own PM₁₀ (Beta Gauge), NO_x, TSP and Pb data;

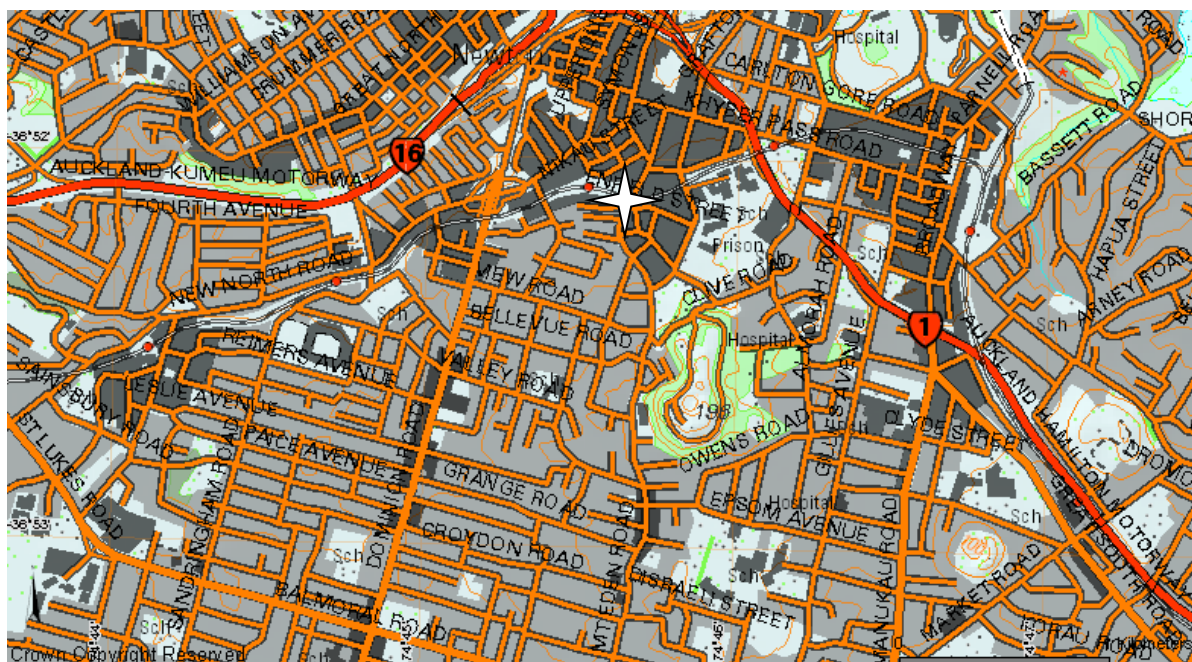
Auckland Council own PM₁₀ / PM_{2.5} (Partisol) data



Inlets on roof of shed.



View NW towards site from Mt Eden showing surrounding area characteristics. Photo taken 2005.



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Musick Point I

Site name

Musick Point I
(Gardener's Shed)

Address

Howick Golf Course
Musick Pt
Bucklands Beach, Manukau

	Easting	Northing	Elevation (m)
NZMG	2679940	6481040	25
NZTM	1769506	5919367	

General site characteristics

Urban



Site - inlet protruding from roof of gardener's shed.

Topography

The peninsula is undulating; bounded by steep cliffs that drop approximately 20m to harbour below.

Micro met characteristics

Wind flows from the N are likely to be influenced by the shed and nearby trees. The wakes from the roof edges will induce turbulence into the flow. However, the site is relatively well exposed to 'urban plume' emissions from central Auckland City (12km W).

Site description and area characteristics

Situated in groundskeeper's shed (22 x 7 x 3.5m) approximately 100m E of Tamaki River, and 1km S of the tip of Musick Point peninsula that protrudes N into the Hauraki Gulf. Sampling inlet extends from western end of the roof, about 1m above roofline. At base of peninsula is residential housing. Many mature trees <8m on the golf course that takes up the northern end of the peninsula. Houses at the southern end and in adjacent Bucklands Beach range from 80 to <5 years old; low to medium density with a range of section sizes. About 30% of houses have chimneys.

Air Quality Management Area

Urban

Predominant sources

Urban plume (predominantly industrial and vehicle emissions) – some emissions associated with groundskeepers' vehicles.

Distance from road and other major sources

35m E of golf course access road; 0.5km N of Musick Point Rd (residential street); 12km E of Auckland CBD.

Vehicle counts

N/a

Any nearby features that could affect measurements?

Large trees near shed

AS/NZS 3580.1.1:2007 compliant?

Monitoring commenced

17.01.96

Monitoring ceased

07.01.99

Pollutants monitored

NO_x: 09.07.96 – 14.08.98

Ozone: 17.01.96 – 07.01.99

Inlet height (m)

4.5

Meteorological parameters measured on site

Wind speed and wind direction

Mast height (m)

6

Data owner

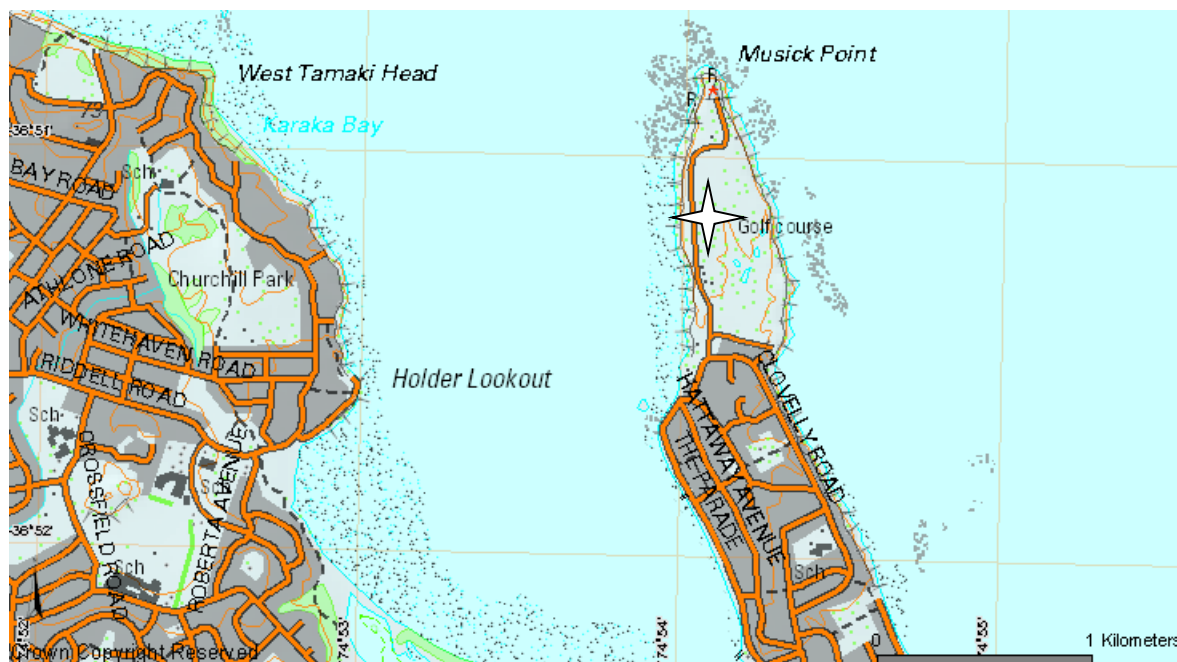
Auckland Council



Inlet extending from roof.



Analysing equipment inside shed.



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Newton

Site name

Newton
(Canada St –Mobile Trailer)

Address

Top Kids Daycare Centre
Canada Street
Newton, Auckland

	Easting	Northing	Elevation (m)
NZMG	2667275	6480996	60
NZTM	1756842	5919298	

General site characteristics

Urban

Topography

Steep slope down (S) to motorway gully and up (N) to Karangahape Rd.

Micro met characteristics

Steep slope and multi storey buildings to N may shelter from this direction.

Site description and area characteristics

In carpark of childcare centre on corner of Canada St and Mercury Lane. Surrounding area is predominantly commercial /light industrial.

Air Quality Management Area

Urban

Predominant sources

Vehicle

Distance from road and other major sources

Mercury St, (E) and Canada St (S) <20m; Southern motorway <70m S; Upper Queen St 100m E.

Vehicle counts

N/a

Any nearby features that could affect measurements?

Multi storey carpark adjacent to site to N; Southern Motorway with many off/on ramps to S.

AS/NZS 3580.1.1:2007 compliant?

No: but not deemed necessary as site purpose is to monitor peak pollutant levels and the effect on child care facility.



Mobile trailer in car park of child-care centre.

Monitoring commenced

03.07.02

Monitoring ceased

07.03.03

Pollutants monitored

CO: 03.07.02 – 03.03.03

NO_x: 10.07.02 – 06.03.03

PM₁₀ (Sequential Partisol): 16.07.02 – 31.12.02

Inlet height (m)

2.5

Meteorological parameters measured on site

Nil

Mast height (m)

N/a

Data owner

Auckland Council



View south over Southern Motorway from adjacent multi-level car park. Trailer not yet installed.



Site viewed from the west. Mobile trailer to be parked where silver car is in image.



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Northcote

Site name

Northcote

Address

Corner of Northcote Road and Akoranga Drive
Northcote
North Shore City

	Easting	Northing	Elevation (m)
NZMG	2666960	6487970	20
NZTM	1756513	5926270	

General site characteristics

Urban

Topography

Flat

Micro met characteristics

Surrounding land reasonably flat and exposed. Buildings in vicinity will introduce turbulence.

Site description and area characteristics

Telecom substation on southern corner of intersection between Akoranga Drive and Northcote Rd. TSP inlet on side of building, Partisol on roof of shed. Surrounding area is residential from S -NW; houses of mixed age but mostly dating from 1960s through 1990s. Wairau commercial/industrial park extends from 1km NNW. Northcote Rd motorway junction (SH1) 0.5km NE; Lake Pupuke 1.5km NE. Sports grounds and golf course to E and N.

Air Quality Management Area

Urban

Predominant sources

Vehicle and domestic

Distance from road and other major sources

15m E to Akoranga Drive (aligned NW-SE); 15m N to Northcote Rd. (aligned NE-SW).

Vehicle counts

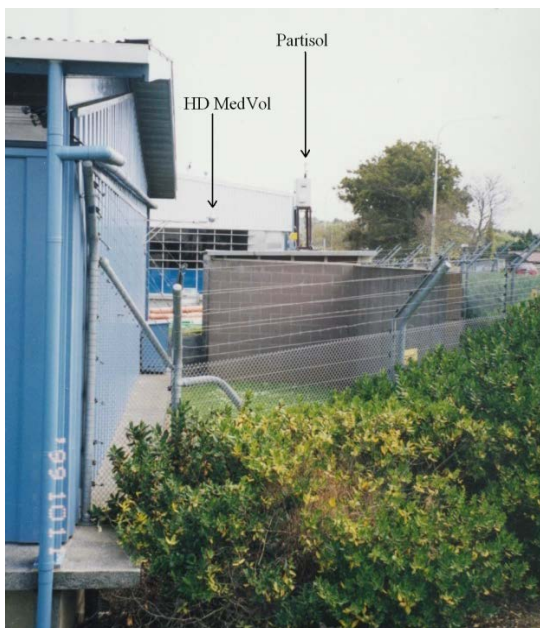
N/a

Any nearby features that could affect measurements?

Large tree close to intersection <10m N of site. Traffic queues for motorway often extend past site in morning rush hour. Service stations on W and N corners of intersection opposite site.

AS/NZS 3580.1.1:2007 compliant?

No; clear sky angle above HD MedVol inlet requirement not met.



HD Med Vol inlet attached to side of building;
Partisol inlet on roof of shed.

Monitoring commenced

24.08.83

Monitoring ceased

05.04.02

Pollutants monitored

TSP (HD MedVol): 24.08.83 – 03.04.02

TSP (Partisol): 25.02.98 – 05.04.02

Lead (HD MedVol): 31.10.93 – 30.06.99

Inlet height (m)

4 HD MedVol

3 Partisol

Meteorological parameters measured on site

Nil

Mast height (m)

N/a

Data owner

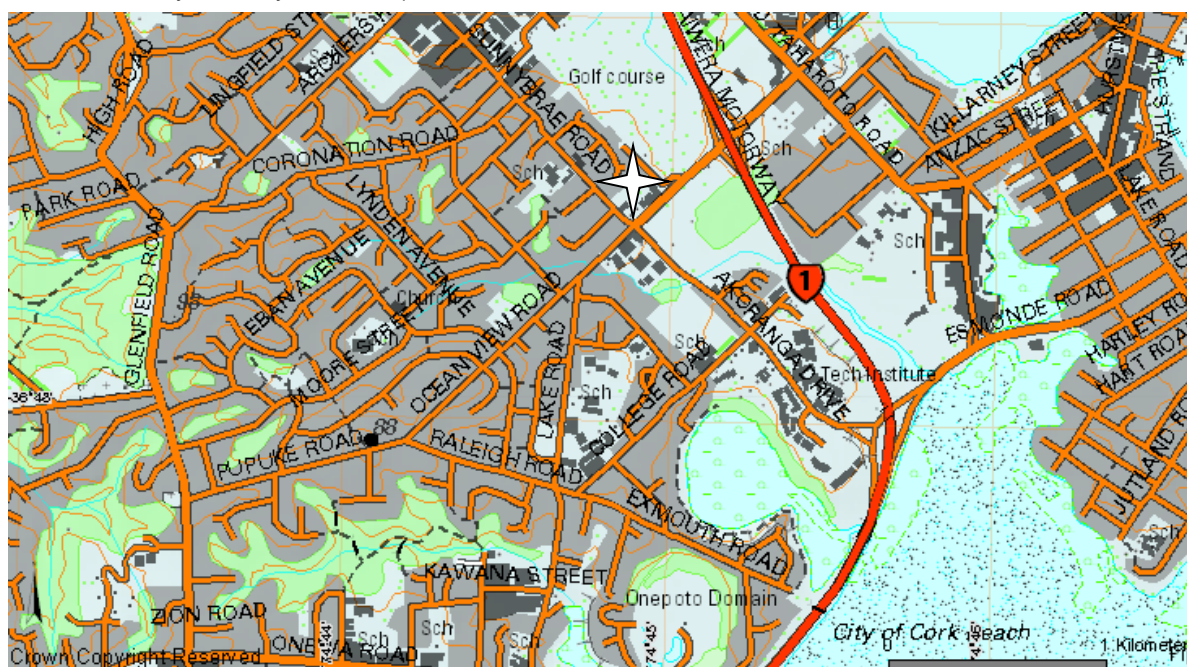
Auckland Council (HD MedVol data prior to 1983 owned by Ministry of Health)



Site viewed from north



Site from northeast side of Akoranga Drive



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

One Tree Hill

Site name

One Tree Hill

Address

One Tree Hill Domain
Manukau Rd
One Tree Hill, Auckland

	Easting	Northing	Elevation (m)
NZMG	2668553	6475786	70
NZTM	1758130	5914091	

No photo available

General site characteristics

Urban

Topography

Mostly flat/undulating to N, W and S; One Tree Hill (summit 183m) 1km NE; Three Kings 1.5km W

Micro met characteristics

Site description and area characteristics

Located in Watercare Services Ltd. shelter in western end of One Tree Hill Domain, within 20m of Manukau Rd, 80 m south of Lewin Rd. Residential to W and N, One Tree Hill Domain to NE (approximately 48 ha).

Air Quality Management Area

Urban

Predominant sources

Vehicles on roads in park and main roads near park

Distance from road and other major sources

Vehicle counts

N/a

Any nearby features that could affect measurements?

AS/NZS 3580.1.1:2007 compliant?

Monitoring commenced

12.02.96

Monitoring ceased

04.05.96

Pollutants monitored

NO_x

Inlet height (m)

Meteorological parameters measured on site

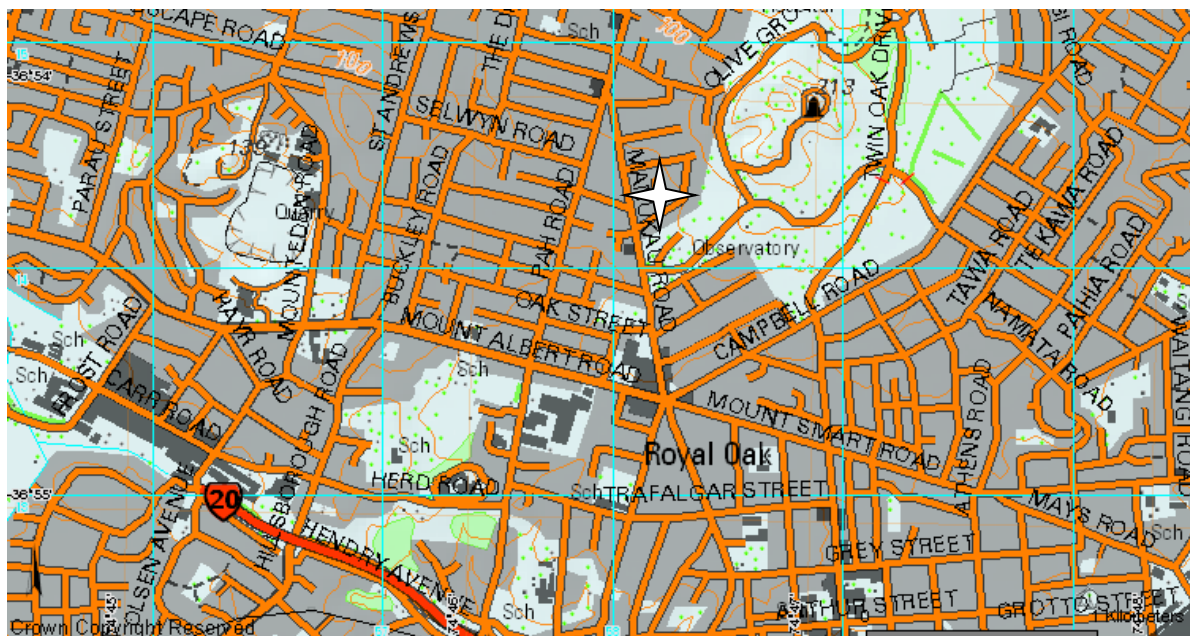
Nil

Mast height (m)

N/a

Data owner

Auckland Council



Location map.

Map sourced from NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Penrose I

Site name

Penrose I
(Great Sth Rd - Clinic Roof)

Address

Penrose Occupational Health Clinic
766 Great South Road
Penrose, Auckland

	Easting	Northing	Elevation (m)
NZMG	2672294	6475235	20
NZTM	1761872	5913547	

General site characteristics

Industrial

Topography

Flat

Micro met characteristics

Surrounding buildings to the NE, E and SE will shield the monitor and introduce turbulence.

Site description and area characteristics

On the eastern side of Great South Rd (a busy arterial road). On the opposite side of Great South Road are a train track and station. From NW-S and to the NE are industrial premises; residential to the N and SW. Houses date from 1930s onward; about 50% with chimneys.

Air Quality Management Area

Urban

Predominant sources

Vehicle and industry

Distance from road and other major sources

40m SW to Great South Road (arterial, aligned NW-SE; 330m NE to Southern Motorway (aligned NW-SE); 150m SE to Penrose Rd (aligned SW-NE). Railway line (aligned NNW-SSE) approximately 90m SW of site.

Vehicle counts

Great South Road: 18,000; Southern Motorway: 99,000 (7-day ADT-1998); [1981: Great South Rd N of site: 22,000 v/day; Great South Rd S of site: 14,500 v/day; Southern Motorway: 55,000 v/day; Penrose Rd 16,000 v/day]

Any nearby features that could affect measurements?

13m to the NE is a large 3 storey building and the ACI industrial plant is to the south east

AS/NZS 3580.1.1:2007 compliant?



Partisol inlets on roof; SO₂ attached to side of building (at right of image).

Monitoring commenced

31.01.64

Monitoring ceased

03.07.02

Pollutants monitored

PM₁₀ (HiVol): 28.04.94 – 09.10.01

PM₁₀ (Partisol): 12.10.01 – 12.04.02

PM_{2.5} (Partisol): 16.09.97 – 12.04.02

TSP (HD MedVol): 31.01.64 – 03.07.02

Lead (HD MedVol): 31.01.64 – 30.06.02

SO₂ (Wet Chem.): 20.07.75 – 27.12.00

Smoke: 20.07.75 – 27.12.00

NOx: 1987 - 1989



View south along Great South Road. Site on LHS of road on roof of clinic (photo taken in 1999).

Inlet height (m)

5.6 Particulate /Lead

4.0 SO₂ and Smoke

Meteorological parameters measured on site

Mast height (m)

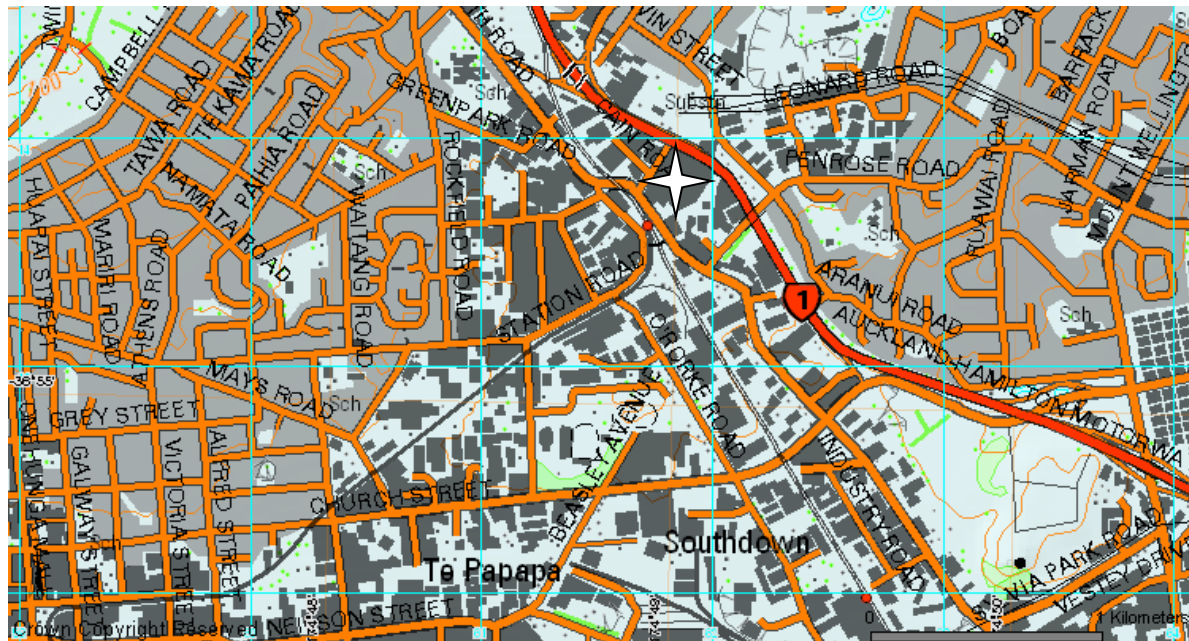
6

Data owner

Auckland Council own PM₁₀ and PM_{2.5} data

Ministry for the Environment and Ministry of

Health own the remaining data



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Penrose II (A)

Site name

Penrose II (A)
(Gavin St Substation - caravan)

Address

19 Gavin St
Penrose, Auckland

	Easting	Northing	Elevation (m)
NZMG	2672153	6475865	20
NZTM	1761730	5914177	



General site characteristics

Industrial

Topography

Flat

Micro met characteristics

Surrounding structures will both shield the monitor and introduce more turbulence into the flow.

Site description and area characteristics

Air conditioned caravan within the Gavin St substation, approximately 50m E of the Southern Motorway. The motorway is approximately 2m lower than the ground level at the monitoring site. To the NE-NW are industrial premises. To the north residential. Houses date from 1930s onward; about 50% with chimneys.

Predominant sources

Vehicle and industry

Distance from road and other major sources

50m W to Southern Motorway (aligned N-S)

Vehicle counts

99,000 (approx., 2001 information)

Any nearby features that could affect measurements?

Building adjacent to caravan - NE; Three stacks (300m S) at ACI Glass.

AS/NZS 3580.1.1:2007 compliant?

Monitoring commenced

1989

Monitoring ceased

October 2000

Pollutants monitored (past)

NO_x

Inlet height (m)

3.6

Meteorological parameters measured on site

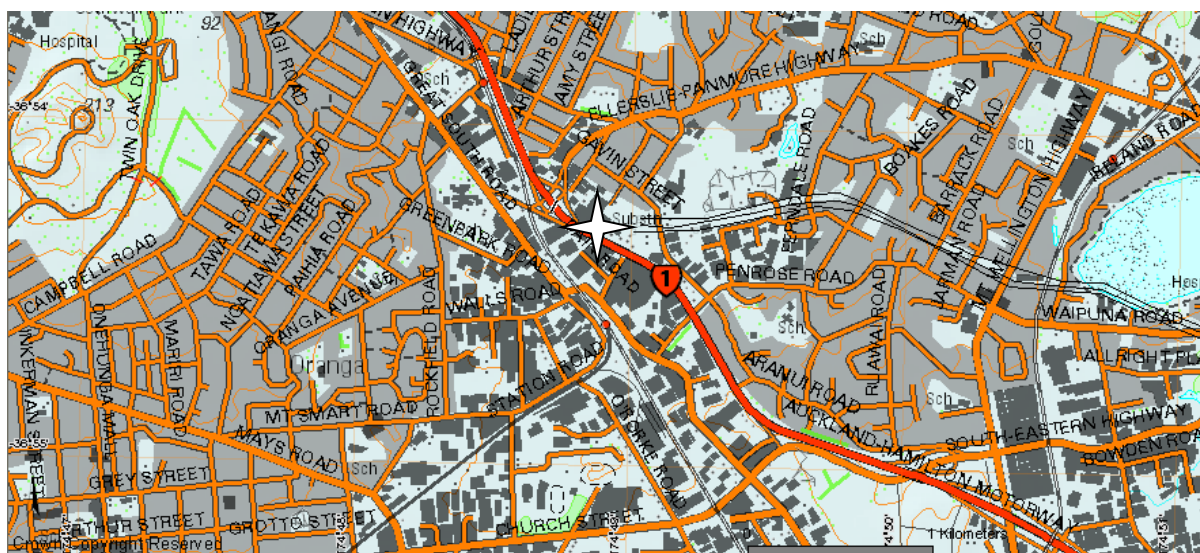
None

Mast height (m)**Data owner**

Ministry for the Environment



Analyser in caravan.



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Penrose III (A)

Site name

Penrose III (A)
(Great Sth Rd - ACI Trailer)

Address

ACI Glass
752 Great South Road
Penrose, Auckland

	Easting	Northing	Elevation (m)
NZMG	2672269	6475230	20
NZTM	1761847	5913542	

No photo available

General site characteristics

Industrial

Topography

Flat

Micro met characteristics

Buildings may affect airflow.

Site description and area characteristics

Temporary location in air conditioned mobile trailer until shed installation at same site - eastern side of Great South Rd (a busy arterial road). On the opposite side of Great South Road are a train track and station. From NW-S and to the NE are industrial premises; residential to the N and SW. Houses date from 1930s onward; about 50% with chimneys.

Air Quality Management Area

Urban

Predominant sources

Vehicle and industry

Distance from road and other major sources

15m SW to Great South Road (arterial, aligned NW-SE; 350m NE to Southern Motorway (aligned NW-SE); 160m SE to Penrose Rd (aligned SW-NE). Railway line (aligned NNW-SSE) approximately 70m SW of site.

Vehicle counts

Any nearby features that could affect measurements?

Immediately to the NE is a large 3 storey building and the ACI industrial plant is to the south east.

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

17.11.00

Monitoring ceased

28.08.01

Pollutants monitored

NO_x: 18.11.00 – 28.08.01

SO₂: 23.01.01 – 28.08.01

Inlet height (m)

3

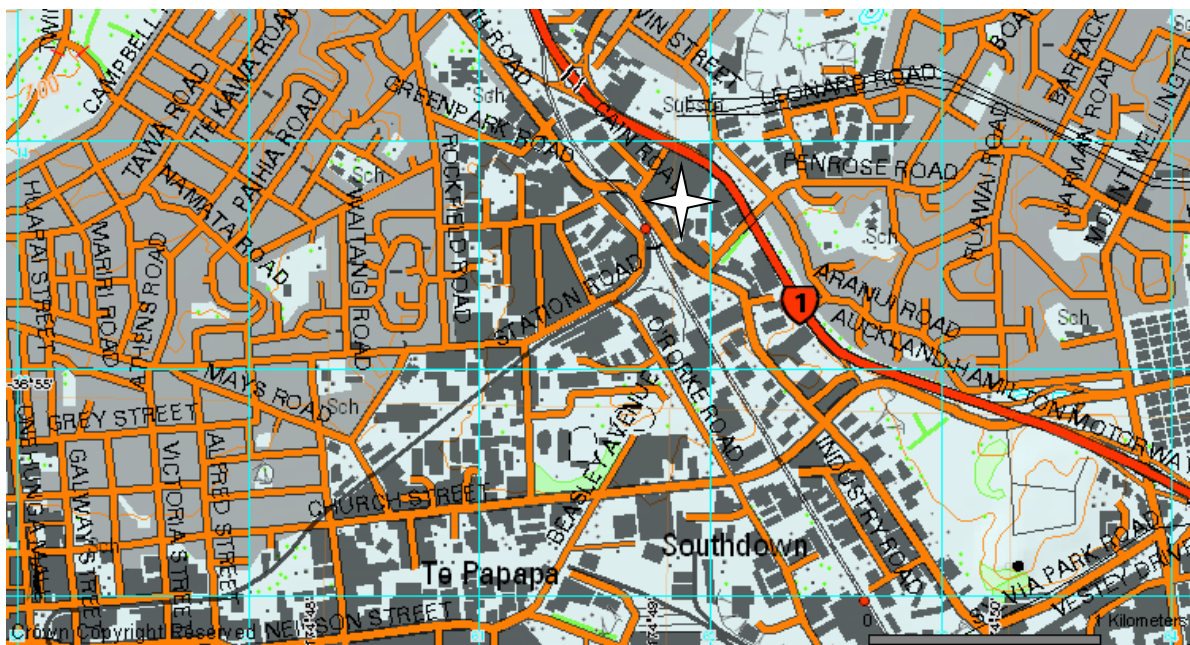
Meteorological parameters measured on site

Mast height (m)

Data owner

Auckland Council own NO_x data

Ministry for the Environment own SO₂ data



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Penrose III (B)

Site name

Penrose III (B)
(Great Sth Rd - ACI Shed)

Address

ACI Glass
752 Great South Road
Penrose, Auckland

	Easting	Northing	Elevation (m)
NZMG	2672269	6475230	20
NZTM	1761847	5913452	

General site characteristics

Industrial



View of site from north.

Topography

Flat

Micro met characteristics

Buildings likely to affect localised airflows

Site description and area characteristics

Eastern side of Great South Rd (a busy arterial road). On the opposite side of Great South Road are a train track and train station. From NW-S and to the NE are industrial premises; residential to the N and SW. Houses date from 1930s onward; about 50% with chimneys.

Air Quality Management Area

Urban

Predominant sources

Vehicle and industry

Distance from road and other major sources

15m SW to Great South Road (arterial, aligned NW-SE); 350m NE to Southern Motorway (aligned NW-SE); 160m SE to Penrose Rd (aligned SW-NE). Railway line (aligned NNW-SSE) approximately 70m SW of site.

Vehicle counts

Any nearby features that could affect measurements?

ACI plant to N and NE and a single storey building immediately to SE.

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

31.08.01

Monitoring ceased

17.05.04

Pollutants monitored

NO_x: 31.08.01 – 30.11.01

PM₁₀ (Partisol): 13.04.02 – 21.03.04

PM₁₀ (TEOM): 18.01.02 – 02.02.03

PM_{2.5} (Partisol): 12.04.02 – 21.03.04

TSP (HD MedVol): 25.09.02 – 17.05.04

Lead (HD MedVol): 01.06.03 – 17.05.04

SO₂ (Fluorescence): 31.08.01 – 30.01.04



Shed and surrounds from north west.

Inlet height (m)

3.5 Particulate;

3.0 gas

Meteorological parameters measured on site

Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

Mast height (m)

6

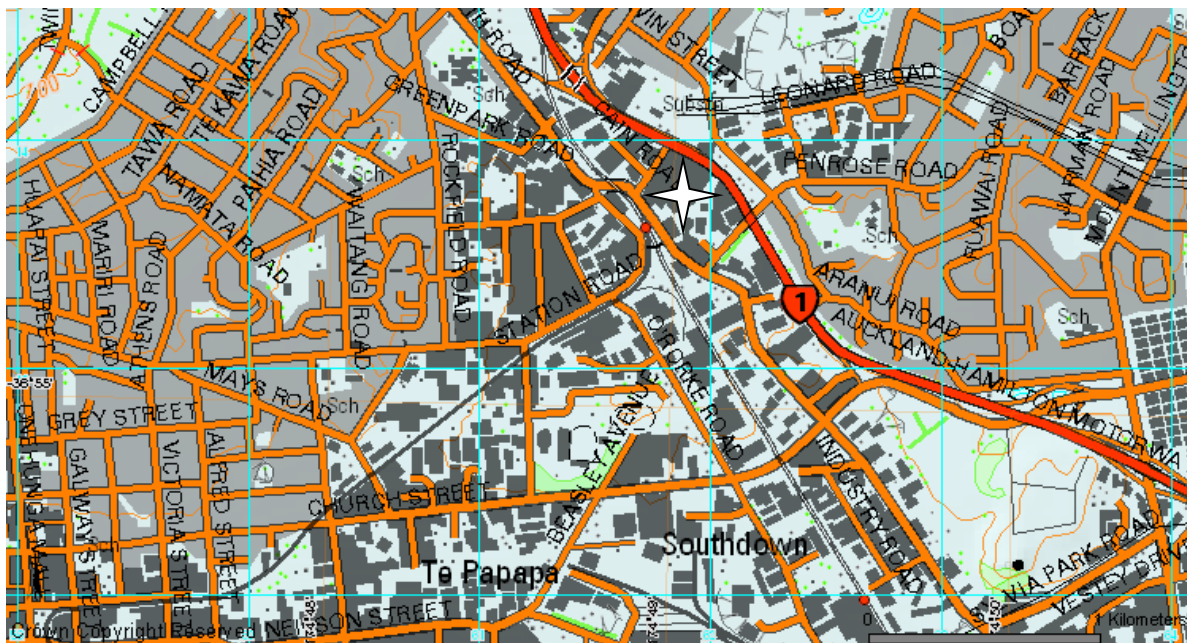
Data owner

Auckland Council own PM₁₀, PM_{2.5} and NO_x data.

Ministry for the Environment own the remaining data



Partisol hub and satellite inside shed.



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Penrose IV (Mobile Trailer)

Site name

Penrose IV - four locations
Gavin St (Mobile Trailer)

Address

19 Gavin St
Penrose, Auckland

Easting	Northing	Elevation (m)
---------	----------	---------------

These vary – see table on next page.

General site characteristics

Industrial

Topography

Flat

Micro met characteristics

Site is reasonably well exposed to winds from all directions, although there will be some sheltering from warehouse-size buildings to W.



Mobile trailer at site two.

Site description and area characteristics

This site has been operating since March 2004 and has had four locations in the grounds of the Transpower substation at Penrose. The monitoring equipment is located within an air conditioned mobile trailer, NE and (at present) approximately 15m from Southern Motorway. This site was established in order to compare monitoring data recorded at different proximities to the motorway and the permanent Ministry for the Environment site, also at the substation. Surrounding area is mostly light industry with some residential properties. Of the latter, many houses date from 1930s onward; approximately 50% with chimneys.

Air Quality Management Area

Industrial

Predominant sources

Vehicle and industry

Distance from road and other major sources

Varies; currently 15m NE of Southern Motorway, has been as far as 120m NE of motorway.

Vehicle counts

140,380 AADT (2005) SH1 EllersliePanmure Hwy to South Eastern Hwy

Any nearby features that could affect measurements?

Three stacks (300m S) at ACI Glass. Trees and substation structures may affect measurements at some locations.

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

05.03.04

Monitoring ceased

17.10.05

Pollutants monitored

CO: 01.04.04 to 17.10.05
NOx: 01.04.04 to 17.10.05
PM₁₀ (Beta Gauge): 04.10.05 to 17.10.05

Inlet height (m)

3.5

Meteorological parameters measured on site

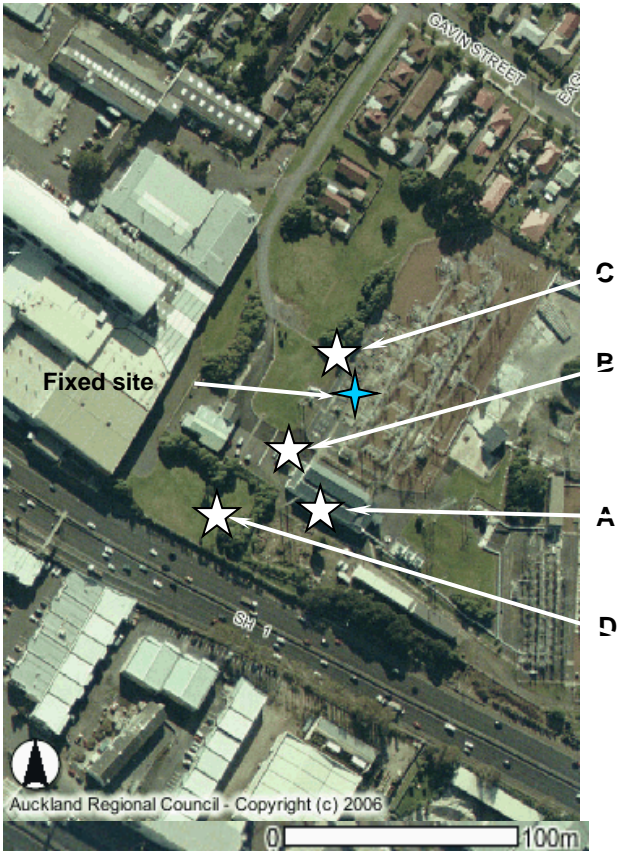
Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.

Mast height (m)

6

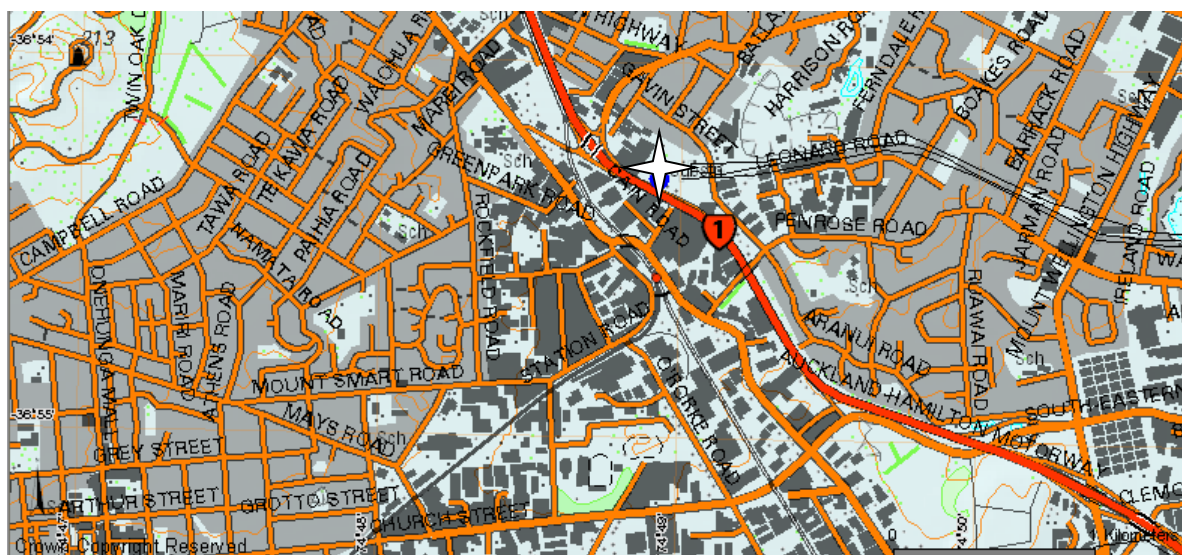
Data owner

Auckland Council



Locations of the four mobile trailer sites and the permanent site.

Site	NZMG		NZTM		Elevation (mast) (m)	Distance from road (m)	Start	Finish
	Easting	Northing	Easting	Northing				
A	2672164	6475797	1761741	5914109	32.4	46	05.03.04	16.06.04
B	2672136	6475820	1761713	5914132	30.4	62	16.06.04	07.10.04
C	2672167	6475889	1761744	5914201	33.5	125	08.10.04	09.03.05
D	2672089	6475799	1761666	5914111	38.8	15	09.03.05	17.10.05



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Queen St I

Site name

Queen St I
(Cruickshank and Miller)

Address

Cruickshank and Miller
(approx) 296 Queen St
Auckland City

	Easting	Northing	Elevation (m)
NZMG	2667760	6481926	<20
NZTM	1757325	5920228	

No photo available

General site characteristics

Urban

Topography

Queen St slopes down to N, Wellesley Street rises to E and W from Queen Street.

Micro met characteristics

Pollutants are likely to entrain within the urban canyon formed by the tall buildings on either side of the Queen St during calm conditions. Wind flows are also likely to be channelled along this corridor.

Site description and area characteristics

Eastern side of Queen St; just N of junction with Wellesley St. The surrounding area is the heart of the central business district. Albert Park (c. 8Ha) <150m to E.

Air Quality Management Area

Urban

Predominant sources

Vehicle

Distance from road and other major sources

10m SSW to Wellesley St.

Vehicle counts

Any nearby features that could affect measurements?

Within 20m of traffic-signal controlled intersection of Queen St and Wellesley St.

AS/NZS 3580.1.1:2007 compliant?

No; but not deemed necessary as site purpose is to monitor peak pollutant levels.

Monitoring commenced

25.09.75

Monitoring ceased

22.12.82

Pollutants monitored

TSP (HD MedVol)

Inlet height (m)**Meteorological parameters measured on site**

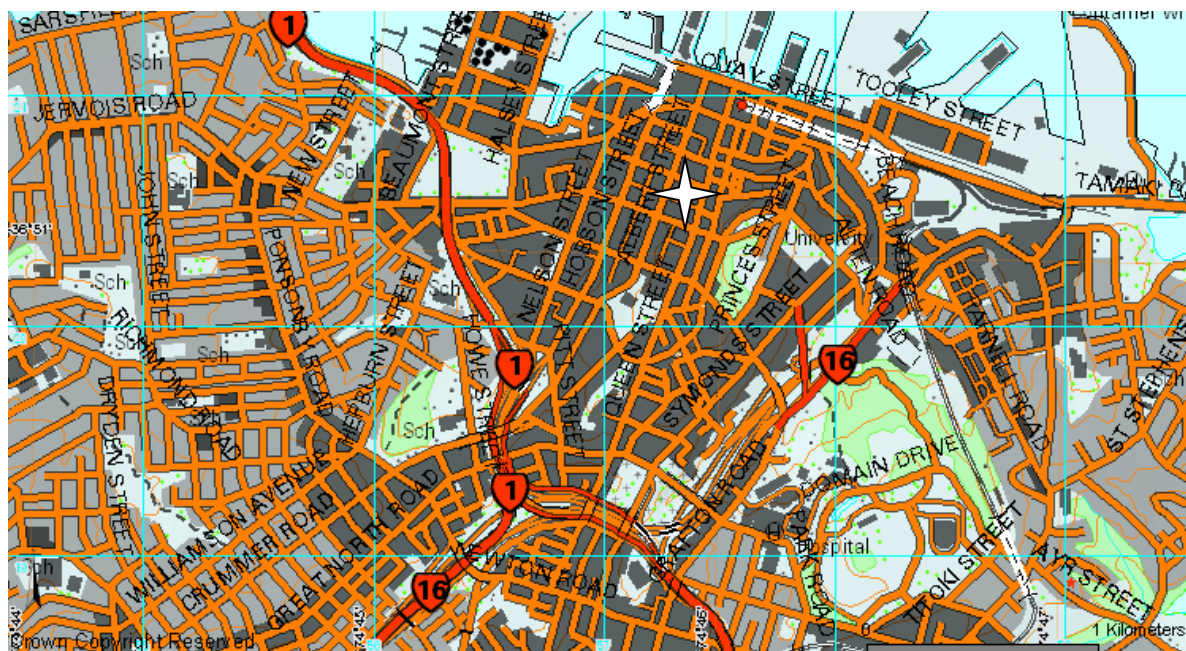
Nil

Mast height (m)

N/a

Data owner

Ministry of Health



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Queen St III

Site name

Queen St III
(Tisdalls)

Address

Tisdalls
176 Queen St
Auckland

	Easting	Northing	Elevation (m)
NZMG	2667865	6482213	15
NZTM	1757429	5920516	



General site characteristics

Urban

Inlet attached to veranda roof to left side of lamp post.

Topography

Queen St slopes gently down from N-S; Wyndham St and Victoria St both slope steeply towards Queen St.

Micro met characteristics

Pollutants are likely to be entrained within the urban canyon formed by the tall buildings on either side of the Queen St during calm conditions. Wind flows are also likely to be channelled along this corridor.

Site description and area characteristics

Eastern side of Queen St between Wyndham St and Victoria in Auckland's CBD. Both of these intersections are lighted. Queen St is located within a valley. The surrounding area is the heart of the central business district.

Air Quality Management Area

Urban

Predominant sources

Vehicle

Distance from road and other major sources

3m to Queen St

Vehicle counts

Any nearby features that could affect measurements?

Within 2m of street parking.

AS/NZS 3580.1.1:2007 compliant?

No; but not deemed necessary as site purpose is to monitor peak pollutant levels.

Monitoring commenced

01.01.91

Monitoring ceased

30.06.00

Pollutants monitored

CO

Inlet height (m)

3.5



URAS 3G CO analyser.

Meteorological parameters measured on site

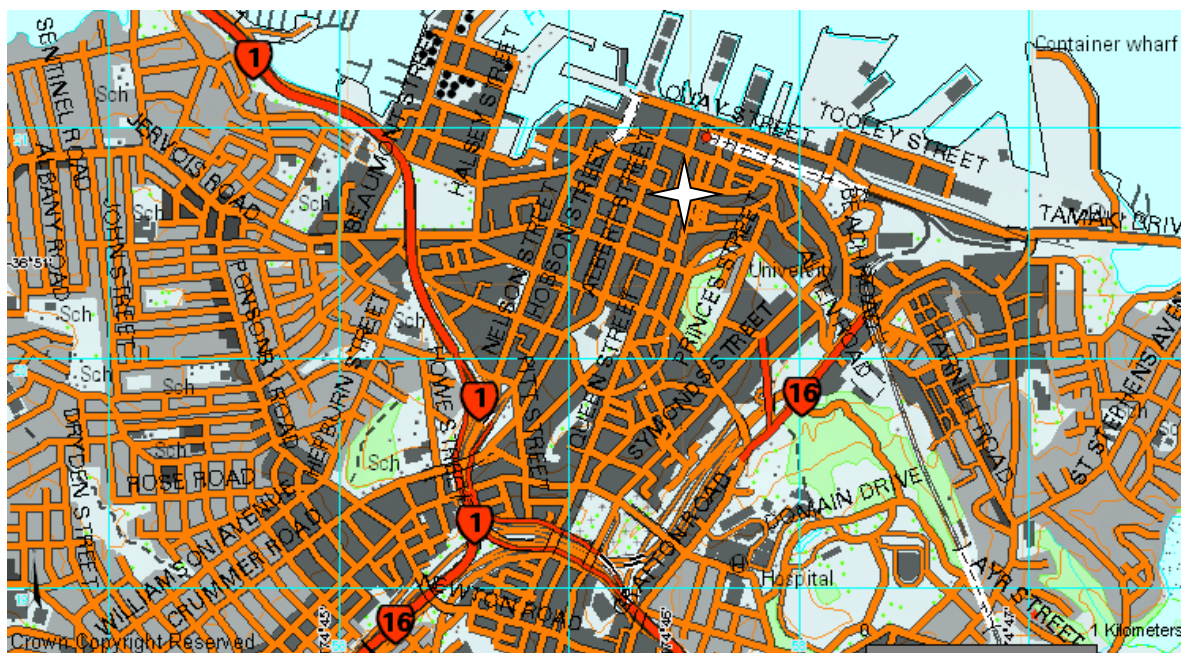
Nil

Mast height (m)

N/a

Data owner

Auckland Council



Location map.

Map sourced from NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Sky Tower

Site name

Sky Tower

Address

Sky City
Cnr Victoria and Federal Streets
Auckland

	Easting	Northing	Elevation (m)
NZMG	2667546	6482200	60
NZTM	1757110	5920502	

General site characteristics

Urban



Topography

The Sky Tower is on the crest of Victoria St (orientation WNW-ESE). Hobson and Federal Sts (orientation SSW-NNE) both slope down to N.

Micro met characteristics

Site is well exposed to winds from all directions.

Site description and area characteristics

The Sky Tower is located at the top of Victoria St West within Auckland's central business district. Numerous multi-story buildings are located near the site. However the sampling intake is located higher than the top of the surrounding structures. Inlet located in the top level of the 'pod' on sky tower.

Air Quality Management Area

Urban

Predominant sources

Urban Plume (predominantly industrial and vehicle emissions)

Distance from road and other major sources

100m S to Wellesley St (arterial, aligned NW-SE); 20m N to Victoria St (arterial, aligned NW-SE); 50m E to Hobson St (arterial, aligned SW-NE)

Vehicle counts

N/a

Any nearby features that could affect measurements?

The inlet is located above all surrounding structures

AS/NZS 3580.1.1:2007 compliant?

Monitoring commenced

03.04.98

Monitoring ceased

29.03.04

Pollutants monitored

Ozone

Inlet height (m)

250

Meteorological parameters measured on site

Wind speed, wind direction, temperature

Mast height (m)

318 above MSL (sensors on second 'crows nest')

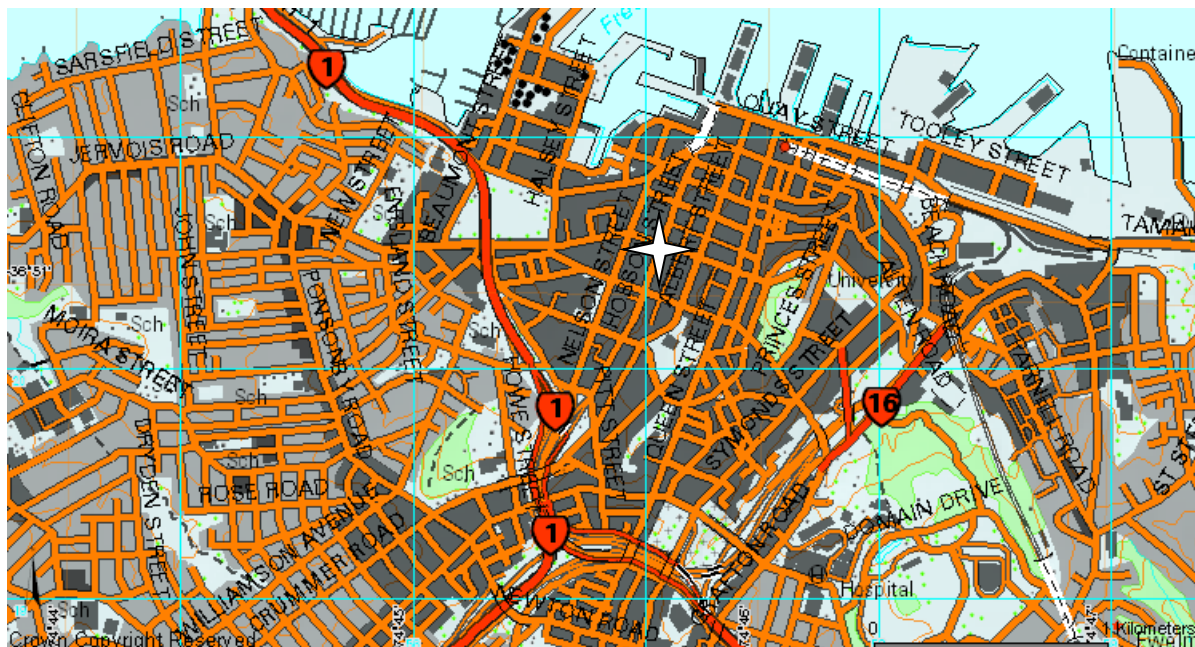
Data owner

Auckland Council

NIWA owns meteorological data from Sky Tower



Site



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Takapuna II

Site name

Takapuna II
(Lake Rd)

Address

488-490 Lake Rd
Takapuna, North Shore City.

	Easting	Northing	Elevation (m)
NZMG	2668516	6488868	<20
NZTM	1758067	5927171	

General site characteristics

Urban

Topography

Flat

Micro met characteristics

Surrounding buildings may cause localised turbulence. Monitor may be shielded from SW wind flows by multi-storey building immediately opposite.



Monitor attached to pole on east side of Lake Road.

Site description and area characteristics

Monitor is attached to a power pole on the kerb. Lake Road runs through the heart of Takapuna's shopping precinct. Most buildings in immediate vicinity (within a circle of 300m radius) are low-rise (3-6 storeys) business/commercial premises. Residential houses, townhouses and apartments beyond. Takapuna Beach approximately 350m E, Lake Pupuke 550m to NW. Note that photos are representative only as they are of the previous site; monitor is a now approximately 25m north of position shown.

Air Quality Management Area

Urban

Predominant sources

Vehicle

Distance from road and other major sources

<1m; Monitor is attached to a power pole that extends from the kerb on Lake Rd (aligned NNW-SSE; one lane each way plus bus stop either side).

Vehicle counts

N/a

Any nearby features that could affect measurements?

Car park (approximately 80 car capacity) immediately E of site. Bus stops are either side of road. A 6 storey building is 15m across the road to SW. Some high rise buildings <300m to S.

AS/NZS 3580.1.1:2007 compliant?

No; <5m from traffic lane.

Monitoring commenced

16.06.03

Monitoring ceased

30.06.07

Pollutants monitored

PM₁₀MicroVol (non regulatory method)

Inlet height (m)

2.5

Meteorological parameters measured on site

Nil

Mast height (m)

N/a

Data owner

Auckland Council



View north west along Lake Road. This photo is taken from the old site. The new location of monitor is attached to next power pole on the near side of the road.



Car park immediately east of monitor.



Location map.

Source: NZTopoOnline, extracted January 2006, Crown Copyright Reserved.

Waiheke Island (Mobile Trailer)

Site name

Waiheke Island (Mobile Trailer)

Address

Corner of Hamilton Drive and Beatty Parade
41 Hamilton Rd
Waiheke

	Easting	Northing	Elevation (m)
NZMG	2691457	6487944	20
NZTM	1780993	5926297	

General site characteristics

Residential

Topography

Undulating to hilly

Micro met characteristics

Site has unrestricted airflow with >120° clear sky angle. Surrounding shrubs and small trees may influence wind flows.



Site, looking west towards the mainland.

Site description and area characteristics

Air conditioned shed located in a valley area in the midst of a densely residential suburb. The site is in an older residential area (where wood burning for home heating is used), in a valley (which may cause pollutants to build up over winter time), and on the south side of the island (which, if it occurs, is more likely to be affected by polluted air coming from central Auckland). The location also meets the siting criteria for air quality monitoring (away from large buildings and trees, nearby power supply available and no major emissions sources nearby)

Air Quality Management Area

Residential

Predominant sources

Residential home heating.

Distance from road and other major sources

6m from Hamilton Drive.

Vehicle counts

N/a

Any nearby features that could affect measurements?

Nearby trees of moderate height >20m north of site.

AS/NZS 3580.1.1:2007 compliant?

Yes

Monitoring commenced

16.02.09

Monitoring ceased

21.12.10

Pollutants monitored

NO_x: 16.02.09 to 20.12.10

PM₁₀ (Beta Gauge): 16.02.09 to 20.12.10

PM_{2.5} (Beta Gauge): 16.02.09 to 20.12.10

Ozone: 16.02.09 to 21.12.10

Inlet height (m)

4

Meteorological parameters measured *

Wind speed, wind direction, standard deviation of wind direction, solar radiation, relative humidity, rainfall and ambient temperature.

Mast height (m)

6

Data owner

Auckland Council



Site viewed from the south.



Aerial view of site.

Source: Auckland Council GIS Viewer, extracted September 2010.



Location map.

Source: Auckland Council GIS Viewer, extracted April 2013.

Waiuku (Mobile Trailer)

Site name

Waiuku (Mobile Trailer)

Address

Massey Park
1 Kent Street,
Waiuku, Auckland

	Easting	Northing	Elevation (m)
NZMG	2663829	6437197	15
NZTM	1753480	5875495	

General site characteristics

Rural town



Site - viewed from the north.

Topography

Micro met characteristics

Site description and area characteristics

The site is located on the Massey Park in the southwest corner of Queen Street and Kent Street. It is in the midst of a residential suburb.

Air Quality Management Area

Urban

Predominant sources

Residential home heating

Distance from road and other major sources

10m

Vehicle counts

N/a

Any nearby features that could affect measurements?

AS/NZS 3580.1.1:2007 compliant?

Yes.

Monitoring commenced

17.02.09

Monitoring ceased

07.01.10

Pollutants monitored

NOx: 17.02.09 – 20.02.10

PM₁₀ (Beta Guage): 17.02.09 – 20.02.10

PM_{2.5} (Beta Guage): 17.02.09 – 20.02.10

Inlet height (m)

5

Meteorological parameters measured on site

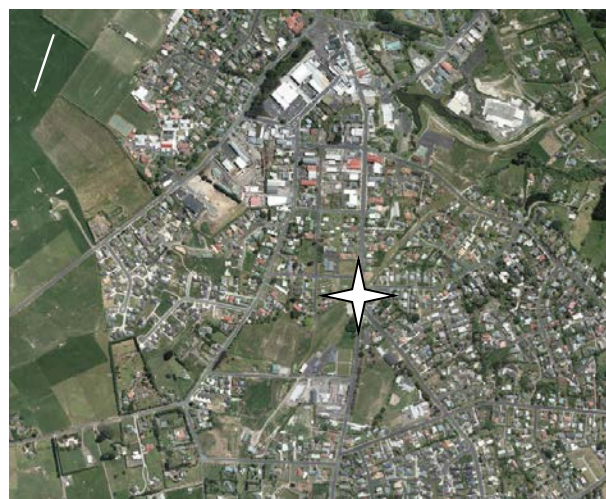
Wind speed, wind direction, ambient temperature, relative humidity, solar radiation, rainfall.

Mast height (m)

6

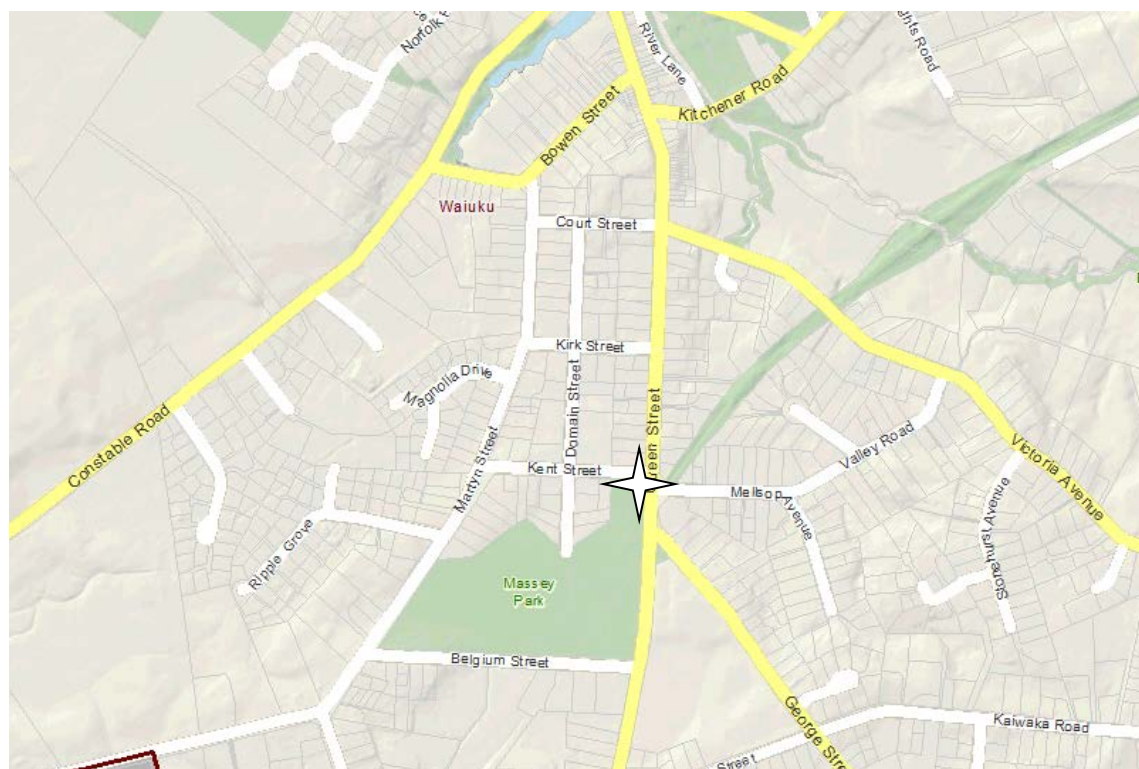
Data owner

Auckland Council



Aerial view of site.

Source: Auckland Council GIS Viewer, extracted May 2013.



Location map

Source: Auckland Council GIS Viewer, extracted May 2013.

Appendix 2. Explanation of metadata

Easting and Northing

- NZ Map Grid coordinates (NZMG). Source: LINZ Digital Cadastral Database. Accuracy $\pm 20\text{m}$
- NZ Transverse Mercator coordinates (NZTM). Source: LINZ

The NZTM projection, based on the New Zealand Geodetic Datum 2000 (NZGD2000), has superseded the NZMG. For each site in this report, the NZMG coordinates are given before the converted NZTM coordinates.

Elevation

For all current sites except Botany Downs, Glen Eden (Ceramco Park), Queen Street, Highbury Bank Street and Takapuna Lake Road elevation is estimated using a hand-held GPS. For old sites and those listed above, the elevation is estimated to the nearest 20m contour from NZ TopoOnline (www.nztopoonline.linz.govt.nz) accessed January 2006. [Contains data sourced from Land Information New Zealand. Land Information New Zealand gives no warranty in relation to the data (including accuracy, reliability, completeness or suitability) and accepts no liability (including, without limitation, liability in negligence) for any loss, damage or costs relating to any use of the data. Crown Copyright Reserved.]

General site characteristics

A general indication of the area the site is to represent.

Topography, micro met characteristics, site description and area characteristics

Observations from field notes made by Auckland Council or contractors visiting site.

Air Quality Management Area

These are the air quality management areas as specified in the Proposed Regional Plan: Air, Land and Water⁸.

Vehicle counts

⁸See AC (2012)

Sourced from Opus, Transit New Zealand, NZ Transport Agency, Auckland Transport and local councils.

AS/NZS 3580.1.1:2007 – 2007 Australia/New Zealand Standard Methods for sampling and analysis of ambient air: Guide for the siting of air monitoring equipment.

This standard has slightly different recommendations depending on the pollutant being measured, and whether the station is peak, neighbourhood or background. Most common stipulations relate to the distance to nearest object above the height of the inlet or to the nearest traffic lane, the clear sky angle above the inlet, and the inlet height above the ground. This document classifies each site as compliant or not; if not, the reasons are identified. For many sites (Lincoln Road, Khyber Pass, Mount Eden Kelly Street, Musick Point., Pakuranga, Penrose ACI (shed), Penrose Gavin Street Substation, Pukekohe, Queen Street, Takapuna (Westlake), Whangaparaoa and Canada Street. (mobile trailer)) site compliance assessments were made from site visits in August 2002⁹. For the remainder of the current sites, an ARC Air Quality Team member made an assessment of compliance with the standard during site visits in 2005. A full description of site criteria can be found in Manuell, 2000¹⁰.

Start/finish dates

These are for the site only and may vary for individual pollutant monitoring at each site.

Site naming convention

Different sites in the same area are denoted by roman numerals (e.g. I, II, III) following the site name.

Different locations of the same site are denoted by letters (e.g. A, B, C) following the site name.

⁹See Lose and Davy (2003) ,

¹⁰See Manuell, D (ed) (2000