National Environment Protection Measure For Ambient Air Quality

Monitoring Plan for Tasmania

May 2001

This Monitoring Plan has been prepared in accordance with the protocol of the National Environment Protection Council (Ambient Air Quality) Measure (1998). The Plan documents monitoring which will be undertaken in the State of Tasmania to determine compliance with the Standards and Goal of the Measure.

Department of Primary Industries, Water and Environment

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ACRONYMS

ABS	Australian Bureau of Statistics
AMG	Australian Map Grid
AS	Australian Standard
CBD	Central Business District
CO	Carbon Monoxide
DEPWA	Department of Environmental Protection, Western Australia
F	Fluorescence
GRUB	Generally Representative Upper Bound for Community Exposure
IR	Non Dispersive Infra Red
masl	Metres Above Sea Level
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure (on Ambient Air Quality)
NO_2	Nitrogen Dioxide
NPI	National Pollutant Inventory
O_3	Ozone
Pb	Lead
PM_{10}	Particulate Matter up to 10 Microns (1 Micron = 10^{-6} Metre) Aerodynamic Diameter
ppm	Parts per Million by Volume
PRC	Peer Review Committee
SO_2	Sulfur Dioxide
TEOM	Tapered Element Oscillating Microbalance
TSP	Total Suspended Particles
$\mu g/m^3$	Micrograms (1 Microgram = 10^{-6} grams) per cubic metre of air referenced to a temperature of 0 degrees Celsius and an absolute pressure of 101.325 kilopascals.
UV	Ultra Violet

GLOSSARY

Accreditation In the context of the Air NEPM, the operator of a performance monitoring station must be accredited by the National Association of Testing Authorities (or equivalent) to ensure adequate monitoring, quality assurance and validation procedures.

Aerodynamic Diameter The diameter of a sphere of unit density which has the same terminal falling speed in air as the particle under consideration.

Air NEPM A shortened reference to the National Environment Protection Council Measure on Ambient Air Quality.

Air Emissions Inventory An estimate of the amount of individual substances emitted into the atmosphere.

Air Monitoring The sampling of air to determine the concentration of one or more substances.

Air Pollutant In the context of the Air NEPM, any substance in air that could, in high enough concentrations, harm human health and well being.

Air Quality The condition of the air compared to some benchmark or standard.

Airshed An area that is defined by natural or topographic features affecting air quality. Once a substance is emitted into an airshed, it is contained therein for a reasonable period of time.

Ambient Air The surrounding outside air at a specified location (i.e. excluding the air inside buildings or structures).

Generally Representative Upper Bound Station Station that is located so as to monitor the upper bound of the distribution of pollutant concentration likely to be experienced by portions of the population, while avoiding the direct impacts of localised pollutant sources. By using such stations to monitor the ambient air across a region, the community can be reasonably sure that, if the Standards of the Measure are met at such sites, then most of the total population of the region will be exposed to air that complies with the Standards. In this way, the Measure's aim of equivalent environmental protection is assured.

Goal In the context of the Air NEPM, an aim that relates to the desired environmental outcomes and guides the formulation of strategies for the management of human activities that may affect the environment. The Goal of the Air NEPM is to achieve the Standards, to the extent specified, by 2008.

Katabatic Downward flow of cooler air. Katabatic flows drain down a valley analogous to stormwater.

Measure A shortened reference to the National Environment Protection Council Measure on

Ambient Air Quality.

Monitoring Method In the context of the Air NEPM, specified Australian Standard Methods should be used for monitoring pollutants. Other methods may be used if they meet the criteria specified by the Measure.

NEPM Formula A mathematical formula for calculating the number of performance monitoring stations for a region with a population of 25,000 people or more.

NEPM Standards and Goal Standards and Goal reported in Schedule 2 of Air NEPM as follows:

Pollutant	Averaging Period	Maximum Concentration	Goal Within 10 Years Maximum Allowable Exceedences
Carbon monoxide	8 hours	9.0 ppm	1 day a year
Nitrogen dioxide	1 hour 1 year	0.12 ppm 0.03 ppm	1 day a year none
Photochemical oxidants (as ozone)	1 hour 4 hours	0.10 ppm 0.08 ppm	1 day a year 1 day a year
Sulfur dioxide	1 hour 1 day 1 year	0.20 ppm 0.08 ppm 0.02 ppm	1 day a year 1 day a year none
Lead	1 year	0.50 µg/m^3	none
Particles as PM_{10}	1 day	50 µg/m^3	5 days a year

Peer Review Committee A committee set up by Ministers to advise on the adequacy of jurisdictional monitoring plans and provide advice on technical issues related to the consistent implementation of the Measure's monitoring protocol.

Performance Monitoring Station In the context of the Air NEPM, a monitoring station used to measure achievement against the Goal. Such a station should be operated in the same location for at least 5 years.

Photochemical Oxidants Reactive substances (oxidants) formed from the action of sunlight on mixtures of organic compounds and oxides of nitrogen. The most significant photochemical oxidant is ozone.

Pollution The presence of one or more substances at a concentration that can cause harmful or undesired effects.

Particle/Particulate Any substance (except pure water) that exists as a liquid or solid in the atmosphere and is of microscopic size. In the context of the Air NEPM, only particles with an aerodynamic diameter up to 10 microns are included in the Standard.

Region In the context of Monitoring Plans for the Air NEPM, a geographical area where the air quality (for a particular pollutant) is determined either entirely or in a large part by the influence of a common collection of anthropogenic emission sources.

Screening A term used to refer to the assessment and demonstration that for a given region and pollutant, fewer monitoring stations than indicated by the Air NEPM formula (possibly zero) are required.

Standard In the context of the Air NEPM, a prescribed level of air quality for the adequate protection of human health and well being. The Air NEPM Standards consist of quantifiable characteristics of the air against which ambient air quality can be assessed.

Substance Gas, particle or liquid either of natural or man-made origin.

TAPM Consultancy Consultancy involving the atmospheric modelling of ozone and nitrogen dioxide for a representative regional centre. The results of this Consultancy may provide data for the screening assessment of pollutants in regional centres.

Total Suspended Particles Particles of up to about 50 microns aerodynamic diameter.

Trend Station In the context of the Air NEPM, a station for monitoring and assessing long term changes (over one or more decades) in ambient air quality at a given location. Such a station should be operated in the same location for one or more decades.

Wind Rose A diagrammatic summary of wind speed and direction for a given location. The number in the centre of each wind rose represents the frequency of calm conditions, defined as winds below 1m/s. The overall length of the segmented vanes represents the proportion of winds coming from each compass point.

EXECUTIVE SUMMARY

In 1998, the National Environment Protection Council (NEPC), made the Measure on Ambient Air Quality. The Measure established a set of Standards and Goal for six air pollutants to allow for the adequate protection of human health and well being. Moreover, the Measure outlined the methods by which these pollutants are to be measured, assessed and reported.

The pollutants covered by the Measure are photochemical oxidants (as ozone, O_3), nitrogen dioxide (NO_2), particles (as particulate matter up to 10 microns aerodynamic diameter, PM_{10}), carbon monoxide (CO), sulfur dioxide (SO_2) and lead (Pb).

A formal requirement of the Measure, is the establishment of monitoring procedures and commencement of assessment and reporting, in accordance with the protocol of the Measure, within three years after its commencement.

This document presents Tasmania's plan for monitoring, assessment and reporting on the NEPC Measure on Ambient Air Quality.

Based on a consideration of the protocol of the Measure and a series of Guideline Papers established by the Peer Review Committee, it is demonstrated that in Tasmania, monitoring is not required for all six pollutants. The monitoring proposed for Tasmania is summarised in Table ES-1 below.

TABLE ES-1
NEPC MEASURE ON AMBIENT AIR QUALITY, MONITORING FOR TASMANIA

Region	Station Locality/Note	PM_{10} (TEOM)[a]	PM_{10} (High Volume Sampler)	CO (IR)[a]	SO_2 (F)[a]
Hobart	Prince of Wales Bay	P & T		P & T	
	To be determined				P & T (Scheduled for 2003)
Launceston	Ti Tree Bend		P & T		
Devonport	Performance monitoring requirement will be assessed after conducting campaign monitoring		C (Scheduled for 2003)		

a. Measurement method for each pollutant in brackets:
TEOM Tapered Element Oscillating Microbalance
IR Non Dispersive Infrared
F Fluorescence

P & T. Performance and Trend Monitoring Station (single station only).

C. Campaign Monitoring.

Under the proposed monitoring plan, daily monitoring of particles (as PM_{10}) will be conducted in both Hobart and Launceston. The need to monitor particles on a similar basis in Devonport will be evaluated after the results of campaign monitoring, scheduled for the winter of 2003, are assessed. Moreover, the need to conduct monitoring for carbon monoxide in each Region, will be evaluated after the assessment of monitoring results for Hobart.

For sulfur dioxide, the assessment conducted as part of this monitoring Plan, demonstrates that monitoring is only required in Hobart. Tasmania's schedule for establishing a performance monitoring station for SO_2 in Hobart is December 2003.

Tasmania is committed to providing NATA (National Association of Testing Authorities) accredited data for NEPM reporting purposes. Tasmania has set a goal of commencing operation of its air quality monitoring activities in accordance with NATA practices not later than 2003. If this target is met, it is reasonable to expect that Tasmania could achieve formal NATA accreditation for its Air NEPM monitoring and reporting requirements by December 2004.

1 INTRODUCTION

On the 26 June 1998, the National Environment Protection Council (NEPC), consisting of Commonwealth, State and Territory Ministers, made the Measure (NEPM) on Ambient Air Quality (NEPC, 1998; hereafter referred to as the Measure). The Measure established a set of Standards and Goal for six air pollutants, and outlined the methods by which these pollutants are to be measured, assessed and reported.

The pollutants covered by the Measure are photochemical oxidants (as ozone, O_3), nitrogen dioxide (NO_2), particles (as particulate matter up to 10 microns aerodynamic diameter, PM_{10}), carbon monoxide (CO), sulfur dioxide (SO_2) and lead (Pb).

A formal requirement of the Measure, is the establishment of monitoring procedures and commencement of assessment and reporting, in accordance with the protocol of the Measure, within three years after its commencement.

After making the Measure, the Ministers resolved to establish a Peer Review Committee (PRC) to advise on jurisdictional monitoring plans. Under its terms of reference, the PRC has two complementary roles. First, the PRC is required to advise the NEPC on the adequacy of monitoring plans submitted by jurisdictions. Secondly, it provides advice on technical issues related to the consistent implementation of the Measure's monitoring protocol. The PRC has developed a series of guideline papers that provide a basis for the preparation of individual monitoring plans (by jurisdictions) and for the assessment of monitoring plans (by the PRC).

It should be noted that the monitoring conducted as part of the requirements of the Measure, may represent only a sub-set of the total ambient air monitoring program of some jurisdictions.

This document presents Tasmania's submission on how it plans to monitor, assess and report air quality for the purposes of the Measure. The document is structured according to the format specified by the PRC (PRC, 2000a). This includes a consideration of:

- Regions to be monitored;
- Monitoring requirements of each region, including (as appropriate) physical and demographic characterisation, emission sources, air quality, identification of pollutants not required to be monitored, and monitoring network;
- Siting and instrumentation;
- Accreditation; and
- Reporting.

2 SELECTION OF REGIONS

In order to provide guidance and facilitate a consistent and transparent selection of regions by jurisdictions, the PRC has provided the following definition of a region:

'*a region for the purposes of performance monitoring is a geographical area where the air quality (for a particular pollutant) is determined either entirely or in a large part by the influence of a common collection of anthropogenic emission sources*'.

Under Clause 14 of the Measure, performance monitoring may be required in regions with a population exceeding 25,000 people.

Moreover, the PRC has produced a guidance document for jurisdictions on the selection of regions (PRC Guideline Paper No.2; PRC 2000b). This document notes that there are three types of regions, namely:

Type 1 A large urban or town complex with a population in excess of 25,000 requiring direct monitoring and contained within a single airshed;

Type 2 A region with no one population centre above 25,000 but with a total population above 25,000 and with significant point source or area based emissions as to require a level of direct monitoring; and

Type 3 A region with a population in excess of 25,000 but with no significant point or area based emissions, so that ancillary data can be used to infer that direct monitoring is not required.

The PRC (PRC, 2000b) consider the ABS 'urban centre' population data to provide a transparent basis for the identification of potential Type 1 regions. Re-classification of a Type 1 region to Type 3 must be supported by arguments based on local knowledge. Identification of Type 2 regions is also reliant on local knowledge of emission sources and airshed characteristics.

2.1 TASMANIAN REGIONS

The State of Tasmania consists of a group of islands whose total area is approximately 0.9% of the total area of Australia. Tasmania measures approximately 300 kilometres from north to south and a similar distance from east to west (at widest point).

The major urban centres in the State are shown in Figure 2-1 and numerically ranked by population in Table 2-1.

FIGURE 2-1
MAP OF TASMANIA SHOWING MAJOR URBAN CENTRES

TABLE 2-1
MAJOR TASMANIAN URBAN CENTRES
(ABS, CENSUS 1996)

Urban Centre	Population ('000)
Hobart	126.1
Launceston	67.7
Devonport	22.3
Burnie-Somerset	19.1
Kingston-Blackmans Bay	13.7
Ulverstone	9.8
Bridgewater-Gagebrook	7.5
New Norfolk	5.3
George Town	4.5

Hobart and Launceston, each represents a Type 1 region. Kingston-Blackmans Bay, Bridgewater-Gagebrook and New Norfolk, because of their close proximity to Hobart are included in the Hobart Region (this will be justified later in the Plan), whilst George Town is included in the Launceston Region (this will also be justified later in the Plan)

Devonport, with a population of 22.3 thousand, represents a sub 25,000 population urban centre. Latrobe, some 8 kilometres away, has a population of approximately 2.8 thousand. Collectively, these two urban centres have a population in excess of 25,000 and need to be considered as a potential Type 2 region.

Whilst the Devonport – Latrobe region is not considered to have major industrial facilities that adversely affect regional ambient air quality, anecdotal evidence indicates that the widespread use of firewood in the region may result in moderate to high levels of PM_{10}.

From a consideration of topography and meteorology, Latrobe is expected to influence air quality in Devonport (via katabatic drainage flows down the Mersey River valley).

Based on population and the significant level of emissions from domestic heating, the Devonport/Latrobe area is considered to represent a Type 2 region.

Burnie-Somerset and Ulverstone each represent urban centres with a sub 25,000 population. There is insufficient population in the region surrounding these two urban centres to increase the regional population beyond the 25,000 threshold. For this reason, Burnie-Somerset and Ulverstone are not considered to represent Type 1 or Type 2 regions.

There are no Type 3 regions in Tasmania.

3 PERFORMANCE MONITORING REQUIREMENTS OF REGIONS

Part 4 of the Measure sets out the monitoring processes to be followed by jurisdictions in order to determine whether the Standards of the Measure are being met or the extent of the difference between the measured pollutant concentrations and the Standards.

Moreover, Clause 14 of the Measure defines the number of performance monitoring stations required, as follows:

(1) Subject to sub-clauses (2) and (3) below, the number of performance monitoring stations for a region with a population of 25,000 or more must be the next whole number above the number calculated in accordance with the formula:

1.5P + 0.5

*where **P** is the population of the region (in millions).*

(2) Additional performance monitoring stations may be needed where the pollutant levels are influenced by local characteristics such as topography, weather or emission sources.

(3) Fewer performance monitoring stations may be needed where it can be demonstrated that pollutant levels are reasonably expected to be consistently lower than the Standards mentioned in this Measure'.

Sub-clauses (1) and (2) are self explanatory. Sub-clause (3) provides to jurisdictions, the opportunity to demonstrate that, for a given region, fewer monitoring stations than indicated by the formula (possibly zero) are required. The PRC refers to this process as "screening".

The PRC has prepared guidelines on screening to ensure a reasonable degree of consistency and rigour in the assessments undertaken by jurisdictions (Guideline Paper No.4; PRC 2000c). The guidelines identify a range of screening procedures which might be used for particular pollutants. Moreover, acceptance limits accompany each procedure (by pollutant) reflecting the level of confidence associated with each procedure.

The following extract from a PRC paper on monitoring strategy (Guideline Paper No.3; PRC 2000d) provides the rationale for the siting of performance monitoring stations:

> *In order to ensure compliance with the NEPM Standards, stations will generally be located so as to monitor the upper bound of the distribution of pollutant concentration likely to be experienced by portions of the population, while avoiding the direct impacts of localised pollutant sources. These stations are called generally representative upper bound for community exposure (GRUB) stations. In regions where there are to be more than one GRUB station, the stations will be distributed to measure the upper bound concentrations in different portions of the populated area, reflecting different emission or dispersion regimes.*

An examination of the distribution of GRUB stations relative to the distribution of population and pollutant will determine the need for, and location of, additional stations to achieve adequate representation of population-average concentrations.

In regions where only a single performance monitoring station is required under the population based formula of the Measure, the PRC recommends that such a station be located to be generally representative of upper bound concentrations (PRC, 2000d).

By using GRUB stations to monitor the ambient air across a region, the community can be reasonably sure that, if the Standards of the Measure are met at such sites, then most of the total population of the region will be exposed to air that complies with the Standards. In this way, the Measure's aim of equivalent environmental protection is assured.

3.1 HOBART

3.1.1 Overview

3.1.1.1 Region Boundaries

The extent to which pollutants emitted in a given area can impact on air quality elsewhere depends on a number of factors. These factors include topography, meteorology and the chemical and physical properties of pollutants. The term airshed is commonly used to refer to an area that is defined by natural or topographic features affecting air quality.

In the case of a secondary pollutant (i.e. one that is formed by chemical reactions in the atmosphere, rather than being directly emitted, e.g. O_3), the airshed may extend relatively large distances from the city centre. However, for a pollutant such as PM_{10} in winter, the extent of influence may be more localised and perhaps confined to areas sharing common nocturnal-drainage air flows.

For Hobart, the availability of meteorological data tends to be relatively low. Moreover, complex atmospheric dispersion models have not been developed for the region. For these reasons, the extent of the Hobart airshed is unclear.

For the purpose of the Measure, the Hobart Region boundaries are defined as presented in Figure 3-1. Although there is no functional purpose served in exactly defining the boundary AMG co-ordinates, these may be taken to be defined by the south-west corner (Easting 500,000; Northing 521,000) and the north-east corner (Easting 550,000; Northing 5290,000).

3.1.1.2 Population and Topography

The population density and topography for the Hobart Region is presented in Figure 3-1. The majority of the population resides within approximately a 10 kilometres radius of the Central Business District (CBD). Moreover, significant satellite urban centres are located within a 30 kilometres radius of the CBD. These include Kingston-Blackmans Bay to the south (population 13,746), and Bridgewater-Gagebrook (population 7,451) and New Norfolk (population 5,286) to the north.

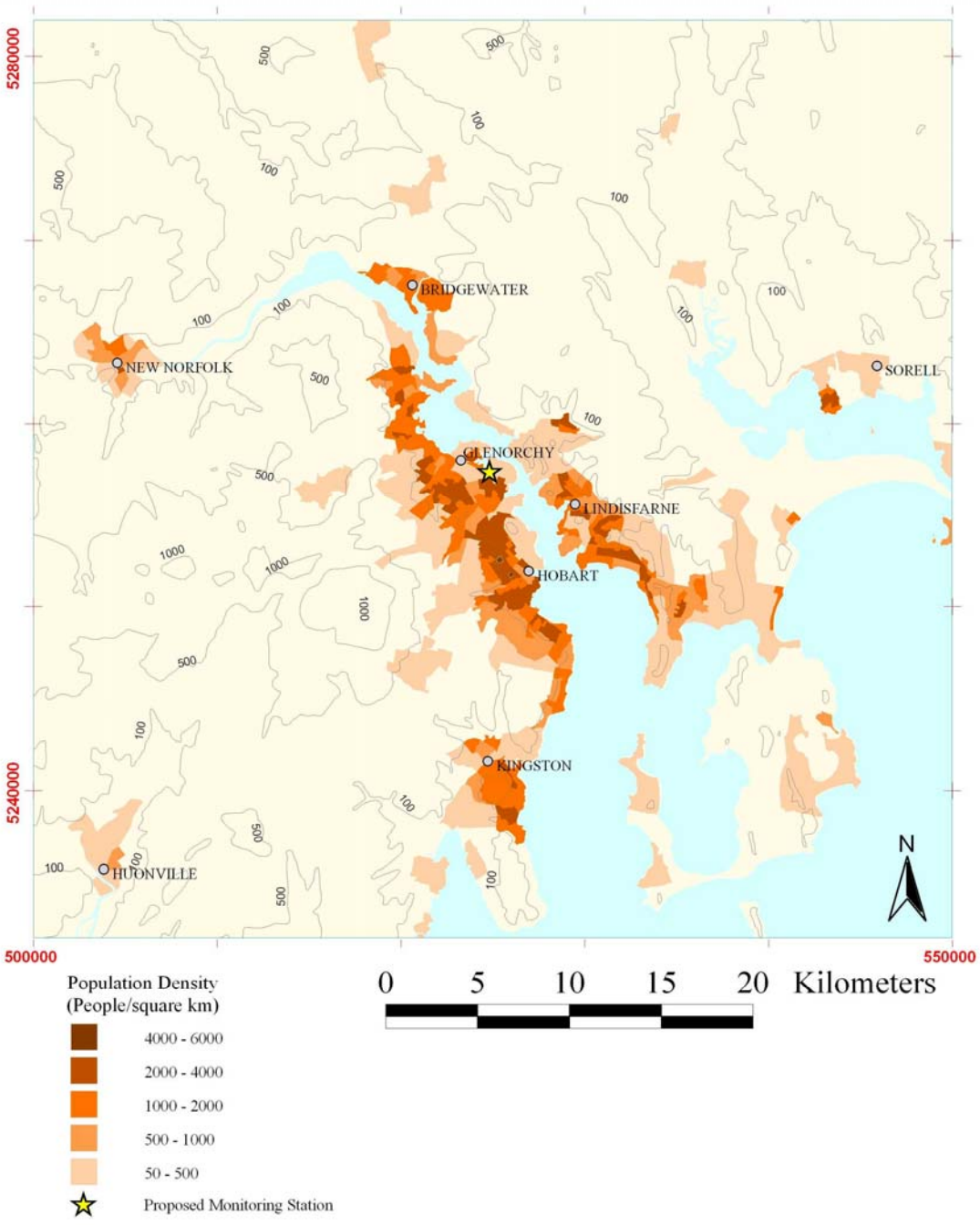

FIGURE 3-1
MAP OF HOBART REGION INCLUDING POPULATION DENSITY AND TOPOGRAPHY

In total, the population of the Hobart Region defined in this Plan is approximately 190,000.

Figure 3-1 illustrates that much of the Hobart Region lies in complex terrain, with local hills and valleys dominating air flow and dispersion. The city of Hobart itself, is located in a well-defined valley with the Derwent Estuary running through its axis. The valley axis is mostly aligned in a north-west to south-east orientation with the dominant topographical feature being Mt. Wellington (1271 masl), approximately 7 kilometres to the south-west of the Hobart CBD.

3.1.1.3 Emissions

An extensive emission inventory has recently been conducted for Hobart (1999/2000) as part of the National Pollutant Inventory (NPI) program (see Table 3-1). The inventory covers a range of pollutants emitted from domestic, mobile, and industrial sources, including PM_{10}, CO, NOx, Pb and SO_2.

TABLE 3-1
SUMMARY OF NPI RESULTS FOR HOBART REGION (FOR YEAR 1999/2000)
EXPRESSED AS PERCENT OF TOTAL EMISSIONS FOR EACH POLLUTANT

Source	PM_{10}	CO	NOx	SO_2	Pb
			%		
Domestic Solid Fuel Combustion	55.8	27.8	3.7	2.7	0.3
Paved Roads	26.6	0.0	0.0	0.0	7.1
Industry	5.1	1.0	11.4	68.8	8.9
Fuel Reduction, Regeneration Burns, Agricultural Burns (Fire Management) /Bushfires	4.9	1.5	1.0	0.0	0.1
Motor Vehicles	4.8	66.1	68.8	6.0	82.2
Domestic Waste Combustion	1.5	0.2	0.1	0.1	0.0
Miscellaneous Domestic and Mobile Sources	0.7	3.5	14.9	0.7	1.4
Domestic Liquid Fuel Combustion	0.5	0.0	0.2	21.6	0.0
Total	100.0	100.0	100.0	100.0	100.0

On an annual basis, domestic solid fuel combustion in Hobart (from domestic woodheaters and fireplaces), was estimated to contribute approximately 56% of total inventoried PM_{10} emissions. Other significant sources of PM_{10} include paved roads, industry, fire management/bushfires and motor vehicles. On a seasonal basis however, the relative contribution of domestic solid fuel combustion to Regional PM_{10} emissions would be expected to vary by a wide margin, from near zero in summer to over 80% in winter.

Motor vehicles are estimated to represent the major source of CO, NOx and Pb, whilst industry is the largest source of SO_2 emissions in the Hobart Region.

3.1.1.4 Meteorology

Based on a one year meteorological study at eight sites around the Derwent Estuary (Pendlebury, 1987), Hobart is documented to have two dominant mesoscale windflows, namely a sea breeze and katabatic drainage flows.

Figure 3-2 summarises the daytime wind regimes for Hobart in winter. The dominant flow during winter is a drainage flow down the valley axis referred to as the "mountain wind". This wind increases in strength and frequency with distance down the valley. The mountain wind is fed by down slope drainage winds (katabatics) flowing off the valley walls on to the Estuary. Light winds are generally associated with either the mountain wind or katabatics.

From an analysis of high particle pollution events in Hobart (Smeal, 1998) it is evident that relatively high concentrations of particles are frequently associated with anticyclones. During the passage of an anticyclone, synoptic-scale winds may be light and highly stable atmospheric conditions can occur. Clear skies result in significant radiative cooling at night and the formation of drainage flows. These slow-moving flows are highly stable, and entrain pollutants within them. As a result, relatively high pollutant concentrations are likely to be found in topographic hollows and basins, and on low-lying land.

Katabatic flows in a valley are analogous to stormwater flows, both draining down gullies to the valley floor. Figure 3-3 presents inferred katabatic and valley axis flows for the Hobart Region.

The summer daytime wind regime for Hobart is presented in Figure 3-4. The katabatic/sea breeze cycle is evident, with morning winds having a strong northerly component due to drainage flows, and afternoon winds from the south due to the sea breeze.

3.1.1.5 Air Quality Monitoring History

There has been limited monitoring of ambient air quality in the Hobart Region.

Ambient air sampling for O_3 was conducted in Hobart at one site between 1994 and 1995, for a single summer. Monitoring for CO and NO_2 in ambient air has not been conducted over the last decade. For SO_2, monitoring is conducted at three sites in the vicinity of a metal smelter approximately 6 kilometres to the north of the CBD.

Pb was monitored at a single site in Hobart up until 1996.

3.1.2 NEPM Formula

From Clause 14(1) of the Measure, the number of performance monitoring stations required for the Hobart Region is one.

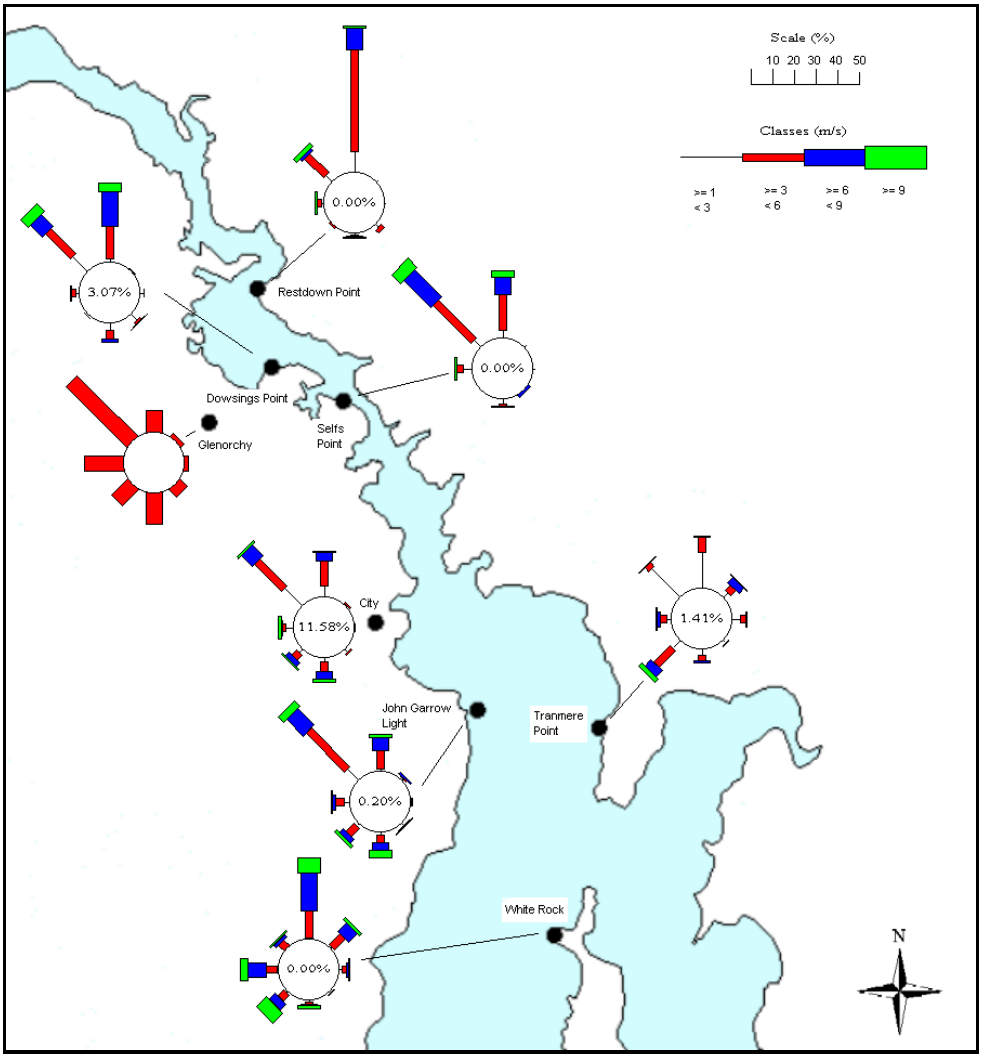

FIGURE 3-2
WINTER WIND ROSES, HOBART REGION
(GLENORCHY ROSE EXCLUDES WIND SPEED)

Explanatory Text for Wind Roses

The number in the centre of each wind rose represents the frequency of calm conditions, defined as winds below 1m/s. The overall length of the segmented vanes represents the proportion of winds coming from each compass point.

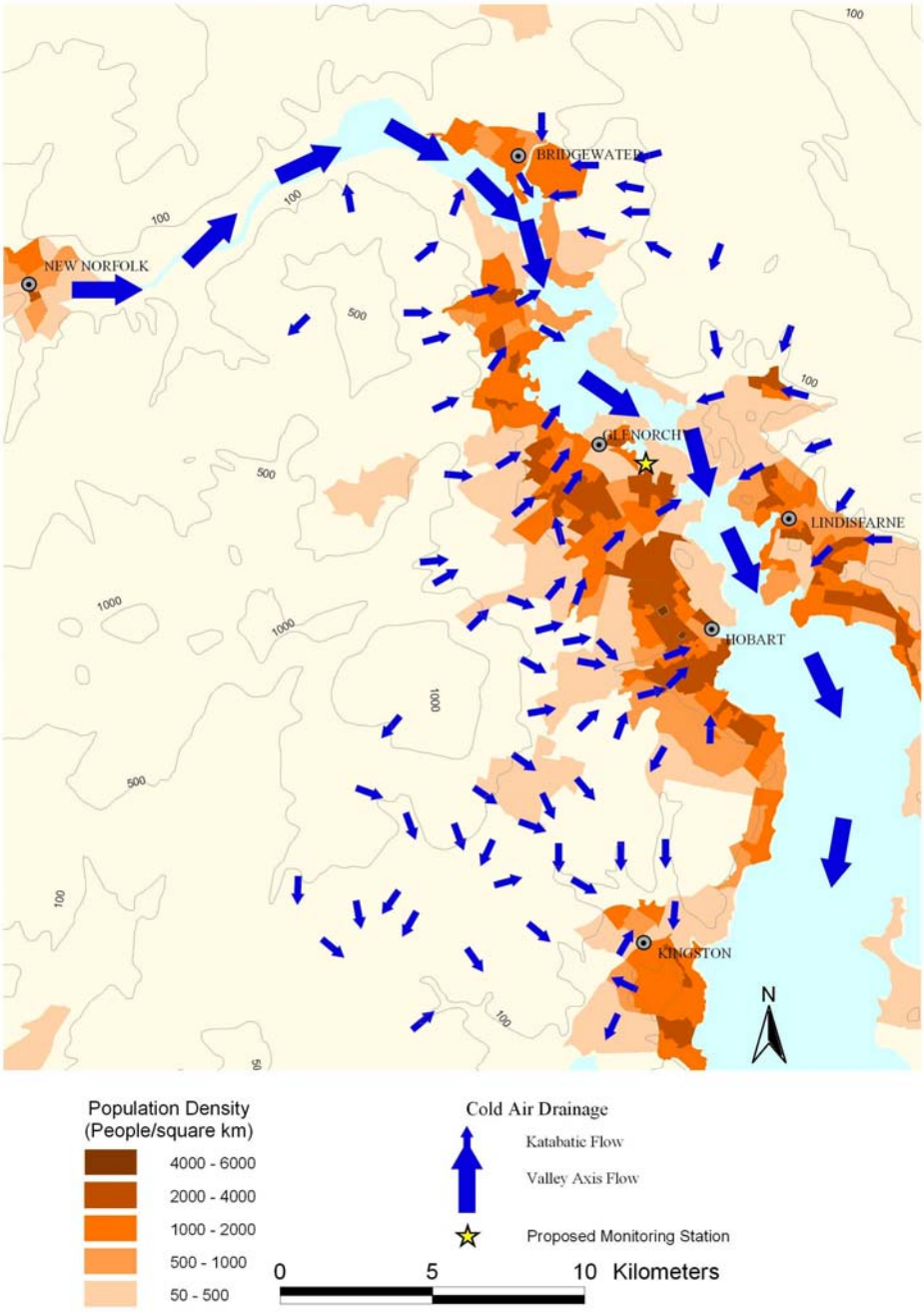

FIGURE 3-3
DRAINAGE FLOWS, HOBART REGION

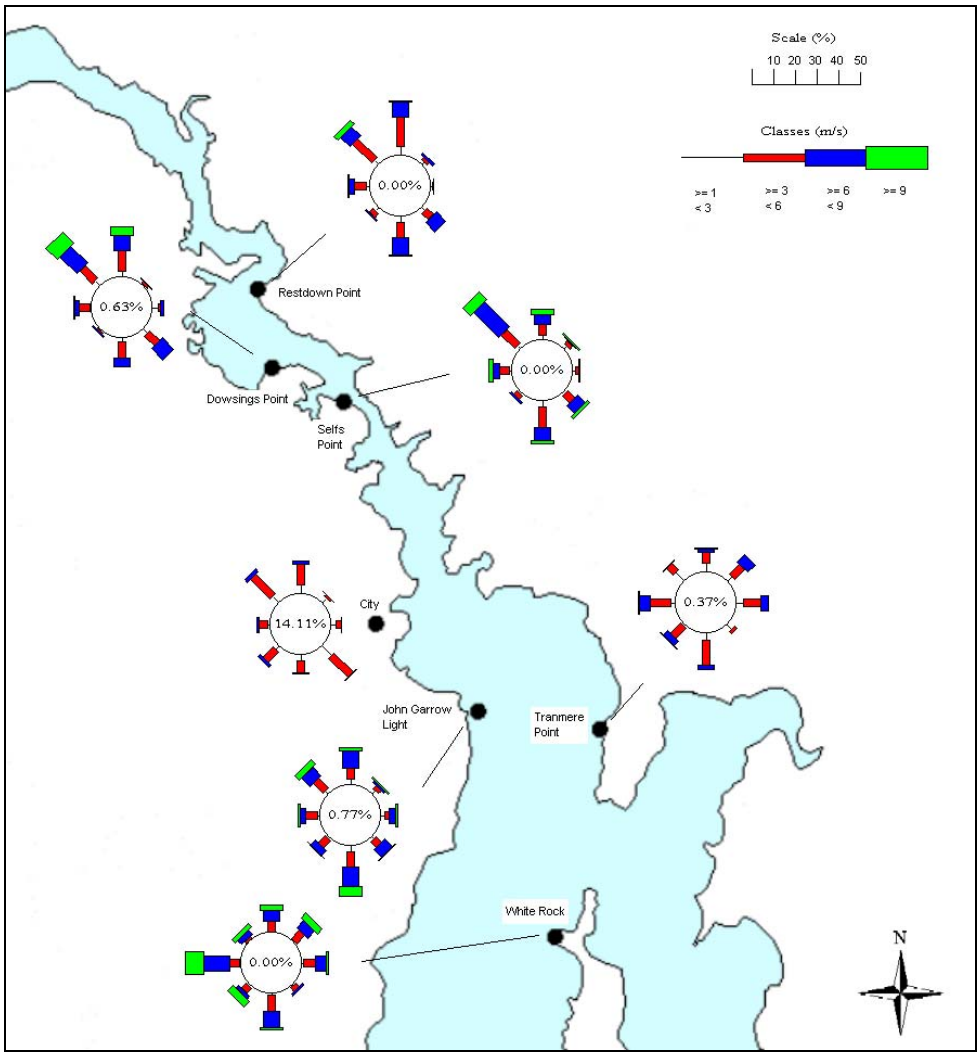

FIGURE 3-4
SUMMER WIND ROSES, HOBART REGION

3.1.3 Photochemical Oxidants (as O_3)

3.1.3.1 Review of Data

Ambient air sampling for O_3 was conducted in Hobart between 1994 and 1995, covering a single summer period. Monitoring was conducted at Moonah, approximately 6 kilometres to the north-west of the Hobart CBD.

Maximum O_3 concentrations reported for the site were approximately 0.03 ppm (1-hr average).

3.1.3.2 Screening Analysis

In the event that the TAPM Consultancy data for O_3 become available, the following section will be modified accordingly.

Tasmania does not propose to undertake performance monitoring of photochemical oxidants (as O_3) in Hobart, based on the application of the PRC Screening Procedure A (PRC, 2000c) as follows:

Acceptance limits by screening procedure for photochemical oxidants (as O_3).

Screening Procedure	Acceptance Limit (% of NEPM Standard)
A. Campaign monitoring at a Generally Representative Upper Bound (GRUB) monitoring location (with no significant deterioration expected over 5-10 years).	60% for 1 year 70% for 2 or more years 75% for 5 or more years

Campaign monitoring of O_3 in Hobart, conducted over a single summer period revealed a maximum O_3 concentration of approximately 30% of the NEPM Standard (1-hr).

The photochemical smog generation potential in Tasmania is considered to be low by comparison with larger Australian urban areas. This is because of relatively small urban populations, low summer temperatures, low solar ultra violet (UV) flux, and low probability of inter-regional oxidant transport.

Although limited, the available ambient air quality monitoring data for O_3 in Hobart are considered to be indicative of regional concentrations. Whilst it is unclear if the monitoring location used in Hobart is representative of a GRUB site, the limited data coupled with the relatively low photochemical smog potential, indicate that O_3 concentrations in the region are low and probably satisfy the PRC screening criteria by a reasonable margin.

3.1.4 Nitrogen Dioxide

3.1.4.1 Review of Data

Monitoring data for NO_2 in Hobart's ambient air are not available.

3.1.4.2 Screening Analysis

To be provided when TAPM Consultancy data for NO_2 become available.

3.1.5 Particulate Matter (as PM_{10})

3.1.5.1 Review of Data

A summary of ambient air quality data for PM_{10} in the Hobart Region is presented in Table 3-2. The data were collected on a daily basis over July/August 1998, in the suburb of Glenorchy, located approximately 7 kilometres to the north-west of Hobart CBD (Smeal, 1998). In total, 27 samples were collected (24-hour period) using a High Volume Sampler.

TABLE 3-2
PM_{10} CONCENTRATIONS (HIGH VOLUME SAMPLER), GLENORCHY

Monitoring	Number of NEPM Exceedences Recorded*	Maximum $\mu g/m^3$	90th Percentile $\mu g/m^3$	6th Highest $\mu g/m^3$
June/July 1998	11	123	76	66

* *NEPM* 24-hour PM_{10} Standard is 50$\mu g\ m^{-3}$, with a Goal of not more than 5 exceedences per year by 2008.

A wide range of concentrations were reported, with a minimum of 7 $\mu g\ m^{-3}$, a maximum of 123 $\mu g\ m^{-3}$, and a 6th highest concentration of 66 $\mu g\ m^{-3}$.

The monitoring site used in the study was located in a region of relatively low to medium housing density. The high frequency of relatively high PM_{10} concentrations may be partially explained by the fact that the site was in a region of older housing which, relative to Hobart as a whole, may be more reliant on woodheating than other forms of home heating.

3.1.5.2 Nominated Performance Monitoring and Trend Station

As noted earlier in this Plan, relatively high concentrations of particles in Hobart are frequently associated with anticyclones. During the passage of an anticyclone, synoptic-scale winds can be light and highly stable atmospheric conditions may occur. Clear skies result in significant radiative cooling at night and the formation of drainage flows. These slow-moving flows are highly stable, and entrain pollutants within them. As a result, relatively high pollutant concentrations are likely to be found in topographic hollows and basins, and on low-lying land.

In Hobart, approximately 80% of people live in areas below a height of 100 metres above sea level.

In this Plan, the criteria used to identify a monitoring site for the purpose of this Measure were as follows:

- Within 100 metres of valley floor (or sea-level);
- Within 1,000 metres of housing densities at or above the 90th percentile;
- Consideration of relative woodheater and firewood use by sub-regions;
- Consistent with requirements of Australian Standard for siting (AS2922-1987); and
- Long term access to land.

Based on the above criteria, the nominated performance monitoring station for PM_{10} in the Hobart Region is located approximately 6 kilometres north-north-west of the Hobart CBD (see Figure 3-1) on the southern shore of Prince of Wales Bay. The site is approximately 5 metres above sea level, 400 metres east of one of the most heavily trafficked arterial roads in Hobart.

The representativeness of the proposed Hobart performance monitoring station is unclear due to the lack of simultaneous multi-site monitoring or atmospheric dispersion modelling for the region. By analogy with Launceston however, for which multi-site data is available (see Section 3.2.5.2), the criteria employed for site selection in Hobart is expected to result in a station that is generally representative of upper bound concentrations of PM_{10} (i.e. GRUB) in the region.

It is acknowledged that because of the complex terrain of the Hobart Region, local air-pondage coupled with above-average emission rates from neighbourhood woodheaters and fireplaces in some localities, could result in higher pollutant concentrations than those at the nominated performance monitoring station. The area of such localities, however is expected to be small and account for a small fraction of the Region's population.

The Prince of Wales Bay Station is also nominated as a trend station for PM_{10}. Under the Measure, trend stations are required to monitor and assess long term changes in ambient air quality at the same location for one or more decades.

3.1.5.3 Exposed Population

For each performance monitoring station, jurisdictions are required to determine the exposed population represented by the station. Because of the uncertainty associated with any quantitative measure of the exposed population, it is proposed that the NEPM requirement be met by a qualitative description which indicates the communities that are expected to experience similar levels of air quality to that of each performance monitoring station (by pollutant), either due to geographic proximity or similarity of emissions, meteorology and topography. This approach is consistent with that specified in PRC Guideline Paper No.3 (PRC, 2000d).

3.1.6 Carbon Monoxide

3.1.6.1 Review of Data

Ambient monitoring of CO in Hobart was discontinued in the mid 1980's.

The most recent monitoring data for CO in Hobart are those reported as part of a University of Tasmania Honours project (Power, 1991). Monitoring was conducted at several sites in the Hobart CBD between July and August of 1991. 8-Hour average values between 6 and 14 ppm were reported over the study period. The NEPM 8-hour Standard for CO is 9 ppm.

These data however, are based on near-kerbside collection of grab samples over sub-hour intervals and the use of an extrapolation procedure to estimate 8-hour averages. The uncertainty associated with such a procedure is unknown. Moreover, the sampling location and the monitoring methodology used in the University project did not comply with relevant Australian Standards for ambient air monitoring.

It should be noted that CO emission rates from motor vehicles are reported to have decreased significantly over the last ten years. According to EPAV estimates (EPAV, 1999), CO emission rates for the Melbourne fleet on arterial roads have decreased by approximately 30% between 1990 and 2000. The emission rate estimates for Melbourne are expected to be broadly indicative of changes for the Tasmanian fleet over the same period.

In Tasmania, it is unlikely that regions suffer from high CO concentrations due to traffic alone. However, by analogy to CO monitoring results for a suburb in Perth WA (where there is significant use of woodheaters; DEPWA 2000), it is possible that the combination of CO from motor vehicle traffic and woodheaters may elevate concentrations to levels comparable to the NEPM Standard in Hobart.

3.1.6.2 Nominated Performance Monitoring and Trend Station

The nominated performance monitoring station for CO in the Hobart Region is located at Prince of Wales Bay, as discussed in Section 3.1.5.2. The site is approximately 400 metres east of one of the most heavily trafficked arterial road in Hobart, in an area of low to medium density housing.

The representativeness of the proposed Hobart performance monitoring station for CO is unclear due to the lack of simultaneous multi-site monitoring or atmospheric dispersion modelling for the region. However, given its proximity to a major arterial road and domestic solid fuel combustion sources, the site is assumed to be generally representative of upper bound CO concentrations (i.e. GRUB) in the region.

The Prince of Wales Bay Station is also nominated as a trend station for CO.

3.1.6.3 Exposed Population

For each performance monitoring station, jurisdictions are required to determine the exposed population represented by the station. Because of the uncertainty associated with any quantitative measure of the exposed population, it is proposed that the NEPM requirement be met by a qualitative description which indicates the communities that are expected to experience similar levels of air quality to that of each performance monitoring station (by pollutant), either due to geographic proximity or similarity of emissions, meteorology and topography. This approach is consistent with that specified in PRC Guideline Paper No.3 (PRC, 2000d).

3.1.7 Sulfur Dioxide

3.1.7.1 Review of Data

Ambient concentrations of SO_2 in the vicinity of a metal smelter (Pasminco EZ), some 6 kilometres north of the Hobart CBD, have been reported to approach or exceed the 1-hr NEPM Standard on up to one or two occasions per year.

Ambient monitoring is currently conducted by Pasminco at three sites, all of which are within a radius of approximately 0.7 – 1.4 kilometres from the facility.

3.1.7.2 Nominated Performance Monitoring and Trend Station

A meteorological monitoring and atmospheric dispersion modelling project is currently being undertaken on behalf of Pasminco. The project, coupled with Pasminco's ambient monitoring of SO_2, is expected to significantly improve the understanding of atmospheric dispersion within several kilometres of the facility.

When the results of this project become available, it is proposed that a performance monitoring station be established in accordance with the protocol of the Measure. Until that time, monitoring will continue at Pasminco's existing three stations.

Tasmania recognises that these existing SO_2 monitoring sites may not necessarily represent GRUB sites. This is acknowledged to be currently inconsistent with the guidelines of the PRC.

In cases where an issue is currently inconsistent with the protocol of the Air NEPM or guidelines of the PRC, but planned action by the jurisdiction is expected to resolve the inconsistency in a reasonable time, the PRC recommends that a time schedule be provided. Tasmania's schedule for establishing a performance monitoring station for SO_2 in Hobart is December 2003.

3.1.8 Lead

3.1.8.1 Review of Data

Measurements of airborne Pb (in Total Suspended Particulates) have been made in the Hobart suburb of Moonah intermittently since 1989 (see Figure 3-5).

The data demonstrate a decline in the 3-month running average for Pb from a winter peak of approximately 0.7 $\mu g/m^3$ in 1989 to 0.3 $\mu g/m^3$ in 1996 when sampling ceased. These reductions are associated with the decreased use of leaded petrol in conjunction with a decrease in the lead content of petrol.

The annual average Pb concentration in Hobart in 1996 was approximately 0.2 $\mu g/m^3$.

3.1.8.2 Screening Analysis

Tasmania does not propose to undertake performance monitoring of Pb in Hobart, based on the application of the PRC Screening Procedure A (PRC, 2000c) as follows:

Acceptance limits by screening procedure for carbon monoxide, nitrogen dioxide, sulfur dioxide and lead.

Screening Procedure	Acceptance Limit (% of NEPM Standard)
A. Campaign monitoring at a Generally Representative Upper Bound (GRUB) monitoring location (with no significant deterioration expected over 5-10 years).	55% for 1 year of data 60% for 2 or more years of data

Pb monitoring near the kerb of a road (daily traffic count of approximately 10,000 vehicles/day) in Hobart in the mid 1990's, revealed levels approximately 40% of the NEPM Standard. Motor vehicles are considered to be the only significant sources of Pb in the Hobart Region.

Because of the scheduled introduction of Pb replacement petrol, it is projected that emissions of Pb from motor vehicles will decrease by over 90% by 2001 relative to 1996.

Based on the above data, it may be concluded that the screening criterion for Pb is met in the Hobart Region by a wide margin.

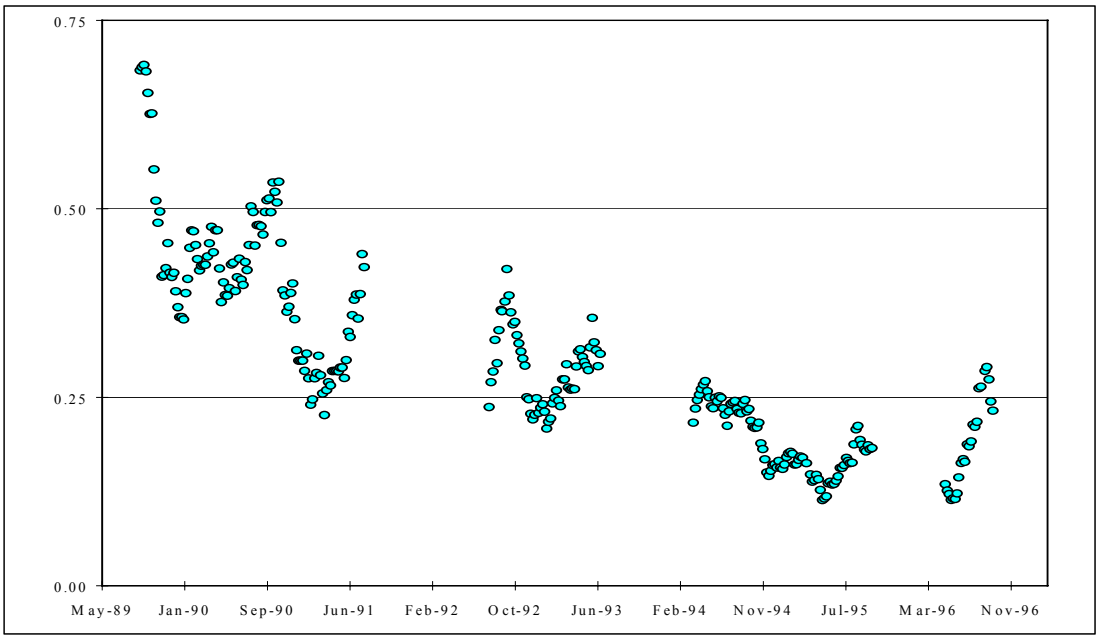

FIGURE 3-5
3-MONTH MOVING AVERAGE CONCENTRATION FOR Pb (MICROGRAMS PER CUBIC METRE OF AIR IN TSP FRACTION), DERWENT PARK RD, MOONAH

3.2 LAUNCESTON

3.2.1 Overview

3.2.1.1 Region Boundaries

Launceston and the Tamar Valley as a whole have been reasonably well studied in terms of the meteorology and atmospheric dispersion of the region. Results of three-dimensional atmospheric dispersion modelling have indicated that emissions from heavy industry at Bell Bay, some 40 kilometres north-west of Launceston, may in cases impact on air quality in Launceston (DPIWE, 1997).

For the purpose of the Measure, the Launceston Region boundaries are defined as presented in Figure 3-6 and cover an area approximately 40 kilometres wide and 60 kilometres long. This area has been selected for consistency with the Tamar Valley Airshed Study (DELM, 1995). Although there is no functional purpose served in exactly defining the boundary AMG co-ordinates, these may be taken to be defined by the south-most corner (Easting 501,250; Northing 5,389,750) and the north-most corner (Easting 498,750; Northing 5,467,250).

3.2.1.2 Population and Topography

The population density and topography of the Launceston Region is presented in Figure 3-6.

Launceston has a population of 67.7 thousand with the second largest urban centre in the region, George Town, having a population of 4.5 thousand. The majority of Launceston's population is located within approximately 5 kilometres of the city centre, with the highest densities located south-east of the city centre and significant densities on the banks of the Tamar River to the north and north-west of the city.

In total, the population of the Launceston Region defined in this Plan is approximately 95,000.

Launceston is located on the upper reaches of the Tamar River, in a well defined valley which extends some 50 kilometres to Bass Strait. The valley axis is mostly aligned in a north-west to south-east orientation and is flanked by hills which reach heights of up to 400 m.

3.2.1.3 Emissions

An extensive emission inventory is currently being conducted for the Launceston Region as part of the NPI program. The inventory covers a range of pollutants emitted from domestic, mobile, and industrial sources, including PM_{10}, CO, NOx, Pb and SO_2.

At this time however, only results for industrial facilities in the Launceston Region are available from the NPI program.

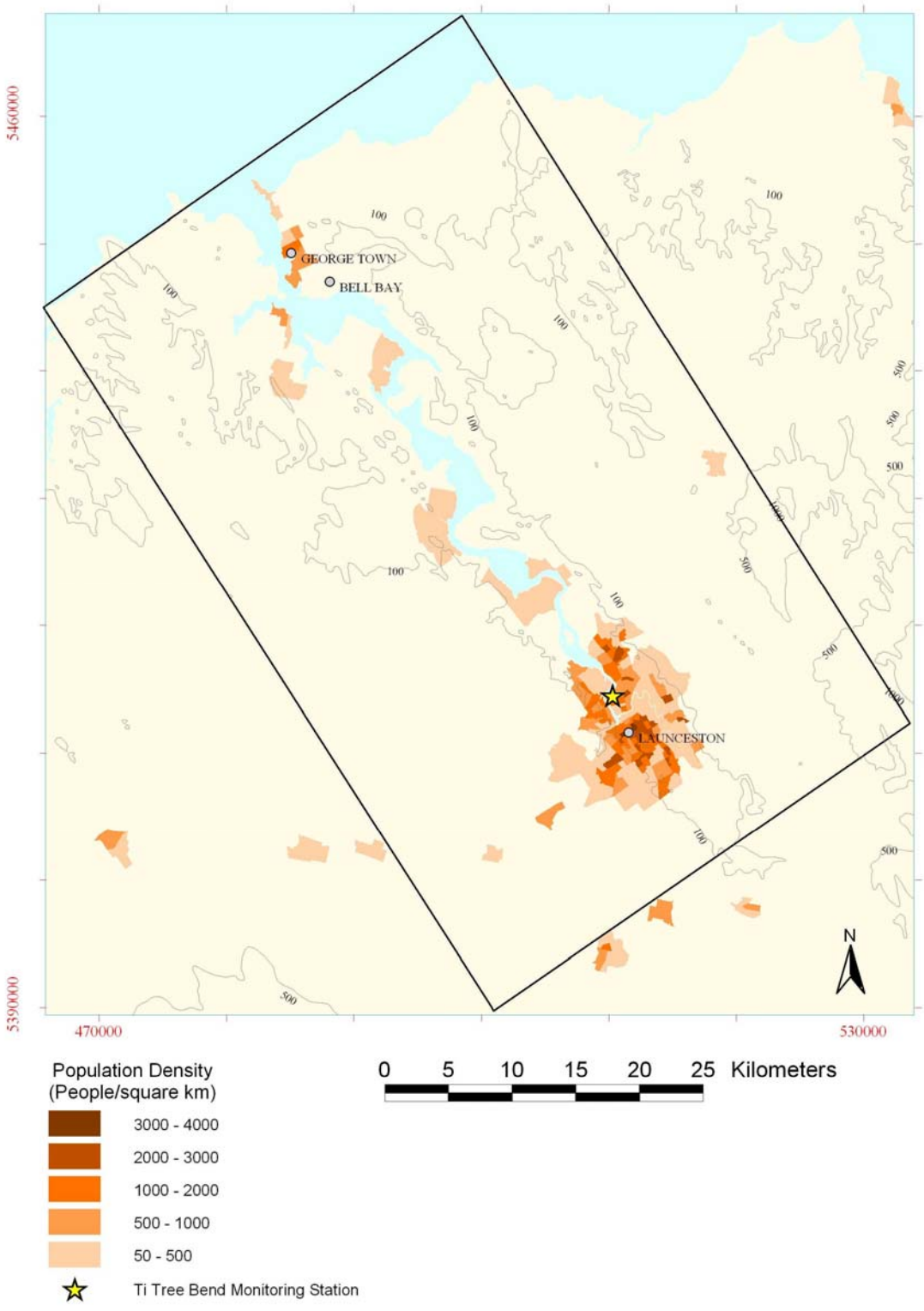

FIGURE 3-6
MAP OF LAUNCESTON REGION INCLUDING POPULATION DENSITY AND TOPOGRAPHY

Earlier inventories have been reported for Launceston (NPI Trials, 1996) and the Tamar Valley Airshed Region (DELM, 1995). The quality of these two inventories however, is not considered to be as high as that of the current NPI program, and moreover some significant emission changes have since occurred. For these reasons, a discussion of the relative significance of emission sources in the Launceston Region is based on available results from the current NPI program for both Launceston and Hobart.

By analogy with Hobart, which has a similar mix of domestic and mobile sources to Launceston, domestic solid fuel combustion in winter is expected to account for over 80% of total PM_{10} emissions in the Launceston Region. Motor vehicles, by analogy to Hobart, are considered to represent the major sources of CO, NOx and Pb in Launceston.

A number of significant industrial facilities are located at Bell Bay, some 5 kilometres to the south-east of George Town. The two most significant facilities in terms of current air emissions are an aluminium smelter (Comalco) emitting approximately 3500 tonnes of SO_2 per year, 7100 tonnes of CO, 50 tonnes of NOx and 45 tonnes of PM_{10}, and a ferro-alloy producer (TEMCO) estimated to emit over 6900 tonnes of CO per year, 600 tonnes of PM_{10}, 74 tonnes of NOx and 40 tonnes of SO_2. Other significant industrial facilities at Bell Bay include a fibre/particle board mill (Starwood) and an oil-fired power station (Bell Bay). The oil-fired power station has not been in use (other than firing for maintenance purposes) for over five years.

3.2.1.4 Meteorology

Wind roses for the Launceston Region are presented in Figure 3-7.

Northerly winds tend to prevail all year round in Launceston, with atmospheric calm conditions reported to be most frequent in the winter and autumn months (Power, 2000).

Strongly stable atmospheric conditions in Launceston are normally associated with southerly, south-easterly or easterly winds draining out of the Valley. This is especially evident in winter.

Figure 3-8 illustrates the inferred drainage flow for Launceston. The predicted drainage flows are based on an analysis of stream directions and the spatial variation in the orientation of the valley axis, as was presented for Hobart.

3.2.1.5 Air Quality Monitoring History

There has been limited monitoring of ambient air quality in the Launceston Region. Historical monitoring data for O_3 in Launceston are available, as are data for PM_{10} and Pb in Launceston and SO_2 in George Town. Data for NO_2 and CO are not available.

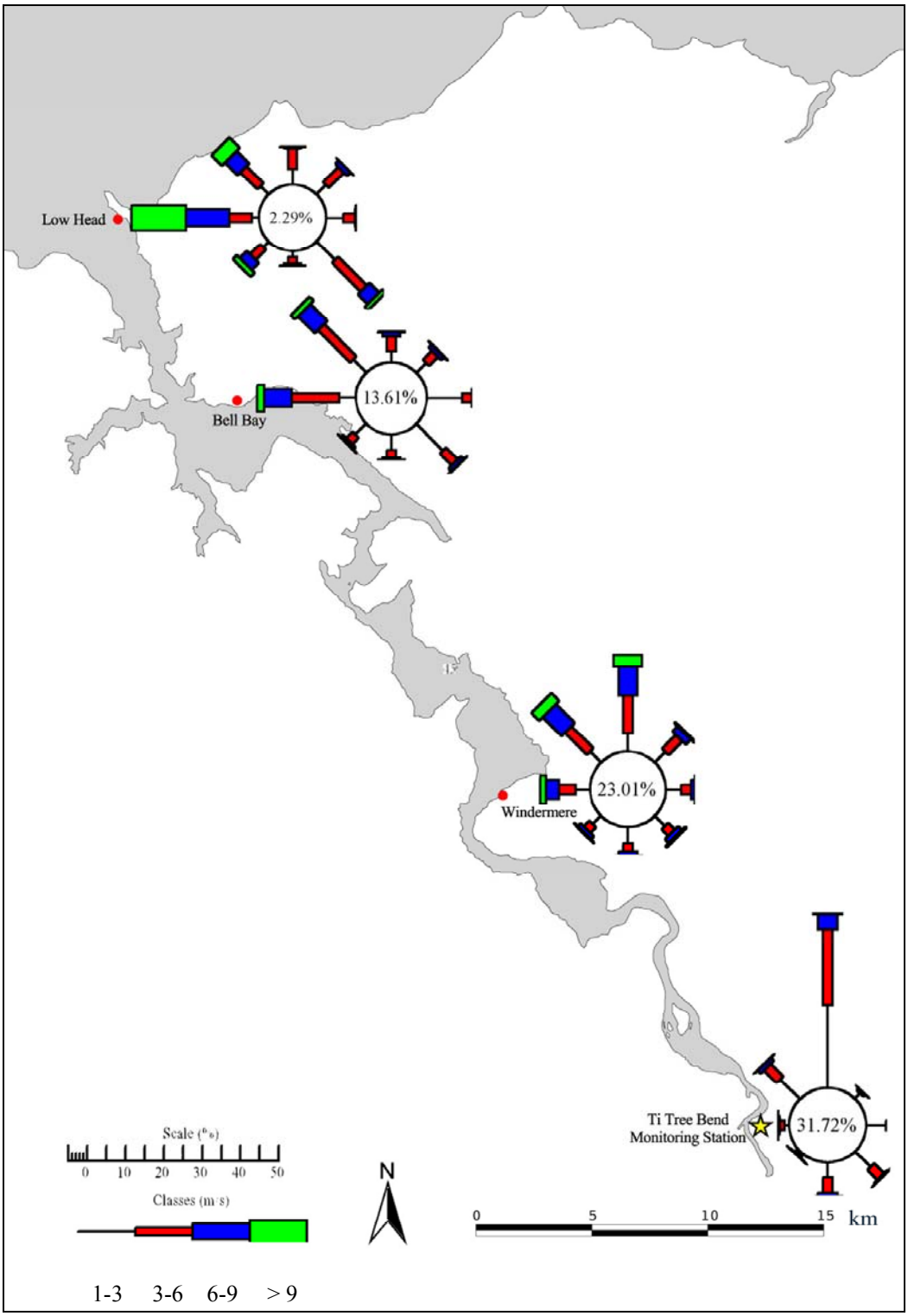

FIGURE 3-7
WIND ROSES, LAUNCESTON REGION

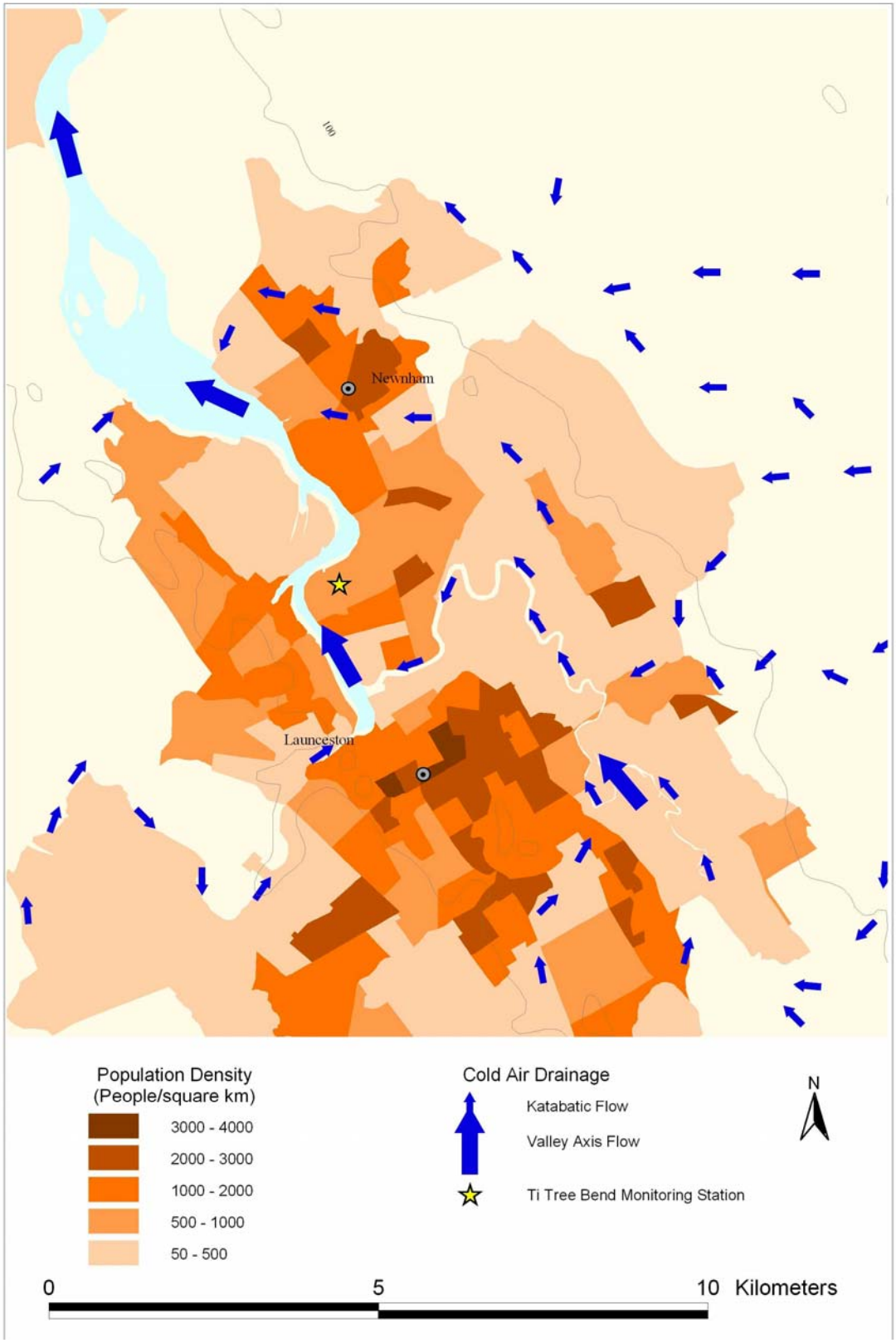

FIGURE 3-8
DRAINAGE FLOWS, LAUNCESTON REGION

3.2.2 NEPM Formula

From Clause 14(1) of the Measure, the number of performance monitoring stations required for the Launceston Region is one.

3.2.3 Photochemical Oxidants (as O_3)

3.2.3.1 Review of Data

Ambient air sampling of O_3 was conducted in Launceston between 1992 and 1993. Monitoring was conducted at Glen Dhu near a major highway several kilometres from the Launceston CBD.

Maximum O_3 concentrations reported for the site were approximately 0.04 ppm (1-hr average).

3.2.3.2 Screening Analysis

In the event that suitable TAPM Consultancy data for O_3 become available, the following section will be modified accordingly.

Tasmania does not propose to undertake performance monitoring of photochemical oxidants (as O_3) in the Launceston Region, based on the application of the PRC Screening Procedure A (PRC, 2000c) as follows:

Acceptance limits by screening procedure for photochemical oxidants (as O_3).

Screening Procedure	Acceptance Limit (% of NEPM Standard)
A. Campaign monitoring at a Generally Representative Upper Bound (GRUB) monitoring location (with no significant deterioration expected over 5-10 years).	60% for 1 year 70% for 2 or more years 75% for 5 or more years

Ambient air sampling of O_3 in Launceston between 1992 and 1993 (Lyons, 1996) found maximum O_3 concentrations of approximately 40% of the NEPM Standard.

The photochemical smog generation potential in Tasmania is considered to be low by comparison with larger Australian urban areas. This is because of relatively small urban populations, low summer temperatures and UV flux, and low probability of inter-regional oxidant transport.

Although limited, the available ambient air quality monitoring data for O_3 in Launceston are considered to be indicative of regional concentrations. Whilst it is unclear if the monitoring location used in Launceston is representative of a GRUB site, the limited data coupled with the relatively low photochemical smog potential, indicate that O_3 concentrations in the region are low and probably satisfy the PRC screening criteria by a reasonable margin.

3.2.4 Nitrogen Dioxide

3.2.4.1 Review of Data

Monitoring data for NO_2 in the Launceston Region are not available.

3.2.4.2 Screening Analysis

To be provided when TAPM Consultancy data for NO_2 become available.

3.2.5 Particulate Matter (as PM_{10})

3.2.5.1 Review of Data

Monitoring data for PM_{10} in Launceston demonstrate that the Ambient Air NEPM Standard of 50 $\mu g/m^3$ is regularly exceeded during the cooler months of the year. Since 1997, PM_{10} has been monitored daily between April and September (via high volume samplers), and on a six day cycle during the warmer months (see Figure 3-9). On average, 42 exceedences of the Standard have been recorded each year (see Table 3-3).

TABLE 3-3
PM_{10} CONCENTRATIONS (HIGH VOLUME SAMPLER), TI TREE BEND, LAUNCESTON

Year	Number of NEPM Exceedences Recorded	Maximum ug/m^3	6^{th} Highest ug/m^3	90^{th} Percentile ug/m^3
2000	36	108	83	69
1999	38	92	80	65
1998	45	122	100	73
1997	47	121	90	72

Between 1997 and 2000, the 6^{th} highest 24-hour average PM_{10} concentration in Launceston has been found to average 88 ug/m^3, well above the NEPM Goal of 50 ug/m^3.

3.2.5.2 Nominated Performance Monitoring and Trend Station

Ti Tree Bend is nominated as the site for both performance and trend monitoring in the Launceston Region.

Available data for the Region clearly indicate that high concentrations of particles are frequently associated with light winds and highly stable atmospheric conditions. Moreover, because of night-time ground cooling and the formation of drainage flows, relatively high pollutant concentrations are likely to be found in topographic hollows and basins, and on low-lying land.

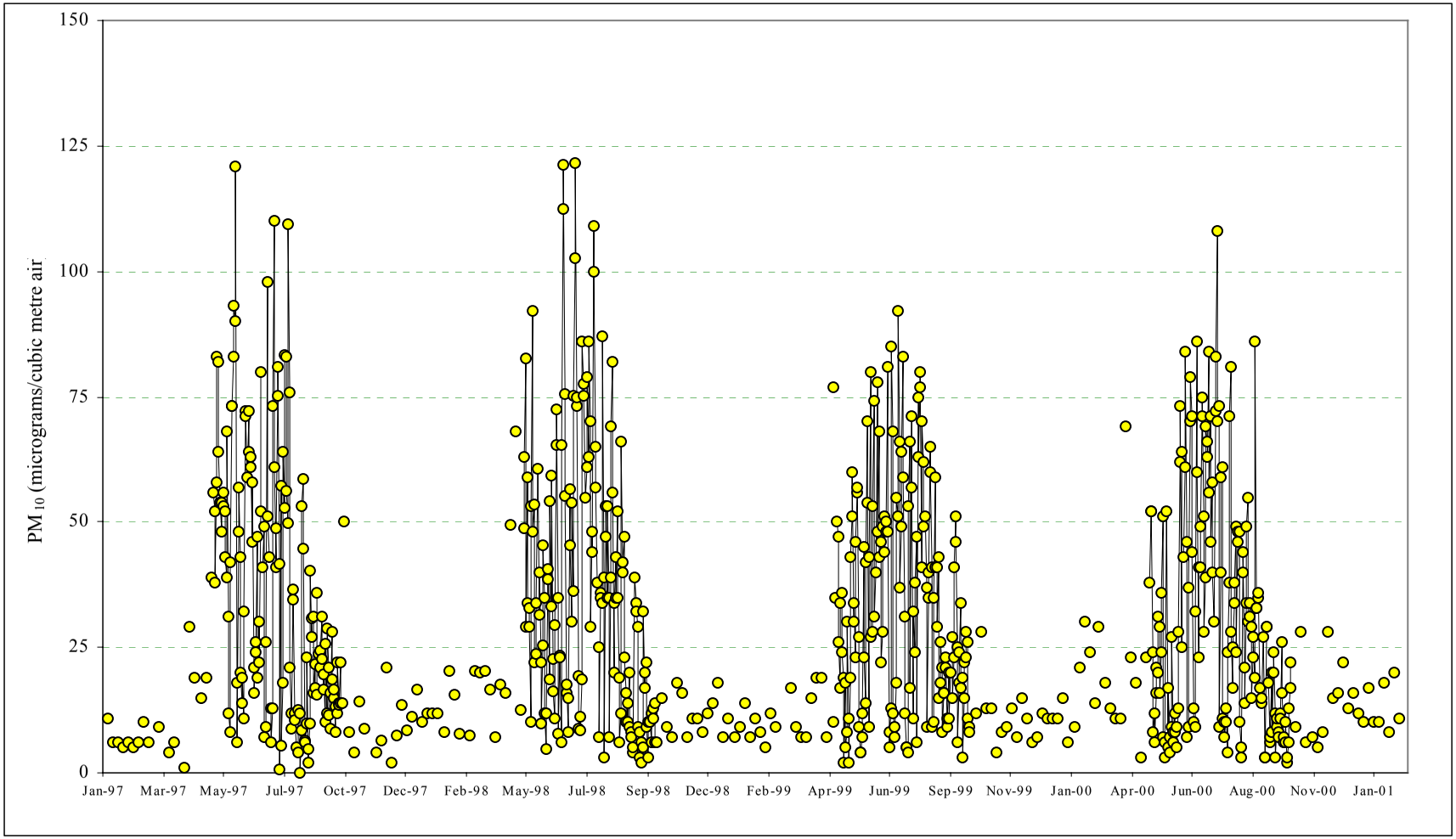

FIGURE 3-9
24-HOUR AVERAGE PM_{10} CONCENTRATIONS (HIGH VOLUME SAMPLING)
TI TREE BEND, LAUNCESTON
(Circles connected by line indicate consecutive day sampling)

Strongly stable atmospheric conditions in Launceston are normally associated with southerly, south-easterly or easterly winds draining out of the Valley. This is especially evident in winter. Such flows slowly transport pollutants from the relatively dense housing situated to the south-east of the Launceston CBD along the Valley axis.

The Ti Tree Bend site is located on the valley axis, downstream of both the Launceston CBD and the relatively densely populated suburbs further south of the city. The site itself lies on flat open ground near the banks of the Tamar River.

The Ti Tree Bend site is considered to be representative of a GRUB location for particulate matter because of the predicted drainage flows in Launceston and its vicinity to residential areas and major arterial roads. Supporting evidence for this, is obtained from a comparison of same-day monitoring of particles conducted at several sites in Launceston during 1992 and 1993. Table 3-4 presents particle monitoring data for four sites in Launceston. For each of the days presented in Table 3-4, same day monitoring was conducted at two sites.

TABLE 3-4
MULTI-SITE COMPARISON OF HIGH POLLUTION EVENT DAYS, LAUNCESTON[a]

Date	Ti Tree Bend TSP	Newnham PM_{10}	East Launceston PM_{10}	Glen Dhu PM_{10}
23/05/92		139		144
28/05/92	144		146	
13/06/92	140		135	
30/06/92		135		142
11/07/92	128		135	
13/07/92	159		162	
14/06/93		150		131
25/06/93	143		160	
Distance from Ti Tree Bend (km) And Bearing	- -	1.2 to NNE	2.7 to SE	4.3 to SSE

a. Adapted from Table 2, Pg 23A, Lyons, 1996, 'Air Pollution, Environmental Health and Respiratory Diseases, Launceston and Upper Tamar Valley, Tasmania, 1991-94'.

Three of the sites monitored in 1992/93 measured PM_{10}, whilst the fouth site (Ti Tree Bend) measured TSP (for resource reasons). Because particles emitted from domestic wood combustion tend to be below 10 microns aerodynamic diameter, TSP data for Ti Tree Bend is assumed to be equivalent to PM_{10} for the purpose of multi-site comparison.

Moreover, given that the Newnham site is approximately only one kilometre from Ti Tree Bend, same day monitoring data for East Launceston and Glen Dhu (see Figure 3-10) respectively, may be compared with that for either Ti Tree Bend or Newnham.

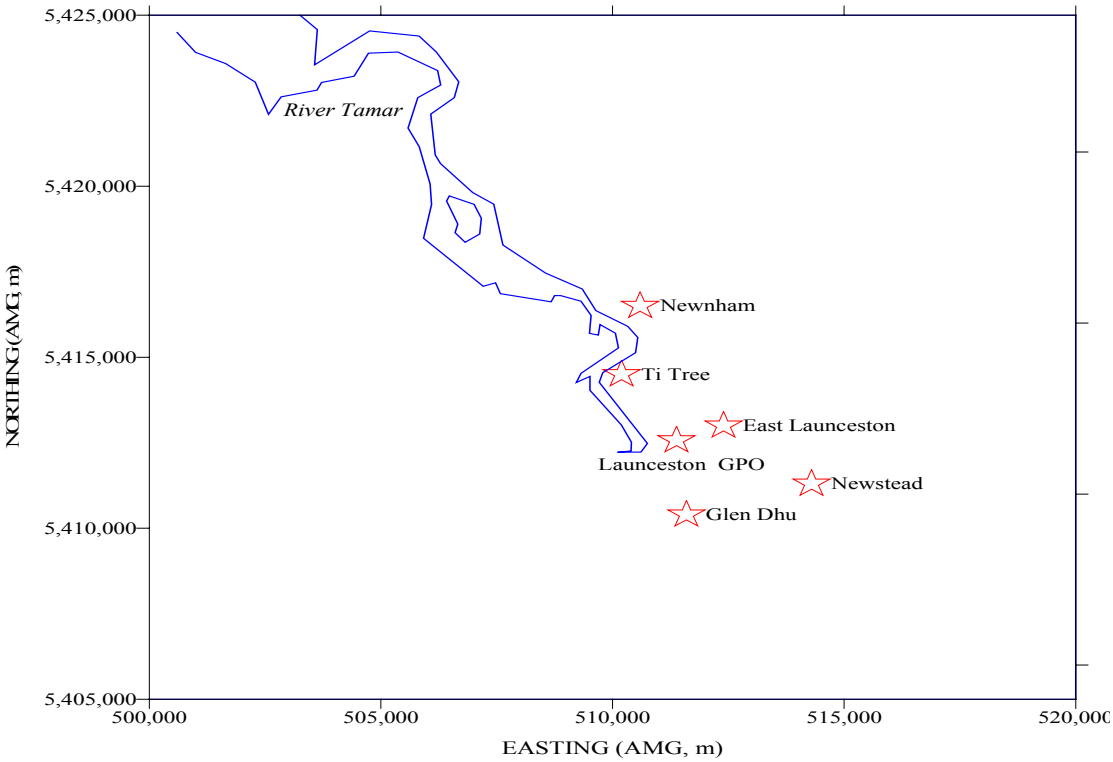

FIGURE 3-10
HISTORICAL MONITORING SITES RELATIVE TO LAUNCESTON GPO

Monitoring results for East Launceston and Glen Dhu for specific high pollution event days in 1992/93, were found to be typically within 10% of those for Ti Tree Bend /Newnham. Such a high level of agreement between sampling results at different locations, coupled with the fact that the majority of the Region's population resides within 5 kilometres from the Launceston GPO, indicates that the Ti Tree Bend site is representative of generally upper bound concentrations in Launceston. However, it is acknowledged that local air-pondage coupled with above-average emission rates from neighbourhood woodheaters and fireplaces in some localities, could result in higher pollutant concentrations than those at the nominated performance monitoring station. The area of such localities is expected to be small and account for a small fraction of the Region's population.

3.2.6 Carbon Monoxide

3.2.6.1 Review of Data

Monitoring data for CO in the Launceston Region are not available.

3.2.6.2 Screening Analysis

Screening analysis is expected to be based on results of monitoring in Hobart. At this time, such data are not available and it remains unclear if the CO screening criteria can be complied with in Launceston.

3.2.7 Sulfur Dioxide

3.2.7.1 Review of Data

Monitoring data for sulfur dioxide in Launceston are not available.

Continuous monitoring of SO_2 at a single site in the Bell Bay region, between August 1997 and September 1998, indicate that the maximum one-hour concentration was less than 10% of the NEPM Standard.

3.2.7.2 Screening Analysis

Tasmania does not propose to undertake performance monitoring of SO_2 in the Launceston Region, based on the application of the PRC Screening Procedure A (PRC, 2000c) as follows:

Acceptance limits by screening procedure for carbon monoxide, nitrogen dioxide, sulfur dioxide and lead.

Screening Procedure	Acceptance Limit (% of NEPM Standard)
A. Campaign monitoring at a Generally Representative Upper Bound (GRUB) monitoring location (with no significant deterioration expected over 5-10 years).	55% for 1 year of data 60% for 2 or more years of data

Whilst there are no significant emission sources of SO_2 in Launceston, the industrial centre at Bell Bay some 50 kilometres to the north-west, contains a number of medium sized industrial sources of SO_2. Emissions from Bell Bay may be transported to Launceston under the influence of prevailing winds.

As noted above, recent monitoring of SO_2 near Bell Bay indicate that the maximum one-hour concentration was less than 10% of the NEPM Standard. During this time, the Bell Bay oil fired power station was not operational. The power station, if operated in future, is expected to be fuelled by natural gas. SO_2 emissions from a gas fired power station would be negligible.

From the available data and consideration of the magnitude and location of SO_2 sources in the Region under existing and most likely future emission scenarios, it is concluded that ambient concentrations of SO_2 in urban areas will be below 10% of the NEPM Standard. The screening criterion for SO_2 in the Launceston Region is therefore considered to be met by a wide margin.

In the event that the Bell Bay power station is operated on high sulfur fuel oil in the future, the screening assessment for the Region will require review because of the potential to exceed the NEPM Standard.

3.2.8 Lead

3.2.8.1 Review of Data

Monitoring data for Pb (in PM_{10} fraction) at Ti Tree Bend, Launceston, are presented in Figure 3-11.

The concentration of Pb in Launceston has decreased progressively over the last decade. The most recent data indicate that the annual average concentration was approximately 0.02 $\mu g/m^3$ (in 1998).

3.2.8.2 Screening Analysis

Tasmania does not propose to undertake performance monitoring of Pb in the Launceston Region, based on the application of the PRC Screening Procedure A (PRC, 2000c) as follows:

Acceptance limits by screening procedure for carbon monoxide, nitrogen dioxide, sulfur dioxide and lead.

Screening Procedure	Acceptance Limit (% of NEPM Standard)
A. Campaign monitoring at a Generally Representative Upper Bound (GRUB) monitoring location (with no significant deterioration expected over 5-10 years).	55% for 1 year of data 60% for 2 or more years of data

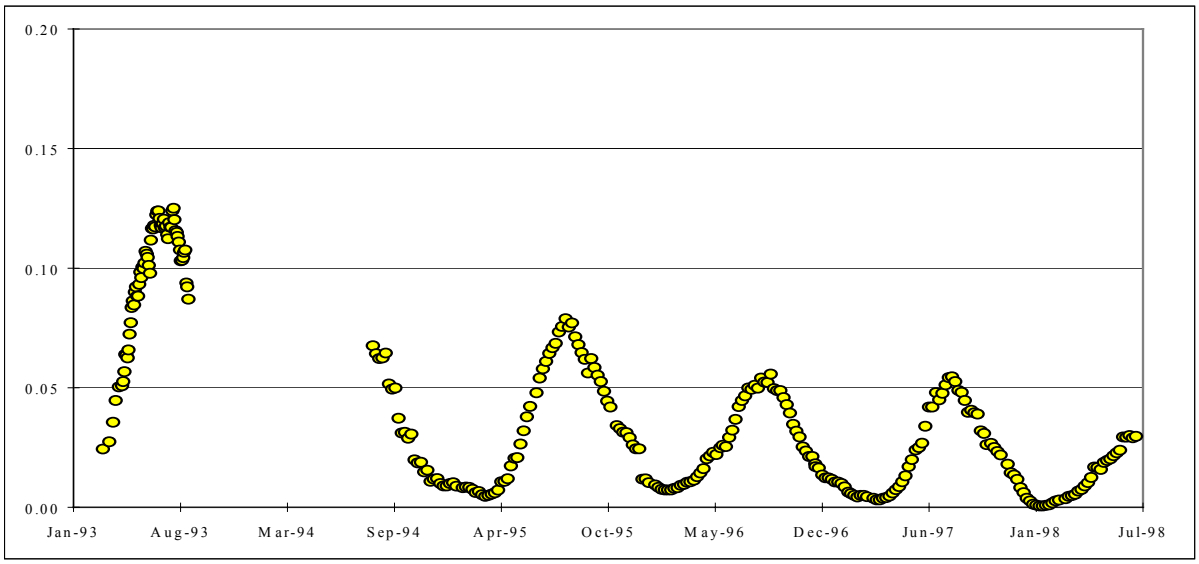

FIGURE 3-11
3-MONTH MOVING AVERAGE CONCENTRATION FOR PB (MICROGRAMS PER CUBIC METRE OF AIR IN PM_{10} FRACTION), TI TREE BEND, LAUNCESTON

Recent monitoring of Pb in Launceston, indicate that ambient concentrations are less than 5% of the NEPM Standard.

Motor vehicles are considered to be the largest source of Pb emissions in the Launceston Region. Given the scheduled introduction of Pb replacement petrol in Tasmania by 2001, it is projected that emissions of Pb from motor vehicles will decrease by over 90% by 2001 relative to 1996.

The screening criteria for Pb is considered to be met by a wide margin in the Launceston Region.

3.3 DEVONPORT

3.3.1 Overview

3.3.1.1 Region Boundaries

For Devonport, the availability of meteorological data tends to be relatively low. Moreover, complex atmospheric dispersion models have not been developed for the Region. For these reasons, the extent of the Devonport airshed is unclear.

For the purpose of the Measure, the Devonport Region boundaries are defined as presented in Figure 3-12. Although there is no functional purpose served in exactly defining the boundary AMG co-ordinates, these may be taken to be defined by the south-west corner (Easting 441,000; Northing 5430,000) and the north-east corner (Easting 454,000; Northing 5444,000).

3.3.1.2 Population and Topography

The population density and topography for the Devonport Region is presented in Figure 3-12.

The majority of the population resides within approximately a 5 kilometres radius of the CBD.

In total, the population of the Devonport Region defined in this Plan is approximately 30,000.

Devonport is located in a shallow coastal plain on the banks of the Mersey River. The Mersey connects the town of Latrobe with Devonport.

3.3.1.3 Emissions

There is no existing inventory of air emissions for the Devonport Region. The major sources of emissions to air in the Region are considered to be domestic (woodheaters and fireplaces) and motor vehicles.

3.3.1.4 Meteorology

Wind Roses for the Devonport Region are presented in Figure 3-13.

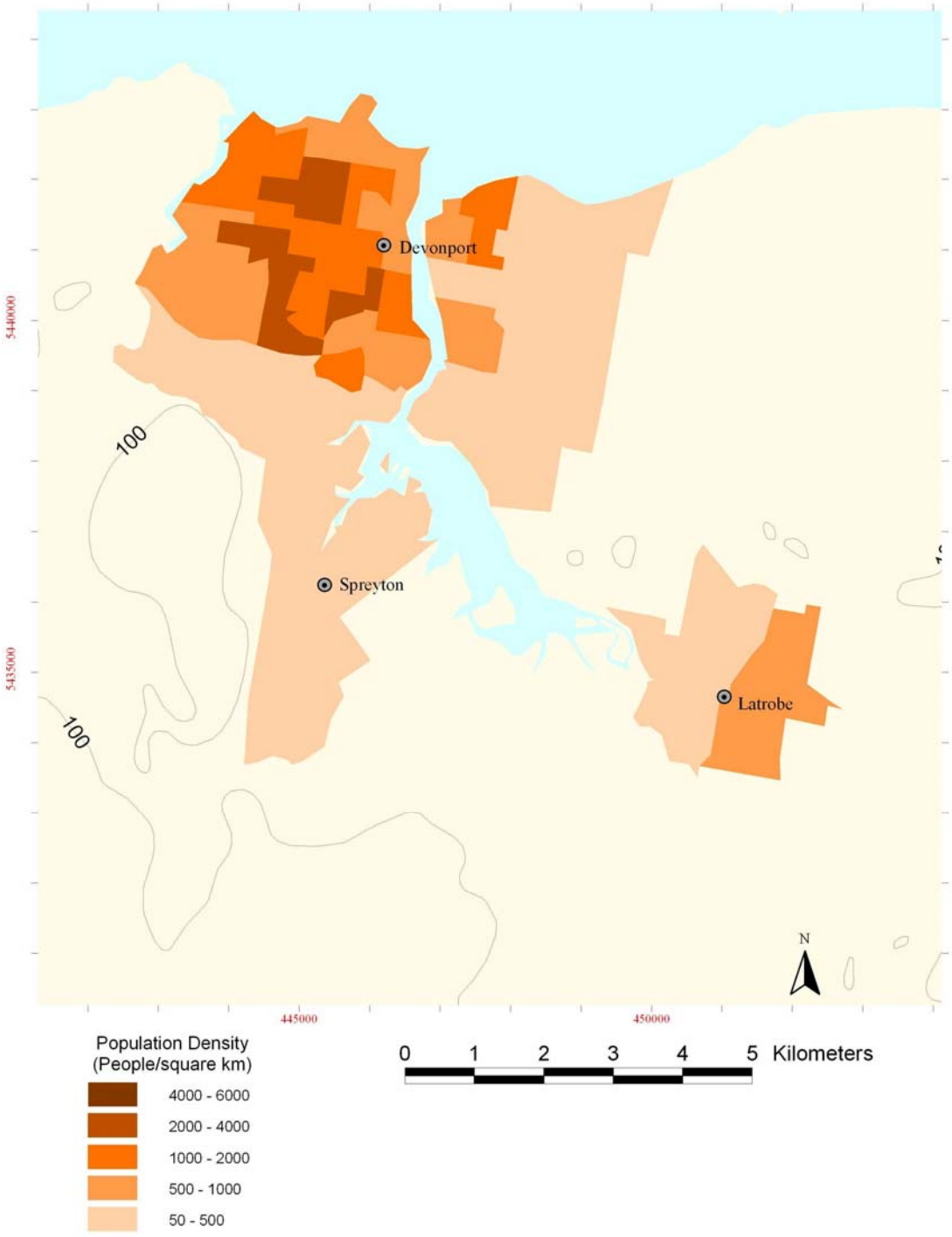

FIGURE 3-12
MAP OF DEVONPORT REGION INCLUDING POPULATION DENSITY AND TOPOGRAPHY

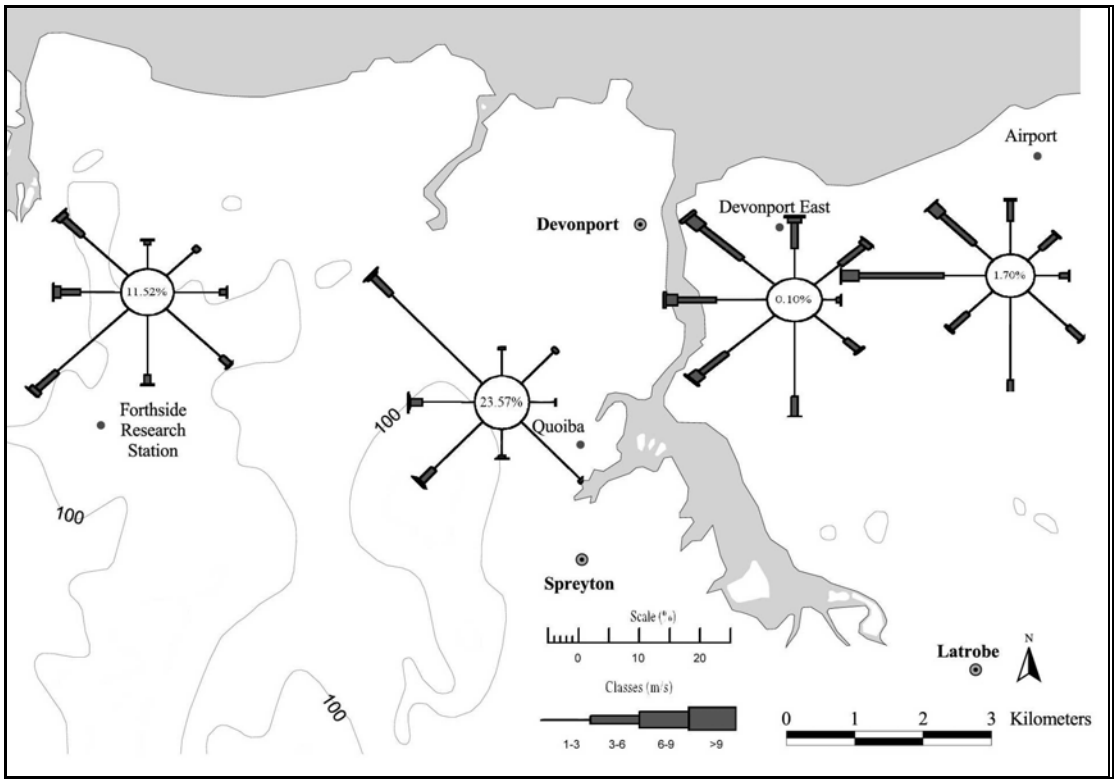

FIGURE 3-13
WIND ROSES, DEVONPORT REGION

Westerly winds tend to prevail in the Devonport Region, with atmospheric calm conditions most frequent in winter and autumn.

3.3.1.5 Air Quality Monitoring History

There are no data on ambient air quality for the Devonport Region. Anecdotal evidence indicates that PM_{10} levels may at times, exceed the NEPM Standard. The level of other pollutants is expected to be low.

3.3.2 NEPM Formula

From Clause 14(1) of the Measure, the number of performance monitoring stations required for the Devonport Region is one.

3.3.3 Photochemical Oxidants (as O_3)

3.3.3.1 Review of Data

Monitoring data for O_3 in Devonport's ambient air are not available.

3.3.3.2 Screening Analysis

To be provided when TAPM Consultancy data for O_3 become available.

3.3.4 Nitrogen Dioxide

3.3.4.1 Review of Data

Monitoring data for NO_2 in Devonport's ambient air are not available.

3.3.4.2 Screening Analysis

To be provided when TAPM Consultancy data for NO_2 become available.

3.3.5 Particulate Matter (as PM_{10})

3.3.5.1 Review of Data

Monitoring data for PM_{10} in Devonport's ambient air are not available.

3.3.5.2 Nominated Performance Monitoring and Trend Station

Tasmania does not propose to conduct performance monitoring of PM_{10} in the Devonport Region until a preliminary monitoring program is conducted to evaluate possible compliance with screening criteria under the Measure.

Campaign monitoring is proposed for the winter of 2003.

3.3.6 Carbon Monoxide

3.3.6.1 Review of Data

Monitoring data for CO in Devonport's ambient air are not available.

3.3.6.2 Screening Analysis

Screening analysis is expected to be based on results of monitoring in Hobart. At this time, such data are not available and it remains unclear if the CO screening criteria can be complied with in Devonport.

3.3.7 Sulfur Dioxide

3.3.7.1 Review of Data

Monitoring data for SO_2 in Devonport's ambient air are not available.

3.3.7.2 Screening Analysis

Tasmania does not propose to undertake performance monitoring of SO_2 in the Devonport Region, based on the application of the PRC Screening Procedure F (PRC, 2000c) as follows:

Acceptance limits by screening procedure for carbon monoxide, nitrogen dioxide, sulfur dioxide and lead.

Screening Procedure	Acceptance Limit (% of NEPM Standard)
F. In a region with no performance monitoring, comparison with a NEPM compliant region with greater population, emissions and pollution potential[a].	35%

a. Pollution potential must take into account meteorology and topography.

There are no known significant industrial sources of SO_2 emissions in the Devonport Region. Moreover, the Region lies on a shallow coastal plain which is expected to have better atmospheric dispersion than the Launceston Region. The population of the Devonport Region is significantly lower than that of Launceston.

As noted previously, SO_2 concentrations in the Launceston Region have been reported to be less than 10% of the NEPM Standard. By analogy, Screening Criterion F is satisfied by a wide margin in the Devonport Region.

3.3.8 Lead

3.3.8.1 Review of Data

Monitoring data for Pb in Devonport's ambient air are not available.

3.3.8.2 Screening Analysis

Tasmania does not propose to undertake performance monitoring of Pb in the Devonport Region, based on the application of the PRC Screening Procedure F (PRC, 2000c) as follows:

Acceptance limits by screening procedure for carbon monoxide, nitrogen dioxide, sulfur dioxide and lead.

Screening Procedure	Acceptance Limit (% of NEPM Standard)
F. In a region with no performance monitoring, comparison with a NEPM compliant region with greater population, emissions and pollution potential[a].	35%

a. Pollution potential must take into account meteorology and topography.

There are no known significant industrial sources of Pb emissions in the Devonport Region. The major source of this pollutant is considered to be motor vehicles.

As noted earlier, the Launceston Region is a NEPM compliant region for Pb, with greater population, emissions and pollutant potential than the Devonport Region. Moreover, ambient concentrations of Pb in Launceston are less than 5% of the NEPM Standard, and will continue to decline in future across the State.

By analogy, Screening Criterion F is satisfied by a wide margin in the Devonport Region.

4 SITING AND INSTRUMENTATION

4.1 DETAILS OF MONITORING STATIONS

The proposed ambient air quality monitoring program for Tasmania, in fulfilment of the requirements of the Measure, is presented in Table 4-1.

TABLE 4-1
NEPC MEASURE ON AMBIENT AIR QUALITY, MONITORING FOR TASMANIA

Region	Station Locality/Note	PM_{10} (TEOM)[a]	PM_{10} (High Volume Sampler)	CO (IR)[a]	SO_2 (F)[a]
Hobart	Prince of Wales Bay	P & T		P & T	
	To be determined				P & T (Scheduled for 2003)
Launceston	Ti Tree Bend		P & T		
Devonport	Performance monitoring requirement will be assessed after conducting campaign monitoring		C (Scheduled for 2003)		

a. Measurement method for each pollutant in brackets:
TEOM Tapered Element Oscillating Microbalance
IR Non Dispersive Infrared
F Fluorescence

P & T. Performance and Trend Monitoring Station (single station only).

C. Campaign Monitoring.

In Hobart, two ambient air monitoring stations are proposed. The first, is located in the suburb of Glenorchy (Easting 524,800; Northing 5257,400) on the banks of Prince of Wales Bay, approximately 6 kilometres north-north-west of the Hobart CBD. This station commenced monitoring in 2000 and represents a GRUB station for PM_{10} and CO. The second station, is proposed to be established in 2003 after the completion of a study which is currently in progress, to represent a GRUB station for SO_2.

In Launceston, the proposed monitoring station is located in the suburb of Invermay (Easting 510,200; Northing 5,414,500) within the Ti Tree Bend Sewage Treatment Works on the east bank of the Tamar River, approximately 3 kilometres north-west of the Launceston CBD.

A decision on monitoring in Devonport will not be made until after campaign monitoring is conducted in 2003.

Tasmania proposes to employ the Australian Standard Methods referenced in Schedule 3 of the Measure for monitoring CO and SO_2.

For particles, Tasmania proposes to initially use a Tapered Element Oscillating Microbalance (TEOM) in Hobart and High Volume Samplers (also referenced in Schedule 3 of the Measure) in Launceston. The method of monitoring PM_{10} in subsequent years will depend on an assessment of High Volume Sampler/TEOM inter-comparability.

4.2 DATA HANDLING

Tasmania is committed to data handling in a manner that is consistent with PRC Guideline Paper No.5 (PRC, 2000e).

4.3 METEOROLOGICAL OBSERVATIONS

Tasmania proposes to use available meteorological data from the Bureau of Meteorology stations in the Hobart, Launceston and Devonport Regions to assist in evaluating exceedences of Standards, as required under Clause 18(3) of the Measure.

4.4 MONITORING STATION SITE COMPLIANCE

Tasmania proposes, to the extent practicable, to site performance monitoring stations in accordance with the requirements of Australian Standard AS2922-1987 (Ambient Air- Guide for Siting of Sampling Units).

Table 4-2 presents an assessment of Tasmanian air monitoring stations against the criteria of AS2922-1987.

5 ACCREDITATION

Tasmania is committed to providing NATA (National Association of Testing Authorities) accredited data for NEPM reporting purposes. Such accreditation is consistent with PRC Guideline Paper No.7 (PRC, 2000f).

Work has commenced on a review of air-monitoring related quality assurance processes. Funding however, has yet to be made available to meet the full costs associated with the NATA accreditation process.

In cases where an issue is currently inconsistent with the protocol of the Air NEPM, but planned action by the jurisdiction is expected to resolve the inconsistency in a reasonable time, the PRC recommends that a time schedule be provided. Tasmania has set a goal of commencing operation of its air quality monitoring activities in accordance with NATA practices not later than 2003. If this target is met, it is reasonable to expect that Tasmania could achieve formal NATA accreditation for its Air NEPM monitoring and reporting requirements by December 2004.

6 REPORTING AND EVALUATION

6.1 ANNUAL REPORTS

Clause 18 of the Measure documents the reporting requirements for jurisdictions. To meet the requirements of the Measure, Tasmania will prepare annual reports by the 30th June following each reporting calendar year (ending 31 December).

The annual reports will be submitted in an approved format and will include:

- The evaluation and assessments mentioned in Clause 17 of the Measure;
- An analysis of the extent to which the Standards of the Measure have or have not been met in Tasmania; and
- A statement of the progress made towards achieving the Goal.

TABLE 4-2
STATION SITING COMPLIANCE WITH AS2922 CRITERIA

Criterion	Hobart Region Prince of Wales Bay	Launceston Region Ti Tree Bend
Height Above Ground	✓[a]	✓
Minimum Distance to Support Structures	✓	✓
Clear Sky Angle	✓	✓
Unrestricted Airflow	✓	✓
20m From Trees	✓	✗[b]
No Boilers of Incinerators Nearby	✓	✓
Minimum Distance From Road Traffic	✓	✓
Sample Line Material	✓	✓
Sample Line Length	✓	✓
Comment	Compliant with all AS2922 Criteria	Trees not considered to significantly affect measurements at this site.

a. Tick designates compliance with criterion.
b. Cross designates non-compliance with criterion.

Moreover, Tasmania will report in a manner consistent with PRC Guideline Paper No.8 (PRC, 2000g).

According to Clause 3 of the Measure, monitoring in accordance with the Protocol is to commence within 3 years of its commencement. Tasmania proposes to report monitoring data for July to December 2001 by 30 June 2002.

6.2 EVALUATION OF PERFORMANCE

Under Clause 17 of the Measure, jurisdictions are required to evaluate their annual performance against the Standards and Goal of the Measure.

For each performance monitoring station, Tasmania will:

- Determine the exposed population represented by the station. Because of the uncertainty associated with any quantitative measure of the exposed population, it is proposed that the NEPM requirement be met by a qualitative description which indicates the communities that are expected to experience similar levels of air quality to that of each performance monitoring station (by pollutant), either due to geographic proximity or similarity of emissions, meteorology and topography. For clarity, such information on each performance monitoring station (by pollutant) will be presented in tabular form. This approach is consistent with that specified in PRC Guideline Paper No.3 (PRC, 2000d); and

- Evaluate the performance against the Standards and Goal of the Measure as either meeting, not meeting or not demonstrated.

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