REPORT AGAINST THE

NATIONAL ENVIRONMENT PROTECTION MEASURE

FOR AMBIENT AIR QUALITY FOR 2007

BY TASMANIA

June 2008

SECTION A – MONITORING SUMMARY

INTRODUCTION

The Environment Division of the Tasmanian Department of Environment, Parks, Heritage, and the Arts (DEPHA) continued to monitor PM_{10} at NEPM Air Quality measuring stations in Launceston (Ti Tree Bend) and Hobart (Newtown), using Low Volume Air Samplers (LVAS) and TEOM instrumentation throughout 2007.

A 12-month equivalence study for the PM_{10} low volume samplers against High Volume Air Samplers, noted in the amended Tasmanian Air Monitoring Plan (2005), was not able to be carried out for reasons noted below.

The planned installation of the Devonport ambient air monitoring station did not take place in 2007 due to logistical and resource issues. The installation has been rescheduled for the second half of 2008.

Other monitoring programmes, not for NEPM reporting, are also being conducted in Tasmania. In mid 2007 the new George Town air monitoring station was commissioned. This is run in conjunction with local industries, and monitors PM10, PM2.5 (by LVAS), and SO_2 and NO_x via gas analysers. PM10, PM2.5 and PM1 are also continuously monitored via an optical Dust Monitor (GRIMM Aerosol Technik). Also, in late 2007 the Environment Division took over the operation of the lower Tamar air stations that were established in the previous year by the Tasmanian Regional Planning and Development Council (RPDC), as part of the baseline environmental studies prior to the construction and operation of the proposed pulp mill at Longreach.

CO monitoring at a peak site within the Hobart CBD is planned for the future.

OVERVIEW OF REGIONS

1 HOBART

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 airflows.

In the past the availability of meteorological data for Hobart has been limited. Moreover, development of complex atmospheric dispersion models for the region has only recently commenced, so the extent of the Hobart airshed is not yet fully characterised.

For the purpose of the Measure, the Hobart Region boundaries are defined as presented in Figure 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).

1.2 POPULATION AND TOPOGRAPHY

The population density and topography for the Hobart Region is presented in Figure 1-1. The city of Hobart is located on the narrow coastal plain of the Derwent Estuary, which lies in a well-defined valley flanked by a complex terrain of hills and mountain ranges. The majority of the region's population of 205,500 (ABS, 2006), reside within a 10 kilometre radius of the Central Business District (CBD), as illustrated in Figure 1-1, with significant satellite urban centres at Kingston-Blackmans Bay to the south (pop 29,000), Bridgewater-Gagebrook (pop. 14,000) and New Norfolk (pop. 6,800) to the north.

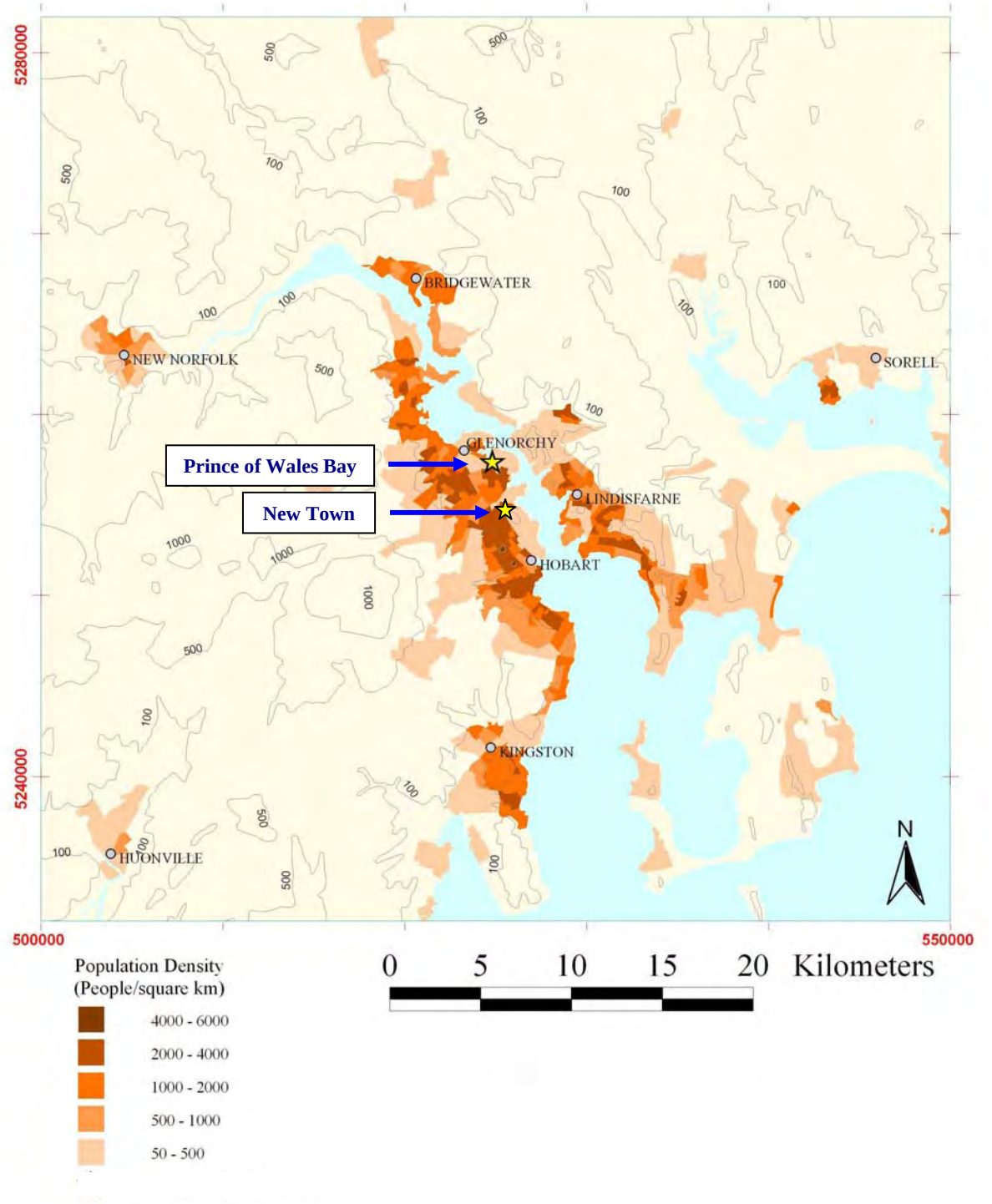

Figure 1-1: Map of the Hobart Region, showing the Population Density, Topography and the location of the NEPM Air Monitoring Stations. The Prince of Wales Bay Air Station was closed in mid 2006 when the Newtown station commenced operation.

1.3 METEOROLOGY

The prevailing wind direction for Tasmania is northwest, which is strongly modified by the complex mountainous terrain surrounding the Derwent Estuary. While the city experiences periods of strong winds during winter storms and the equinox, the city also experiences relatively calm anti-cyclonic conditions for much of the year. During these periods, the wind flows are dominated by the katabatic drainage winds flowing down the Derwent Valley during the night and early mornings, and a south-easterly sea breeze on warm afternoons. In clear, calm autumn and winter weather, relatively high levels of locally generated air pollution can be trapped in hollows and basins.

1.4 HOBART, PERFORMANCE AND TREND MONITORING STATION:

The Performance and Trend air monitoring station for Hobart was established In June 2000 at the Prince of Wales Bay sports fields, approximately 6km WNW of the Hobart CBD in the northern suburb of Glenorchy. Following the review of the Tasmanian Air Monitoring Plan in 2005, a new Performance and Trend air monitoring station was established 2.5 km closer to the CBD at a more representative site in New Town, in May 2006, as illustrated in Figure 1-1.

1.4.1 Newtown Station

The Environment Division moved the primary *Hobart Performance and Trend Monitoring Station* to New Town in May 2006, on property leased by the Hockey Association of Tasmania, some 2.5km SSE from the original station. The new station incorporates the TEOM from the decommissioned Prince of Wales Station, plus an Andersen RAAS low volume sampler for each of PM_{10} and $PM_{2.5,}$ and provision for installing an integrating nephelometer.

The choice of this site was also supported by recent preliminary TAPM modelling of the greater Hobart airshed, which predicts elevated smoke concentrations in the areas illustrated in Figure 1-2.

The following indicators were measured at the Newtown station in 2007:

- $PM_{2.5}$ measured by Andersen RAAS low volume air sampler (LVAS), according to AS 3580.9.10-2006, sampled every day.
- PM_{10} measured by Andersen RAAS low volume air sampler (LVAS), according to AS 3580.9.9-2006, sampled every day.
- A collocated TEOM direct-reading instrument with a PM_{10} head.

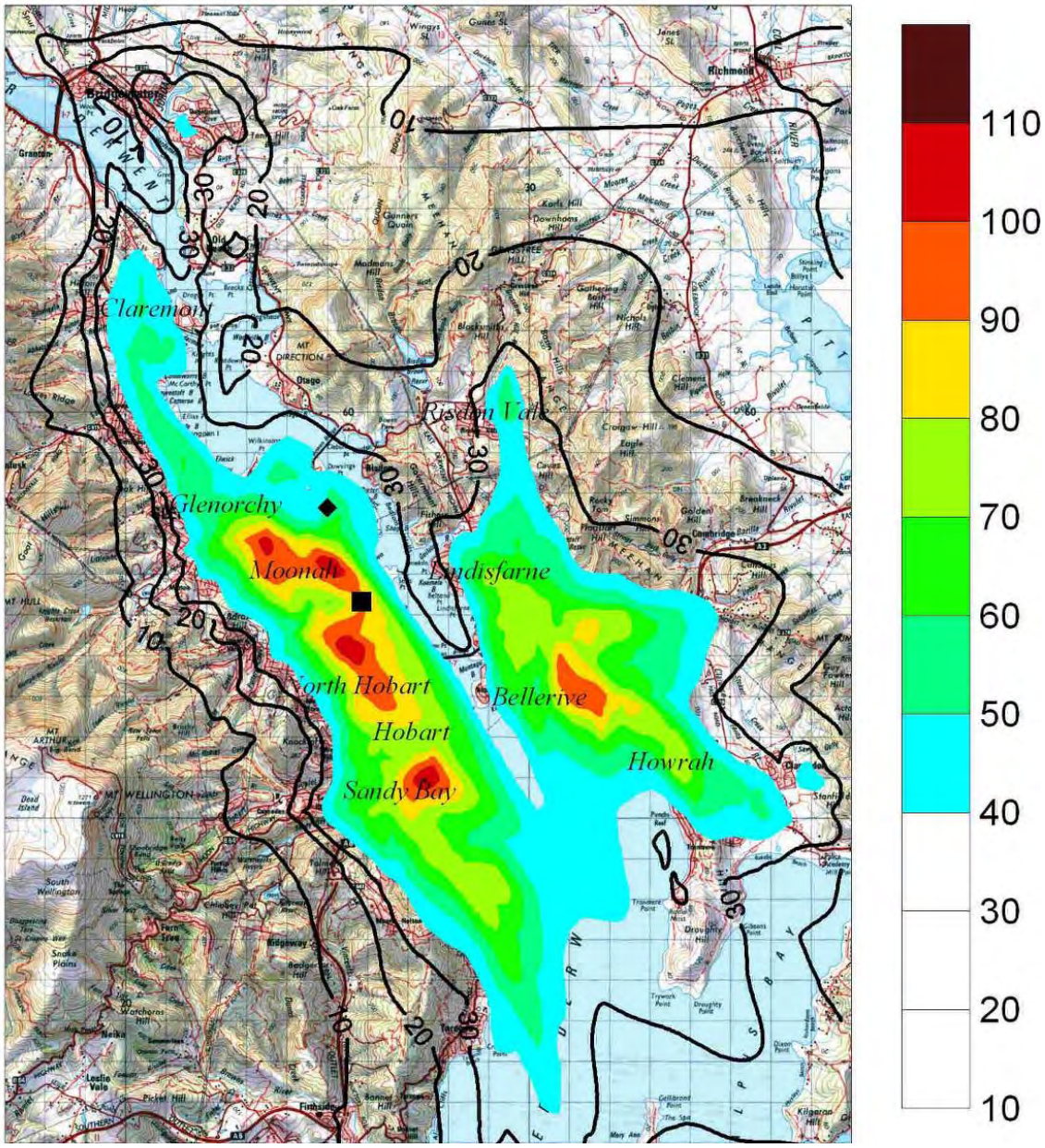

Figure 1-2: Results of preliminary modelling of maximum 24 hr average PM_{10} concentrations in the Hobart region, showing indicative "hot-spots" (in red) for particulates. The black square and diamond symbols respectively represent the locations of the Newtown air monitoring station and earlier, now decommissioned, Prince of Wales Bay station.

2. LAUNCESTON

2.1 REGION BOUNDARIES

Launceston and the Tamar Valley as a whole have been 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 occasionally have a minor impact on air quality in Launceston under unfavourable weather conditions (DPIWE, 1997).

For the purpose of the Measure, the Launceston Region boundaries are defined as presented in Figure 2 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).

2.2 POPULATION AND TOPOGRAPHY

The population density and topography of the Launceston Region is presented in Figure 2-1.

The total population of the Launceston Region as defined in the *Air Monitoring Plan for Tasmania*, and illustrated in Figure 2-1, is approximately 108,000 (ABS, 2006). The city of Launceston is located on the upper reaches of the Tamar River, in a well defined valley that 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 that reach heights of up to 400 m.

Most of Launceston's population of 64,000 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. George Town, near the mouth of the Tamar river, is the second largest urban centre in the region with a population of 6,700.

2.3 METEOROLOGY

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, PhD thesis, University of Tasmania).

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.

2.4 LAUNCESTON, TI TREE BEND PERFORMANCE AND TREND MONITORING STATION.

Seasonal PM_{10} measurements using a High Volume Air Sampler have been collected at Ti Tree Bend since 1992, with year round sampling commencing in 1997. The station is located in the grounds of the Launceston Council Waste Water Treatment Plant, on the banks of the Tamar River, some 300 metres from the Launceston Weather Station operated by the Bureau of Meteorology, as illustrated in Figure 2-1. The station was upgraded in March 2002 with the installation of a PM_{10} TEOM, a permanent station building in 2004, and the installation of Andersen RAAS Low Volume Air Samplers (LVAS) for $PM_{2.5}$ and PM_{10} in August 2005, as part of the *Tasmanian Air Quality Monitoring System Development Project, 2004-2008*.

The following indicators were measured at the Ti Tree Bend station in 2007.

- $PM_{2.5}$ measured by Andersen RAAS low volume air sampler (LVAS), according to AS 3580.9.10-2006, sampled every day.

- PM_{10} measured by Andersen RAAS low volume air sampler (LVAS), according to AS 3580.9.9-2006, sampled every day.
- A collocated TEOM direct-reading instrument with a PM_{10} head.
- In addition, comparative studies have been undertaken of DustTrak particle counters against both of the above methods, as part of the Launceston Woodheater Program.

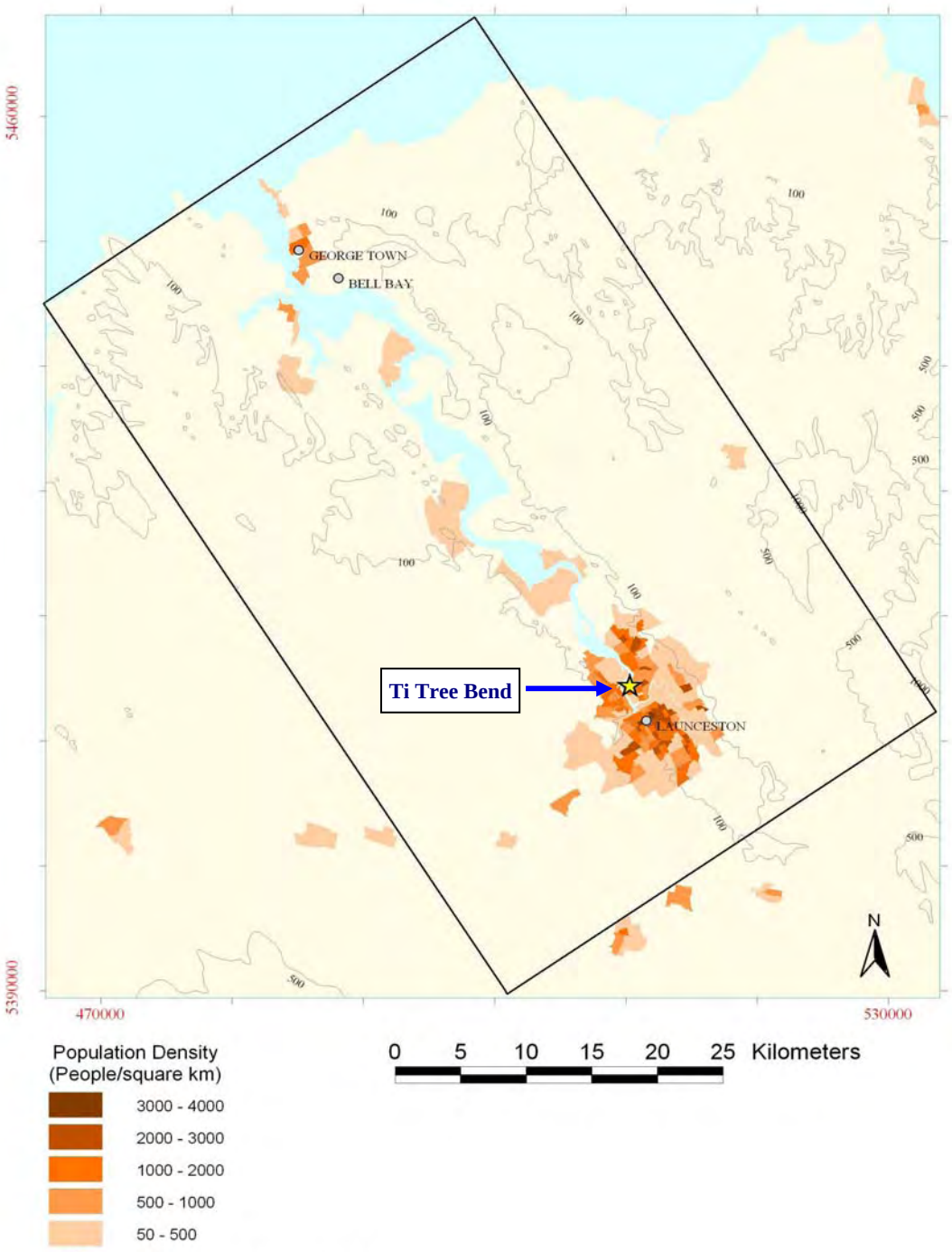

Figure 2-1: Map of Launceston Region showing the Population Density, Topography and the location of the Air Monitoring Station.

3. DEVONPORT

3.1 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).

3.2 POPULATION AND TOPOGRAPHY

The population density and topography for the Devonport Region is presented in Figure 3-1. The majority of the population resides within approximately a 5 km radius of the CBD. In total, the population of the Devonport Region as defined in the *Air Monitoring Plan for Tasmania* is approximately 33,500 (ABS 2006).

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 METEOROLOGY

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

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

3.4 DEVONPORT PERFORMANCE AND TREND MONITORING STATION

Campaign monitoring of particulates was completed at Devonport in 2003, to assess the need for a permanent station. The results of this survey confirmed that central Devonport experienced elevated levels of PM_{10} air pollution during the winter months, which could exceed the 50µg/m^3 NEPM limit under calm atmospheric conditions. In response to these findings, planning was undertaken to install a monitoring station in the grounds of the Devonport High School in 2007 as part *The Tasmanian Air Quality Monitoring System Development Project, 2004-2008*. The proposed location is in an open space close to the Devonport CBD as shown in Figure 3-1. For logistical and resource limitation reasons, this installation did not go ahead in 2007 but is planned for the second part of 2008, although the final location for the station is to be determined.

Equipment has been acquired to measure the following air quality indicators at the Devonport site:

- $PM_{2.5}$ measured by sequential Low Volume Air Sampler (LVAS), according to AS 3580.9.10 (2006), sampled every day.
- PM_{10} measured by sequential Low Volume Air Sampler (LVAS), according to AS 3580.9.9 (2006), sampled every day.
- A collocated TEOM direct-reading instrument with a PM_{10} head.

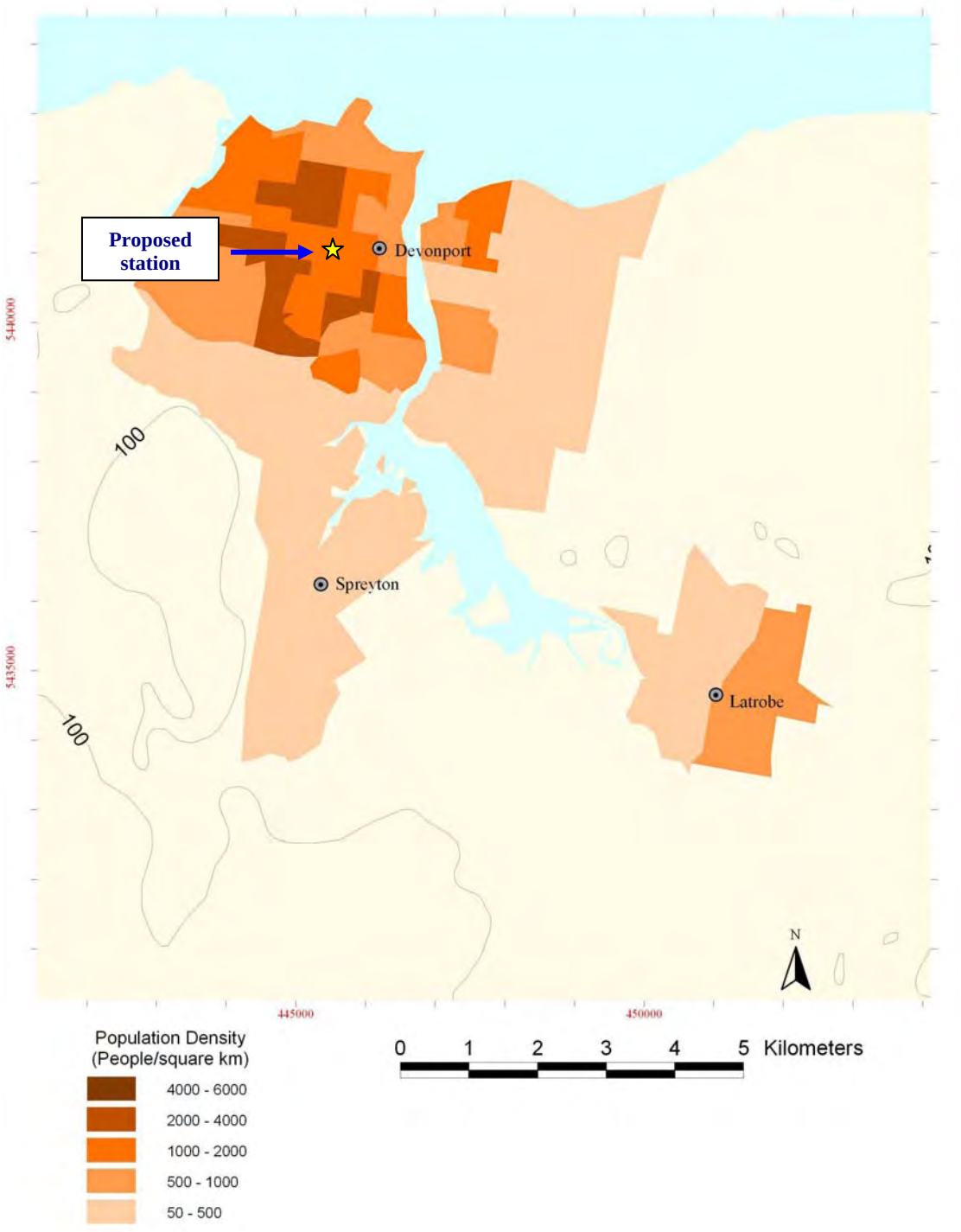

Figure 3-1: Map of Devonport Region Including Population Density and Topography

4. REFERENCE METHODS

The reference methods specified in Schedule 3 of the *National Environment Protection (Ambient Air Quality) Measure* (2003) for determining PM_{10} particulate concentration in ambient air are:

AS3580.9.6–1990	Determination of Suspended Particulate Matter – PM_{10} High Volume Sampler with Size Selective Inlet – Gravimetric Method.
AS3580.9.7-1990	Determination of Suspended Particulate Matter - PM_{10} Dichotomous Sampler – Gravimetric method

Advances in air sampler technology and the requirement to measure smaller particulate size fractions have seen the widespread adoption of USEPA compliant low volume air samplers as the preferred method for the measurement of PM_{10} and $PM_{2.5}$ in ambient air. These techniques are now recognised by the following Australia/New Zealand standards:

AS3580.9.9–1990	Determination of Suspended Particulate Matter – PM_{10} low volume sampler – Gravimetric Method.
AS3580.9.10-1990	Determination of Suspended Particulate Matter – $PM_{2.5}$ low volume Sampler – Gravimetric method

The Thermo-Electron/Andersen RAAS and Partisol sequential low volume air samplers used by the Environment Division are recognised as the following Manual Reference Methods for $PM_{2.5}$ and PM_{10} monitoring in the USEPA *List of Designated Reference and Equivalent Methods* (www.epa.gov/ttn/amtic/criteria.html):

Air Sampler	**Size**	**USEPA Approval No.**
Andersen Model RAAS10-300	PM_{10}	*Manual Reference Method* RFPS-0699-132
R&P Partisol®-Plus Model 2025	PM_{10}	*Manual Reference Method* RFPS-1298-127
Thermo-Electron Model RAAS2.5-300	$PM_{2.5}$	*Manual Reference Method* RFPS-0699-132
R&P Partisol®-Plus Model 2025 FEM	$PM_{2.5}$	*Manual Reference Method* RFPS-1298-145

Where practicable, the daily average PM_{10} concentrations measured by an approved High Volume or Low Volume air sampler were used for the purposes of determining compliance with the NEPM Standard. In the absence of validated air sampler data, the daily average PM_{10} measurement from the TEOM was used, with the following empirical temperature adjustment developed for Tasmanian conditions.

Adjusted PM_{10} = Measured PM_{10} x Temperature Correction Factor [TCF]

Where TCF = 1.00 for 24 hr average temperature $[T_{24}] >/= 15°C$

$1.00 + (15 - T_{24}) / 15$ $0°C < T_{24} < 15°C$

2.00 When $T_{24} =< 0°C$

5. PROGRESS TOWARDS NATA ACCREDITATION

Progress towards NATA Accreditation for the Environment Division of the Tasmanian Department of Environment, Parks, Heritage and the Arts (DEPHA) Ambient Air Monitoring Programme continued to be made in 2007. However the increase in work load (for no staff increase) associated with the commissioning of the George Town station in mid 2007 meant that the planned resources could not be allocated to the accreditation task. Additionally the hand-over of the Rowella monitoring station to the Environment Division in late November 2007 also required a significant resource commitment. Hence an external audit of the Air Monitoring Programme by an accredited NATA inspector scheduled for mid 2007 did not take place. The audit is now scheduled for late 2008.

Work towards NATA accreditation in 2007 included:

- Continued review and revision of all operating and calibration protocols, especially those associated with the measurement of PM_{10} and $PM_{2.5}$ airborne particulates using LVAS according to AS 3590.9.10 (2006).
- Staff training in NATA Quality System workshops
- The continued operation of a full document control system including;
  - Approved calibration and operation procedures,
  - Test forms
  - Technical Records and
  - Staff Training records
- Revision and upgrading of instrument Service and Calibration schedules
- External calibration of all critical test equipment (*e.g.* Flow meters, balances, temperature, pressure and humidity sensors) by NATA accredited measurement laboratories to ensure traceability to national and international standards.

6. SITING CRITERIA FOR AIR QUALITY MONITORING STATIONS

The following Australian Standards were used to select appropriate locations for Tasmania's air quality monitoring stations in Hobart and Launceston.

6.1 APPLICABLE AUSTRALIAN STANDARDS

1. AS2922 (Guide for siting of sampling)
   Critical criteria for location of sampling site:
   (i) Hg = Height of sampling inlet above ground. (2 to 5 m)
   (ii) Ho = Height of nearby obstacle above sampling inlet
   (iii) D = Horizontal Distance to nearby obstruction - typically >20 m.
   (iv) 120^0 = Minimum clear sky angle above sampling inlet
2. AS2923 (Ambient Air- Guide for the Measurement of Wind).
   Critical criteria for placement of 10 m meteorological tower
   Recommended minimum distance from obstruction = 10 x H
   Where H = Height of obstruction

6.2 COMPLIANCE WITH APPLICABLE STANDARDS

(i) New Town Air Quality Monitoring Site, Hobart

The Air Monitoring Station is located in a corner of an old jam factory site at 0 Bell St, New Town, which is currently used as a hockey complex. This air monitoring site has several obstructions within critical distances.

AS2922 (*Guide for siting of sampling*)

No.	Obstruction Description	Distance D (m)	H_o (m)	$2 H_o \leq D$	120^0 Sky Angle
1	Power Pole [1]	**3**	**7.6**	Does not comply	Does not comply
2	Met Mast [1]	**6**	**6.6**	Does not comply	Does not comply
3	Brick Wall	**15**	**-1**	Complies	Complies
4	Chimney	**50**	**22.6**	Complies	Complies

AS2923 (Ambient Air - Guide for the Measurement of Wind).

No.	Obstruction Description	Distance (m)	Height (m)	D > 20m	D > 10H
1	Power Pole [1]	**5**	**11**	Does not comply	Does not comply
2	Brick Wall	**13**	**2.4**	Does not comply	Does not comply
3	Chimney	**47**	**26**	Complies	Does not comply

Note 1. The power pole and meteorological masts are integral parts of the air monitoring station, and do not have a significant effect on air flow to the samplers and meteorological instruments.

6.2 COMPLIANCE WITH APPLICABLE STANDARDS (continued)

(ii) Ti-Tree Bend Air Quality Monitoring Site, Launceston.

The Launceston Ambient Air Quality Monitoring Station is located within the grounds of the Launceston City Council Waste Water Treatment Plant at Ti-Tree Bend. The station building and instruments are located besides the 4 settling lagoons away from the built-up area of the sewage treatment plant.

AS2922 (*Guide for siting of sampling*)

No.	Obstruction Description	Distance D (m)	H_o (m)	$2 H_o \leq D$	120^0 Sky Angle
1	Met Mast [1]	**8**	**6.6**	Does not comply	Does not comply
2	Tree 1	**27**	**6.6**	Complies	Complies
3	Shed 1	**30**	**1.6**	Complies	Complies
4	Shed 2	**50**	**1.6**	Complies	Complies

AS2923 (Ambient Air - Guide for the Measurement of Wind).

No.	Obstruction Description	Distance (m)	Height (m)	D > 20m	D > 10H
1	Tree 1	**38**	**10**	Complies	Does not comply
2	Shed 1	**22**	**5**	Complies	Does not comply
3	Shed 2	**55**	**5**	Complies	Complies

Note 1. The meteorological mast is an integral part of the air monitoring station, and does not have a significant effect on air flow to the samplers and meteorological instruments.

SECTION B – ASSESSMENT OF COMPLIANCE WITH STANDARDS AND GOALS

The monitoring results from 1st January 2007 to 31st December 2007, at Tasmanian Performance Monitoring stations are presented in Table 1.

Table 1: Summary of Performance against Standards for PM_{10} and $PM_{2.5}$ at Tasmanian Monitoring stations for the 2007 calendar year.

Region/Performance Monitoring Station	**Data Availability Rates (% of days for sampling regime)**					**No. of Exceedences**		**Performance Against Standard and Goal**
Hobart: New Town	***Q1***	***Q2***	***Q3***	***Q4***	***Annual***	***Period***	***No.***	
PM_{10} (All instruments)	100	100	100	99	100	24 hour	0	***MET***
- LVAS (every day)	91	95	98	85	92	24 hour		
- TEOM [1]	100	100	99	82	95	24 hour		
$PM_{2.5}$ *Reporting Standard only*	87	95	93	72	87	24 hour	7	
- LVAS (every day)	Average annual $PM_{2.5}$ conc. = 7.6 µg/m^3					Annual		
Launceston: Ti Tree bend	***Q1***	***Q2***	***Q3***	***Q4***	***Annual***	***Period***	***No.***	
PM_{10} (All instruments)	100	100	95	91	96	24 hour	5	***MET***
- LVAS (every day)	90	89	85	90	88	24 hour		
- TEOM[1]	99	100	84	49	83	24 hour		
$PM_{2.5}$ *Reporting Standard only* - LVAS (every day)	81	98	89	79	87	24 hour	20	
	Average annual $PM_{2.5}$ conc. = 9.5 µg/m^3					Annual		
Devonport: (Site: TBD) PM_{10}	Station under construction. Scheduled to begin operation in late 2008 No data					24 hour	N/A	

Notes: **1.** Temperature adjusted using local model according to Technical Guidance Paper 10

Adjusted PM_{10} = Measured PM_{10} x Temperature Correction Factor [TCF]

Where TCF = 1.00 for 24 hr average temperature [T_{24}] >/= 15°C
1.00 + (15 - T_{24}) / 15 0°C < T_{24} < 15°C
2.00 When T_{24} =< 0°C

SECTION C – ANALYSIS OF AIR QUALITY MONITORING

1. HOBART

In contrast to 2006, the results of the 2007 monitoring at Newtown demonstrate compliance with the NEPM Standards for PM_{10}, as data were collected for more than 272 days (75%) of the year in total and for more than 75% of each quarter. No exceedences of the PM_{10} Standard were recorded at New Town station during the year (Tables 1 and 2).

The 24 hour $PM_{2.5}$ concentration was observed to exceed the 25 µg/m^3 reporting limit on seven (7) days during 2007. (See Table 3 and section D1 below for more discussion.)

The annual average $PM_{2.5}$ concentration for 2007 was 7.6 µg/m^3 (Table 1). Compliance with the NEPM $PM_{2.5}$ annual reporting limit of 8µg/m^3 is therefore demonstrated as data were collected for more than 272 days (75%) of the year and for more than 75% of each quarter. The 2007 annual average value of 7.6 µg/m^3 is very similar to the previous year's annual average value of 7.2 µg/m^3.

Table 2: Exceedences of PM_{10} Standard during 2007 at New Town, Hobart, with Attribution of Cause.

Date	LVAS (µg/m^3)	24 Hour TEOM (µg/m^3)	Mean Temp (^{o}C)	Reason
NO EXCEEDENCES RECORDED				

Table 3: Exceedences of $PM_{2.5}$ 24-Hour Reporting Standard in 2007 at New Town, Hobart, with attribution of causes (in descending order of concentration).

National Environment Protection (Reporting) Standards: 25 µg/m^3 24 hour average
8 µg/m^3 annual average

Date	LVAS PM2.5 (µg/m^3)	LVAS PM10 (µg/m^3)	Corr. TEOM PM10 (µg/m^3)	Mean Temp. (^{o}C)	Reason
1. 26/06/2007	32	39	45	4.1	Temperature inversion with smoke
2. 12/07/2007	30	38	42	4.7	Temperature inversion with smoke
3. 23/06/2007	28	35	38	3.9	Temperature inversion with smoke
4. 13/08/2007	27	34	43	2.9	Frost with smoke
5. 29/06/2007	26	35	36	6.8	Temperature inversion with smoke
6. 9/09/2007	25	33	41	9.6	Cold night – presumed woodsmoke
7. 4/07/2007	25	39	47	6.9	Cold with smoke

2. LAUNCESTON

Results for Ti Tree Bend show that the air quality in Launceston complied with the NEPM goal for PM_{10} during 2007 (see Table 1), as there were only 5 reported exceedences (Table 4). Four of these exceedence events have been attributed to winter woodsmoke built up under still atmospheric conditions, and one to smoke from forestry operations in Tasmania.

On three further days in 2007, although the measured PM10 concentration at Ti Tree Bend was greater than 50 µg/m^3, an exceedence was not reported as the LVAS data were contaminated by local dust, raised by road machinery (one day) and wind gusts (two days). These are listed in Table 5. Note that the LVAS $PM_{2.5}$ readings for these three days are only slightly above the Launceston 2007 annual average value of 9.5 µg/m^3, indicating that the elevated PM_{10} levels were not due to smoke.

The annual average $PM_{2.5}$ concentration of 9.5 µg/m^3 (Table 1) for 2007 exceeds the reporting standard of 8 µg/m^3. However, the annual average for 2007 was slightly reduced from the 2006 value of 10.4 µg/m^3.

The 24 hour average $PM_{2.5}$ concentration exceeded the Reporting Standard of 25 µg/m^3 on 20 days during 2007 (see Table 6). This is a reduction compared to the 36 days of exceedences of the Reporting Standard in 2006.

Table 4: Exceedences of PM_{10} standard at Ti Tree Bend, Launceston in 2007, with attribution of causes (in descending order of concentration).

National Environment Protection Standard: 50 µg/m^3 (24 hour average)

Date	LVAS PM_{10} (µg/m^3)	Corr. TEOM (µg/m^3)	Mean Temp (^{o}C)	LVAS $PM_{2.5}$ (µg/m^3)	Reason
1. 25/06/2007	77	76	6.8	54.0	Temp. inversion with smoke
2. 15/05/2007	56	48	12.4	38.0	Fuel reduction burn with fog
3. 22/06/2007	54	71	3.4	38.0	Temp. inversion with smoke
4. 01/07/2007	52	58	4.9	43.0	Temp. inversion with smoke
5. 19/07/2007	No data	64	3.1	37.0	Temp. inversion with smoke

Note. The 24-hour average PM_{10} concentration from the TEOM was adjusted for the loss of volatiles from the heated TEOM filter using an empirical local temperature correction model developed according to Technical Guidance Paper 10

Adjusted PM_{10} = Measured PM_{10} x Temperature Correction Factor [TCF]

Where TCF = 1.00 for 24 hr average temperature [T_{24}] >/= 15°C

= $1.00 + (15 - T_{24}) / 15$ where $0°C < T_{24} < 15°C$

= 2.00 When $T_{24} =< 0°C$

Table 5: High PM_{10} observations at Ti Tree Bend, Launceston in 2007, not considered as exceedences

Date	LVAS PM_{10} (µg/m^3)	Corr. TEOM (µg/m^3)	Mean Temp (^{o}C)	LVAS $PM_{2.5}$ (µg/m^3)	Reason
1. 19/10/2007	57	65	15	10	Heavy Local Road dust
2. 19/11/2007	59	No data	20	11	Hot with wind gusts & dust
3. 20/11/2007	58	No data	23	11	Hot with wind gusts & dust

Table 6: Exceedences of $PM_{2.5}$ 24-Hour Reporting Standard at Ti Tree Bend, Launceston, 2007, with attribution of causes (in descending order of concentration).

National Environment Protection (Reporting) Standards: 25 μg/m^3 for 24 hours
8 μg/m^3 annual average

Date	LVAS PM2.5 μg/m^3	LVAS PM10 μg/m^3	Corr. TEOM PM10 μg/m^3	Mean Temp. (^{o}C)	Reason
1. 25/06/2007	54	77	76	6.8	Temperature inversion with smoke
2. 01/07/2007	43	52	58	4.9	Temperature inversion with smoke
3. 12/05/2007	40	No data	48	11.8	Inferred as forestry operations
4. 22/06/2007	38	54	71	3.4	Temperature inversion with smoke
5. 15/05/2007	38	56	48	12.4	Forestry/Fuel reduction burning with fog
6. 19/07/2007	37	No data	64	3.1	Temperature inversion with smoke
7. 16/05/2007	35	49	35	14.1	Forestry/Fuel reduction burning with fog
8. 10/06/2007	34	44	47	7.0	Temperature inversion with smoke
9. 23/06/2007	33	44	52	4.3	Temperature inversion with smoke
10. 24/06/2007	32	40	41	6.7	Temperature inversion with smoke
11. 02/07/2007	32	41	42	8.6	Temperature inversion with smoke
12. 26/06/2007	32	46	46	6.5	Temperature inversion with smoke
13. 14/05/2007	32	No data	44	10.4	Forestry/Fuel reduction burning with fog
14. 20/07/2007	29	No data	47	4.0	Temperature inversion with smoke
15. 22/07/2007	28	No data	37	5.2	Temperature inversion with smoke
16. 09/06/2007	27	35	35	7.0	Temperature inversion with smoke
17. 08/06/2007	26	40	49	5.2	Temperature inversion with smoke
18. 23/07/2007	26	No data	37	6.5	Temperature inversion with smoke
19. 04/07/2007	26	39	39	6.3	Cool with smoke periods
20. 11/01/2007	25	41	34	21.7	Heavy smoke from Vic. bushfires in morning

3. DEVONPORT

No data are available. A new PM_{10} station is due to be established at Devonport by the end of 2008 in response to the results of monitoring undertaken there in 2003.

SECTION D – DATA ANALYSIS

1. HOBART:

Andersen RAAS sequential Low Volume air samplers for $PM_{2.5}$ and PM_{10} measurements were in operation at the New Town station for the whole of 2007. Exceedences of the NEPM PM_{10} air quality standard were determined using the data from these instruments as they are now a recognised method for gravimetric PM_{10} and $PM_{2.5}$ measurements under AS 3580.9.9 and AS 3580.9.10 (2006). For days when LVAS data were not available observations made with the TEOM were used to determine if a PM_{10} exceedence occurred.

No daily average PM_{10} concentrations exceeding 50µg/m^3 were recorded at the New Town stations in 2007. In contrast to 2006, for 2007 the overall data availability was sufficient to demonstrate that Hobart's air quality complied with the NEPM goal for PM_{10}.

The daily average $PM_{2.5}$ concentration measured at New Town for 2007 exceeded the 25µg/m^3 reporting limit on seven (7) days. Six (6) of these exceedences occurred during cold weather in June, July and August. The remaining exceedence occurred on the 9th of September. Minimum overnight temperatures on the 8th and 9th of September were both below 3^{o}C, indicating cold and stable conditions, which appears to have contributed to smoke build up and the occurrence of the exceedence.

2. LAUNCESTON

A TEOM with a PM_{10} size selective inlet and Andersen Reference Ambient Air Samplers (RAAS) for PM_{10} and $PM_{2.5}$ were collocated at the Launceston station for the whole year. Exceedences of the NEPM PM_{10} air quality standard were determined using the data from the Andersen RAAS low volume sampler. For days when LVAS data were not available observations made with the TEOM were used to determine if a PM_{10} exceedence occurred.

As noted in the 2006 report, while Air Quality in Launceston, as measured at Ti Tree Bend has consistently been out of compliance with the PM_{10} goal since commencement of monitoring in 1997, there has been a trend downwards (e.g. there were 50 exceedences in 1997, 13 exceedences in 2005, and 6 exceedences in 2006), as illustrated in Figure 4-1. In 2007 there were only five (5) exceedences of the National Environment Protection Standard for PM_{10}.

Four (4) of the PM_{10} exceedences occurred in the autumn and winter period when temperature inversions can lead to high levels of fine particulate pollution from trapped wood smoke. The remaining exceedence was directly attributed to smoke from forestry operations in Tasmania in May 2007.

The $PM_{2.5}$ data indicate that Launceston still experiences relatively high levels of fine particulate pollution, with the daily average $PM_{2.5}$ concentration measured at Ti Tree Bend exceeding the 25µg/m^3 reporting standard on 20 days during the year. One (1) event occurred in the summer and was associated with the large Victorian bushfires burning at the time. Fifteen (15) exceedences of the Reporting Standard (75%) occurred during cold weather in June and July and are likely to be attributable to urban woodsmoke. The remaining four (4) events occurred on the 12th, 14th, 15th and 16th of May during mild conditions. The latter three events were explicitly noted in the Air Section database at the time as being due to smoke from forestry operations. It seems likely that the 12th of May exceedence has a similar origin – the Environment Division Incident Database has an entry of a smoke complaint from the 10th of May 2007 noting thick smoke at Pipers River (about 40 km north of Launceston). The weather over this interval was dominated by anti-cyclonic systems, giving calm conditions and morning fog in Launceston, and reducing the likelihood of smoke dispersing during the day.

As noted, Figure 4-1 shows the decrease in the annual number of recorded exceedences as measured at Ti Tree Bend. There have been several programs aimed at reducing particulate emissions in Launceston in recent years (e.g. wood heater buy-back schemes, education programs, etc., some of which are listed in the final section of this report). The reduction over time in the Launceston particulate concentrations is significant, and is suggestive that these programs have been effective.

It is worth briefly considering however if an ambient temperature influence is present, as it is clear that the level of particulates in Launceston show a dependence on ambient temperature. Figure 4-2 shows this for all PM_{10} Ti Tree Bend data (1992 to present), where it can be seen that the occurrences of PM_{10} observations greater than 50 $\mu g/m^3$ are more prevalent when the daily-averaged temperature is below around 10^oC. This result would imply that if there has been a long-term warming trend in Launceston a corresponding decreasing trend in PM_{10} concentrations may result.

Such an effect does not appear to be able to explain the decreased PM_{10} levels however. Figure 4-3 shows in the top panel the daily PM10 measurements for Launceston from 1992 to present. As noted there is a clear decline in particulate concentrations over time. As a check on data completeness, the middle panel shows the number of days of observations in the winter quarter (June-August, 92 days in total) for each year. From 1997 onwards the duty cycle has been high each winter. The lower panel shows the number of days in each winter when the average air temperature was below 7^oC (dotted line joined by squares), and the number of days with a minimum temperature below zero degrees (crosses joined by the dash-dot line), for days when PM_{10} observations were obtained. As can be seen, while 1999, 2000 and 2001 exhibited fewer frosts than for most years since 1997, the most recent years (2002-2007) showed a similar number of frosts and cold days as 1997 and 1998. However, as noted, the average level of PM_{10} concentration and the annual number of NEPM PM_{10} limit exceedences have shown a steady decline over this time. Hence it is considered unlikely that the decline in PM_{10} in Launceston over this interval can be explained by fewer cold days in the winter season.

Finally, it is worth noting that one of the five PM_{10} NEPM standard exceedences and four of the twenty $PM_{2.5}$ reporting limit exceedences have been ascribed to forestry burn-off operations.

3. DEVONPORT

The winter monitoring campaign in Devonport during winter 2003 showed that the local air quality is adversely affected by particulate pollution and may not comply with the NEPM goal. It is planned to establish a PM_{10} monitoring station at Devonport by the end of 2008.

4. STATISTICAL SUMMARY

The statistical summary of the PM_{10} and $PM_{2.5}$ data collected in Tasmania during 2007 against the National Environment Protection Measure for Air Quality are listed in Tables 7 and 8 below.

Table 7: 2007 Summary Statistics for PM_{10}

National Environment Protection Standard: 50 μg/m^3 (24 Hour Average)

Pollutant	Number of Valid days	Highest		6th Highest		Percentiles [μg/m^3]		
		μg/m^3	Date	μg/m^3	Date	98th	95th	90th
New Town, Hobart								
LV Air Sampler	336	44	17/01/2007	36	16/05/2007	36	30	26
TEOM - Measured	347	42	11/01/2007	31	16/05/2007	31	25	22
- Corrected	347	49	06/07/2007	42	17/01/2007	42	37	29
Ti Tree Bend, Launceston								
LV Air Sampler[1]	323	77	25/06/2007	54	22/06/2007	54	40	30
TEOM[1] - Measured	302	65[2]	19/10/2007	40	12/05/2007	40	32	27
- Corrected	302	76	25/06/2007	52	23/07/2007	52	44	36
Devonport	Monitoring scheduled to commence by end of 2008							

[1] Refers to all reported data, including observations over 50 μg/m^3 not considered exceedences.

[2] Ti Tree Bend, 19/10/2007: high TEOM reading due to local raised dust, not from smoke.

Table 8: 2007 Summary Statistics for $PM_{2.5}$

National Environment Protection (Reporting) Standards: 25 μg/m^3 (24 Hour Average); 8μg/m^3 (Annual Average)

Pollutant	Number of Valid days	Highest		6th Highest		Percentiles [μg/m^3]		
		μg/m^3	Date	μg/m^3	Date	98th	95th	90th
New Town, Hobart								
LV Air Sampler	316	32	26/06/2007	25	09/09/2007	25	21	17
Ti Tree Bend, Launceston								
LV Air Sampler	317	54	25/06/2007	37	19/07/2007	37	27	21

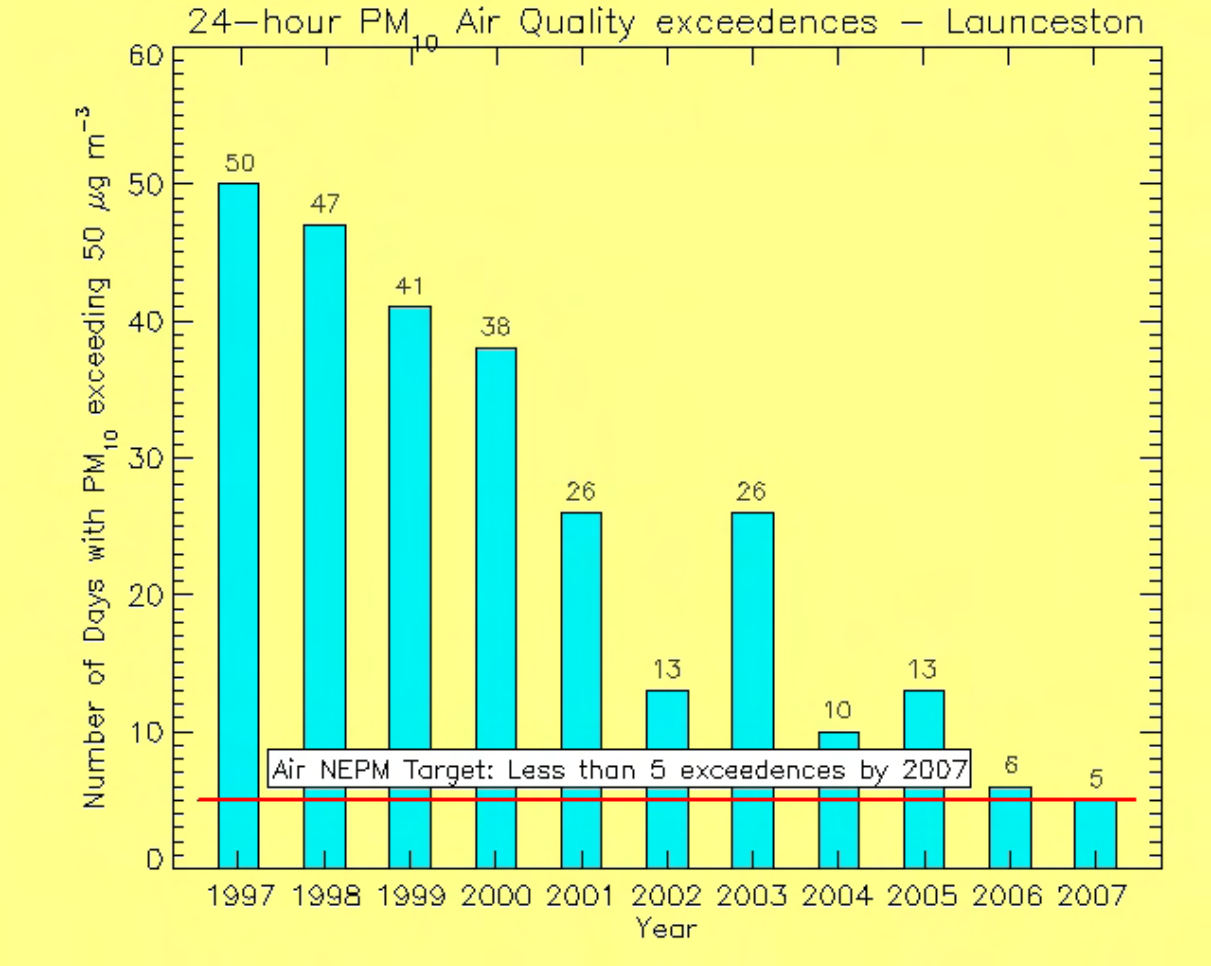

Figure 4-1: Annual exceedences of the PM_{10} Standard at Launceston for 1997 to 2007

NOTE: The development of the Tasmanian Air Quality Database has allowed the air density corrections for the historical high volume air sampler data to be recalculated using the observed meteorological data for the measurement period. This has resulted in some revision of the historical PM_{10} concentrations and the number of exceedences for past years.

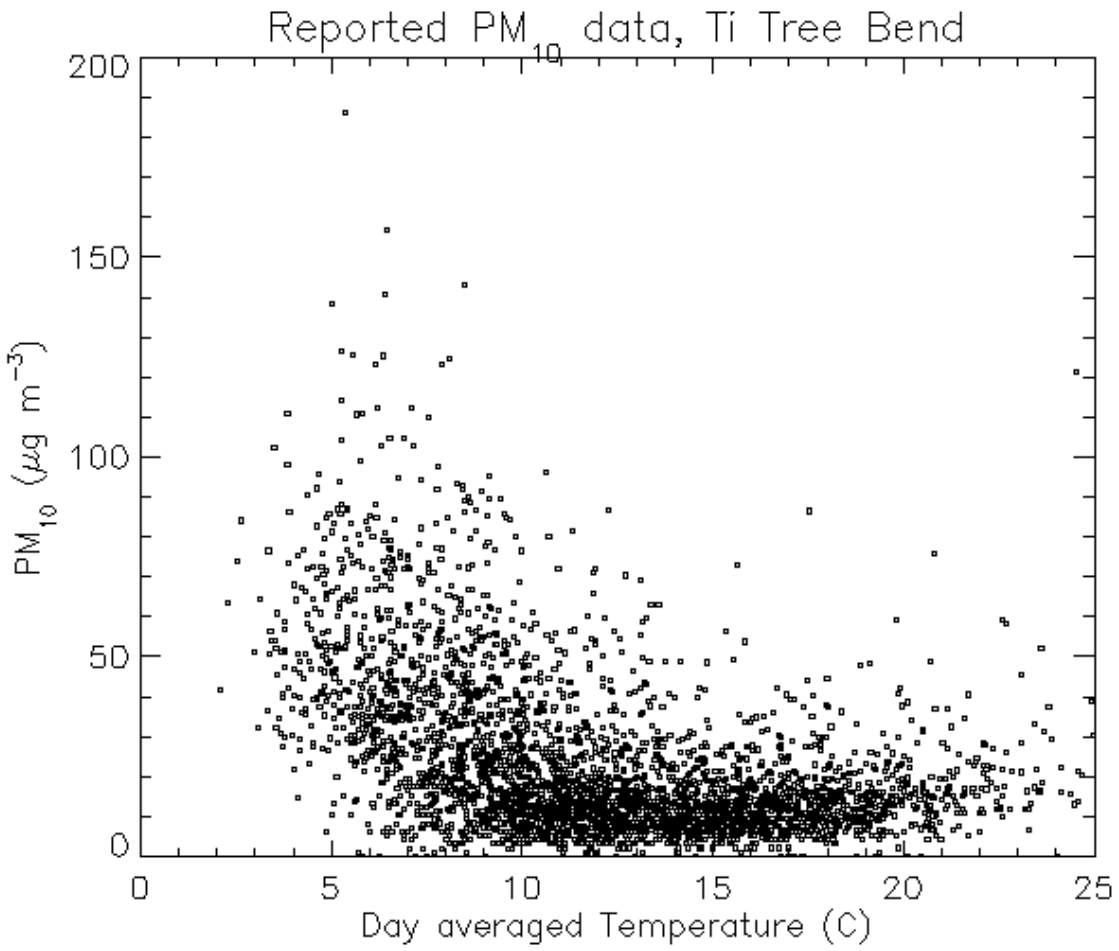

Figure 4-2: Ti Tree Bend PM_{10} data, 1992-present, versus daily averaged temperature. The occurrences of PM_{10} observations above 50 µg m^{-3} are much more frequent on colder days.

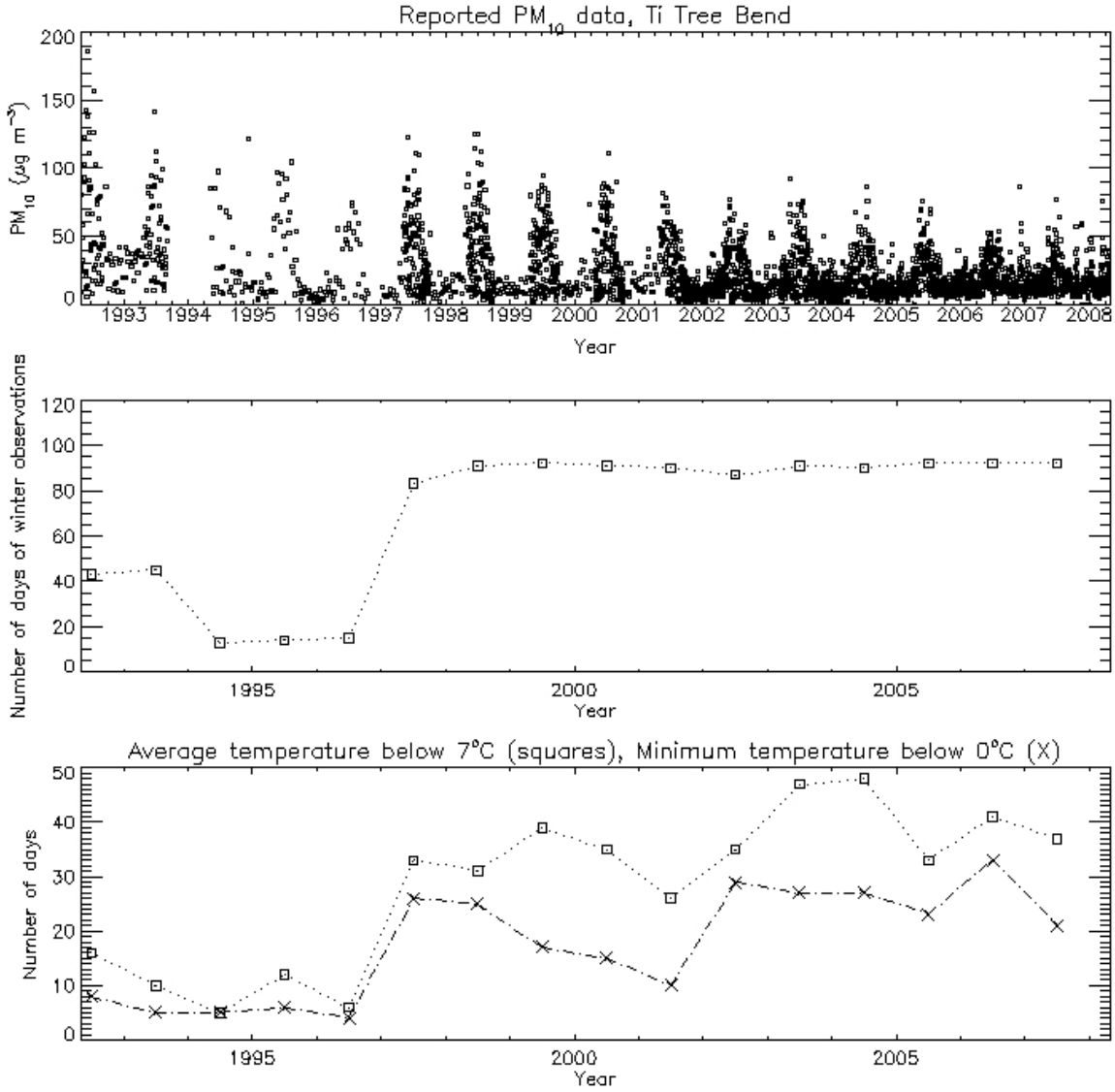

Figure 4-3: Top: Ti Tree Bend PM_{10} data, 1992-present, showing a decline in the levels of particulates over this interval. Middle: The number of days of PM_{10} observations in the winter quarter (June-August) for each year. After 1997 the duty-cycle of observations in winter is very high. Lower: The number of days with an average temperature below 7°C (squares joined by dotted lines) and the number of days with a minimum temperature below 0°C (crosses joined by the dash-dot line). There is no obvious warming trend present in these data; hence the observed decline in particulate levels in Launceston cannot be ascribed to a trend in ambient temperature.

SUMMARY OF ACHIEVEMENTS AND FUTURE DIRECTIONS

The Tasmanian Government has several programmes in place to assess compliance with the Air NEPM and to achieve progressive improvement in air quality throughout the state. These are outlined below, along with brief descriptions of related programmes and information on other developments.

- The Environment Protection Policy (Air Quality) 2004 came into force on 1 June 2005. The Policy includes specific reference to meeting the requirements of the Air NEPM through regulation of industry and management of diffuse sources and planned burning activities.
- New Regulations, titled *Distributed Atmospheric Emissions*, have been developed, and are aimed at controlling the manufacture, import and sale of solid fuel heaters, creating an offence for emission of excessive smoke and restricting backyard burning in Tasmania. Three workshops for local government officers were conducted in April 2007. The workshops detailed how the regulations are likely to function and the role the officers will take as agents of the main regulating body.
- The *Tasmanian Air Quality Strategy* was released by the Minister for Tourism, the Arts and Environment, Hon Paula Wriedt on 5 June 2006. The five-year Strategy aims to further reduce domestic and industrial emissions of fine particles in critical regions of the State, while maintaining a balance with economic growth and social equity issues, particularly relating to home energy use and conservation.
- The Tasmanian Government provided funding of $816,000 over the period 2004 to 2008 to develop a monitoring capability for $PM_{2.5}$ particles as required in the amendment to the Air NEPM (May 2003), and upgrade existing PM_{10} monitoring. The new system is in operation at Hobart and Launceston and will be extended to Devonport in late 2008, in line with the *Amended Tasmanian Air Monitoring Plan 2005*.
- The Australian Government-funded Launceston Woodheater Replacement Program replacement Scheme ceased in May 2004. This joint project between local, State and national governments, was managed through the Launceston City Council and directly resulted in removal of some 2200 woodheaters from the airshed. However, many more were also replaced during the three-year program and it is likely that some of these were an indirect result of the education component of the program. Launceston City Council is currently operating a similar, although smaller scale, woodheater buy-back programme.
- The Department initiated a radio advertising campaign during winter 2006 to encourage woodheater users to improve the operation of their heaters.
- A pilot air monitoring education program using a DustTrak commenced in 2007 in two schools in the Greater Hobart area. A consultant was contracted to work with the teachers to develop teaching and learning materials on air quality issues using the data collected at each of the schools. These Materials will be incorporated into school curricula and will be made available for other schools to implement via the web. In support of this program the Environment Division will install a Dustrak at the Newtown Air Station.
- A Partnership Agreement has been signed between the State Government and the Launceston City Council. This agreement is designed to reflect the desire of both parties for continued cooperation between the State and Local Governments. The parties aim to work together to identify new opportunities to promote and implement environmental policies and practices. It is anticipated that a similar agreement will be commenced with the Devonport City Council once the Devonport Air Station is commissioned.

- The Environment Division of The Department of Environment, Parks, Heritage, and the Arts has submitted a proposal for funds to purchase and operate mobile facilities to monitor $PM_{2.5}$ and PM_{10} in selected smaller communities in Tasmania.
- The Environment Division is working with the National Woodheater Reference Group to ensure a national certification system will be in place for wood heaters, and the Australian Standard is revised to include a reduced particulate emission standards and to include an efficiency standard.
- The Environment Division is actively working with interested stakeholders to reduce the impact of planned burning operations on air quality by ensuring that the forestry practices regulatory system is used to enforce best practice smoke management procedures as required by the Tasmanian Environmental Protection Policy (Air Quality) 2004. The Division is also contributing partial funding and other support to a research project on the health effects of planned burning.
- Funding is also currently being sought to implement a state-wide domestic heating survey together with a comprehensive review and collation of stack-test emission results for industry throughout the state. This information will be used to improve the predictive capability of dispersion modelling undertaken by the Environment Division and may enable some Tasmanian cities to be included in the Australian Air Quality Forecasting System administered by the Bureau of Meteorology.
- An ambient air monitoring station was commissioned at George Town in the upper Tamar Valley, as a cooperative project between the Industry, State and Local Government. This is a non-NEPM station established to provide valuable information about the air quality in George Town, which is the second largest population centre in the Tamar Valley, and situated adjacent to the heavy industrial area of Bell Bay and the Port of Launceston near the mouth of the Tamar River.

  This station, commenced operation in July 2007, and measures the following air quality parameters.

  - $PM_{2.5}$ measured by a sequential Low Volume Air Sampler (LVAS), according to AS 3580.9.10 (2006) sampled every day.
  - PM_{10} measured by a sequential Low Volume Air Sampler (LVAS), according to AS 3580.9.9 (2006) sampled every day.
  - Particle count and size distribution, measured by a 180 Grimm continuous optical particle counter – 10 minute average data
  - Sulphur Dioxide – 10 minute average data
  - Oxides of Nitrogen – 10 minute average data
  - Meteorology using a Vaisala MAWS-300 automatic weather station.
- In November 2007 the Environment Division assumed responsibility for the Tamar Valley Air Monitoring Project (TVAMP) which measures background levels of air pollutants in the central Tamar Valley in the vicinity of the proposed Longreach pulp mill. This is a non-NEPM project that includes the following air quality monitoring equipment:

  - A network of 11 Level 1 stations distributed along the valley, measuring the following parameters:
    - PM_{10} using Microvol (1 l\Litre/minute) air samplers – 7 day samples
    - Sulphur dioxide using passive adsorption tubes – 14 day average.
    - Oxides of Nitrogen using passive adsorption tubes – 14 day average.
    - Meteorology

- A Level 2 station near the township of Rowella in the central Tamar Valley, measuring air quality parameters including:
  - $PM_{2.5}$ using a Tapered Element Oscillating Microbalance (TEOM)
  - PM_{10} using a Tapered Element Oscillating Microbalance (TEOM)
  - Sulphur Dioxide – 10 minute average data
  - Oxides of Nitrogen – 10 minute average data
  - Poly Aromatic Hydrocarbons measured by a high volume PUF sampler
  - Meteorology.

  This network of stations was operated by Sinclair Knight Mertz (SKM), of behalf of the Tasmanian Regional Planning and Development Commission, from mid 2006 to the end of November 2007, when the Environment Division assumed responsibility. Note that six level 1 stations were decommissioned in mid 2007 after completing a year of baseline data collection. The Environment Division is now wholly responsible for the network, and operates, calibrates, and maintains the stations, and downloads and analyses the data. This has been, and is, a significant commitment on the part of the Environment Division to the TVAMP.

- In late 2008 a new NEPM station will be established at Devonport, as noted earlier in this report.