

AIUS

AUGUST 1998



# Environmental Indicators For Inner Metropolitan Melbourne

## BULLETIN 1

### WHAT'S INSIDE

#### INDICATORS OF

- waste
- water quality
- air quality
- noise
- open space
- how we travel to work





AUSTRALIAN INSTITUTE OF URBAN STUDIES & CITY OF MELBOURNE

This pilot bulletin is another step towards the development of a State of the Environment database for metropolitan Melbourne. It builds on an earlier study commissioned by the Institute from Context Pty Ltd and funded by the City of Melbourne that identified 46 indicators (see page 16) that could be used to monitor the state of Melbourne's urban environment. This bulletin presents data that has been collected and collated for 11 of these indicators. The Cities of Hobsons Bay and Moreland have also provided financial support.

The Institute plans to publish a regular series of environmental indicator bulletins such as this one. We would like to extend the range of themes covered so that Councils and their local communities can get an increasing flow of valuable information on the state of their environment. The geographic scope of the project could also be expanded to include other Councils beyond inner Melbourne.

However this will only happen if more Councils provide data and financial support for the continuation of this project. If you like this bulletin please forward any suggestions and indicate your support for the preparation of future bulletins.

I hope you find this bulletin interesting reading. There are some positive trends in the quality of the environment in inner Melbourne, but also some of concern. Some information is readily available but much remains uncollected and whilst there are limitations in some of the data presented, it is the best available at this stage. I hope that Councils will take up the challenge to become involved in further stages of this project. After all, if we don't measure how we are progressing, then we won't know when we have reached our goals.

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## INDICATOR: Total tonnage of municipal waste sent to landfill

A landfill levy was introduced in Victoria in 1992 under the Environment Protection (Resource Recovery) Act 1992. The levy applies to municipal waste (which includes household waste) and other solid waste such as building waste that is sent to landfill sites in metropolitan Melbourne.

The levy provides an incentive to reach the State's landfill reduction target and also provides information about the amount of waste disposed of.

Municipal waste sent to landfill, inner Melbourne municipalities, 1995/96 and 1996/97				
Municipality	Waste Deposited 1995/96 (tonnes) <sup>2</sup>	Waste Deposited 1996/97 (tonnes)	Estimated resident population 1996	Waste per head of resident population 1996 (kgs)
Bayside	24,919	22,985	86,365	266
Boroondara	55,088	55,368	153,860	360
Darebin	24,990	26,934	127,430	211
Glen Eira	na	28,705	120,271	239
Hobsons Bay	20,258	22,866	77,764	294
Maribyrnong	28,381	25,151	61,329	410
Melbourne	39,354	37,615	39,716	947
Moonee Valley	45,286	43,392	110,004	394
Moreland	40,000	32,000	136,733	234
Port Phillip	36,429	30,356	76,089	399
Stonnington	na	52,631	88,562	594
Yarra	23,186	26,050	67,136	388
<b>TOTAL</b>	<b>331,891</b>	<b>404,053</b>	<b>1,145,259</b>	<b>353</b>
<b>TOTAL URBAN VICTORIA</b>	<b>1,290,000</b>	<b>1,189,747</b>	<b>3,650,000</b>	<b>326</b>

Notes: 1 "Total Urban Victoria" refers to metropolitan Melbourne, the Mornington Peninsula and main regional centres of Geelong, Ballarat and Bendigo. Eighty percent of Victoria's population lives in these areas.

2. 1995/96 figures are considered to be less reliable than 1996/97 figures

Source: Municipal waste figures provided by Western Regional Waste Management Group, South Eastern Waste Management Group, Northern Region Waste Management Group. Total Urban Victoria figures provided by Environment Protection Authority. Estimated Resident Population as at 30 June 1996 published by Government of Victoria, 1998.

## INDICATOR: Proportion of domestic waste recycled

The Beverage Industry Environment Council (formerly the Litter and Recycling Research Association) has carried out annual Recycling Audit and Garbage Bin Analyses since 1993. These survey the waste disposal habits and recycling behaviour of households across 30 municipalities in the Melbourne metropolitan area.

The results for the 1200 households surveyed in the inner Melbourne area are:

Municipality	No. of households in survey who were recycling	Average (kg) per household			Division Rate
		Recyclables placed for collection	Contamination in recyclables placed for collection	Waste in Garbage Bins	
Bayside	53	5.19	0.00	15.45	25.2%
Boroondara	63	4.89	0.04	11.03	30.6%
Darebin	51	5.07	0.50	9.56	33.5%
Glen Eira	65	5.17	0.03	12.71	28.9%
Hobsons Bay	63	2.74	0.08	10.74	20.2%
Maribyrnong	32	1.50	0.02	13.93	9.7%
Melbourne	53	5.54	0.03	8.97	38.1%
Moonee Valley	33	4.50	0.00	15.05	23.0%
Moreland	45	2.19	0.02	13.68	13.8%
Port Phillip	55	2.95	0.04	12.82	18.7%
Stonnington	58	3.44	0.01	14.50	19.2%
Yarra	46	2.55	0.01	6.55	28.0%
<b>TOTAL INNER</b>	<b>617</b>	<b>3.81</b>	<b>0.07</b>	<b>12.08</b>	<b>19.0%</b>
<b>TOTAL SURVEY RESULTS (3000 HOUSEHOLDS)</b>	<b>617</b>	<b>3.18</b>	<b>0.18</b>	<b>12.34</b>	<b>23.2%</b>

Note: 1 Diversion rate of waste from landfill is the weight of recyclables placed for collection compared to the total weight of all waste from the household (recyclables plus garbage).

Source: Litter and Recycling Research Association, 1996

## What has been happening?

### Municipal waste to landfill;

Municipal waste deposited in landfill in urban Victoria has declined over the past five years. However, the rate of decline will need to increase if the State's 50 percent reduction target is to be met, especially when other waste – commercial and industrial waste - is taken into account. The combined total of municipal and other waste to landfill has remained virtually static since 1992/93.

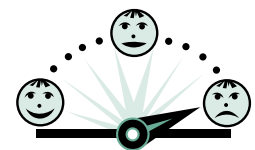
The amount of municipal waste collected from residents in inner Melbourne in 1996 was higher than the average for the rest of urban Victoria - 353 kgs per head of resident population compared to 326 kgs per resident of urban Victoria.

### Recycling

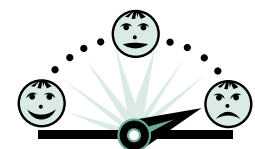
Melbourne survey results show that:

- the total recycling recovery rate - recyclables placed for recycling – has increased 15 percent since 1993
- the total diversion rate of recyclables from landfill to recycling has increased from 14.1 percent in 1993 to 23.2 percent in 1996
- recovery rates for glass beverage containers, PET drink containers and aluminium beverage containers have increased
- the average household's total waste (recyclables plus garbage) increased between 1993 and 1996

These trends are of concern. Households are reducing the amount of garbage going to landfill, but more recyclables are being consumed, even though they are eventually being placed for collection for recycling. Total waste is therefore increasing.



**Envirometer reading: caution/attention needed!**



**Envirometer reading: caution/attention needed!**

**INDICATOR: Suspended solids, nutrients, dissolved oxygen, turbidity, E. coli levels and heavy metals in main waterways**

Melbourne Water's StreamWatch program monitors water quality within the Greater Melbourne area at 60 sites, twelve of which are in inner Melbourne.

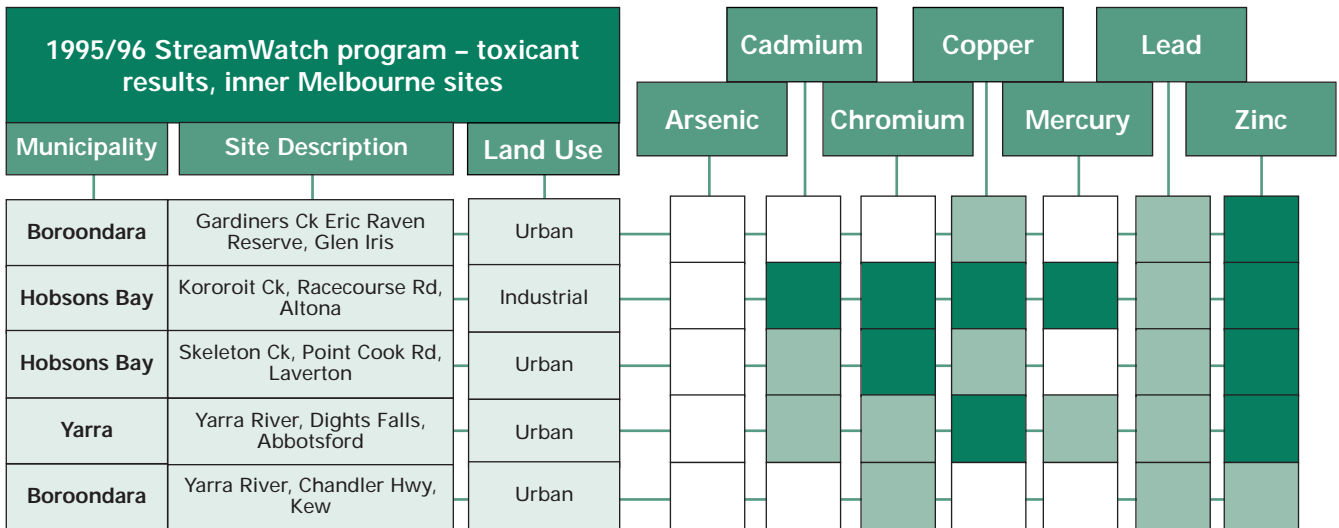
1995/96 StreamWatch Water Quality Monitoring Results - inner Melbourne sites.  
(Shaded cells indicate non-compliance with SEPP objectives).

YARRA CATCHMENT - Urban Tributaries		Dissolved Oxygen mg/L Mean	Turbidity BTU Median	Suspended Solids mg/L Mean	Total Nitrogen mg/L Mean	Total Phosphorous mg/L Mean	Escherichia coli org/100mL GeoMean
Municipality	Site Description						
Boroondara	Gardiners Ck at South Eastern Fwy, Hawthorn	10.9	55	44	2.27	0.15	2502
Yarra/Banyule	Darebin Creek at Clark Rd footbridge, Ivanhoe	9.5	22	8	1.58	0.12	356
Yarra	Merri Creek at Roseneath St, Yarra Bend	9.7	40	14	2.26	0.20	ns
Moonee Valley	Moonee Ponds Creek at Mt Alexander Rd, Parville	10.5	27	16	2.78	0.17	668
SEPP OBJECTIVES		>6.0	<25	<25	<1.00	<0.10	<1000
YARRA CATCHMENT - Yarra Mainstream & Estuary							
Boroondara	Yarra River at Chandler Hwy, Kew	9	34	36	1.19	0.10	450
Stonnington	Yarra River downstream Prahran Main Drain, South Yarra	ns	ns	ns	ns	ns	ns
Melbourne	Yarra River at Princes Bridge, South Melbourne	8.9	27	21	1.23	0.10	664
SEPP OBJECTIVES		>6.0	<30	<50	<0.90	<0.08	<200
MARIBYRNONG CATCHMENT - Estuarine							
Moonee Valley	Maribyrnong River downstream Ascot Vale Main Drain	8.8	14	11	1.43	0.22	325
Maribyrnong	Maribyrnong River at Yarraville Wharf 1, Yarraville	8.7	12	13	1.69	1.14	ns
SEPP OBJECTIVES		>5.0	<25*	<25	<0.75	<0.10	<1000
OTHER WESTERN WATERWAYS							
Maribyrnong	Stony Creek at Bena Street, Yarraville	12.8	27	28	4.20	0.30	390
Hobsons Bay	Skeleton Creek at Ayr Street, Laverton	6	5.5	7	0.87	0.10	ns
Hobsons Bay	Kororoit Creek upstream of Racecourse Rd Ford, Altona	9.3	21	25	1.80	0.17	236
Hobsons Bay#	Cherry Lake, Millers Road, Altona	ns	ns	ns	ns	ns	205
SEPP OBJECTIVES		>6.0	<25*	<25	<0.75	<0.10	<1000

# Cherry Lake has an E. coli objective of <200 org/100mL during summer, due to primary contact recreational activities  
Key: mg/L - milligrams per litre; org/100mL - organisms per 100 millilitres; ns - not surveyed. Source: Melbourne Water, 1997

## 2 WATER QUALITY - WATERWAYS AND BEACHES

The stream sediments from 15 sites, five of which are in inner Melbourne on four waterways, are tested for heavy metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc) as part of the Streamwatch Toxicant Program.



**Key:**

- passed both criteria: LEL and Australian Level B
- failed LEL criteria: moderate contamination for aquatic sediments
- failed Australian Level B criteria (and LEL): higher contamination for soils

**Note:**

- Two measures are used to assess metal concentrations in aquatic sediments:
  1. the lowest effect level (LEL) that each metal has on bottom-dwelling invertebrates, based on toxicity tests (Ontario Ministry of the Environment); and
  2. draft Australian Level B criteria for soils (further investigation is often recommended for metals exceeding these criteria); this measure is less stringent than the Ontario LEL

Source: Melbourne Water 1997

### INDICATOR: Biological monitoring in main waterways

The StreamWatch program also monitors the biological health of various sites on waterways in Greater Melbourne. This involves assessing aquatic macroinvertebrate populations of each waterway to determine overall stream quality. The type and diversity of macroinvertebrates that inhabit a waterway provide an indication of its health.

1995/96 StreamWatch program – ecosystem health rating, waterways in inner Melbourne			
Municipality	Site Description	Health rating	Key Factors Influencing Ecosystem Health
Boroondara	Back Creek, Dawson Dve, Glen Iris	1	Stream habitat, general water quality
Boroondara	Gardiners Creek, Eric Raven Reserve, Glen Iris	2	Stream habitat, nutrients, metals
Boroondara	Gardiners Creek, Toorak Road, Kooyong	1	Stream habitat, sedimentation
Boroondara	Gardiners Creek, Warrigal Road, Chadstone	2	Stream habitat, nutrients, metals
Hobsons Bay	Kororoit Creek, Racecourse Road, Altona	1	Toxicants in sediments, nutrients
Hobsons Bay	Skeleton Creek, Point Cook Rd, Laverton	2	Nutrients, salinity
Boroondara	Yarra River, Chandler Hwy, Kew	2	Stream habitat, turbidities, metals
Yarra	Yarra River Dights Falls, Abbotsford	1	Stream habitat, turbidities, metals

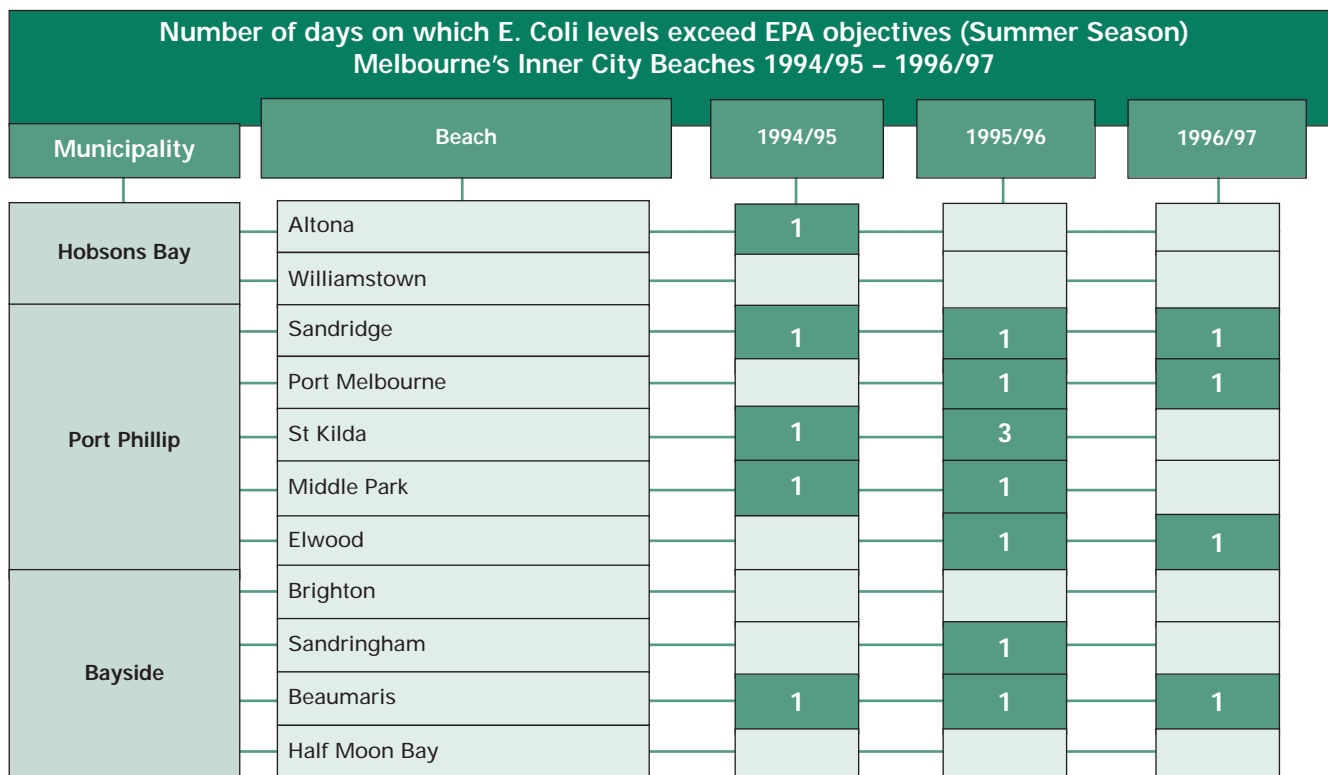
**Key:**

- |                                  |   |                 |   |
|----------------------------------|---|-----------------|---|
| Very Good to Excellent Condition | 4 | Moderate Stress | 2 |
| Mild Signs of Stress             | 3 | Severe Stress   | 1 |

Source: Melbourne Water 1997

## INDICATOR: Number of days on which E.coli levels at City beaches exceed EPA objectives

The EPA carries out water sampling of 35 beaches around Port Phillip Bay every six days in the summer months as part of its Beachwatch program. Levels of an indicator bacterium - Escherichia coli (E. coli) - are used to indicate if the water is acceptable or unacceptable for swimming.



### Key

- E. coli levels never exceeded EPA objectives in Beachwatch season
- E. coli levels exceeded EPA objectives, returning to acceptable levels the next day;

The numbers in the cells refer to number of days on which levels were unacceptable  
Source: Environment Protection Authority

## What has been happening?

### Waterways

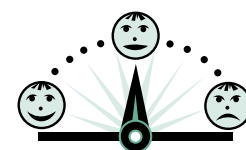
The water quality and biological health of many of metropolitan Melbourne's waterways have improved noticeably over the past 25 years. There are fewer major pollution incidents, fish have returned to estuaries and bacterial and organic levels have decreased.

While excellent ratings were recorded in inner Melbourne waterways for dissolved oxygen, further improvements are needed at some sites for turbidity and suspended solids, levels of nutrients, E. coli and toxicants and conditions for macroinvertebrate populations.

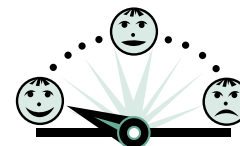
### Beaches

The EPA advises that in the late 1990's, beach water quality with respect to E. coli levels has generally been very good. This is mostly due to low summer rainfalls as urban runoff is one of the major sources of contaminants in Port Phillip Bay. There were no beach closures in the 1996/97 summer season.

A wetter summer season may provide a better test of performance.



**Envirometer reading:  
Improving/good but  
care still needed**



**Envirometer reading:  
Improving/good but  
care still needed**

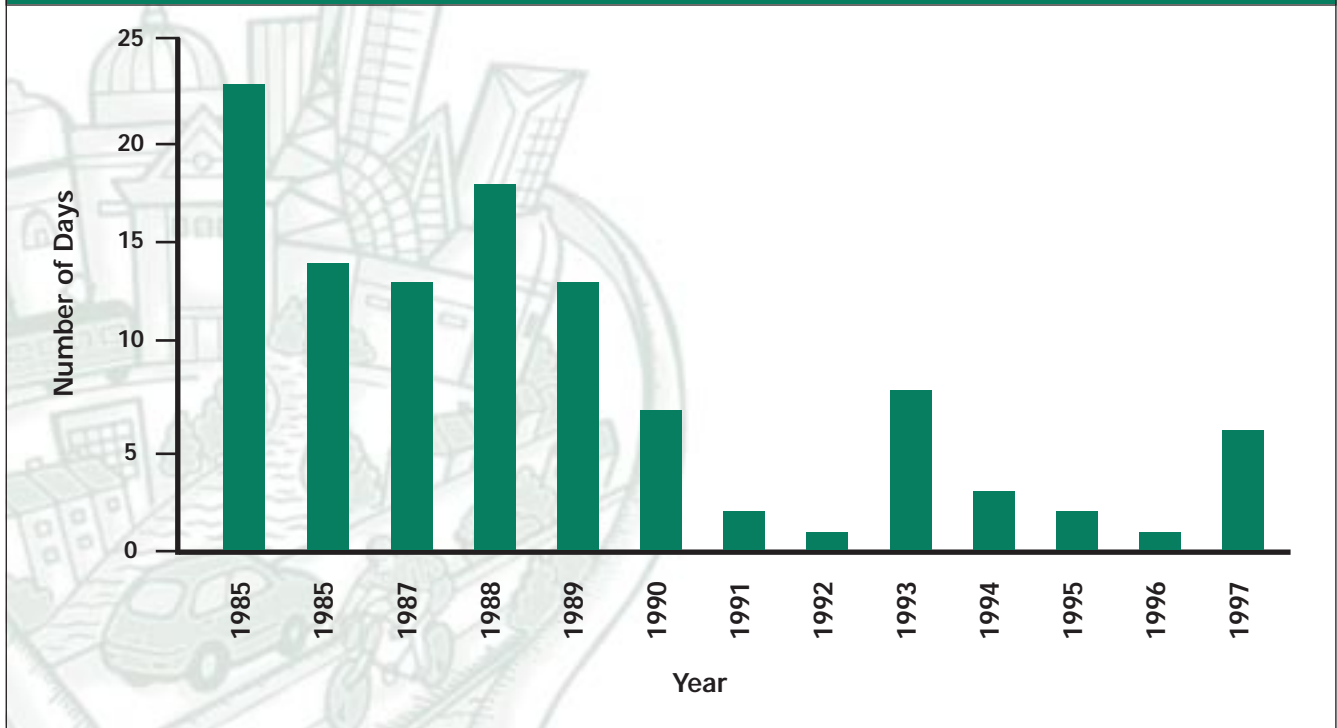
### 3 AIR QUALITY

**INDICATOR: Number of days on which ozone levels exceed proposed National Environment Protection Measure (100 parts per billion, Air NEPM 1-hour level)**

The EPA monitors ozone levels in Melbourne as part of its ongoing air monitoring program which began in 1974. The EPA maintains a network of nine fixed stations in Melbourne and two in Geelong.

Ozone is the main component of photochemical smog in Melbourne in summer and early autumn.

**Number of days per year on which ozone levels exceeded proposed National Environment Protection Measure (ozone > 100 ppb, air NEPM 1-hour level), Melbourne and Geelong 1985-1997**

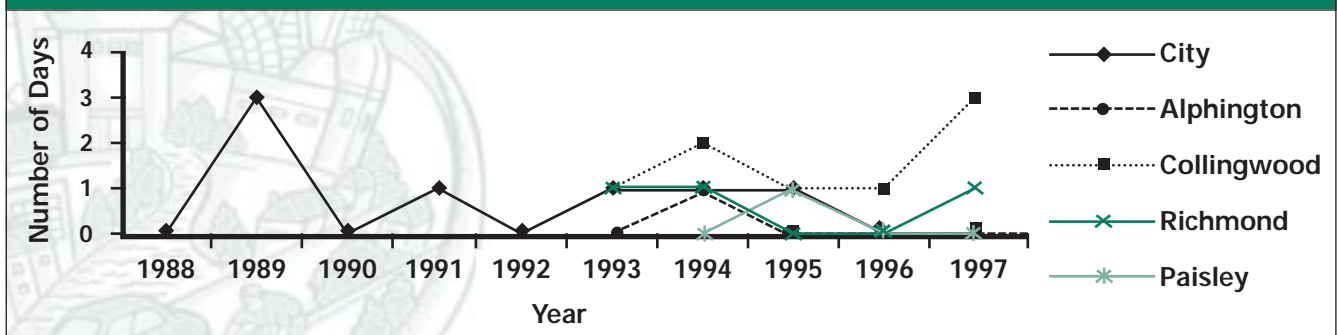


Source: Environment Protection Authority, Centre for Air Quality Studies

**INDICATOR: Number of days on which proposed National Environment Protection Measure (50 micrograms/cubic metre) for airborne particles (PM10) is exceeded.**

EPA's air monitoring includes monitoring of fine particles in air. PM10 refers to particles that are less than 10 micrometres in diameter. Particles of this size can be inhaled deeply into the lung and cause respiratory problems. Monitoring occurs at 6 sites, five of which are in inner Melbourne.

**Number of days on which proposed NEPM for airborne particles (PM10) is exceeded, inner Melbourne monitoring sites, 1988 - 1997**

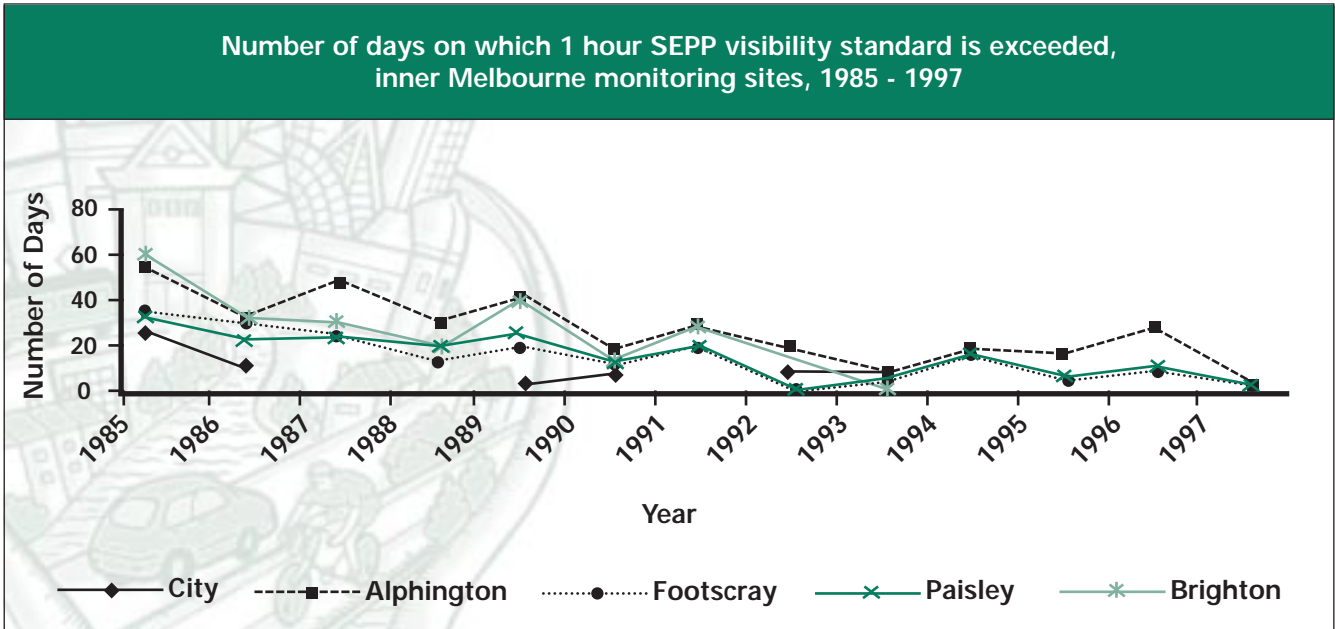


Source: Environment Protection Authority, Centre for Air Quality Studies

## INDICATOR: Number of days on which 1-hour State Environment Protection Policy visibility standard is exceeded

As well as posing a health hazard, fine particles in air can also reduce visibility. The EPA monitors visibility according to the State Environment Protection Policy standard of 20 kilometres, averaged over 1 hour. Measures of visibility-reducing particles have been shown to correlate well with very fine particles of less than 2.5 micrometres. (PM 2.5).

Measures are made at seven sites, five of which are in inner Melbourne.



Note: monitoring at the Brighton site ended in 1993.  
 Source: Environment Protection Authority, Centre for Air Quality Studies

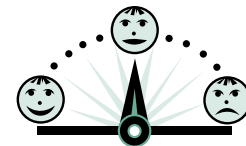
### What has been happening?

Melbourne's air is considerably cleaner than it was 20 years ago.

Breaches of standards for ozone concentrations in the Melbourne-Geelong airshed have dropped significantly since the early to mid-1980's. Annual breaches of the standard for visibility-reducing particles are down to a third of that in the early 1980's.

Levels of lead, nitrogen dioxide, carbon monoxide and sulphur dioxide have all remained below acceptable standards throughout the 1990's.

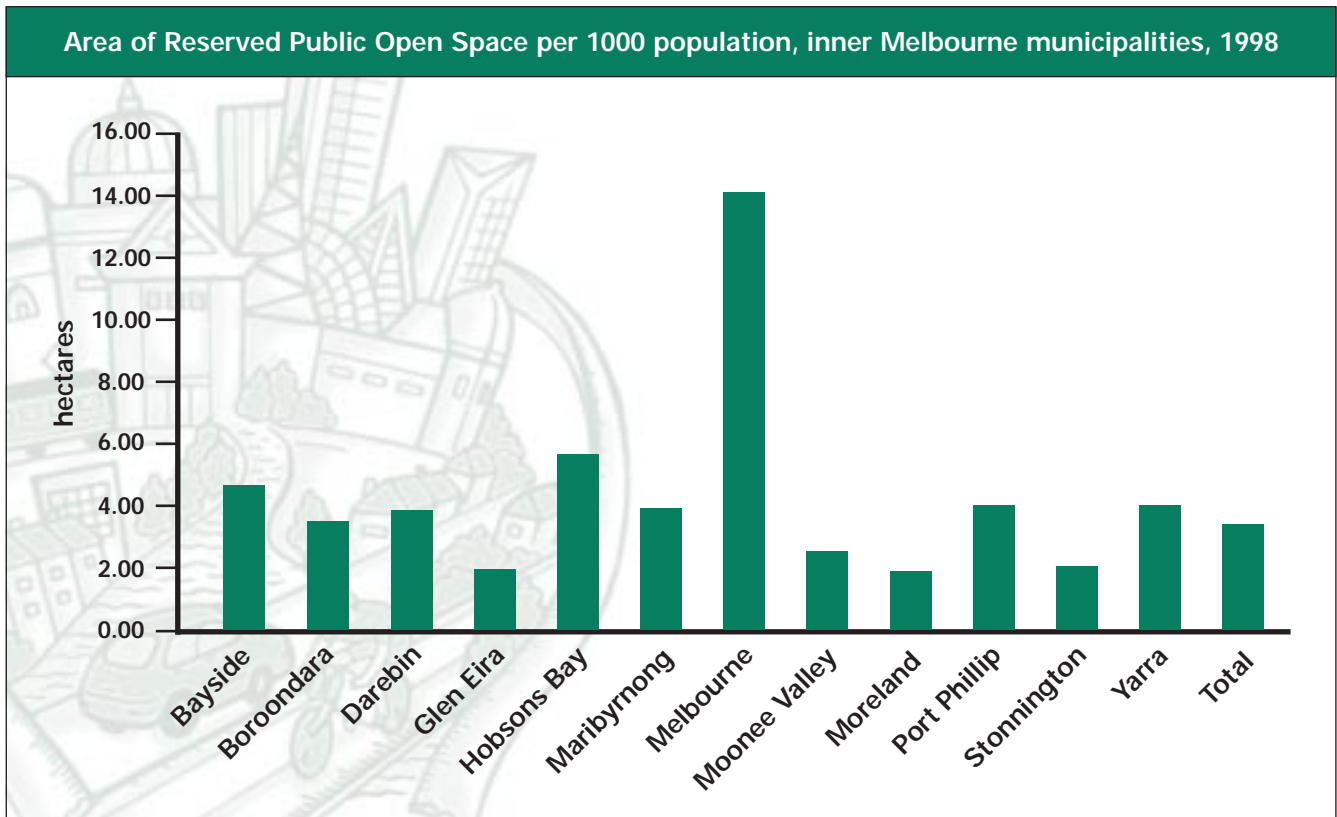
There is no room for complacency however as improvements could be offset by the increasing light commercial fleet, increasing vehicle ownership, higher vehicle kilometres travelled and congestion effects.



**Envirometer reading:  
 good/improving but care still  
 needed**

## INDICATOR: Area of developed open space per 1000 residents

Most existing open space areas that are developed and available for public use are reserved as 'Public Open Space' (POS) in municipal planning schemes.



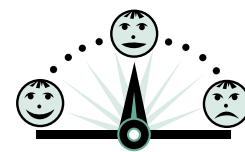
Note: Some municipalities, notably Melbourne, contain open space of regional/metropolitan significance.

Source: Open space figures provided by Department of Infrastructure. Estimated Resident Population as at 30 June 1996 published by Government of Victoria, 1998.

### What has been happening?

The open space network in inner Melbourne has been extended and developed in recent years. However, it is not clear if there has been a net increase in open space.

Recent development trends in inner Melbourne have resulted in more dwellings being constructed in this area than ever before. In addition, the State Government has been reviewing its property assets and selling under-utilised sites. Many sites which residents may have regarded as part of their local 'open space' system have been built on. In turn, many new dwellings may not have large private open spaces and there will be increased pressures on existing public open spaces.



**Envirometer reading:  
precise trend not known;  
care needed in future as  
situation may worsen**

## INDICATOR: Modal split for journey to work by residents

Information on the mode of transport used by residents to travel to work is obtained for each municipality through Australia's Census of Population and Housing.

Mode of Travel to Work, residents of inner Melbourne municipalities, 1981 - 1996																
percent of modes used	train/bus/tram				car as driver				car as passenger				other means (walking/cycling atc)			
	'81	'86	'91	'96	'81	'86	'91	'96	'81	'86	'91	'96	'81	'86	'91	'96
Municipality																
Bayside	13.1	17.3	16.0	13.0	69.7	68.0	71.3	76.0	6.3	8.7	7.2	5.2	10.9	6.0	5.5	5.8
Boroondara	18.9	23.2	22.3	18.1	64.1	62.9	65.8	70.1	5.7	7.8	6.6	5.4	11.3	6.1	5.3	6.4
Darebin	21.5	25.7	24.4	19.4	58.6	54.7	58.4	64.8	9.4	12.2	10.2	7.8	10.5	7.4	6.9	7.9
Glen Eira	19.9	23.6	23.2	18.5	63.1	60.7	63.5	69.1	7.0	9.4	7.7	6.0	10.0	6.3	5.5	6.4
Hobsons Bay	14.5	19.6	18.5	12.5	66.7	58.9	64.0	72.9	10.2	12.9	10.5	8.5	8.6	8.6	7.0	6.2
Maribyrnong	21.8	26.9	25.8	18.6	56.2	50.4	54.4	64.2	10.4	11.8	10.7	9.0	11.6	10.8	9.2	8.1
Melbourne	23.0	27.7	26.3	21.6	37.6	35.0	37.9	39.9	5.0	6.2	5.4	5.1	34.5	31.1	30.4	31.9
Moonee Valley	18.5	22.9	21.5	16.3	64.5	59.9	63.8	70.4	8.6	11.2	9.7	7.2	8.4	5.9	5.0	6.1
Moreland	21.5	27.0	24.3	19.4	58.7	53.4	58.3	64.4	9.3	11.8	10.2	7.8	10.5	7.7	7.1	8.2
Port Phillip	27.1	34.4	32.7	25.2	50.8	45.2	50.1	56.7	6.6	8.9	7.2	5.6	15.5	11.5	10.0	11.9
Stonnington	23.8	28.8	27.4	23.7	56.8	54.5	57.6	61.6	5.4	7.2	6.1	5.0	14.0	9.6	8.9	9.3
Yarra	26.1	32.4	29.8	26.5	45.4	40.3	45.8	49.3	5.9	7.8	7.0	5.1	22.7	19.5	17.4	18.5
Average 'Inner'	20.8	25.8	24.4	19.4	57.7	53.7	57.6	63.3	7.5	9.7	8.1	6.5	14.0	10.9	9.9	10.6
Total metropolitan Melbourne	15.2	19.9	18.4	13.2	66.1	61.7	66.0	72.1	8.5	11.2	9.6	7.3	10.3	7.2	6.1	6.8

\*Note: 1996 mode of travel to work results may be reported differently in other publications but in this table, they have been calculated on the same basis as earlier Censuses to allow comparisons to be made.

Source: Government of Victoria, 1996; Australian Bureau of Statistics, 1996.

### What has been happening?

In all four Censuses between 1981 and 1996, the car has been the dominant mode of transport for work trips in inner Melbourne. The proportion of work trips made by car as passenger and driver increased from nearly 73% in 1986 to nearly 80% in 1996.

More inner area residents use public transport for work trips than the average for metropolitan Melbourne. However, between 1986 and 1996, the percentage of work trips by inner area residents on public transport fell from 25.8% to 19.4%.

Other patterns are:

- Public transport usage grew slightly between 1981 and 1986 Censuses in all inner municipalities, but has declined since then.
- Public transport usage for inner area residents' work trips has averaged around 6 percentage points higher than the metropolitan average.
- Car as passenger: one of the least favoured modes has followed the same pattern as for public transport.
- Other modes: results steadily declined in all inner municipalities between 1981 and 1991 Censuses but are now on the increase in all but two municipalities.



**Envirometer reading: caution/attention needed!**

## INDICATOR: Noise levels on main roads.

The best available data on noise levels on main roads is available from VicRoads which carries out noise measurements throughout the State on an ad hoc basis for particular projects.

Noise Measurements, sample inner Melbourne sites, 1990 - 1997 *Shading indicates readings which the Australian Environment Council considers to be undesirable (58dB(A) or higher)			Noise Measurement dB(L)10 (18 hr)#	Date Measured
Municipality	Suburb	Location		
Bayside	Brighton East	Roseberry Ave, nr Nepean Hwy	66.6	1992
Boroondara	Balwyn North	Orion St, opp Eastern Fwy east of Burke Rd	67.6	1996
	Glen Iris	Gardiner Pde, nr South Eastern Fwy north of High St	61.8	1996
	Hawthorn	Reserve Rd, opposite South Eastern Fwy nr Glenferrie Rd	65.0	1995
	Kew	Kellet Gve, nr Eastern Fwy	61.6	1997
	Kooyong	Talbot Cres, opp South Eastern Freeway	61.3	1995
Darebin	Reservoir	Joan Crt, nr Mahoneys Rd	62.2	1996
Glen Eira	Bentleigh East	Nina Crt, nr cnr South Rd and Warrigal Hwy	72.7	1993
	Caulfield North	Alma Rd, nr Dandenong Rd/Hawthorn Rd intersection	69.7	1995
Hobsons Bay	Altona North	Murdoch Crt, nr Westgate Fwy east of Grieve Pde	76.1	1997
	Laverton	Watts St, nr Princes Fwy east of Pt Cook Rd	71.0	1996
Maribyrnong	Spotswood	Cullen St, nr Westgate Fwy and Melbourne Rd	67.7	1995
	Yarraville	Bena St, nr Westgate Fwy west of Williamstown Rd	70.0	1995
Melbourne	Carlton	Neill St (nr. Princes Street)	65.3	1995
	North Melbourne	Primary School (external), nr Flemington Rd	69.3	1990
	Parkville	Oak St, nr Tullamarine Fwy	70.3	1993
	South Melbourne	Prince Henry's Hospital (nr Grant St)	55.5	1991
	South Yarra	Alexandra Ave, b/n Anderson St and Punt Rd	68.2	1995
Moonee Valley	Ascot Vale	Mangalore St, between Mt Alexander Rd and Tullamarine Freeway	61.3	1994
	Airport West	Bowes Street, between Tullamarine and Calder Freeways	56.0	1996
	Essendon North	Kerferd St, nr Tullamarine Fwy	68.0	1993
	Moonee Ponds	Pattison St, nr Tullamarine Fwy b/n Ormond Rd and Dean St	61.9	1996
	Niddrie	Hanson St, nr Calder Fwy	66.9	1996
	Strathmore	Collier Pl, nr Tullamarine Fwy	66.2	1996
Moreland	Brunswick West	Moreland Rd, nr Tullamarine Fwy	68.7	1992
	Fawkner	Birchwood St, nr Western Ring Rd, east of Hume Hwy	58.9	1996
	Glenroy	Cross Tce, nr Western Ring Road	53.8	1995
	Pascoe Vale	Marsden Ave, nr Tullamarine Fwy	67.7	1994
Port Phillip	Albert Park	Beaconsfield Pde, near Mills St	75.9	1990
	Port Melbourne	Graham St, nr Williamstown Rd	74.0	1992
Stonnington	Ashburton	Glen Rd, nr South Eastern Fwy	58.7	1995
	Malvern East	Alcala Ave (b/n Waverley Rd and South Eastern Fwy)	60.1	1997
	Toorak	St Georges Rd, b/n Orrong and Grange Rds	61.6	1995
Yarra	Abbotsford	Maugie Street, near Eastern Freeway east of Hoddle Street	67.5	1996
	Collingwood	Alexander St, nr Alexandra Pde	68.2	1995
	Clifton Hill	Alexandra Pde, nr Hoddle St	78.6	1994
	Fitzroy	Alexandra Pde, b/n Nicholson and Brunswick Sts	73.3	1995
	Richmond	Mary St, nr South Eastern Fwy	67.7	1990

# Measures are made in decibels (dB). Because the human ear cannot hear all sounds, the level has been weighted (shown as 'A') so that the scale approximates the response of the human ear. L10 (18 hour) noise level index is the arithmetic average of the highest 10 percent of measures made in the 18 hours between 6 am and midnight.

Note: changed conditions at some sites may mean that readings, particularly older readings, do not reflect current situation

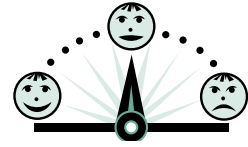
Source: VicRoads Register of Noise Sites sorted by suburb, April 1997

## What has been happening?

The available data does not allow for detailed conclusions to be drawn about traffic noise in inner Melbourne, but some inferences can be made.

There is a strong relationship between traffic volumes and noise levels generated. As Melbourne's traffic volumes have grown, noise levels on all roads will have increased. Traffic volumes are estimated to grow by 2 percent per annum and on this basis, noise levels can be expected to increase by 1 decibel over a decade.

Traffic is not the only source of noise. Inner city areas are characterised by a range of land use activities, which generate noise, sometimes at all times of the day and night. Noise can significantly reduce quality of life for residents, workers and visitors alike. Complaints about noise can be expected to increase along with the increase in the population of inner city areas and the construction activity arising from development.



**Envirometer reading:  
precise situation not  
known, but indication  
is that situation will  
worsen**

## WASTE

Government of Victoria, Melbourne in Fact. 1996 Census Statistics for Melbourne's Local Government Areas, Department of Infrastructure 1998  
 Litter and Recycling Research Association Victoria, Recycling Audit and Garbage Bin Analysis, June - September 1996, November 1996

## WATER QUALITY

Environment Protection Authority, Information Bulletin, Beachwatch, December 1997  
 Melbourne Water, The State of Greater Melbourne's Waterways, StreamWatch Annual Report 1996  
 Waterways and Drainage Group, 1997

## AIR QUALITY

Environment Protection Authority, Air Quality Management Plan. Taking Stock, Port Phillip Region July 1997  
 Commonwealth of Australia, Urban Air Pollution in Australia. An Inquiry by the Australian Academy of Technological Sciences and Engineering, 1997

## OPEN SPACE

Department of Infrastructure database

## JOURNEY TO WORK

Australian Bureau of Statistics, Journey to Work data tables, 1996 Census  
 Government of Victoria, Victoria in Time: 1981, 1986, 1991 Census Statistics for Victoria's New Local Government Areas Department of Infrastructure 1996

## NOISE

VicRoads, Register of Noise Sites sorted by Suburb, unpublished, April 1997  
 Commonwealth of Australia, Green Cities. Strategy Paper # 3 Australian Urban & Regional Development Review, Department of Housing and Regional Development, May 1995

### Visit these websites:

AIUS	<a href="http://vicnet.net.au/~aius">http://vicnet.net.au/~aius</a>
City of Melbourne	<a href="http://www.melbourne.vic.gov.au">http://www.melbourne.vic.gov.au</a>
Boroondara City Council	<a href="http://avoca.vicnet.net.au/~boroondara">http://avoca.vicnet.net.au/~boroondara</a>
Darebin City Council	<a href="http://www.darebin.vic.gov.au">http://www.darebin.vic.gov.au</a>
Glen Eira City Council	<a href="http://www.gleneira.vic.gov.au">http://www.gleneira.vic.gov.au</a>
Moreland City Council	<a href="http://www.moreland.vic.gov.au">http://www.moreland.vic.gov.au</a>
Port Phillip City Council	<a href="http://www.portphillip.vic.gov.au">http://www.portphillip.vic.gov.au</a>
Stonnington City Council	<a href="http://home.vicnet.net.au/~sscanlan/stonning/stonnington.html">http://home.vicnet.net.au/~sscanlan/stonning/stonnington.html</a>
Yarra City Council	<a href="http://yarranet.net.au/council/council.htm">http://yarranet.net.au/council/council.htm</a>
Australian Bureau of Statistics	<a href="http://abs.gov.au">http://abs.gov.au</a>
Dept. of Infrastructure	<a href="http://www.doi.vic.gov.au">http://www.doi.vic.gov.au</a>
Dept. of Natural Resources and Environment	<a href="http://www.nre.vic.gov.au">http://www.nre.vic.gov.au</a>
Ecorecycle	<a href="http://www.ecorecycle.vic.gov.au">http://www.ecorecycle.vic.gov.au</a>
EPA (Victoria)	<a href="http://www.epa.vic.gov.au">http://www.epa.vic.gov.au</a>
Municipal Association of Victoria	<a href="http://www.mav.msn.au">http://www.mav.msn.au</a>
Land Channel	<a href="http://www.land.vic.gov.au">http://www.land.vic.gov.au</a>
Know your catchments	<a href="http://www.nre.vic.gov.au/catchmnt/conditn">http://www.nre.vic.gov.au/catchmnt/conditn</a>

# PROPOSED INDICATORS FOR ENVIRONMENTAL MONITORING

Theme	Indicator
AIR	<p>A1 Frequency of light/significant/heavy pollution at air monitoring stations*</p> <p>A2 Ozone and lead levels in air</p> <p>A3 Levels of airborne particulates*</p> <p>A4 Carbon dioxide emissions from gas, electricity and transport fuel consumption</p>
WATER	<p>W1 Water use by sector</p> <p>W2 Councils' water consumption</p> <p>W3 % treated wastewater reused</p> <p>W4 Suspended solids, nutrients, heavy metals, biological oxygen demand and E. coli levels in main waterways*</p> <p>W5 Biological monitoring in main waterways*</p> <p>W6 No. of days on which E. coli levels at City beaches exceed EPA objectives*</p> <p>W7 Net change in area of impermeable surfaces, due to development</p>
CONTAMINATED LAND	<p>L1 Total area with Certificates of Environmental Audit issued for cleanup/year</p>
BIODIVERSITY	<p>B1 Tree canopy coverage (%)</p> <p>B2 Trees planted by councils/year, as % of existing trees</p> <p>B3 No. of native bird species observed</p> <p>B4 % municipality revegetated with indigenous flora/year</p> <p>B5 No. of species of indigenous flora established/year</p>
ENERGY	<p>E1 Electricity and gas consumption by sector</p> <p>E2 Councils' energy consumption (gas, electricity, other fossil fuels, renewable energy)</p> <p>E3 % households utilising renewable energy sources</p> <p>E5 Energy rating of new buildings</p>
WASTE	<p>R1 Proportion of domestic wastes recycled by type*</p> <p>R2 Total volume of waste sent to landfill*</p> <p>R3 Recycling participation rate</p> <p>R4 Litter count by category at inner metropolitan sites</p> <p>R5 Proportion of green waste composted or mulched</p> <p>R6 Public satisfaction with cleanliness of municipality</p>
URBAN FORM	<p>U1 An objective indicator relating to permeability, linkages, connectivity</p> <p>U2 A subjective indicator eg. of imageability or satisfaction with urban form</p>
TRANSPORT	<p>T1 Modal split for journey to work by residents*</p> <p>T2 Km/capita/year by car and by public transport</p> <p>T3 Traffic volumes on specified roads</p> <p>T4 % total length of streets with adequate bicycle routes</p>
OPEN SPACE	<p>O1 % urban area zoned and operating as public open space</p> <p>O2 % residents within walking distance of open space</p> <p>O3 Area of developed public open space/1000 residents*</p> <p>O4 Amenity rating of beach weed and litter levels</p> <p>O5 Index of environmental condition of waterways</p>
HUMAN HEALTH	<p>H1 No. of asthma cases/day, reported annually</p> <p>H2 Indoor air pollution</p> <p>H3 Noise levels on main roads*</p> <p>H4 No. of noise complaints received by councils</p>
HERITAGE	<p>N1 No. of heritage listed places</p> <p>N2 % of total listed heritage places that are protected</p>
AWARENESS	<p>C1 % change in no. of residents who are members of environmental groups</p> <p>C2 Perceived importance rating of environmental issues</p>

\* Included in Bulletin 1



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