



**Australian Government**

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**Department of Transport and Regional Services**

Bureau of Transport and Regional Economics

## **URBAN POLLUTANT EMISSIONS FROM MOTOR VEHICLES: AUSTRALIAN TRENDS TO 2020**

**Final Draft Report for  
Environment Australia**

June 2003



# **URBAN POLLUTANT EMISSIONS FROM MOTOR VEHICLES: AUSTRALIAN TRENDS TO 2020**

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Bureau of Transport and Regional Economics (BTRE)**

**Consultancy Report for Environment Australia**

**Final Draft  
June 2003**



## **FOREWORD**

This report presents the results of a Bureau of Transport and Regional Economics (BTRE) study to estimate likely future levels of noxious pollutant emissions from motor vehicles in Australian metropolitan areas. Base case (or 'business-as-usual') projections of national vehicle fleet attributes (including fleet size by vehicle type and age of vehicle), total vehicle kilometres travelled (VKT) and total vehicle fuel use are given to 2020. The estimated emissions generated by these base case trends in future vehicle task are presented for all major pollutants – for national travel, non-metropolitan travel and metropolitan travel (for each Australian State and Territory capital city area). Emission projections are also derived for scenarios dealing with possible future emission abatement measures (such as tighter vehicle design standards and travel demand management programs, including the introduction of road traffic pricing on urban networks). The work was undertaken on behalf of Environment Australia (EA).

This work extends base case projections of transport sector greenhouse gas emissions published in BTRE Report 107 *Greenhouse Gas Emissions From Transport: Australian Trends To 2020*. Report 107 had in turn extended and updated previous Bureau projections of transport sector emissions, published in Bureau of Transport and Communications Economics (BTCE) Report 88 (*Greenhouse Gas Emissions from Australian Transport: Long-term projections*) and BTCE Report 94 (*Transport and Greenhouse: Costs and options for reducing emissions*).

The study was undertaken by Dr David Cosgrove.

Bureau of Transport and Regional Economics  
Canberra  
June 2003



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## UNITS

micro ( $\mu$ )	=	$10^{-6}$
milli (m)	=	$10^{-3}$
kilo (k)	=	$10^3$ (thousand)
mega (M)	=	$10^6$ (million)
giga (G)	=	$10^9$ (billion)
peta (P)	=	$10^{15}$

Note:

1 gigagram	=	1 kilotonne
1 kilowatt-hour (kWh)	=	3.6 megajoules
micron	=	micrometer

## **EXECUTIVE SUMMARY**

BTRE *base case* projections have metropolitan vehicle kilometres travelled (VKT) growing reasonably strongly over the projection period – with total VKT of 113 billion kilometres in 2000 projected to increase 46 per cent (1.9 per cent per annum) by 2020, to around 166 billion kilometres.

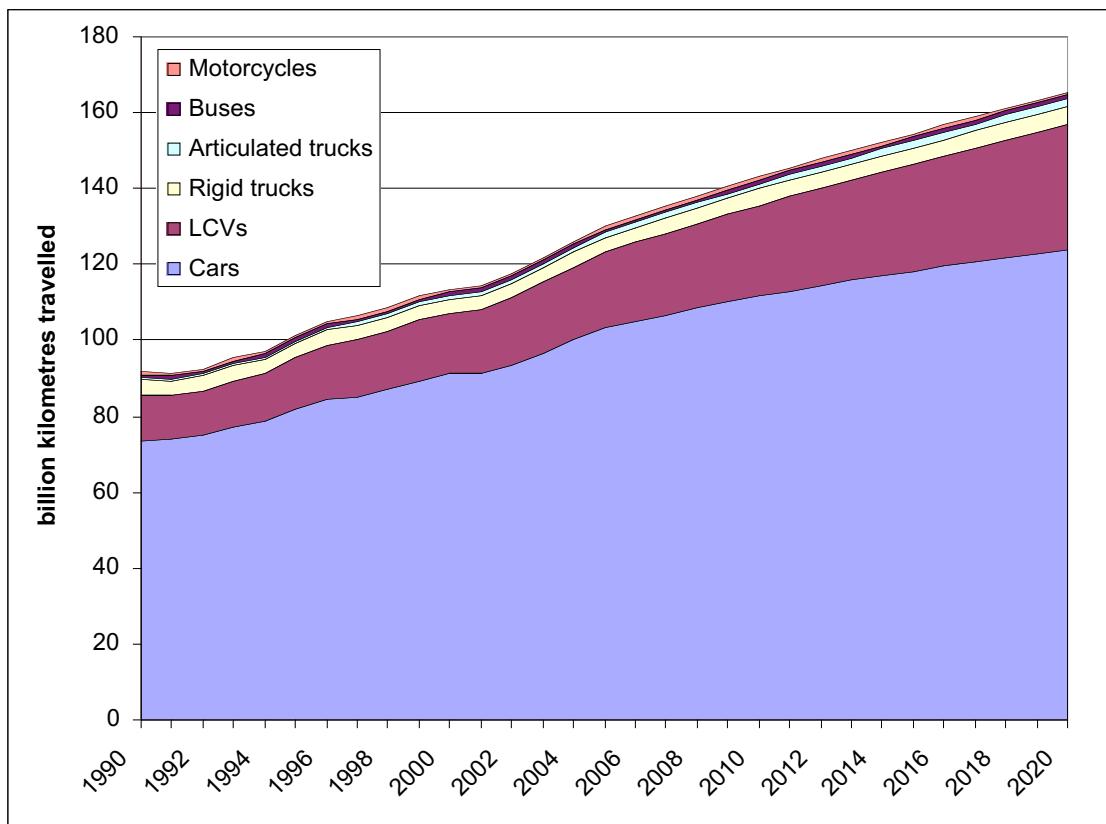
This projected increase of 46 per cent in VKT by all vehicles (between 2000 and 2020) is comprised of an increase of about 36 per cent in travel by cars (including 4-wheel drive passenger vehicles), 107 per cent by light commercial vehicles (LCVs), 26 per cent by rigid trucks, 120 per cent by articulated trucks, 31 per cent by buses and 16 per cent by motorcycles (see figure ES.1).

Due to the base case incorporating the effects of:

- future economic growth and increasing national population levels (and a consequent increase in demand for travel),
- an increasing proportion of the Australian population living in urban areas,
- increasing urban traffic congestion levels,
- deterioration in average vehicle performance as the vehicle ages, and
- an increasing proportion of total travel accounted for by the heavier commercial component of the vehicle fleet (since forecast rates of growth are stronger for truck VKT than for car VKT),

total metropolitan fuel consumption is projected to rise substantially over the projection period (at around 2.2 per cent per annum between 2000 and 2020), despite an expected continuation of improvements in the (rated) fuel efficiency of new vehicles.

**Figure ES.1 Base case projected growth in motor vehicle travel for Australian metropolitan areas, 1990 - 2020**



Notes: 'Cars' include 4-wheel drive passenger vehicles ('All Terrain Wagons' – ATWs).

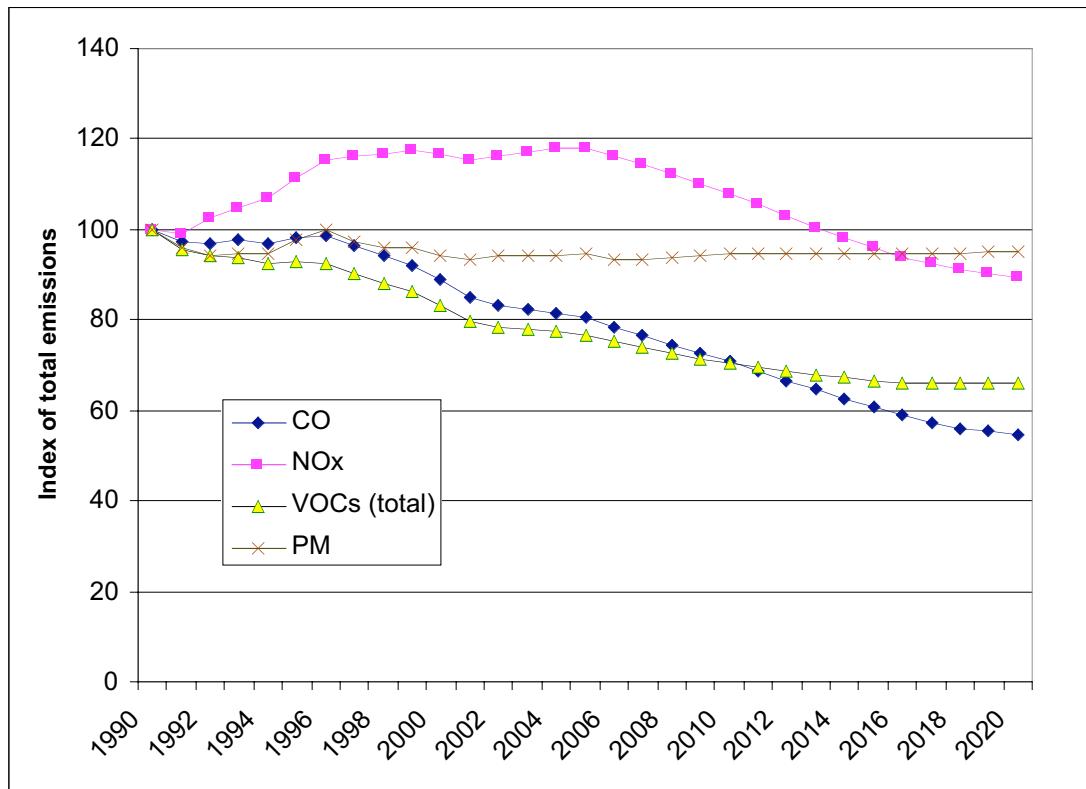
LCVs - light commercial vehicles.

'Metropolitan' refers to all travel undertaken within the eight State and Territory capital cities.

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

**Figure ES.2 Base case projected growth in major pollutant emissions from motor vehicles for Australian metropolitan areas, 1990 – 2020**

(index with 1990 = 100)



Notes: CO – carbon monoxide, NO<sub>x</sub> – nitrogen oxides, VOCs – volatile organic compounds, PM – particulate matter.

'Metropolitan' refers to all travel undertaken within the eight State and Territory capital cities.

Sources: BTRE estimates, BTRE (2002), BTE (1999).

Offsetting the projected increase in VKT is that the average emission performance of the fleet will typically continue to improve – as newer, more efficient vehicles replace older vehicles (particularly those with non-catalyst emission control). The continued retirement of non-catalyst vehicles, combined with the current program of legislated Australian Design Rules (ADRs) – which tighten emission standards for new vehicles out to 2006 – are projected to deliver overall reductions in pollutant emissions from metropolitan motor vehicles over the projection period.

The projected reductions are most significant for emissions of carbon monoxide (CO) and volatile organic compounds (often referred to as 'hydrocarbon' emissions – HC). Emissions of particulate matter (PM) from heavy vehicles should decline substantially following introduction of the new emission standards, but total PM emissions remain fairly stable over the base case

projections – since petrol car PM emissions are unregulated in the new standards and are not expected (for the base case) to exhibit the declines forecast for diesel vehicles.

All the projected trends derived by such aggregate modelling techniques as used in this study will have reasonably high levels of uncertainty (especially for PM results) - due to the difficulty in making the modelling procedures detailed enough to be representative of actual *real-world* emissions and due to the lack of data for some elements of the analysis. The estimation of pollutant emissions from motor vehicles is typically quite complex, since emission levels depend on a wide variety of factors (such as the type of pollution control equipment fitted to the various vehicles; the type of fuel used and the exact vehicle operating conditions).

Specifically, detailed estimation methods can require information on a diverse range of factors, such as:

- the average utilisation rates for the different vehicle types (by area of operation);
- the different average emission rates for vehicles manufactured in different years (typically derived using dynamometer cycle tests);
- the typical difference between emission rates derived for dynamometer tests over certification cycles and *actual on-road* emission rates;
- average rates of deterioration in emissions performance as vehicles age;
- dependence of emission rates on congestion levels;
- the specifications of the fuels the vehicles are using (especially with regard to parameters such as sulfur, lead and benzene content);
- the effects of heightened emission output for cold engine starts (especially for catalyst equipped vehicles);
- likely penetration rates for future technology improvements (especially to emission control equipment); and
- the contribution to average emission rates from gross polluting vehicles.

Under key BTRE base case assumptions concerning:

- future vehicle travel demand (see chapter 1 and appendix 1);
- fuel efficiency trends (see chapter 2);
- future vehicle design and fuel standards (see appendix tables I.8 to I.10c); and
- vehicle fleet emission characteristics (eg see appendix figures I.4 to I.10);

even though total fleet emissions are generally expected to decline steadily over the next 20 years, output of most pollutants will still remain at significant levels.

Lead emissions from vehicles will, however, not be significant in the future. With the introduction of Lead Replacement Petrol, metropolitan emissions of lead due to motor vehicle fuel consumption are now at low levels (and have a projected output of only around 14 tonnes per annum).

Total metropolitan emissions of sulfur oxides ( $\text{SO}_x$ ) from motor vehicles are also projected to decline strongly - following the reductions in fuel sulfur content with the new fuel standards (see tables I.8 and I.9) – falling by over 50 per cent between 2000 and 2020. Emission levels will still be, however, at around 3.6 thousand tonnes in 2020, unless standards on fuel sulfur content are tightened further than currently specified.

Metropolitan emissions of carbon monoxide (CO) are projected to decline by around 38 per cent by 2020, to around 1.5 million tonnes per annum.

Projected emissions of nitrogen oxides ( $\text{NO}_x$ ) decline less, in the base case, than CO emissions – decreasing by around 23 per cent between 2000 and 2020 (to a level of about 205 thousand tonnes per annum for metropolitan Australia).

A wide range of volatile organic compounds (VOCs) are emitted from vehicle exhausts and from vehicle fuel evaporation. Emissions of metropolitan VOCs (total – ie the sum of exhaust and evaporative VOCs, for all gaseous species emitted) are projected to decline by around 21 per cent between 2000 and 2020 (with 2020 emissions of about 278 thousand tonnes per annum). Exhaust emissions of VOCs are projected to decline at a faster rate than total VOC output (down by 38 per cent over 2000-2020) – though the uncertainty in the estimates for future levels of evaporative emissions is quite high.

The emission results given in this report (chapter 3) relate to direct emissions from vehicle operation. Total urban air pollution will, of course, be derived from a wide variety of sources – including industrial, agricultural, natural and residential (eg wood fires) – some of which will also be transport related. For example, the inclusion of VOC emissions from vehicle re-fuelling (and other evaporative losses from service stations) would probably add around 15 per cent to the VOC totals estimated in this study (and given in chapter 3).

Similarly, the PM estimates in this study do not include '*road dust*' (produced as motor vehicle movement gradually pulverises road pavement surfaces and stirs up any suspendable dirt on the road) or secondary particles (that is, those formed in the atmosphere from chemical reactions, primarily involving motor vehicle emissions of  $\text{SO}_x$  and  $\text{NO}_x$ ).

Motor vehicle traffic produces considerable amounts of road dust; however, like most non-combustion PM sources, road dust is relatively coarse compared with vehicle exhaust PM, and the road dust material does not typically disperse as widely as PM from combustion sources.

The PM projections (with aggregate metropolitan levels remaining roughly constant over the projection period) are probably the part of the analysis with the greatest uncertainty – since there has not been anywhere near the same amount of vehicle testing for PM emissions as for emissions of CO, NO<sub>x</sub> and VOCs. The (base case) modelled results are sensitive to several assumptions, due to a relative paucity of data on the details of average Australian fleet PM production, and more testing (both of new vehicles and in-service vehicles), would be useful in improving the accuracy of fleet PM estimation.

As an example of the sensitivity of the projected PM total to the input assumptions: using *pessimistic* base case inputs to the PM fleet estimation model gives a 2020 projected result of around 30 per cent *higher* than for current PM levels, while using *optimistic* base case inputs gives estimated metropolitan PM emissions for 2020 around 40 per cent *lower* than current levels (as opposed to the median values used in the BTRE base case - which result in estimated levels staying fairly stable).

Emissions of particularly toxic VOCs (a variety of which have been estimated separately in this study by applying speciation factors to total VOC output) are projected to decline in line with the downward trend in VOC totals. For example, with future trends in vehicle emission and fuel formulation standards, metropolitan acetaldehyde emissions are forecast to decline by about 28 per cent between 2000 and 2020 – yet still be at a significant level of 2.3 thousand tonnes per annum in 2020. Emissions of formaldehyde (another reactive carbonyl VOC) are projected to decrease by around 33 per cent (to 3.2 thousand tonnes per annum by 2020). Emissions of all carbonyl species from metropolitan motor vehicles are forecast to decline by 32 per cent over 2000-2020 (with 2020 emissions of 9.6 thousand tonnes).

Declines (between 2000 and 2020, for metropolitan levels) are also projected for the following toxic emission species: benzene down by 51 per cent (though still at around 4.9 thousand tonnes in 2020), toluene down by 33 per cent, xylene down by 33 per cent, total polycyclic aromatic hydrocarbon (PAH) species down by 28 per cent (to an estimated 536 tonnes in 2020) and 1,3-butadiene down by 32 per cent.

The downward trends in pollutant emissions projected in the base case will only be obtained if the emission-control technology embodied in future motor vehicle fleets (particularly for new models designed to meet the tightened emission standards) does not suffer high rates of equipment failure (see chapter 5, section 5.2, for sensitivity analyses of the projection results with respect to varying equipment deterioration rates). Further research in this area (such as more in-service vehicle testing or more roadside emission sensing) is warranted if emission trend estimation processes are to be improved.

Scenarios for possible policy options aimed at emission abatement (including a further tightening of new vehicle emission standards by 2010, and the imposition of targeted road user charges to reduce urban traffic congestion) are investigated in Chapter 4. ‘Optimal Road Pricing’ is demonstrated as having

significant potential for decreasing the projected trends (figure ES.2) in metropolitan pollutant output (see section 4.1).

As mentioned above, the projected trends are sensitive to a variety of input assumptions in the projection modelling – such as assumed vehicle deterioration rates, the effects of future congestion levels, the contributions of gross polluting vehicles, the possible penetration rates of advanced vehicle technology, and the effects of cold vehicle starts (eg for many short car trips, up to half of the pollutant emissions are caused by cold start conditions – before the car's catalytic converter has reached full operating temperature).

Sensitivity analyses – to variations in several key input assumptions – are presented in Chapter 5. One of these sensitivity analyses (see figures 5.10 to 5.13) has estimated the likely future emission levels if the new emission standards (which tighten new vehicle limits out to 2006) had not been introduced. The results imply that in the absence of the new design standards, 2020 metropolitan emission levels would have been 28 per cent higher for CO, 46 per cent higher for NO<sub>x</sub>, 21 per cent higher for VOCs and 21 per cent higher for PM than now expected (under the base case assumptions).



## **CHAPTER 1 BASE CASE PROJECTIONS OF AUSTRALIAN MOTOR VEHICLE FLEET ACTIVITY TO 2020**

This Bureau of Transport and Regional Economics (BTRE) report presents projections to 2020 of Australian motor vehicle travel, fuel use and air pollution. The projections of vehicle fuel consumption (given in Chapter 2) and pollutant emissions (given in Chapter 3) are derived from BTRE 'base case' (or *business-as-usual*) projections of transport demand, and the consequent levels of vehicle activity for metropolitan and non-metropolitan travel.

This work extends base case projections of transport sector greenhouse gas emissions published in BTRE Report 107 (*Greenhouse Gas Emissions From Transport: Australian Trends To 2020*, BTRE 2002). The base case projections have been developed using detailed Bureau modelling of Australian vehicle fleets, estimates of likely trends in new vehicle efficiency, and long-term projections of national and state populations by the Australian Bureau of Statistics (ABS - see Appendix tables I.1 and I.2). VKT time-series estimates are based on data collected by the ABS *Survey of Motor Vehicle Use* – which have been appropriately scaled and standardised, according to the methods described in Cosgrove & Mitchell (2001), to allow for methodological variations between the various survey years. An essential feature of the VKT projections is BTRE modelling relating the trend in Australian per capita vehicle use to the trend in per capita income levels (the modelled saturating curve is given in Appendix figure I.3).

For total metropolitan vehicle kilometres travelled (VKT), the base case scenario has projected growth of around 1.9 per cent per annum between 2000 (with total VKT estimated at 113 billion kilometres) to 2020 (with around 166 billion vehicle kilometres travelled). This projected increase of 46 per cent in VKT by all vehicles, over the projection period, is comprised of an increase of about 36 per cent in travel by cars (including 4-wheel drive passenger vehicles), 107 per cent by light commercial vehicles (LCVs), 26 per cent by rigid trucks, 120 per cent by articulated trucks, 31 per cent by buses and 16 per cent by motorcycles (see table 1.2).

National VKT by all vehicles is projected to increase by around 1.6 per cent per annum between 2000 and 2020 (see table 1.1).

TABLE 1.1    BASE CASE PROJECTIONS OF NATIONAL VEHICLE KILOMETRES  
TRAVELED BY TYPE OF VEHICLE, 1990-2020  
(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	124.16	22.57	4.15	6.79	1.41	1.70	160.79
1991	124.88	23.00	4.07	6.13	1.36	1.61	161.05
1992	126.95	23.36	4.13	6.02	1.34	1.59	163.39
1993	130.08	23.72	4.52	5.99	1.35	1.57	167.23
1994	132.62	23.86	4.62	6.23	1.41	1.55	170.29
1995	138.22	25.19	4.92	6.33	1.45	1.53	177.63
1996	142.03	25.59	4.95	6.43	1.50	1.58	182.08
1997	143.33	25.98	5.06	6.58	1.55	1.58	184.08
1998	145.99	27.61	5.45	6.73	1.60	1.58	188.97
1999	149.75	28.53	5.64	6.79	1.65	1.58	193.95
2000	152.76	29.13	5.71	6.85	1.75	1.60	197.80
2001	152.43	30.04	5.68	6.80	1.73	1.61	198.30
2002	155.77	31.30	5.88	6.97	1.75	1.63	203.29
2003	161.32	32.31	5.99	6.99	1.78	1.64	210.02
2004	166.67	33.26	6.22	7.17	1.80	1.66	216.77
2005	171.47	34.29	6.36	7.18	1.83	1.67	222.80
2006	174.20	35.10	6.56	7.23	1.85	1.68	226.62
2007	176.88	36.06	6.77	7.30	1.88	1.70	230.59
2008	179.52	36.87	6.97	7.34	1.90	1.71	234.31
2009	182.01	37.69	7.16	7.37	1.93	1.73	237.88
2010	184.41	38.86	7.40	7.43	1.95	1.74	241.79
2011	186.55	39.87	7.62	7.47	1.98	1.75	245.23
2012	188.62	40.88	7.84	7.49	2.00	1.76	248.59
2013	190.55	41.91	8.06	7.51	2.03	1.77	251.83
2014	192.41	42.95	8.29	7.53	2.05	1.79	255.01
2015	194.18	44.01	8.52	7.54	2.08	1.80	258.12
2016	195.85	45.07	8.75	7.55	2.10	1.81	261.12
2017	197.47	46.36	9.02	7.59	2.13	1.82	264.38
2018	199.02	47.52	9.24	7.58	2.15	1.83	267.34
2019	200.51	48.68	9.45	7.56	2.18	1.84	270.21
2020	201.95	49.84	9.66	7.52	2.21	1.85	273.02

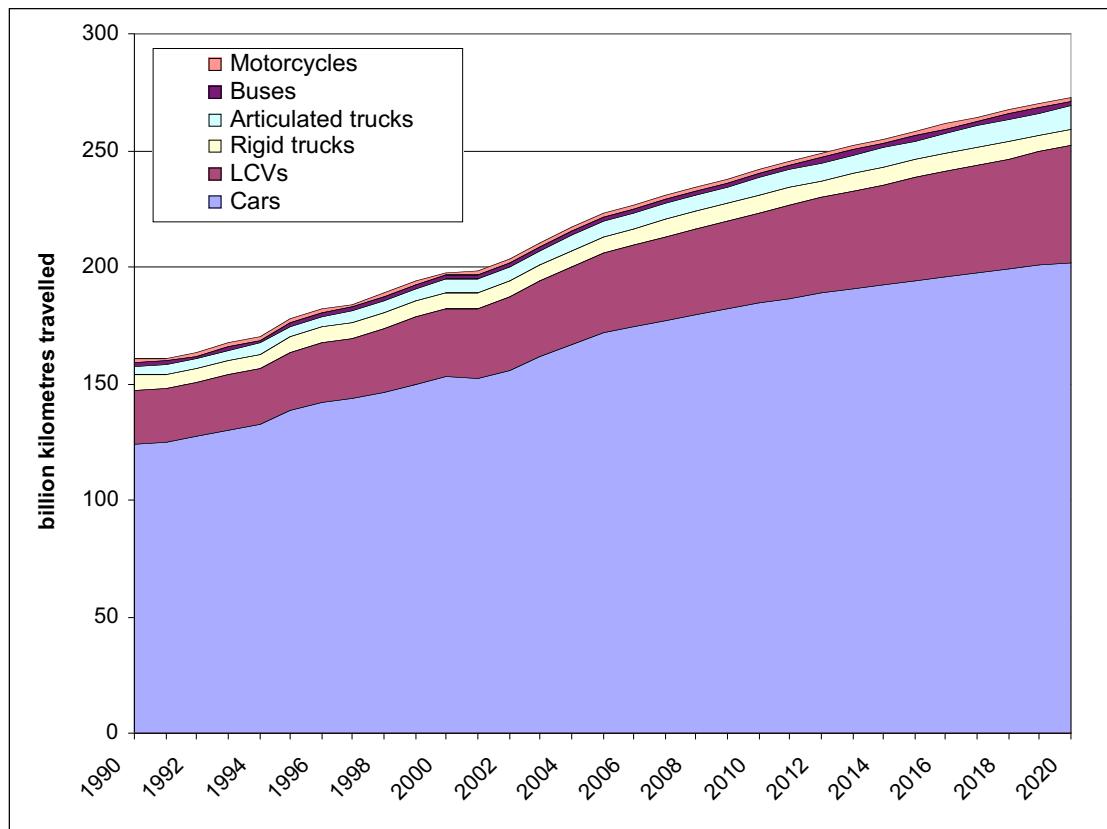
*Note:* 'Passenger car' results in all tables include 4-wheel drive passenger vehicles ('All Terrain Wagons' – ATWs), unless explicitly noted otherwise.

LCV (light commercial vehicle) fleet results include the (generally) heavier 4-wheel drive vehicles primarily purchased for business uses.

In projection tables, 'year' values refer to financial year (ie 'year ending 30 June').

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

**Figure 1.1 Base case projected growth in motor vehicle travel for Australia, 1990 - 2020**



Notes: 'Cars' include 4-wheel drive passenger vehicles ('All Terrain Wagons' – ATWs).  
LCVs - light commercial vehicles.

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

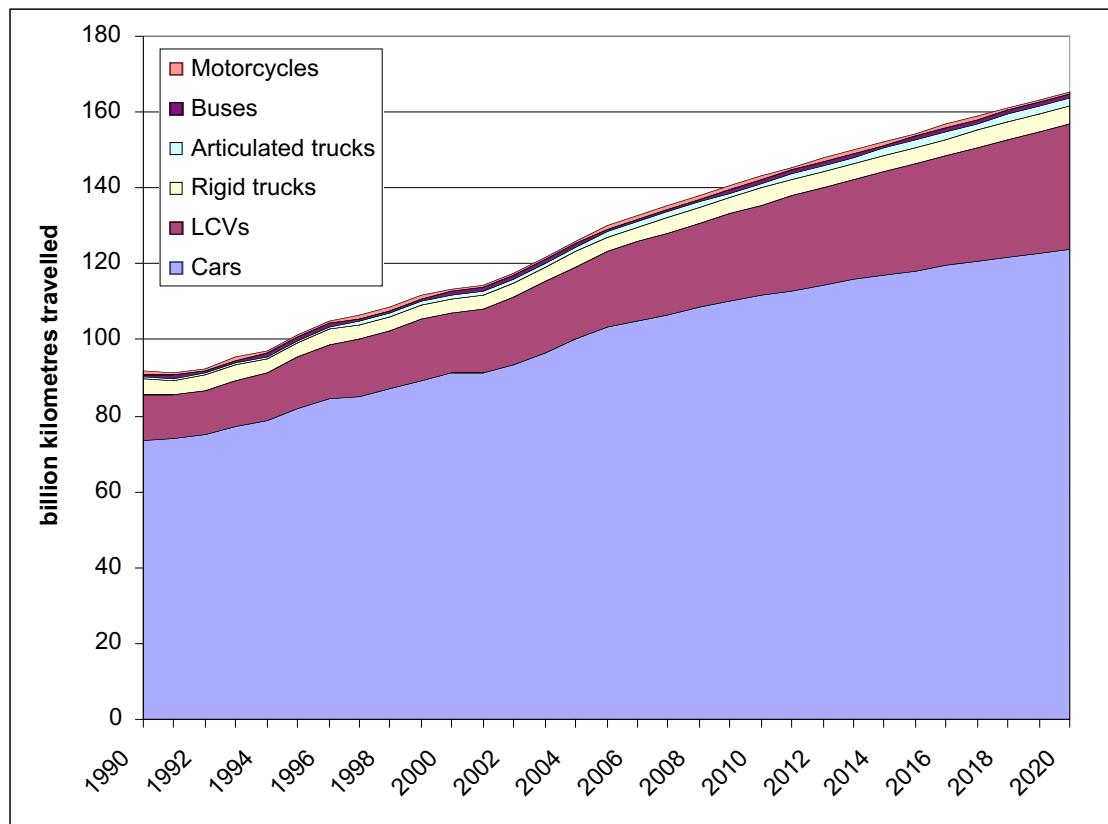
TABLE 1.2      BASE CASE PROJECTIONS OF METROPOLITAN VEHICLE  
KILOMETRES TRAVELED BY TYPE OF VEHICLE, 1990-2020  
(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	73.43	12.20	0.69	4.13	0.59	0.84	91.88
1991	73.84	11.56	0.64	3.89	0.60	0.79	91.33
1992	75.07	11.67	0.67	3.80	0.60	0.78	92.60
1993	76.98	12.46	0.70	3.75	0.59	0.77	95.26
1994	78.56	12.65	0.75	3.77	0.62	0.76	97.11
1995	81.96	13.29	0.81	3.90	0.64	0.75	101.35
1996	84.30	14.49	0.86	3.89	0.66	0.78	104.98
1997	85.21	14.89	0.91	3.87	0.69	0.78	106.35
1998	86.92	15.22	0.94	3.79	0.72	0.78	108.38
1999	89.21	16.03	1.01	3.82	0.74	0.78	111.60
2000	91.24	15.88	1.02	3.73	0.79	0.79	113.44
2001	91.21	16.85	1.03	3.76	0.78	0.80	114.43
2002	93.33	17.79	1.08	3.90	0.79	0.80	117.70
2003	96.78	18.53	1.10	3.91	0.81	0.81	121.94
2004	100.12	19.26	1.14	3.99	0.82	0.82	126.15
2005	103.14	20.12	1.19	4.00	0.83	0.82	130.10
2006	104.91	20.79	1.24	4.05	0.84	0.83	132.67
2007	106.67	21.60	1.30	4.12	0.85	0.84	135.38
2008	108.40	22.32	1.36	4.17	0.86	0.84	137.95
2009	110.04	23.06	1.42	4.22	0.88	0.85	140.47
2010	111.63	23.95	1.49	4.29	0.90	0.86	143.11
2011	113.07	24.72	1.55	4.33	0.91	0.86	145.44
2012	114.46	25.52	1.61	4.38	0.92	0.87	147.76
2013	115.78	26.34	1.68	4.42	0.93	0.87	150.02
2014	117.05	27.18	1.75	4.46	0.94	0.88	152.26
2015	118.28	28.05	1.82	4.50	0.95	0.89	154.49
2016	119.44	28.94	1.90	4.53	0.97	0.89	156.67
2017	120.58	30.01	1.98	4.59	0.99	0.90	159.05
2018	121.68	30.95	2.06	4.63	1.00	0.90	161.22
2019	122.74	31.93	2.15	4.66	1.01	0.91	163.39
2020	123.77	32.93	2.23	4.69	1.03	0.91	165.56

*Note:*            'Metropolitan' results refer to all activity within the greater metropolitan areas of the 8 State and Territory capital cities.

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

**Figure 1.2 Base case projected growth in motor vehicle travel for Australian metropolitan areas, 1990 - 2020**



Notes: 'Cars' include 4-wheel drive passenger vehicles ('All Terrain Wagons' – ATWs).

LCVs - light commercial vehicles.

'Metropolitan' refers to all travel undertaken within the eight State and Territory capital cities.

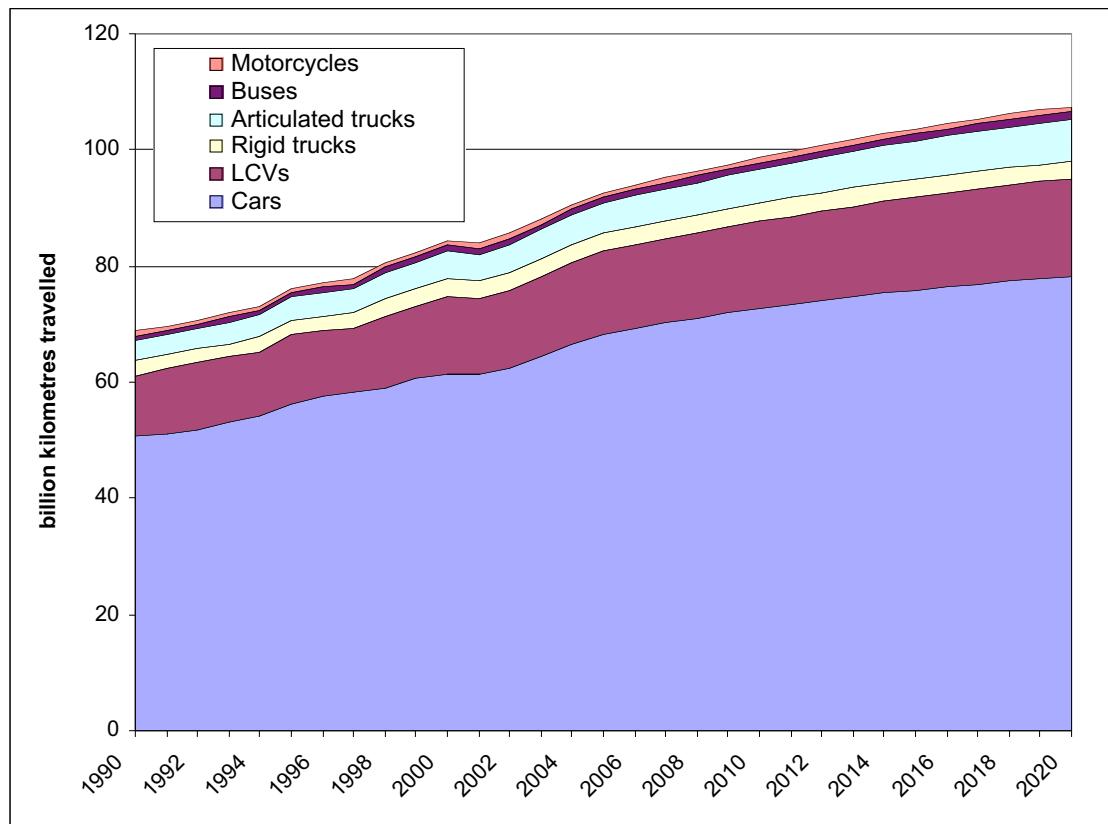
Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.3 BASE CASE PROJECTIONS OF NON-METROPOLITAN VEHICLE  
KILOMETRES TRAVELED BY TYPE OF VEHICLE, 1990-2020  
(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	50.74	10.36	3.46	2.66	0.82	0.86	68.91
1991	51.04	11.43	3.43	2.24	0.76	0.82	69.72
1992	51.88	11.68	3.47	2.22	0.74	0.81	70.79
1993	53.10	11.25	3.83	2.24	0.76	0.80	71.97
1994	54.06	11.21	3.88	2.46	0.79	0.79	73.18
1995	56.26	11.89	4.10	2.43	0.81	0.78	76.28
1996	57.73	11.10	4.09	2.54	0.84	0.80	77.10
1997	58.12	11.09	4.15	2.71	0.86	0.80	77.74
1998	59.07	12.39	4.51	2.94	0.88	0.80	80.60
1999	60.54	12.50	4.63	2.97	0.91	0.80	82.35
2000	61.52	13.26	4.69	3.11	0.96	0.81	84.36
2001	61.23	13.19	4.65	3.04	0.95	0.82	83.87
2002	62.44	13.50	4.80	3.07	0.96	0.83	85.59
2003	64.54	13.77	4.89	3.08	0.97	0.83	88.08
2004	66.55	13.99	5.08	3.19	0.98	0.84	90.62
2005	68.33	14.17	5.17	3.18	0.99	0.85	92.70
2006	69.28	14.30	5.31	3.18	1.01	0.85	93.94
2007	70.21	14.46	5.47	3.18	1.02	0.86	95.21
2008	71.13	14.55	5.61	3.17	1.04	0.87	96.36
2009	71.97	14.62	5.74	3.15	1.05	0.87	97.41
2010	72.78	14.91	5.91	3.14	1.05	0.88	98.68
2011	73.48	15.14	6.07	3.14	1.07	0.89	99.78
2012	74.16	15.36	6.22	3.12	1.08	0.89	100.83
2013	74.77	15.57	6.38	3.10	1.09	0.90	101.81
2014	75.36	15.77	6.54	3.07	1.11	0.91	102.75
2015	75.90	15.96	6.69	3.04	1.12	0.91	103.63
2016	76.41	16.13	6.85	3.02	1.13	0.92	104.46
2017	76.89	16.35	7.03	3.00	1.14	0.92	105.34
2018	77.34	16.56	7.17	2.96	1.15	0.93	106.12
2019	77.77	16.75	7.30	2.90	1.16	0.93	106.82
2020	78.17	16.90	7.42	2.84	1.18	0.94	107.46

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

**Figure 1.3 Base case projected growth in motor vehicle travel for Australian non-metropolitan areas, 1990 - 2020**



Notes: 'Cars' include 4-wheel drive passenger vehicles ('All Terrain Wagons' – ATWs).

LCVs - light commercial vehicles.

'Non-metropolitan' refers to all travel undertaken outside the eight State and Territory capital cities.

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

## NEW SOUTH WALES VKT

TABLE 1.4 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR SYDNEY, 1990-2020

(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	23.49	4.44	0.22	1.54	0.189	0.294	30.17
1991	23.66	4.20	0.21	1.45	0.190	0.278	29.99
1992	23.87	4.24	0.22	1.42	0.192	0.274	30.21
1993	24.48	4.53	0.22	1.40	0.188	0.270	31.09
1994	24.98	4.59	0.24	1.41	0.197	0.266	31.68
1995	26.06	4.81	0.26	1.45	0.202	0.262	33.05
1996	26.80	5.24	0.28	1.44	0.209	0.271	34.23
1997	27.13	5.38	0.29	1.44	0.219	0.271	34.73
1998	27.45	5.49	0.30	1.41	0.228	0.270	35.15
1999	28.05	5.79	0.32	1.42	0.236	0.270	36.09
2000	28.93	5.73	0.33	1.38	0.250	0.273	36.90
2001	28.92	6.09	0.33	1.40	0.247	0.275	37.26
2002	29.60	6.43	0.35	1.45	0.250	0.277	38.35
2003	30.70	6.69	0.35	1.45	0.257	0.279	39.74
2004	31.78	6.96	0.37	1.48	0.260	0.282	41.12
2005	32.75	7.27	0.38	1.48	0.264	0.284	42.43
2006	33.32	7.52	0.40	1.50	0.268	0.286	43.29
2007	33.90	7.81	0.42	1.53	0.271	0.288	44.21
2008	34.46	8.07	0.44	1.55	0.275	0.290	45.08
2009	35.00	8.34	0.46	1.57	0.278	0.292	45.94
2010	35.52	8.67	0.48	1.59	0.285	0.294	46.84
2011	36.00	8.95	0.50	1.61	0.289	0.296	47.64
2012	36.46	9.24	0.52	1.63	0.292	0.298	48.43
2013	36.90	9.54	0.54	1.64	0.296	0.299	49.21
2014	37.32	9.85	0.56	1.66	0.300	0.301	49.99
2015	37.73	10.17	0.59	1.67	0.304	0.303	50.76
2016	38.12	10.49	0.61	1.69	0.307	0.305	51.52
2017	38.50	10.88	0.64	1.71	0.314	0.306	52.36
2018	38.87	11.23	0.67	1.72	0.318	0.308	53.12
2019	39.23	11.59	0.69	1.74	0.322	0.309	53.88
2020	39.59	11.95	0.72	1.75	0.327	0.311	54.65

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.5 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR NON-METROPOLITAN NSW, 1990-2020  
*(billion kilometres)*

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	15.40	2.52	1.50	0.60	0.23	0.29	20.54
1991	15.50	2.90	1.49	0.45	0.21	0.28	20.82
1992	15.61	2.87	1.49	0.55	0.20	0.27	20.99
1993	15.97	2.48	1.60	0.61	0.21	0.27	21.14
1994	16.26	2.31	1.60	0.77	0.22	0.27	21.42
1995	16.93	2.31	1.67	0.82	0.22	0.26	22.22
1996	17.37	2.13	1.66	0.88	0.23	0.27	22.54
1997	17.45	2.30	1.69	0.96	0.23	0.27	22.90
1998	17.57	2.86	1.82	1.06	0.24	0.27	23.82
1999	17.83	3.04	1.87	1.09	0.24	0.27	24.33
2000	18.23	3.27	1.89	1.13	0.26	0.27	25.04
2001	18.10	3.15	1.86	1.09	0.25	0.28	24.73
2002	18.41	3.20	1.91	1.09	0.26	0.28	25.14
2003	18.97	3.21	1.94	1.09	0.26	0.28	25.75
2004	19.50	3.21	2.00	1.13	0.26	0.28	26.38
2005	19.97	3.22	2.03	1.12	0.26	0.28	26.89
2006	20.18	3.20	2.08	1.12	0.26	0.29	27.13
2007	20.39	3.19	2.13	1.12	0.27	0.29	27.39
2008	20.59	3.16	2.18	1.11	0.27	0.29	27.60
2009	20.78	3.13	2.22	1.10	0.27	0.29	27.79
2010	20.94	3.17	2.28	1.10	0.27	0.29	28.05
2011	21.08	3.19	2.33	1.09	0.27	0.30	28.26
2012	21.21	3.21	2.38	1.08	0.27	0.30	28.46
2013	21.31	3.23	2.44	1.07	0.28	0.30	28.63
2014	21.41	3.25	2.49	1.06	0.28	0.30	28.79
2015	21.50	3.27	2.54	1.04	0.28	0.30	28.94
2016	21.57	3.29	2.59	1.03	0.28	0.30	29.07
2017	21.64	3.32	2.65	1.01	0.28	0.31	29.21
2018	21.70	3.37	2.70	0.99	0.28	0.31	29.34
2019	21.74	3.42	2.74	0.96	0.29	0.31	29.46
2020	21.79	3.47	2.78	0.93	0.29	0.31	29.56

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.6 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR STATE OF NSW, 1990-2020  
*(billion kilometres)*

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	38.89	6.95	1.73	2.14	0.42	0.59	50.71
1991	39.16	7.10	1.69	1.90	0.40	0.56	50.81
1992	39.48	7.11	1.70	1.97	0.40	0.55	51.20
1993	40.46	7.00	1.82	2.01	0.40	0.54	52.23
1994	41.24	6.90	1.84	2.17	0.41	0.53	53.10
1995	42.99	7.13	1.93	2.27	0.42	0.52	55.27
1996	44.17	7.36	1.94	2.32	0.44	0.54	56.77
1997	44.58	7.68	1.98	2.40	0.45	0.54	57.63
1998	45.01	8.35	2.12	2.47	0.46	0.54	58.96
1999	45.88	8.83	2.19	2.50	0.48	0.54	60.42
2000	47.16	9.00	2.21	2.51	0.51	0.55	61.94
2001	47.02	9.23	2.20	2.49	0.50	0.55	61.99
2002	48.01	9.63	2.26	2.53	0.51	0.55	63.49
2003	49.68	9.90	2.29	2.54	0.51	0.56	65.48
2004	51.28	10.17	2.37	2.60	0.52	0.56	67.50
2005	52.71	10.49	2.42	2.60	0.52	0.57	69.32
2006	53.51	10.71	2.48	2.62	0.53	0.57	70.43
2007	54.29	11.00	2.55	2.65	0.54	0.58	71.60
2008	55.06	11.23	2.62	2.66	0.54	0.58	72.69
2009	55.78	11.47	2.68	2.67	0.55	0.58	73.73
2010	56.47	11.84	2.76	2.69	0.55	0.59	74.89
2011	57.08	12.14	2.83	2.70	0.56	0.59	75.90
2012	57.67	12.45	2.90	2.71	0.57	0.60	76.89
2013	58.21	12.77	2.98	2.71	0.57	0.60	77.84
2014	58.73	13.10	3.05	2.72	0.58	0.60	78.78
2015	59.23	13.44	3.13	2.72	0.58	0.61	79.70
2016	59.69	13.78	3.20	2.72	0.59	0.61	80.59
2017	60.14	14.20	3.29	2.72	0.60	0.61	81.57
2018	60.57	14.60	3.36	2.71	0.60	0.62	82.46
2019	60.98	15.00	3.43	2.70	0.61	0.62	83.34
2020	61.37	15.42	3.50	2.68	0.62	0.62	84.20

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

## VICTORIA VKT

TABLE 1.7 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR MELBOURNE, 1990-2020

(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	22.57	2.80	0.20	1.18	0.136	0.192	27.07
1991	22.62	2.65	0.19	1.11	0.137	0.181	26.89
1992	22.89	2.67	0.20	1.08	0.137	0.178	27.14
1993	23.49	2.83	0.20	1.06	0.134	0.174	27.90
1994	23.99	2.87	0.22	1.07	0.140	0.171	28.45
1995	25.04	3.00	0.24	1.10	0.143	0.168	29.68
1996	25.78	3.25	0.25	1.09	0.148	0.173	30.69
1997	26.06	3.34	0.26	1.08	0.154	0.173	31.07
1998	26.82	3.41	0.27	1.06	0.161	0.173	31.90
1999	27.59	3.59	0.29	1.07	0.167	0.173	32.88
2000	28.09	3.56	0.29	1.04	0.177	0.174	33.34
2001	28.10	3.78	0.30	1.05	0.174	0.176	33.58
2002	28.77	4.00	0.31	1.09	0.177	0.178	34.53
2003	29.80	4.16	0.32	1.09	0.181	0.179	35.73
2004	30.79	4.33	0.33	1.11	0.183	0.181	36.92
2005	31.68	4.52	0.34	1.12	0.185	0.182	38.03
2006	32.19	4.67	0.36	1.13	0.188	0.183	38.72
2007	32.69	4.85	0.38	1.15	0.190	0.185	39.44
2008	33.19	5.01	0.39	1.16	0.192	0.186	40.13
2009	33.66	5.17	0.41	1.18	0.194	0.188	40.80
2010	34.11	5.37	0.43	1.20	0.198	0.189	41.49
2011	34.51	5.54	0.45	1.21	0.200	0.190	42.10
2012	34.90	5.72	0.46	1.22	0.202	0.191	42.70
2013	35.26	5.90	0.48	1.23	0.204	0.193	43.27
2014	35.60	6.09	0.50	1.24	0.206	0.194	43.84
2015	35.94	6.28	0.52	1.25	0.208	0.195	44.40
2016	36.25	6.48	0.54	1.26	0.210	0.196	44.94
2017	36.55	6.72	0.57	1.28	0.215	0.197	45.53
2018	36.84	6.93	0.59	1.29	0.217	0.198	46.06
2019	37.12	7.14	0.62	1.30	0.219	0.199	46.59
2020	37.39	7.36	0.64	1.31	0.222	0.200	47.12

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.8 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR NON-METROPOLITAN VICTORIA, 1990-2020  
*(billion kilometres)*

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	12.54	2.44	0.70	0.37	0.107	0.287	16.45
1991	12.57	2.64	0.70	0.27	0.096	0.271	16.54
1992	12.66	2.72	0.70	0.24	0.091	0.266	16.67
1993	12.93	2.74	0.79	0.23	0.093	0.261	17.05
1994	13.15	2.84	0.81	0.25	0.096	0.256	17.39
1995	13.66	3.05	0.85	0.19	0.098	0.251	18.10
1996	13.99	2.81	0.82	0.25	0.101	0.259	18.23
1997	14.07	2.79	0.82	0.32	0.102	0.259	18.36
1998	14.38	3.02	0.87	0.41	0.103	0.259	19.04
1999	14.68	3.06	0.89	0.46	0.106	0.259	19.45
2000	14.84	3.27	0.92	0.49	0.112	0.262	19.89
2001	14.76	3.22	0.90	0.48	0.110	0.264	19.74
2002	15.03	3.33	0.92	0.49	0.111	0.266	20.15
2003	15.48	3.46	0.94	0.49	0.110	0.269	20.75
2004	15.92	3.59	0.97	0.51	0.111	0.271	21.37
2005	16.30	3.66	0.98	0.51	0.112	0.273	21.83
2006	16.48	3.76	1.00	0.51	0.113	0.275	22.13
2007	16.65	3.85	1.02	0.50	0.114	0.277	22.42
2008	16.82	3.92	1.04	0.50	0.114	0.279	22.68
2009	16.98	3.99	1.06	0.49	0.115	0.281	22.92
2010	17.12	4.08	1.09	0.48	0.114	0.283	23.16
2011	17.24	4.16	1.11	0.48	0.115	0.285	23.39
2012	17.35	4.24	1.13	0.47	0.115	0.287	23.59
2013	17.44	4.30	1.15	0.47	0.116	0.289	23.77
2014	17.53	4.36	1.17	0.46	0.117	0.291	23.93
2015	17.61	4.42	1.20	0.45	0.117	0.292	24.08
2016	17.67	4.46	1.22	0.44	0.118	0.294	24.20
2017	17.73	4.50	1.24	0.43	0.116	0.296	24.32
2018	17.79	4.51	1.26	0.41	0.117	0.297	24.38
2019	17.84	4.49	1.27	0.39	0.118	0.299	24.41
2020	17.88	4.44	1.29	0.37	0.119	0.301	24.40

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.9 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR STATE OF VICTORIA, 1990-2020  
*(billion kilometres)*

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	35.10	5.24	0.90	1.55	0.24	0.48	43.52
1991	35.19	5.29	0.89	1.38	0.23	0.45	43.42
1992	35.55	5.38	0.90	1.32	0.23	0.44	43.82
1993	36.42	5.58	0.99	1.29	0.23	0.44	44.95
1994	37.13	5.70	1.02	1.32	0.24	0.43	45.84
1995	38.70	6.05	1.08	1.29	0.24	0.42	47.79
1996	39.77	6.07	1.07	1.33	0.25	0.43	48.92
1997	40.13	6.13	1.08	1.40	0.26	0.43	49.43
1998	41.20	6.43	1.14	1.47	0.26	0.43	50.94
1999	42.27	6.65	1.18	1.53	0.27	0.43	52.33
2000	42.93	6.83	1.21	1.54	0.29	0.44	53.23
2001	42.86	7.01	1.20	1.54	0.28	0.44	53.32
2002	43.80	7.33	1.24	1.58	0.29	0.44	54.68
2003	45.28	7.62	1.26	1.58	0.29	0.45	56.48
2004	46.71	7.92	1.30	1.62	0.29	0.45	58.29
2005	47.98	8.18	1.32	1.63	0.30	0.46	59.86
2006	48.67	8.42	1.36	1.64	0.30	0.46	60.85
2007	49.35	8.70	1.40	1.65	0.30	0.46	61.86
2008	50.01	8.93	1.43	1.66	0.31	0.47	62.81
2009	50.63	9.17	1.47	1.67	0.31	0.47	63.71
2010	51.23	9.45	1.51	1.68	0.31	0.47	64.65
2011	51.74	9.71	1.55	1.69	0.31	0.48	65.49
2012	52.24	9.96	1.60	1.69	0.32	0.48	66.28
2013	52.70	10.21	1.64	1.70	0.32	0.48	67.04
2014	53.13	10.46	1.68	1.70	0.32	0.48	67.77
2015	53.54	10.70	1.72	1.70	0.33	0.49	68.48
2016	53.92	10.94	1.76	1.70	0.33	0.49	69.14
2017	54.28	11.22	1.81	1.71	0.33	0.49	69.85
2018	54.63	11.43	1.85	1.70	0.33	0.50	70.45
2019	54.95	11.63	1.89	1.69	0.34	0.50	71.00
2020	55.27	11.80	1.93	1.68	0.34	0.50	71.52

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

## QUEENSLAND VKT

TABLE 1.10 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR BRISBANE, 1990-2020

(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	9.04	1.65	0.09	0.49	0.085	0.163	11.51
1991	9.12	1.56	0.08	0.46	0.086	0.156	11.47
1992	9.38	1.59	0.09	0.46	0.088	0.156	11.76
1993	9.59	1.71	0.09	0.46	0.088	0.156	12.10
1994	9.78	1.75	0.10	0.46	0.093	0.156	12.34
1995	10.19	1.86	0.11	0.48	0.096	0.156	12.90
1996	10.47	2.05	0.12	0.49	0.100	0.163	13.39
1997	10.57	2.12	0.12	0.49	0.105	0.164	13.56
1998	10.76	2.17	0.13	0.48	0.111	0.165	13.82
1999	11.21	2.30	0.14	0.48	0.114	0.165	14.41
2000	11.29	2.28	0.14	0.47	0.122	0.167	14.47
2001	11.31	2.42	0.14	0.48	0.120	0.169	14.65
2002	11.61	2.56	0.15	0.50	0.123	0.172	15.12
2003	12.10	2.68	0.15	0.50	0.126	0.174	15.73
2004	12.57	2.79	0.16	0.51	0.129	0.176	16.34
2005	13.01	2.92	0.17	0.51	0.131	0.178	16.92
2006	13.29	3.03	0.18	0.52	0.134	0.180	17.33
2007	13.57	3.16	0.18	0.53	0.136	0.183	17.76
2008	13.85	3.27	0.19	0.54	0.139	0.185	18.17
2009	14.11	3.39	0.20	0.55	0.142	0.187	18.58
2010	14.38	3.53	0.21	0.56	0.146	0.189	19.01
2011	14.62	3.65	0.22	0.57	0.148	0.191	19.40
2012	14.86	3.78	0.23	0.57	0.151	0.193	19.79
2013	15.09	3.91	0.24	0.58	0.154	0.195	20.17
2014	15.32	4.05	0.25	0.59	0.156	0.197	20.55
2015	15.54	4.19	0.26	0.59	0.159	0.199	20.94
2016	15.75	4.33	0.27	0.60	0.162	0.201	21.31
2017	15.96	4.50	0.29	0.61	0.166	0.203	21.72
2018	16.16	4.65	0.30	0.61	0.169	0.205	22.11
2019	16.37	4.81	0.31	0.62	0.172	0.207	22.49
2020	16.56	4.97	0.33	0.63	0.175	0.209	22.87

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.11 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR NON-METROPOLITAN QLD, 1990-2020  
*(billion kilometres)*

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	12.94	2.91	0.56	0.80	0.217	0.163	17.58
1991	13.06	3.13	0.55	0.77	0.206	0.156	17.87
1992	13.47	3.40	0.57	0.70	0.203	0.156	18.50
1993	13.82	3.63	0.65	0.71	0.210	0.156	19.18
1994	14.10	3.81	0.66	0.73	0.221	0.156	19.68
1995	14.69	4.33	0.72	0.74	0.230	0.156	20.87
1996	15.10	4.22	0.74	0.77	0.240	0.163	21.23
1997	15.23	4.18	0.77	0.81	0.248	0.164	21.41
1998	15.52	4.41	0.86	0.85	0.255	0.165	22.06
1999	16.17	4.44	0.90	0.86	0.264	0.165	22.81
2000	16.28	4.51	0.89	0.88	0.281	0.167	23.01
2001	16.30	4.67	0.89	0.90	0.278	0.169	23.21
2002	16.72	4.80	0.93	0.91	0.283	0.172	23.81
2003	17.42	4.85	0.95	0.91	0.288	0.174	24.59
2004	18.09	4.90	0.99	0.93	0.293	0.176	25.38
2005	18.70	4.97	1.01	0.93	0.299	0.178	26.09
2006	19.10	4.98	1.05	0.93	0.304	0.180	26.54
2007	19.49	5.01	1.08	0.94	0.310	0.183	27.01
2008	19.88	5.02	1.12	0.93	0.316	0.185	27.45
2009	20.26	5.02	1.15	0.93	0.322	0.187	27.86
2010	20.62	5.13	1.19	0.93	0.326	0.189	28.40
2011	20.96	5.22	1.23	0.93	0.332	0.191	28.87
2012	21.30	5.31	1.27	0.93	0.337	0.193	29.34
2013	21.62	5.40	1.31	0.92	0.343	0.195	29.79
2014	21.93	5.49	1.35	0.92	0.349	0.197	30.23
2015	22.23	5.58	1.40	0.91	0.355	0.199	30.67
2016	22.52	5.66	1.44	0.92	0.361	0.201	31.11
2017	22.81	5.78	1.49	0.92	0.365	0.203	31.57
2018	23.09	5.93	1.53	0.93	0.371	0.205	32.05
2019	23.36	6.08	1.57	0.92	0.377	0.207	32.53
2020	23.63	6.24	1.61	0.92	0.384	0.209	32.99

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.12 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR STATE OF QUEENSLAND, 1990-2020

(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	21.98	4.56	0.65	1.29	0.302	0.326	29.10
1991	22.17	4.69	0.64	1.24	0.292	0.312	29.33
1992	22.85	4.99	0.66	1.15	0.291	0.311	30.25
1993	23.41	5.35	0.74	1.16	0.297	0.313	31.27
1994	23.87	5.57	0.76	1.20	0.314	0.313	32.02
1995	24.88	6.19	0.83	1.23	0.327	0.312	33.77
1996	25.56	6.27	0.86	1.26	0.340	0.326	34.63
1997	25.80	6.29	0.90	1.30	0.353	0.328	34.97
1998	26.28	6.59	0.99	1.33	0.366	0.329	35.88
1999	27.38	6.74	1.05	1.34	0.378	0.330	37.22
2000	27.56	6.78	1.04	1.35	0.403	0.335	37.48
2001	27.61	7.09	1.04	1.37	0.398	0.339	37.85
2002	28.34	7.36	1.08	1.40	0.406	0.343	38.92
2003	29.52	7.53	1.10	1.41	0.414	0.348	40.32
2004	30.66	7.69	1.15	1.44	0.422	0.352	41.72
2005	31.71	7.89	1.18	1.44	0.430	0.357	43.01
2006	32.39	8.01	1.22	1.45	0.438	0.361	43.87
2007	33.06	8.17	1.27	1.47	0.447	0.365	44.77
2008	33.73	8.29	1.31	1.47	0.455	0.370	45.62
2009	34.37	8.41	1.35	1.48	0.463	0.374	46.44
2010	35.00	8.66	1.41	1.49	0.471	0.379	47.41
2011	35.58	8.87	1.45	1.50	0.480	0.383	48.27
2012	36.16	9.09	1.50	1.50	0.488	0.387	49.12
2013	36.70	9.31	1.55	1.50	0.497	0.391	49.96
2014	37.24	9.53	1.61	1.50	0.505	0.395	50.79
2015	37.77	9.76	1.66	1.50	0.514	0.399	51.61
2016	38.27	9.99	1.71	1.52	0.522	0.403	52.42
2017	38.77	10.28	1.78	1.53	0.531	0.407	53.30
2018	39.26	10.58	1.83	1.54	0.540	0.411	54.16
2019	39.73	10.89	1.88	1.54	0.548	0.415	55.01
2020	40.20	11.21	1.94	1.55	0.560	0.419	55.87

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

## SOUTH AUSTRALIA VKT

TABLE 1.13 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR ADELAIDE, 1990-2020

(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	6.50	0.96	0.06	0.28	0.062	0.067	7.92
1991	6.62	0.91	0.05	0.26	0.063	0.063	7.96
1992	6.69	0.91	0.05	0.26	0.063	0.062	8.03
1993	6.86	0.96	0.06	0.25	0.061	0.061	8.25
1994	6.99	0.97	0.06	0.25	0.064	0.060	8.39
1995	7.29	1.01	0.06	0.26	0.065	0.058	8.74
1996	7.49	1.09	0.07	0.25	0.066	0.060	9.03
1997	7.56	1.11	0.07	0.25	0.069	0.059	9.12
1998	7.93	1.13	0.07	0.24	0.071	0.059	9.51
1999	8.00	1.18	0.08	0.24	0.073	0.058	9.63
2000	8.21	1.16	0.08	0.23	0.077	0.059	9.82
2001	8.16	1.22	0.08	0.24	0.075	0.059	9.82
2002	8.31	1.28	0.08	0.24	0.076	0.059	10.05
2003	8.56	1.33	0.08	0.24	0.077	0.059	10.35
2004	8.82	1.38	0.09	0.25	0.078	0.059	10.66
2005	9.04	1.43	0.09	0.25	0.078	0.060	10.94
2006	9.15	1.47	0.09	0.25	0.079	0.060	11.11
2007	9.26	1.53	0.10	0.25	0.079	0.060	11.28
2008	9.37	1.57	0.10	0.25	0.080	0.060	11.43
2009	9.47	1.62	0.10	0.26	0.080	0.060	11.58
2010	9.56	1.67	0.11	0.26	0.082	0.060	11.74
2011	9.64	1.72	0.11	0.26	0.082	0.061	11.87
2012	9.71	1.77	0.12	0.26	0.083	0.061	12.01
2013	9.78	1.82	0.12	0.26	0.083	0.061	12.13
2014	9.85	1.87	0.13	0.26	0.084	0.061	12.25
2015	9.91	1.92	0.13	0.27	0.084	0.061	12.37
2016	9.96	1.98	0.14	0.27	0.084	0.061	12.49
2017	10.01	2.04	0.14	0.27	0.086	0.061	12.62
2018	10.06	2.10	0.15	0.27	0.086	0.061	12.73
2019	10.11	2.16	0.15	0.27	0.087	0.061	12.84
2020	10.15	2.22	0.16	0.27	0.088	0.062	12.95

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.14 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR NON-METROPOLITAN SA, 1990-2020  
*(billion kilometres)*

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	3.37	0.84	0.25	0.22	0.053	0.029	4.77
1991	3.43	0.91	0.25	0.18	0.048	0.027	4.85
1992	3.47	0.85	0.26	0.17	0.045	0.027	4.82
1993	3.55	0.74	0.30	0.16	0.046	0.026	4.82
1994	3.62	0.68	0.31	0.16	0.048	0.026	4.84
1995	3.77	0.60	0.32	0.13	0.049	0.025	4.90
1996	3.87	0.48	0.32	0.11	0.050	0.026	4.86
1997	3.91	0.44	0.32	0.10	0.050	0.025	4.84
1998	4.10	0.50	0.36	0.11	0.050	0.025	5.14
1999	4.14	0.42	0.35	0.08	0.052	0.025	5.08
2000	4.23	0.55	0.38	0.11	0.055	0.025	5.35
2001	4.18	0.52	0.37	0.10	0.053	0.025	5.25
2002	4.23	0.53	0.39	0.10	0.054	0.025	5.33
2003	4.33	0.55	0.40	0.10	0.053	0.025	5.47
2004	4.43	0.57	0.42	0.11	0.053	0.025	5.60
2005	4.52	0.57	0.43	0.11	0.054	0.026	5.70
2006	4.54	0.58	0.44	0.10	0.054	0.026	5.74
2007	4.56	0.59	0.45	0.10	0.054	0.026	5.79
2008	4.59	0.59	0.46	0.10	0.054	0.026	5.82
2009	4.60	0.59	0.47	0.10	0.055	0.026	5.85
2010	4.62	0.60	0.49	0.10	0.054	0.026	5.88
2011	4.62	0.61	0.50	0.10	0.054	0.026	5.91
2012	4.63	0.61	0.51	0.09	0.054	0.026	5.92
2013	4.63	0.61	0.53	0.09	0.055	0.026	5.93
2014	4.62	0.61	0.54	0.09	0.055	0.026	5.94
2015	4.62	0.60	0.55	0.09	0.055	0.026	5.94
2016	4.61	0.59	0.56	0.09	0.055	0.026	5.93
2017	4.60	0.59	0.57	0.08	0.054	0.026	5.92
2018	4.59	0.57	0.58	0.08	0.055	0.026	5.90
2019	4.57	0.55	0.59	0.08	0.055	0.026	5.86
2020	4.56	0.52	0.60	0.07	0.055	0.026	5.82

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.15 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR STATE OF SA, 1990-2020  
*(billion kilometres)*

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	9.87	1.80	0.31	0.50	0.115	0.096	12.69
1991	10.05	1.82	0.30	0.44	0.110	0.090	12.81
1992	10.16	1.76	0.31	0.42	0.108	0.089	12.85
1993	10.41	1.71	0.35	0.41	0.108	0.087	13.07
1994	10.61	1.65	0.37	0.41	0.111	0.085	13.23
1995	11.06	1.61	0.39	0.39	0.113	0.083	13.65
1996	11.36	1.57	0.39	0.37	0.116	0.085	13.89
1997	11.47	1.55	0.39	0.35	0.119	0.085	13.96
1998	12.03	1.63	0.43	0.35	0.122	0.084	14.65
1999	12.14	1.60	0.43	0.33	0.125	0.083	14.71
2000	12.44	1.70	0.46	0.35	0.131	0.084	15.16
2001	12.33	1.74	0.45	0.34	0.128	0.084	15.07
2002	12.53	1.81	0.47	0.35	0.129	0.084	15.38
2003	12.90	1.88	0.48	0.34	0.130	0.084	15.82
2004	13.25	1.94	0.50	0.35	0.131	0.085	16.27
2005	13.56	2.00	0.51	0.35	0.132	0.085	16.64
2006	13.69	2.05	0.53	0.35	0.133	0.085	16.85
2007	13.83	2.11	0.55	0.35	0.133	0.086	17.06
2008	13.96	2.16	0.56	0.35	0.134	0.086	17.26
2009	14.07	2.21	0.58	0.35	0.135	0.086	17.44
2010	14.18	2.27	0.60	0.36	0.136	0.086	17.62
2011	14.26	2.33	0.61	0.36	0.136	0.087	17.78
2012	14.34	2.38	0.63	0.36	0.137	0.087	17.93
2013	14.41	2.43	0.65	0.36	0.138	0.087	18.06
2014	14.47	2.48	0.66	0.36	0.138	0.087	18.19
2015	14.52	2.53	0.68	0.35	0.139	0.087	18.31
2016	14.57	2.57	0.70	0.35	0.140	0.087	18.42
2017	14.61	2.63	0.71	0.35	0.140	0.088	18.54
2018	14.65	2.67	0.73	0.35	0.141	0.088	18.63
2019	14.68	2.71	0.74	0.35	0.141	0.088	18.70
2020	14.71	2.74	0.75	0.34	0.143	0.088	18.77

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

## WESTERN AUSTRALIA VKT

TABLE 1.16 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR PERTH, 1990-2020

(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	7.99	1.63	0.09	0.44	0.070	0.068	10.30
1991	8.01	1.55	0.09	0.41	0.071	0.065	10.19
1992	8.24	1.57	0.09	0.40	0.072	0.064	10.44
1993	8.46	1.68	0.10	0.40	0.071	0.063	10.77
1994	8.64	1.72	0.10	0.41	0.075	0.063	11.00
1995	9.02	1.81	0.11	0.42	0.077	0.062	11.50
1996	9.28	1.99	0.12	0.42	0.081	0.065	11.96
1997	9.38	2.05	0.13	0.42	0.085	0.065	12.12
1998	9.46	2.10	0.13	0.41	0.089	0.066	12.27
1999	9.68	2.22	0.14	0.42	0.092	0.066	12.62
2000	9.97	2.20	0.14	0.41	0.097	0.067	12.89
2001	10.00	2.34	0.15	0.41	0.096	0.067	13.06
2002	10.25	2.48	0.15	0.43	0.098	0.068	13.47
2003	10.66	2.58	0.16	0.43	0.101	0.069	14.00
2004	11.06	2.69	0.16	0.44	0.103	0.070	14.52
2005	11.42	2.81	0.17	0.44	0.104	0.071	15.02
2006	11.65	2.91	0.18	0.45	0.106	0.071	15.36
2007	11.88	3.03	0.19	0.46	0.108	0.072	15.72
2008	12.10	3.13	0.19	0.46	0.110	0.073	16.07
2009	12.31	3.24	0.20	0.47	0.112	0.074	16.41
2010	12.52	3.37	0.21	0.48	0.115	0.074	16.77
2011	12.72	3.48	0.22	0.48	0.117	0.075	17.10
2012	12.91	3.60	0.23	0.49	0.118	0.076	17.42
2013	13.09	3.72	0.24	0.49	0.120	0.076	17.74
2014	13.26	3.84	0.25	0.50	0.122	0.077	18.05
2015	13.43	3.97	0.26	0.50	0.124	0.078	18.37
2016	13.60	4.10	0.27	0.51	0.126	0.078	18.68
2017	13.76	4.26	0.28	0.52	0.129	0.079	19.03
2018	13.92	4.40	0.30	0.52	0.131	0.080	19.34
2019	14.07	4.54	0.31	0.52	0.133	0.080	19.66
2020	14.22	4.69	0.32	0.53	0.135	0.081	19.97

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.17 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR NON-METROPOLITAN WA, 1990-2020  
*(billion kilometres)*

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	4.35	1.24	0.29	0.45	0.143	0.045	6.53
1991	4.36	1.45	0.29	0.38	0.134	0.043	6.66
1992	4.46	1.43	0.30	0.39	0.130	0.043	6.75
1993	4.55	1.24	0.33	0.37	0.132	0.042	6.67
1994	4.62	1.16	0.34	0.40	0.139	0.042	6.71
1995	4.80	1.15	0.36	0.40	0.143	0.041	6.90
1996	4.92	0.98	0.37	0.38	0.148	0.043	6.85
1997	4.96	0.88	0.38	0.36	0.153	0.043	6.77
1998	5.03	1.01	0.42	0.36	0.158	0.044	7.02
1999	5.14	0.86	0.43	0.32	0.163	0.044	6.95
2000	5.29	1.00	0.44	0.34	0.174	0.044	7.29
2001	5.28	0.96	0.43	0.32	0.172	0.045	7.21
2002	5.40	0.95	0.46	0.33	0.175	0.045	7.37
2003	5.62	0.99	0.48	0.34	0.177	0.046	7.64
2004	5.82	0.99	0.50	0.36	0.180	0.046	7.90
2005	6.01	1.01	0.52	0.36	0.183	0.047	8.12
2006	6.12	1.02	0.54	0.37	0.186	0.048	8.28
2007	6.23	1.04	0.56	0.37	0.189	0.048	8.44
2008	6.35	1.05	0.58	0.37	0.193	0.049	8.60
2009	6.45	1.07	0.60	0.38	0.196	0.049	8.75
2010	6.56	1.08	0.63	0.38	0.198	0.050	8.90
2011	6.66	1.10	0.65	0.39	0.201	0.050	9.05
2012	6.75	1.12	0.68	0.39	0.204	0.050	9.19
2013	6.84	1.13	0.70	0.39	0.208	0.051	9.32
2014	6.93	1.15	0.72	0.40	0.211	0.051	9.46
2015	7.01	1.17	0.75	0.40	0.214	0.052	9.59
2016	7.09	1.18	0.77	0.40	0.217	0.052	9.72
2017	7.17	1.20	0.80	0.40	0.219	0.053	9.85
2018	7.25	1.22	0.82	0.40	0.222	0.053	9.97
2019	7.32	1.24	0.84	0.40	0.226	0.054	10.08
2020	7.40	1.26	0.86	0.39	0.230	0.054	10.19

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.18 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR STATE OF WA, 1990-2020  
*(billion kilometres)*

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	12.35	2.87	0.39	0.89	0.213	0.114	16.82
1991	12.36	3.00	0.38	0.79	0.205	0.108	16.85
1992	12.69	3.00	0.39	0.79	0.202	0.106	17.19
1993	13.01	2.93	0.43	0.77	0.203	0.105	17.44
1994	13.26	2.88	0.44	0.81	0.213	0.105	17.71
1995	13.82	2.96	0.48	0.82	0.220	0.104	18.41
1996	14.20	2.97	0.49	0.81	0.229	0.108	18.80
1997	14.33	2.92	0.50	0.78	0.237	0.109	18.89
1998	14.50	3.11	0.55	0.77	0.247	0.109	19.28
1999	14.83	3.08	0.57	0.74	0.255	0.110	19.57
2000	15.26	3.21	0.58	0.75	0.271	0.111	20.18
2001	15.28	3.30	0.58	0.74	0.268	0.112	20.27
2002	15.65	3.43	0.61	0.76	0.273	0.114	20.84
2003	16.28	3.57	0.63	0.77	0.278	0.115	21.64
2004	16.88	3.68	0.66	0.80	0.283	0.116	22.42
2005	17.43	3.82	0.69	0.80	0.288	0.118	23.14
2006	17.77	3.93	0.72	0.81	0.293	0.119	23.64
2007	18.11	4.06	0.75	0.83	0.297	0.120	24.16
2008	18.45	4.18	0.78	0.84	0.303	0.121	24.67
2009	18.77	4.31	0.81	0.85	0.308	0.123	25.16
2010	19.08	4.45	0.84	0.86	0.313	0.124	25.67
2011	19.37	4.58	0.87	0.87	0.318	0.125	26.14
2012	19.66	4.72	0.91	0.88	0.323	0.126	26.60
2013	19.93	4.85	0.94	0.89	0.328	0.127	27.06
2014	20.19	4.99	0.98	0.89	0.333	0.129	27.51
2015	20.44	5.14	1.01	0.90	0.338	0.130	27.96
2016	20.69	5.29	1.04	0.91	0.343	0.131	28.40
2017	20.93	5.46	1.08	0.92	0.348	0.132	28.87
2018	21.17	5.62	1.12	0.92	0.354	0.133	29.31
2019	21.39	5.78	1.15	0.92	0.359	0.134	29.74
2020	21.62	5.94	1.18	0.92	0.366	0.135	30.17

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

## TASMANIA VKT

TABLE 1.19 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR HOBART, 1990-2020

(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	1.130	0.186	0.011	0.095	0.017	0.011	1.450
1991	1.107	0.176	0.010	0.089	0.017	0.010	1.410
1992	1.147	0.177	0.011	0.087	0.017	0.010	1.449
1993	1.178	0.188	0.011	0.085	0.017	0.010	1.489
1994	1.203	0.189	0.012	0.085	0.018	0.009	1.517
1995	1.257	0.198	0.013	0.087	0.018	0.009	1.581
1996	1.293	0.214	0.014	0.087	0.018	0.009	1.636
1997	1.308	0.217	0.014	0.086	0.019	0.009	1.653
1998	1.283	0.218	0.014	0.084	0.019	0.009	1.629
1999	1.347	0.226	0.015	0.084	0.020	0.009	1.700
2000	1.389	0.220	0.015	0.082	0.021	0.009	1.735
2001	1.367	0.230	0.015	0.082	0.020	0.009	1.723
2002	1.381	0.239	0.016	0.085	0.020	0.009	1.750
2003	1.414	0.246	0.016	0.085	0.020	0.009	1.790
2004	1.448	0.252	0.016	0.086	0.020	0.009	1.831
2005	1.475	0.259	0.016	0.086	0.020	0.009	1.866
2006	1.484	0.264	0.017	0.086	0.020	0.009	1.880
2007	1.492	0.271	0.017	0.086	0.020	0.009	1.896
2008	1.500	0.276	0.018	0.086	0.020	0.009	1.908
2009	1.506	0.281	0.018	0.086	0.021	0.009	1.920
2010	1.511	0.288	0.019	0.086	0.021	0.008	1.932
2011	1.514	0.293	0.020	0.086	0.021	0.008	1.940
2012	1.515	0.298	0.020	0.085	0.021	0.008	1.947
2013	1.516	0.303	0.021	0.085	0.021	0.008	1.954
2014	1.517	0.308	0.021	0.084	0.021	0.008	1.959
2015	1.515	0.313	0.022	0.084	0.021	0.008	1.963
2016	1.513	0.318	0.022	0.083	0.021	0.008	1.966
2017	1.511	0.325	0.023	0.083	0.021	0.008	1.971
2018	1.507	0.330	0.024	0.082	0.021	0.008	1.972
2019	1.504	0.335	0.024	0.082	0.021	0.008	1.974
2020	1.500	0.340	0.025	0.081	0.021	0.008	1.975

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.20 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR NON-METROPOLITAN TASMANIA, 1990-2020  
 (billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	1.751	0.268	0.086	0.169	0.023	0.032	2.329
1991	1.715	0.282	0.085	0.145	0.021	0.030	2.278
1992	1.772	0.286	0.089	0.130	0.020	0.029	2.326
1993	1.814	0.274	0.099	0.112	0.020	0.029	2.348
1994	1.847	0.266	0.101	0.102	0.021	0.028	2.364
1995	1.922	0.283	0.110	0.089	0.021	0.027	2.452
1996	1.973	0.321	0.107	0.101	0.021	0.028	2.551
1997	1.989	0.369	0.105	0.112	0.022	0.028	2.624
1998	1.952	0.447	0.109	0.125	0.022	0.027	2.681
1999	2.050	0.524	0.109	0.136	0.022	0.027	2.869
2000	2.117	0.515	0.106	0.135	0.023	0.027	2.923
2001	2.085	0.518	0.105	0.128	0.023	0.027	2.884
2002	2.102	0.537	0.107	0.129	0.023	0.027	2.924
2003	2.151	0.556	0.108	0.128	0.022	0.026	2.991
2004	2.198	0.574	0.111	0.131	0.022	0.026	3.063
2005	2.236	0.587	0.112	0.129	0.022	0.026	3.113
2006	2.246	0.601	0.114	0.129	0.023	0.026	3.138
2007	2.254	0.616	0.116	0.130	0.023	0.026	3.164
2008	2.261	0.628	0.118	0.129	0.023	0.026	3.184
2009	2.266	0.640	0.120	0.128	0.023	0.026	3.202
2010	2.269	0.655	0.122	0.128	0.022	0.025	3.222
2011	2.269	0.668	0.124	0.128	0.022	0.025	3.237
2012	2.267	0.680	0.126	0.128	0.022	0.025	3.249
2013	2.263	0.692	0.128	0.127	0.022	0.025	3.257
2014	2.258	0.703	0.130	0.126	0.022	0.025	3.265
2015	2.252	0.714	0.133	0.125	0.022	0.024	3.271
2016	2.244	0.724	0.135	0.124	0.022	0.024	3.274
2017	2.235	0.736	0.137	0.124	0.022	0.024	3.278
2018	2.225	0.743	0.139	0.122	0.022	0.024	3.275
2019	2.214	0.748	0.140	0.120	0.022	0.024	3.268
2020	2.202	0.751	0.142	0.118	0.022	0.023	3.257

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.21 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR STATE OF TASMANIA, 1990-2020  
*(billion kilometres)*

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	2.881	0.455	0.097	0.264	0.040	0.042	3.779
1991	2.822	0.459	0.096	0.234	0.038	0.040	3.688
1992	2.920	0.463	0.100	0.216	0.037	0.039	3.775
1993	2.992	0.462	0.110	0.197	0.037	0.038	3.836
1994	3.050	0.455	0.113	0.187	0.038	0.037	3.881
1995	3.179	0.481	0.123	0.176	0.039	0.036	4.034
1996	3.267	0.535	0.121	0.188	0.040	0.037	4.187
1997	3.297	0.585	0.119	0.199	0.040	0.037	4.277
1998	3.235	0.665	0.123	0.209	0.041	0.036	4.310
1999	3.397	0.750	0.124	0.221	0.042	0.036	4.569
2000	3.506	0.735	0.121	0.217	0.044	0.036	4.658
2001	3.452	0.748	0.120	0.210	0.043	0.035	4.607
2002	3.483	0.776	0.122	0.214	0.043	0.035	4.674
2003	3.565	0.802	0.123	0.213	0.043	0.035	4.781
2004	3.646	0.826	0.127	0.217	0.043	0.035	4.893
2005	3.711	0.847	0.128	0.215	0.043	0.035	4.979
2006	3.729	0.866	0.131	0.215	0.043	0.035	5.019
2007	3.746	0.887	0.133	0.216	0.043	0.034	5.059
2008	3.761	0.904	0.136	0.215	0.043	0.034	5.093
2009	3.771	0.921	0.138	0.214	0.043	0.034	5.122
2010	3.780	0.942	0.141	0.214	0.043	0.034	5.154
2011	3.782	0.961	0.144	0.214	0.043	0.034	5.177
2012	3.782	0.978	0.146	0.213	0.043	0.033	5.196
2013	3.779	0.995	0.149	0.212	0.043	0.033	5.211
2014	3.774	1.011	0.152	0.210	0.043	0.033	5.224
2015	3.767	1.027	0.154	0.209	0.043	0.033	5.234
2016	3.757	1.042	0.157	0.207	0.043	0.032	5.239
2017	3.746	1.061	0.160	0.207	0.043	0.032	5.248
2018	3.732	1.073	0.162	0.204	0.043	0.032	5.247
2019	3.718	1.083	0.165	0.202	0.043	0.031	5.242
2020	3.702	1.091	0.166	0.199	0.043	0.031	5.232

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

## NORTHERN TERRITORY VKT

TABLE 1.22 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR DARWIN, 1990-2020

(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	0.395	0.162	0.010	0.049	0.013	0.009	0.637
1991	0.418	0.154	0.009	0.047	0.013	0.008	0.648
1992	0.446	0.155	0.009	0.045	0.013	0.008	0.677
1993	0.455	0.165	0.010	0.045	0.013	0.008	0.695
1994	0.461	0.167	0.010	0.045	0.013	0.008	0.706
1995	0.479	0.176	0.011	0.047	0.014	0.008	0.735
1996	0.490	0.193	0.012	0.047	0.015	0.009	0.766
1997	0.497	0.196	0.013	0.047	0.015	0.009	0.777
1998	0.517	0.198	0.013	0.046	0.016	0.009	0.798
1999	0.526	0.207	0.014	0.046	0.017	0.009	0.819
2000	0.546	0.204	0.014	0.045	0.018	0.009	0.836
2001	0.547	0.215	0.014	0.046	0.018	0.009	0.849
2002	0.563	0.226	0.015	0.048	0.018	0.009	0.878
2003	0.588	0.233	0.015	0.048	0.019	0.009	0.912
2004	0.610	0.240	0.015	0.049	0.019	0.009	0.943
2005	0.630	0.249	0.016	0.049	0.020	0.009	0.973
2006	0.643	0.255	0.016	0.050	0.020	0.009	0.993
2007	0.656	0.262	0.017	0.050	0.021	0.009	1.015
2008	0.669	0.268	0.017	0.050	0.021	0.009	1.035
2009	0.681	0.275	0.018	0.050	0.022	0.009	1.055
2010	0.693	0.283	0.019	0.051	0.022	0.009	1.076
2011	0.705	0.289	0.019	0.051	0.023	0.010	1.096
2012	0.715	0.296	0.020	0.051	0.023	0.010	1.114
2013	0.726	0.302	0.020	0.051	0.024	0.010	1.133
2014	0.736	0.309	0.021	0.051	0.024	0.010	1.151
2015	0.747	0.316	0.022	0.051	0.025	0.010	1.169
2016	0.757	0.323	0.022	0.051	0.025	0.010	1.187
2017	0.767	0.332	0.023	0.051	0.026	0.010	1.209
2018	0.777	0.339	0.024	0.051	0.026	0.010	1.227
2019	0.787	0.346	0.025	0.051	0.027	0.010	1.245
2020	0.797	0.353	0.025	0.050	0.027	0.010	1.263

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.23 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR NON-METROPOLITAN NT, 1990-2020  
(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	0.387	0.145	0.066	0.055	0.048	0.013	0.714
1991	0.410	0.132	0.065	0.046	0.045	0.012	0.711
1992	0.443	0.136	0.062	0.044	0.044	0.012	0.741
1993	0.456	0.136	0.064	0.042	0.045	0.012	0.755
1994	0.467	0.142	0.062	0.043	0.047	0.012	0.773
1995	0.489	0.161	0.066	0.045	0.049	0.012	0.823
1996	0.504	0.159	0.072	0.044	0.052	0.013	0.842
1997	0.506	0.143	0.072	0.037	0.054	0.013	0.826
1998	0.518	0.144	0.079	0.032	0.055	0.013	0.842
1999	0.521	0.157	0.084	0.028	0.057	0.013	0.860
2000	0.537	0.146	0.075	0.022	0.061	0.013	0.853
2001	0.536	0.145	0.075	0.020	0.060	0.013	0.849
2002	0.545	0.150	0.080	0.020	0.061	0.013	0.870
2003	0.566	0.155	0.082	0.021	0.062	0.014	0.900
2004	0.585	0.160	0.087	0.022	0.063	0.014	0.931
2005	0.602	0.166	0.090	0.022	0.064	0.014	0.958
2006	0.612	0.170	0.094	0.022	0.065	0.014	0.977
2007	0.621	0.175	0.098	0.023	0.067	0.014	0.998
2008	0.632	0.179	0.102	0.024	0.068	0.014	1.018
2009	0.641	0.183	0.106	0.024	0.069	0.014	1.037
2010	0.651	0.189	0.110	0.025	0.070	0.014	1.058
2011	0.658	0.193	0.115	0.025	0.071	0.014	1.076
2012	0.666	0.197	0.119	0.026	0.072	0.014	1.095
2013	0.674	0.202	0.124	0.026	0.073	0.014	1.113
2014	0.681	0.206	0.128	0.027	0.075	0.015	1.131
2015	0.688	0.211	0.133	0.027	0.076	0.015	1.149
2016	0.695	0.215	0.137	0.028	0.077	0.015	1.167
2017	0.701	0.221	0.142	0.028	0.078	0.015	1.186
2018	0.707	0.226	0.147	0.028	0.079	0.015	1.203
2019	0.714	0.231	0.151	0.028	0.081	0.015	1.220
2020	0.720	0.236	0.155	0.028	0.082	0.015	1.236

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.24 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR STATE OF NORTHERN TERRITORY, 1990-2020  
(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	0.781	0.307	0.076	0.104	0.061	0.022	1.351
1991	0.828	0.285	0.074	0.093	0.058	0.021	1.359
1992	0.889	0.291	0.071	0.089	0.057	0.021	1.418
1993	0.911	0.301	0.074	0.086	0.058	0.020	1.450
1994	0.928	0.309	0.072	0.088	0.061	0.020	1.478
1995	0.968	0.337	0.078	0.092	0.063	0.020	1.558
1996	0.994	0.352	0.084	0.091	0.066	0.021	1.608
1997	1.003	0.339	0.085	0.084	0.069	0.022	1.602
1998	1.035	0.342	0.092	0.078	0.072	0.022	1.641
1999	1.047	0.365	0.098	0.074	0.074	0.022	1.679
2000	1.082	0.349	0.089	0.067	0.079	0.022	1.689
2001	1.083	0.360	0.089	0.066	0.078	0.022	1.698
2002	1.108	0.376	0.094	0.068	0.079	0.022	1.748
2003	1.154	0.389	0.097	0.069	0.081	0.023	1.812
2004	1.195	0.400	0.102	0.071	0.082	0.023	1.873
2005	1.233	0.414	0.106	0.071	0.084	0.023	1.931
2006	1.255	0.425	0.110	0.072	0.086	0.023	1.970
2007	1.278	0.437	0.115	0.073	0.087	0.023	2.013
2008	1.300	0.447	0.119	0.074	0.089	0.023	2.053
2009	1.322	0.458	0.124	0.074	0.090	0.024	2.092
2010	1.343	0.471	0.129	0.075	0.092	0.024	2.134
2011	1.362	0.482	0.134	0.076	0.094	0.024	2.172
2012	1.381	0.493	0.139	0.077	0.095	0.024	2.209
2013	1.400	0.504	0.144	0.077	0.097	0.024	2.246
2014	1.418	0.515	0.149	0.078	0.099	0.024	2.282
2015	1.435	0.527	0.154	0.078	0.100	0.024	2.318
2016	1.452	0.538	0.160	0.078	0.102	0.025	2.354
2017	1.469	0.553	0.166	0.079	0.104	0.025	2.394
2018	1.485	0.565	0.171	0.079	0.106	0.025	2.429
2019	1.501	0.577	0.175	0.079	0.107	0.025	2.464
2020	1.517	0.589	0.180	0.079	0.110	0.025	2.500

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

## AUSTRALIAN CAPITAL TERRITORY VKT

TABLE 1.25 BASE CASE PROJECTIONS OF VEHICLE KILOMETRES TRAVELED BY TYPE OF VEHICLE FOR ACT (CANBERRA), 1990-2020

(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	2.316	0.384	0.004	0.059	0.020	0.034	2.818
1991	2.300	0.364	0.004	0.056	0.021	0.033	2.777
1992	2.412	0.367	0.004	0.054	0.021	0.033	2.891
1993	2.472	0.393	0.004	0.054	0.021	0.032	2.975
1994	2.520	0.399	0.004	0.054	0.021	0.032	3.031
1995	2.626	0.421	0.005	0.056	0.022	0.031	3.161
1996	2.698	0.461	0.005	0.057	0.023	0.032	3.276
1997	2.723	0.479	0.005	0.058	0.023	0.032	3.321
1998	2.701	0.494	0.006	0.058	0.024	0.031	3.314
1999	2.804	0.522	0.006	0.059	0.025	0.031	3.447
2000	2.822	0.519	0.006	0.058	0.026	0.032	3.463
2001	2.803	0.552	0.006	0.060	0.026	0.032	3.478
2002	2.850	0.583	0.007	0.062	0.026	0.032	3.560
2003	2.947	0.607	0.007	0.063	0.026	0.032	3.683
2004	3.054	0.629	0.007	0.065	0.027	0.032	3.813
2005	3.136	0.655	0.007	0.066	0.027	0.032	3.923
2006	3.179	0.676	0.008	0.066	0.027	0.032	3.988
2007	3.221	0.700	0.008	0.067	0.028	0.032	4.057
2008	3.262	0.722	0.008	0.068	0.028	0.032	4.119
2009	3.300	0.744	0.009	0.069	0.028	0.032	4.181
2010	3.336	0.770	0.009	0.070	0.029	0.032	4.246
2011	3.367	0.794	0.009	0.070	0.029	0.032	4.302
2012	3.396	0.818	0.010	0.071	0.029	0.032	4.355
2013	3.424	0.842	0.010	0.071	0.030	0.032	4.409
2014	3.449	0.867	0.010	0.072	0.030	0.032	4.460
2015	3.474	0.893	0.011	0.072	0.030	0.032	4.511
2016	3.495	0.919	0.011	0.073	0.030	0.031	4.561
2017	3.517	0.952	0.012	0.074	0.031	0.031	4.617
2018	3.536	0.981	0.012	0.074	0.031	0.031	4.666
2019	3.555	1.010	0.013	0.074	0.031	0.031	4.715
2020	3.573	1.040	0.013	0.075	0.032	0.031	4.764

Note: For simplicity, all VKT within the ACT is assigned to 'metropolitan' travel.

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).



## Vehicle Fleets

TABLE 1.26 BASE CASE PROJECTIONS OF NATIONAL VEHICLE STOCK BY TYPE OF VEHICLE, 1990-2020

(thousand vehicles)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	7797.3	1350.0	51.7	331.9	37.7	369.6	9938.2
1991	8011.9	1381.5	52.1	331.0	38.8	350.0	10165.3
1992	8143.0	1407.2	51.4	329.6	41.4	345.7	10318.2
1993	8280.2	1443.5	52.4	328.6	43.2	341.3	10489.1
1994	8404.2	1442.1	52.6	332.7	44.0	337.0	10612.6
1995	8627.9	1518.2	55.2	334.0	45.5	332.6	10913.3
1996	8882.1	1577.9	56.5	345.0	46.5	344.3	11252.4
1997	9100.6	1590.3	58.0	355.8	48.0	344.3	11497.0
1998	9418.8	1681.6	61.1	356.0	49.0	344.3	11910.8
1999	9690.0	1759.8	63.7	359.3	51.0	344.3	12268.2
2000	9836.5	1786.3	63.4	362.0	53.0	347.8	12449.0
2001	9995.7	1797.9	64.3	364.0	54.0	351.0	12626.9
2002	10181.1	1847.3	64.6	365.8	56.0	354.1	12868.9
2003	10407.5	1905.9	65.7	372.1	56.8	357.2	13165.1
2004	10649.8	1972.9	67.1	376.6	57.6	360.2	13484.2
2005	10844.8	2022.3	67.8	377.5	58.4	363.3	13734.1
2006	11016.1	2087.9	69.1	381.1	59.2	366.3	13979.7
2007	11179.6	2149.3	70.3	383.6	60.0	369.2	14212.1
2008	11330.6	2212.4	71.5	386.2	60.8	372.1	14433.5
2009	11473.6	2275.3	72.7	388.4	61.6	375.1	14646.6
2010	11617.5	2339.2	73.9	390.4	62.4	378.0	14861.5
2011	11745.9	2408.4	75.3	393.1	63.2	380.5	15066.4
2012	11875.7	2476.0	76.7	395.2	64.0	383.1	15270.6
2013	11999.4	2543.6	78.0	397.0	64.8	385.6	15468.5
2014	12118.2	2611.6	79.4	398.6	65.6	388.2	15661.6
2015	12232.0	2679.3	80.8	399.8	66.4	390.7	15849.0
2016	12339.4	2745.3	82.1	400.6	67.2	393.2	16027.8
2017	12442.8	2808.8	83.4	400.8	68.0	395.6	16199.4
2018	12542.5	2869.0	84.6	400.3	68.8	398.0	16363.3
2019	12638.6	2924.9	85.7	399.1	69.6	400.4	16518.3
2020	12731.7	2977.2	86.7	397.2	70.7	402.8	16666.4

Sources: BTRE estimates, BTRE (2002), BTE(1999), ABS (2002 and earlier).

TABLE 1.27      BASE CASE PROJECTIONS OF NATIONAL PASSENGER CAR STOCK  
BY AGE OF VEHICLE, 1990-2020  
(*thousand vehicles*)

<i>Age of vehicle (years)</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>
New	492.2	440.8	437.0	449.8	476.0	528.4	531.3	550.9
1	491.7	489.8	435.0	435.0	448.9	475.0	520.0	531.3
2	415.7	491.7	488.5	428.0	433.9	447.7	470.0	520.0
3	356.4	415.7	470.0	488.0	426.6	432.4	440.0	470.0
4	442.2	356.4	400.0	460.0	484.9	424.8	430.0	440.0
5	511.1	442.2	354.5	390.0	455.0	482.3	420.0	430.0
6	461.7	511.1	441.4	350.0	384.8	451.9	480.0	420.0
7	450.1	461.7	495.0	440.0	344.5	381.5	480.0	480.0
8	440.2	450.1	456.6	480.0	433.0	340.7	400.0	474.8
9	411.7	440.2	443.9	440.0	471.4	429.0	380.0	394.5
10	372.1	411.7	432.6	442.5	430.4	467.0	440.0	372.4
11	435.9	372.1	402.8	425.0	430.9	426.0	470.0	428.5
12	347.3	435.9	362.1	395.0	411.6	425.0	430.0	454.4
13	291.6	347.3	407.0	360.0	379.9	405.0	420.0	412.7
14	335.5	291.6	325.9	380.0	343.4	373.0	393.5	399.9
15	257.0	335.5	280.0	300.0	350.8	330.0	359.6	371.1
16	257.3	257.0	315.0	272.5	273.4	325.0	314.9	335.2
17	200.0	257.3	250.0	290.0	245.2	248.0	294.8	288.7
18	170.0	152.5	240.0	250.0	257.9	219.7	188.0	260.2
19	160.0	125.7	135.0	230.0	219.3	228.2	170.0	162.4
20	150.0	118.1	109.9	105.0	199.1	191.8	160.0	144.7
Over 20 (pre-1986 new)	347.8	407.7	460.8	469.4	503.4	595.5	690.0	758.9
Over 20 (post-1986 new)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	7797.3	8011.9	8143.0	8280.2	8404.2	8627.9	8882.1	9100.6

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2002 and earlier).

TABLE 1.27 (cont) BASE CASE PROJECTIONS OF NATIONAL PASSENGER CAR STOCK BY AGE OF VEHICLE, 1990-2020  
(thousand vehicles)

Age of vehicle (years)	Fin. Year							
	1998	1999	2000	2001	2002	2003	2004	2005
New	654.8	672.7	596.0	684.9	657.1	685.0	692.0	691.4
1	548.0	653.5	671.4	591.8	680.1	652.5	680.2	685.2
2	529.9	546.6	651.8	666.3	587.3	674.9	647.6	673.1
3	518.3	528.1	543.8	645.4	660.8	582.5	669.3	640.2
4	468.0	516.1	523.9	536.8	639.4	654.7	577.1	661.2
5	437.6	465.5	511.3	516.5	531.2	632.8	647.9	569.2
6	427.1	434.6	460.3	503.3	510.4	525.0	625.4	638.3
7	416.4	423.4	428.9	451.1	496.5	503.5	517.8	614.9
8	474.8	411.8	416.7	419.1	443.9	488.6	495.5	507.6
9	468.2	468.2	404.2	406.0	411.3	435.6	479.5	484.3
10	387.7	460.1	458.1	392.2	397.0	402.2	426.0	466.8
11	364.4	379.3	448.2	443.0	381.8	386.5	391.5	412.7
12	417.0	354.6	367.1	431.0	429.0	369.7	374.2	377.1
13	439.3	403.2	340.8	350.2	414.6	412.7	355.7	358.0
14	396.0	421.4	384.8	322.4	334.3	395.8	393.9	337.5
15	380.2	376.4	397.6	359.9	304.9	316.2	374.4	370.6
16	349.1	357.6	351.1	368.2	336.9	285.4	295.9	348.4
17	311.6	324.5	329.4	320.7	340.5	311.6	264.0	271.7
18	264.9	285.9	294.7	296.7	292.7	310.8	284.4	238.9
19	230.3	239.6	255.6	260.2	267.0	263.5	279.8	254.0
20	142.0	201.4	207.5	220.7	230.8	236.8	233.7	248.1
Over 20 (pre-1986 new)	793.4	765.5	793.4	809.6	833.6	881.3	944.0	995.5
Over 20 (post-1986 new)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	9418.8	9690.0	9836.5	9995.7	10181.1	10407.5	10649.8	10844.8

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2002 and earlier).

TABLE 1.27 (cont)      BASE CASE PROJECTIONS OF NATIONAL PASSENGER CAR STOCK BY AGE OF VEHICLE, 1990-2020  
*(thousand vehicles)*

Age of vehicle (years)	Fin. Year							
	2006	2007	2008	2009	2010	2011	2012	2013
New	672.9	666.5	661.2	652.1	660.0	649.1	661.4	655.7
1	684.6	668.1	661.8	656.5	647.5	655.4	644.6	656.8
2	678.0	679.4	663.1	656.8	651.6	642.6	650.4	639.7
3	665.5	670.3	673.8	657.6	651.3	646.2	637.3	645.0
4	632.3	657.4	662.2	665.6	649.5	645.4	640.2	631.4
5	652.4	623.8	648.6	653.4	656.7	640.8	638.7	633.6
6	560.5	642.7	614.5	639.0	643.7	647.0	631.3	631.2
7	627.6	550.9	632.0	604.1	628.3	632.9	636.2	620.7
8	603.2	615.7	540.1	619.9	592.5	616.3	620.9	624.1
9	496.2	589.9	602.2	528.0	606.4	579.5	602.8	607.3
10	471.5	483.2	574.8	586.8	514.3	590.9	564.6	587.5
11	452.5	457.0	468.4	557.6	569.3	498.7	573.3	547.7
12	397.6	436.1	440.6	451.5	537.9	549.3	480.9	553.1
13	360.8	380.5	417.6	421.8	432.4	515.5	526.4	460.6
14	339.7	342.4	361.2	396.6	400.7	410.7	490.1	502.5
15	317.2	319.3	321.9	339.7	373.1	377.0	386.5	463.6
16	344.9	294.9	296.9	299.2	315.9	347.2	350.8	361.8
17	320.2	317.0	270.8	272.6	274.8	292.2	319.2	324.5
18	246.0	292.3	287.3	245.2	246.8	250.8	266.7	291.3
19	215.1	221.4	263.1	256.6	220.7	222.2	225.7	240.1
20	225.3	190.7	196.4	233.3	227.6	195.7	197.0	200.2
Over 20 (pre-1986 new)	1052.2	882.2	737.1	623.5	526.7	444.4	374.6	315.5
Over 20 (post-1986 new)	0.0	197.8	335.2	456.0	589.6	695.9	755.8	805.5
Total	11016.1	11179.6	11330.6	11473.6	11617.5	11745.9	11875.7	11999.4

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2002 and earlier).

TABLE 1.27 (cont) BASE CASE PROJECTIONS OF NATIONAL PASSENGER CAR STOCK BY AGE OF VEHICLE, 1990-2020  
(thousand vehicles)

Age of vehicle (years)	Fin. Year						
	2014	2015	2016	2017	2018	2019	2020
New	648.2	655.6	662.4	672.1	681.6	690.7	701.4
1	651.1	643.6	651.0	657.7	667.3	676.8	685.8
2	651.8	646.2	638.7	646.1	652.7	662.3	671.7
3	634.4	646.4	640.8	633.4	640.8	647.3	656.8
4	639.1	628.6	640.5	634.9	627.6	634.9	641.4
5	624.9	632.5	622.1	633.9	628.4	621.1	628.3
6	626.2	617.6	625.1	614.8	626.4	621.0	613.8
7	622.6	617.7	609.2	616.6	606.4	617.9	612.6
8	610.9	612.7	607.9	599.5	606.8	596.8	608.1
9	612.5	599.5	601.3	596.5	588.3	595.5	585.7
10	593.8	598.9	586.2	588.0	583.3	575.3	582.3
11	571.9	578.1	583.0	570.7	572.4	567.9	560.1
12	530.3	553.8	559.8	564.6	552.6	554.3	549.9
13	532.1	510.2	532.8	538.5	543.1	531.6	533.2
14	439.7	507.9	487.0	508.6	514.1	518.4	507.4
15	475.3	415.9	480.4	460.7	481.0	486.3	490.4
16	433.9	444.9	389.3	449.7	431.2	450.2	455.1
17	334.6	401.3	411.5	360.1	415.9	398.8	416.4
18	296.2	305.4	366.3	375.6	328.7	379.7	364.0
19	262.2	266.6	274.9	329.7	338.0	295.8	341.7
20	212.9	232.6	236.4	243.8	292.4	299.8	262.3
Over 20 (pre-1986 new)	265.6	223.6	188.3	158.8	134.1	113.5	96.4
Over 20 (post-1986 new)	847.9	892.4	944.5	988.8	1029.4	1102.9	1166.9
Total	12118.2	12232.0	12339.4	12442.8	12542.5	12638.6	12731.7

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2002 and earlier).

TABLE 1.28      BASE CASE PROJECTIONS OF NATIONAL LIGHT COMMERCIAL VEHICLE STOCK BY AGE OF VEHICLE, 1990-2020  
*(thousand vehicles)*

Age of vehicle (years)	Fin. Year						
	1990	1995	2000	2005	2010	2015	2020
New	95.0	95.3	115.3	108.6	132.2	146.0	140.1
1	80.6	77.3	108.4	124.2	129.4	144.4	142.0
2	66.8	83.1	100.1	113.3	126.7	141.0	143.6
3	48.8	76.2	91.0	101.9	122.3	138.0	144.0
4	62.1	82.6	88.8	88.0	123.6	136.4	143.4
5	97.8	90.8	91.9	111.6	105.3	128.2	141.7
6	96.5	74.4	73.8	103.4	119.1	124.2	138.7
7	75.8	61.2	78.8	94.9	108.1	121.0	134.8
8	80.7	44.4	71.8	85.7	96.6	116.1	131.1
9	81.0	56.0	77.2	82.9	82.8	116.4	128.7
10	68.6	87.3	84.1	85.0	104.2	98.5	120.0
11	60.3	85.2	68.1	67.6	95.7	110.3	115.2
12	63.2	66.0	55.4	71.4	86.9	99.1	111.1
13	56.7	69.2	39.6	64.1	77.5	87.5	105.4
14	55.5	68.4	49.3	67.9	74.0	74.0	104.4
15	43.3	56.2	75.5	72.7	74.7	91.8	87.0
16	41.0	48.4	72.3	57.8	58.4	82.9	95.9
17	31.4	49.7	54.9	46.1	60.6	74.0	84.7
18	26.3	43.5	56.4	32.2	53.4	64.8	73.4
19	19.1	41.5	54.4	39.2	55.4	60.6	60.9
20	12.8	31.6	43.8	58.7	58.2	60.0	74.1
Over 20 (pre-1986 new)	86.7	129.8	235.4	345.1	287.1	172.1	30.0
Over 20 (post-1986 new)	0.0	0.0	0.0	0.0	106.9	292.2	527.1
Total	1350.0	1518.2	1786.3	2022.3	2339.2	2679.3	2977.2

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2002 and earlier).

TABLE 1.29 BASE CASE PROJECTIONS OF NATIONAL RIGID TRUCK STOCK BY AGE OF VEHICLE, 1990-2020

(thousand vehicles)

Age of vehicle (years)	Fin. Year						
	1990	1995	2000	2005	2010	2015	2020
New	13.8	11.4	13.5	11.3	12.7	12.2	9.1
1	17.0	9.8	13.2	14.8	12.8	12.5	9.8
2	14.5	9.7	11.3	16.2	13.0	12.6	10.5
3	11.3	9.8	9.4	11.7	12.9	12.8	11.1
4	14.5	9.8	9.6	11.9	13.8	13.2	11.7
5	21.9	13.5	11.2	13.3	11.1	12.6	12.0
6	16.8	16.1	9.7	12.9	14.5	12.6	12.3
7	11.5	13.7	9.6	11.1	15.9	12.7	12.3
8	14.4	10.6	9.6	9.1	11.4	12.6	12.5
9	17.7	13.6	9.6	9.3	11.5	13.4	12.8
10	15.4	20.4	13.1	10.8	12.8	10.7	12.1
11	14.0	15.5	15.6	9.3	12.4	13.9	12.1
12	14.7	10.5	13.2	9.1	10.6	15.1	12.2
13	14.1	13.1	10.2	9.1	8.7	10.8	11.9
14	15.8	16.0	12.9	9.0	8.7	10.8	12.7
15	12.1	13.6	19.3	12.2	10.1	12.0	10.0
16	11.7	12.2	14.6	14.3	8.5	11.4	12.9
17	8.9	12.5	9.8	11.9	8.3	9.6	13.8
18	7.3	11.8	12.1	9.1	8.2	7.8	9.8
19	7.4	13.0	14.5	11.3	7.9	7.7	9.6
20	6.2	9.8	12.2	16.7	10.6	8.8	10.5
Over 20 (pre-1986 new)	51.0	67.5	107.9	133.2	114.3	78.1	42.3
Over 20 (post-1986 new)	0.0	0.0	0.0	0.0	39.6	75.7	113.3
Total	331.9	334.0	362.0	377.5	390.4	399.8	397.2

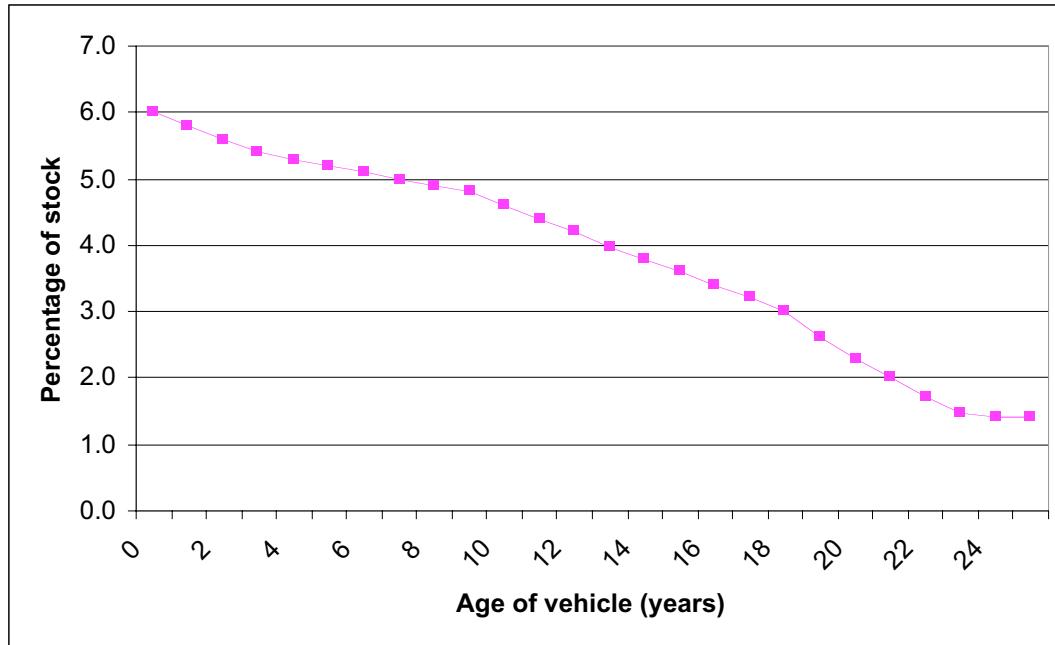
Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2002 and earlier).

TABLE 1.30      BASE CASE PROJECTIONS OF NATIONAL ARTICULATED TRUCK STOCK  
BY AGE OF VEHICLE, 1990-2020  
(*thousand vehicles*)

Age of vehicle (years)	Fin. Year						
	1990	1995	2000	2005	2010	2015	2020
New	2.86	4.81	3.30	3.28	3.96	4.35	4.24
1	3.77	3.15	3.97	3.84	3.88	4.30	4.27
2	3.29	2.16	3.92	3.47	3.79	4.17	4.27
3	2.58	1.68	3.05	2.62	3.64	4.06	4.24
4	2.67	2.01	2.79	3.10	3.67	3.98	4.17
5	3.75	2.64	4.54	3.09	3.08	3.71	4.08
6	2.58	3.35	2.92	3.64	3.52	3.56	3.95
7	1.50	2.89	1.99	3.55	3.15	3.44	3.79
8	2.08	2.24	1.52	2.73	2.35	3.26	3.64
9	2.50	2.29	1.81	2.46	2.75	3.25	3.53
10	2.83	3.17	2.34	3.96	2.69	2.69	3.24
11	3.00	2.15	2.94	2.50	3.13	3.03	3.06
12	2.54	1.23	2.50	1.68	3.01	2.67	2.92
13	2.34	1.68	1.91	1.27	2.28	1.97	2.73
14	2.71	1.99	1.93	1.48	2.03	2.26	2.68
15	1.84	2.20	2.64	1.89	3.21	2.18	2.18
16	1.55	2.30	1.77	2.33	2.00	2.50	2.42
17	1.19	1.92	1.00	1.96	1.32	2.37	2.10
18	0.81	1.74	1.35	1.48	0.98	1.76	1.53
19	0.89	1.99	1.58	1.47	1.13	1.55	1.73
20	0.56	1.34	1.73	1.99	1.43	2.42	1.65
Over 20 (pre-1986 new)	3.85	6.27	11.94	14.04	13.83	13.14	11.75
Over 20 (post-1986 new)	0.00	0.00	0.00	0.00	3.12	4.18	8.61
Total	51.67	55.17	63.44	67.83	73.93	80.80	86.74

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2002 and earlier).

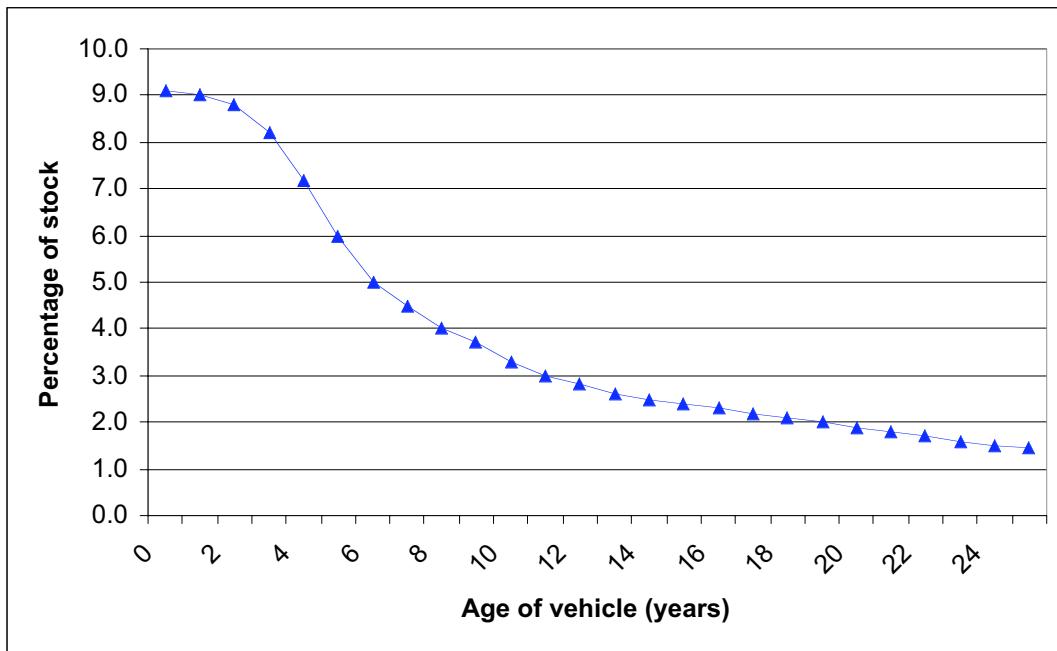
**Figure 1.4 Base level distribution of bus fleet stock by age**



*Note:* Smoothed values, based on year 2000 fleet composition.

*Sources:* BTRE estimates, BTRE (2002), BTE (1999), ABS (2002 and earlier).

**Figure 1.5 Base level distribution of motorcycle fleet stock by age**



*Note:* Smoothed values, based on year 2000 fleet composition.

*Sources:* BTRE estimates, BTRE (2002), BTE (1999), ABS (2002 and earlier).

TABLE 1.31      BASE CASE PROJECTIONS OF NATIONAL PASSENGER CAR TRAVEL  
BY AGE OF VEHICLE, 1990-2020  
(million kilometres)

Age of vehicle (years)	Fin. Year							
	1990	1991	1992	1993	1994	1995	1996	1997
New	6030	5535	5487	5648	5977	6634	6671	6917
1	11650	11341	10187	10356	10800	11671	12720	12813
2	8715	10068	10117	9012	9233	9731	10173	11092
3	7169	8162	9334	9851	8707	9017	9138	9618
4	8506	6698	7604	8887	9467	8474	8544	8618
5	9479	8017	6501	7271	8571	9277	8053	8126
6	8274	8949	7817	6305	7007	8401	8884	7668
7	7780	7798	8456	7641	6051	6845	8567	8446
8	7260	7254	7442	7951	7250	5835	6817	7970
9	6532	6824	6960	7012	7591	7058	6231	6376
10	5726	6189	6577	6838	6722	7445	6989	5837
11	6496	5419	5933	6364	6521	6584	7232	6503
12	5013	6144	5163	5725	6029	6357	6406	6672
13	4070	4733	5609	5043	5378	5853	6045	5858
14	4517	3837	4336	5139	4693	5205	5468	5479
15	3289	4192	3539	3854	4553	4375	4747	4829
16	3115	3041	3769	3314	3360	4076	3935	4129
17	2288	2874	2824	3329	2845	2939	3478	3358
18	1865	1634	2599	2752	2868	2497	2131	2902
19	1722	1321	1435	2484	2394	2545	1891	1781
20	1538	1181	1113	1082	2070	2038	1696	1512
Over 20 (pre-1986 new)	3130	3669	4148	4225	4531	5360	6210	6830
Over 20 (post-1986 new)	0	0	0	0	0	0	0	0
Total	124164	124879	126949	130082	132618	138219	142025	143335

Notes: New vehicles are bought throughout the year, so the average utilisation across the new fleet (ie during year of age '0' ) is approximately half the full annual VKT of such vehicles.

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.31 (cont) BASE CASE PROJECTIONS OF NATIONAL PASSENGER CAR TRAVEL BY AGE OF VEHICLE, 1990-2020  
(million kilometres)

Age of vehicle (years)	Fin. Year							
	1998	1999	2000	2001	2002	2003	2004	2005
New	8222	8447	7484	8599	8251	8601	8689	8682
1	13036	15387	15786	13664	15669	15246	16041	16330
2	11149	11385	13554	13605	11967	13946	13507	14188
3	10458	10550	10846	12636	12910	11543	13387	12944
4	9039	9866	10001	10059	11958	12415	11049	12791
5	8156	8586	9416	9336	9582	11577	11964	10626
6	7689	7746	8190	8787	8892	9278	11155	11508
7	7230	7278	7361	7597	8344	8584	8913	10693
8	7862	6754	6824	6734	7118	7947	8137	8427
9	7459	7385	6367	6276	6344	6818	7575	7734
10	5991	7037	6997	5879	5938	6103	6527	7229
11	5457	5623	6632	6434	5533	5683	5813	6195
12	6042	5088	5259	6058	6016	5262	5378	5481
13	6149	5589	4719	4758	5622	5676	4940	5027
14	5352	5640	5142	4229	4376	5256	5281	4576
15	4880	4784	5046	4485	3790	3988	4766	4770
16	4242	4303	4218	4344	3966	3408	3568	4244
17	3575	3686	3736	3572	3785	3512	3004	3126
18	2914	3114	3205	3169	3120	3359	3103	2637
19	2486	2561	2728	2726	2791	2794	2994	2749
20	1463	2050	2109	2200	2296	2391	2382	2557
Over 20 (pre-1986 new)	7141	6889	7140	7286	7502	7932	8496	8960
Over 20 (post-1986 new)	0	0	0	0	0	0	0	0
Total	145991	149749	152761	152434	155771	161317	166669	171473

Notes: New vehicles are bought throughout the year, so the average utilisation across the new fleet (ie during year of age '0') is approximately half the full annual VKT of such vehicles.

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.31 (cont) BASE CASE PROJECTIONS OF NATIONAL PASSENGER CAR TRAVEL BY AGE OF VEHICLE, 1990-2020  
(million kilometres)

Age of vehicle (years)	Fin. Year							
	2006	2007	2008	2009	2010	2011	2012	2013
New	8449	8368	8302	8188	8287	8151	8305	8233
1	16316	15949	15837	15761	15603	15836	15625	15952
2	14288	14343	14034	13945	13885	13734	13943	13742
3	13451	13571	13675	13390	13313	13244	13103	13289
4	12232	12735	12860	12968	12703	12656	12594	12447
5	12172	11660	12152	12279	12390	12125	12122	12050
6	10107	11603	11123	11602	11731	11826	11576	11597
7	10912	9596	11032	10581	11044	11155	11250	10999
8	10006	10229	9000	10358	9938	10365	10473	10550
9	7922	9429	9649	8491	9782	9376	9783	9875
10	7301	7492	8931	9146	8050	9269	8885	9262
11	6789	6868	7056	8422	8630	7585	8741	8369
12	5777	6345	6425	6606	7894	8082	7103	8180
13	5066	5351	5884	5963	6135	7329	7507	6586
14	4605	4649	4916	5413	5489	5642	6747	6931
15	4085	4119	4162	4405	4856	4919	5059	6075
16	4201	3600	3633	3673	3892	4288	4346	4489
17	3682	3651	3128	3160	3197	3408	3733	3803
18	2714	3228	3181	2725	2754	2806	2993	3274
19	2329	2401	2859	2798	2417	2440	2487	2649
20	2322	1971	2034	2423	2373	2048	2069	2106
Over 20 (pre-1986 new)	9470	7940	6634	5612	4741	4000	3371	2840
Over 20 (post-1986 new)	0	1780	3017	4104	5306	6263	6802	7249
Total	174195	176878	179522	182011	184408	186547	188616	190547

Notes: New vehicles are bought throughout the year, so the average utilisation across the new fleet (ie during year of age '0' ) is approximately half the full annual VKT of such vehicles.

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.31 (cont)      BASE CASE PROJECTIONS OF NATIONAL PASSENGER CAR TRAVEL BY AGE OF VEHICLE, 1990-2020  
*(million kilometres)*

Age of vehicle (years)	Fin. Year						
	2014	2015	2016	2017	2018	2019	2020
New	8138	8232	8317	8438	8558	8672	8807
1	15855	15723	15945	16144	16406	16660	16893
2	14038	13961	13837	14027	14194	14421	14634
3	13105	13395	13314	13192	13365	13521	13727
4	12630	12463	12731	12649	12525	12687	12825
5	11916	12098	11932	12183	12099	11977	12123
6	11534	11413	11582	11418	11652	11569	11445
7	11060	11007	10885	11041	10878	11099	11011
8	10354	10418	10362	10243	10384	10229	10429
9	9986	9806	9861	9804	9686	9817	9663
10	9386	9497	9320	9369	9310	9195	9313
11	8760	8883	8984	8813	8854	8796	8683
12	7865	8238	8348	8440	8275	8312	8252
13	7622	7333	7676	7776	7856	7701	7729
14	6085	7046	6775	7088	7177	7249	7100
15	6244	5485	6347	6101	6380	6457	6518
16	5394	5547	4870	5633	5411	5657	5722
17	3930	4725	4857	4262	4927	4732	4943
18	3337	3451	4146	4260	3737	4319	4145
19	2900	2958	3057	3671	3770	3306	3818
20	2245	2459	2506	2590	3107	3190	2797
Over 20 (pre-1986 new)	2391	2012	1695	1429	1207	1021	868
Over 20 (post-1986 new)	7631	8032	8500	8899	9264	9926	10502
Total	192407	194180	195848	197470	199022	200511	201947

Notes: New vehicles are bought throughout the year, so the average utilisation across the new fleet (ie during year of age '0' ) is approximately half the full annual VKT of such vehicles.

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.32 BASE CASE PROJECTIONS OF NATIONAL LIGHT COMMERCIAL VEHICLE TRAVEL BY AGE OF VEHICLE, 1990-2020  
*(million kilometres)*

Age of vehicle (years)	Fin. Year						
	1990	1995	2000	2005	2010	2015	2020
New	1176	1214	1473	1448	1733	1903	1886
1	1926	1902	2674	3195	3276	3633	3691
2	1539	1971	2380	2810	3094	3421	3599
3	1082	1741	2084	2433	2876	3222	3476
4	1325	1814	1954	2020	2792	3062	3326
5	2010	1922	1949	2470	2294	2774	3169
6	1910	1514	1507	2203	2497	2587	2985
7	1440	1197	1545	1941	2175	2420	2785
8	1470	832	1350	1682	1865	2227	2598
9	1414	1006	1390	1558	1532	2139	2443
10	1138	1491	1440	1519	1832	1720	2166
11	949	1381	1108	1146	1597	1830	1975
12	942	1012	852	1144	1371	1553	1801
13	796	1001	575	970	1154	1294	1611
14	732	929	671	964	1034	1028	1498
15	546	730	983	988	999	1219	1194
16	493	600	899	749	746	1051	1257
17	360	586	650	569	736	893	1056
18	287	487	633	378	616	743	870
19	197	441	580	435	606	658	684
20	124	317	440	615	601	616	785
Over 20 (pre-1986 new)	712	1098	1997	3054	2500	1489	268
Over 20 (post-1986 new)	0	0	0	0	931	2529	4713
Total	22567	25188	29133	34291	38860	44012	49836

Notes: New vehicles are bought throughout the year, so the average utilisation across the new fleet (ie during year of age '0' ) is approximately half the full annual VKT of such vehicles.

SOURCES: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.33 BASE CASE PROJECTIONS OF NATIONAL RIGID TRUCK TRAVEL BY AGE OF VEHICLE, 1990-2020  
*(million kilometres)*

Age of vehicle (years)	Fin. Year						
	1990	1995	2000	2005	2010	2015	2020
New	218.8	186.2	247.3	212.1	241.3	229.0	177.8
1	530.3	316.4	476.4	550.0	479.1	462.4	375.6
2	447.3	309.4	404.3	595.4	479.9	460.4	398.7
3	341.9	307.4	328.8	422.5	467.1	458.3	414.9
4	432.3	302.2	330.7	420.8	493.2	466.4	427.2
5	644.3	409.1	381.6	464.4	388.9	436.0	435.3
6	486.8	479.5	323.4	444.4	501.2	430.2	436.8
7	323.0	397.4	311.1	370.7	533.5	423.7	427.7
8	388.3	294.1	299.7	292.0	366.8	399.6	412.5
9	454.5	358.1	284.2	283.0	352.0	406.7	404.6
10	374.3	511.5	369.4	313.2	372.8	307.7	363.0
11	322.2	369.1	414.6	253.9	341.1	379.3	342.5
12	310.0	229.2	322.4	228.8	266.7	378.3	316.2
13	276.2	266.1	231.1	213.1	203.2	251.7	288.5
14	286.9	299.4	271.4	194.5	189.6	232.6	282.9
15	201.7	233.1	371.6	241.8	200.8	235.7	204.8
16	169.1	180.9	242.9	245.1	147.1	195.0	228.3
17	113.8	165.1	143.9	181.4	126.3	145.2	216.9
18	81.1	135.0	154.6	119.7	108.3	101.9	133.1
19	69.5	126.5	158.2	127.1	89.5	86.1	111.3
20	48.3	78.3	109.2	153.5	98.2	80.5	99.6
Over 20 (pre-1986 new)	273.1	373.2	668.4	848.9	731.8	494.4	278.5
Over 20 (post-1986 new)	0.0	0.0	0.0	0.0	253.7	479.7	746.5
Total	6793.7	6327.1	6845.4	7176.3	7432.1	7540.5	7523.2

Notes: New vehicles are bought throughout the year, so the average utilisation across the new fleet (ie during year of age '0' ) is approximately half the full annual VKT of such vehicles.

SOURCES: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

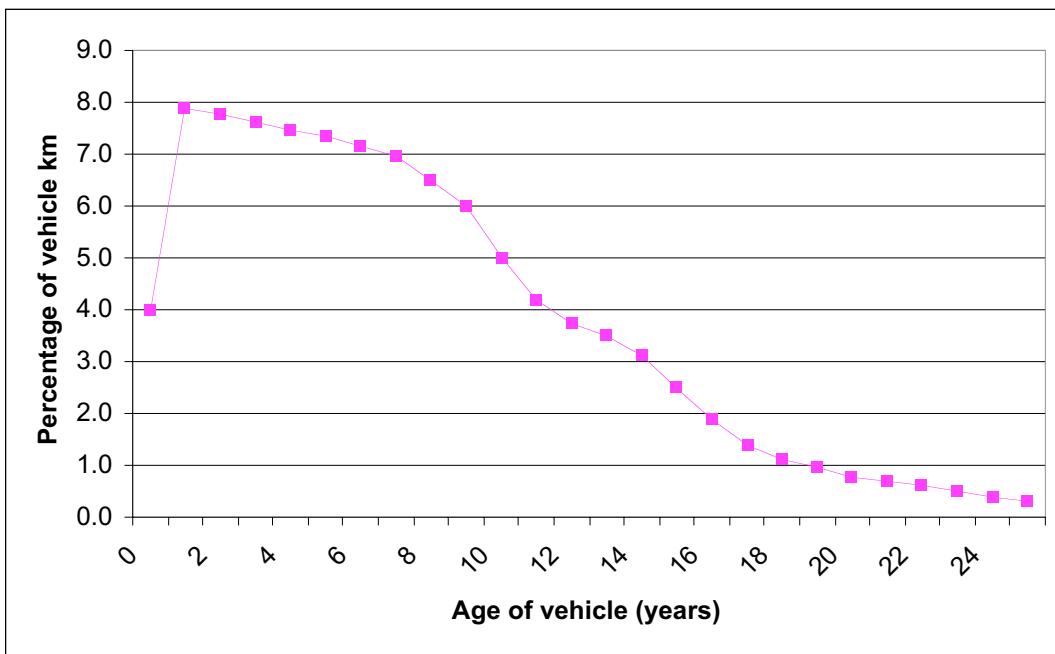
TABLE 1.34 BASE CASE PROJECTIONS OF NATIONAL ARTICULATED TRUCK TRAVEL  
BY AGE OF VEHICLE, 1990-2020  
(million kilometres)

Age of vehicle (years)	Fin. Year						
	1990	1995	2000	2005	2010	2015	2020
New	216.9	450.8	312.4	333.7	433.8	500.5	519.9
1	526.0	541.6	692.5	716.9	782.5	909.9	964.7
2	428.6	347.9	638.5	606.0	713.5	824.3	901.0
3	312.6	250.6	461.2	426.0	637.3	744.8	831.8
4	299.2	277.8	390.6	465.6	594.3	676.2	756.8
5	395.0	342.7	597.3	435.0	467.4	591.5	694.7
6	254.0	406.8	358.6	479.9	500.0	531.2	628.7
7	138.1	327.0	227.7	436.6	417.3	478.3	562.3
8	180.0	239.1	164.8	316.5	294.4	428.5	509.8
9	206.6	233.1	186.4	272.8	327.8	407.2	471.7
10	213.8	295.1	221.0	400.1	293.4	307.0	395.7
11	207.8	183.5	254.1	232.2	313.0	317.5	343.3
12	159.4	95.4	195.9	141.1	272.6	253.6	295.9
13	129.8	114.9	132.6	94.3	182.4	165.3	244.9
14	138.5	125.5	123.2	101.4	149.5	174.9	221.3
15	86.6	127.9	155.5	119.4	218.1	155.6	165.9
16	67.1	122.2	95.3	134.8	124.3	163.1	168.6
17	47.6	94.5	50.0	104.8	76.1	143.2	135.7
18	29.2	77.2	60.6	71.1	51.0	96.1	88.7
19	27.7	76.6	61.6	61.4	51.0	73.1	87.2
20	15.8	46.1	60.5	74.5	57.8	102.7	74.6
Over 20 (pre-1986 new)	69.3	139.0	268.1	337.9	358.9	357.6	341.5
Over 20 (post-1986 new)	0.0	0.0	0.0	0.0	80.9	113.9	250.3
Total	4149.5	4915.3	5708.2	6362.0	7397.1	8515.9	9655.0

Notes: New vehicles are bought throughout the year, so the average utilisation across the new fleet (ie during year of age '0' ) is approximately half the full annual VKT of such vehicles.

SOURCES: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

**Figure 1.6 Base level distribution of bus fleet travel by age**

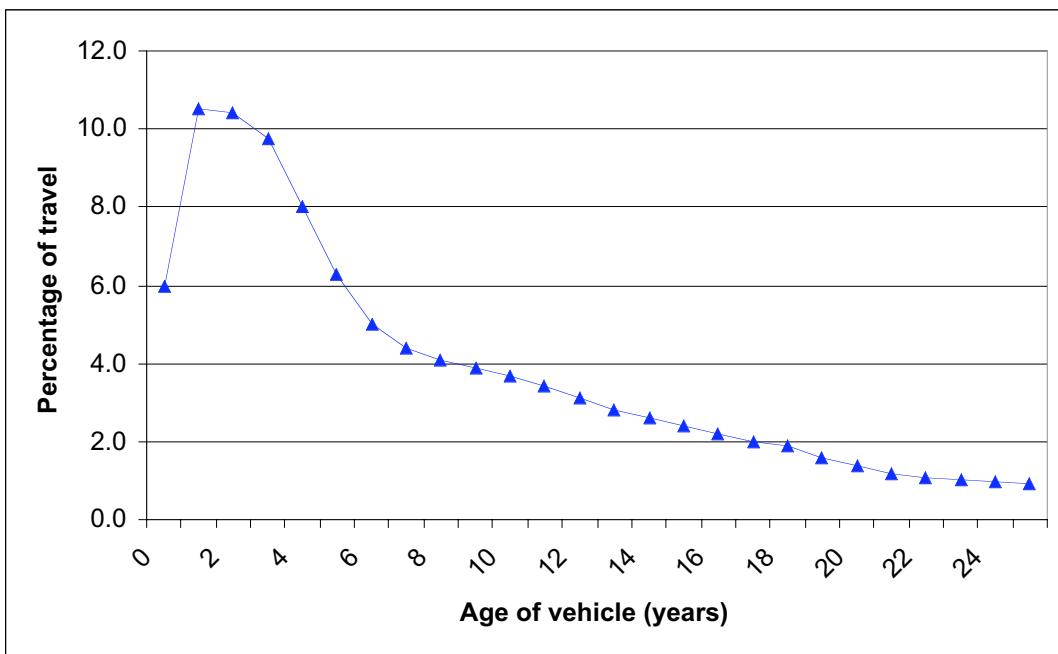


**Notes:** New vehicles are bought throughout the year, so the average utilisation across the new fleet (ie during year of age '0') is approximately half the full annual VKT of such vehicles.

Smoothed values, based on year 2000 fleet composition.

**Sources:** BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

**Figure 1.7 Base level distribution of motorcycle fleet travel by age**



*Notes:* New vehicles are bought throughout the year, so the average utilisation across the new fleet (ie during year of age '0') is approximately half the full annual VKT of such vehicles.

Smoothed values, based on year 2000 fleet composition.

*Sources:* BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

## Metropolitan traffic growth

TABLE 1.35 BASE CASE PROJECTED GROWTH IN PASSENGER CAR EQUIVALENT UNITS (PCUs) FOR AUSTRALIAN METROPOLITAN AREAS, 1990-2020  
*(billion PCU-kilometres)*

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	32.20	28.69	12.19	8.34	10.96	1.58	0.71	2.89	97.56
1991	31.90	28.42	12.11	8.36	10.81	1.53	0.72	2.84	96.71
1992	32.11	28.66	12.40	8.43	11.06	1.57	0.75	2.96	97.95
1993	32.99	29.42	12.75	8.64	11.40	1.61	0.77	3.04	100.61
1994	33.62	30.00	13.02	8.80	11.65	1.64	0.78	3.10	102.61
1995	35.09	31.31	13.62	9.17	12.20	1.71	0.81	3.23	107.13
1996	36.30	32.33	14.14	9.46	12.66	1.76	0.85	3.35	110.85
1997	36.83	32.74	14.32	9.55	12.85	1.78	0.86	3.40	112.32
1998	37.25	33.57	14.59	9.94	13.00	1.76	0.88	3.39	114.38
1999	38.25	34.61	15.21	10.07	13.38	1.83	0.91	3.53	117.79
2000	39.05	35.06	15.26	10.25	13.65	1.86	0.92	3.54	119.59
2001	39.43	35.32	15.45	10.26	13.83	1.85	0.94	3.56	120.63
2002	40.60	36.33	15.96	10.50	14.27	1.88	0.97	3.65	124.16
2003	42.01	37.55	16.58	10.81	14.81	1.92	1.00	3.77	128.46
2004	43.45	38.79	17.21	11.13	15.35	1.96	1.04	3.90	132.83
2005	44.80	39.92	17.81	11.42	15.87	2.00	1.07	4.01	136.90
2006	45.72	40.66	18.25	11.59	16.23	2.02	1.09	4.08	139.63
2007	46.71	41.44	18.71	11.77	16.62	2.03	1.11	4.15	142.54
2008	47.64	42.18	19.15	11.94	16.99	2.05	1.14	4.22	145.29
2009	48.55	42.89	19.58	12.10	17.36	2.06	1.16	4.28	147.97
2010	49.53	43.65	20.04	12.27	17.75	2.07	1.18	4.35	150.84
2011	50.39	44.30	20.46	12.41	18.10	2.08	1.20	4.40	153.35
2012	51.24	44.95	20.88	12.55	18.45	2.09	1.22	4.46	155.84
2013	52.09	45.58	21.29	12.69	18.79	2.10	1.24	4.51	158.29
2014	52.93	46.20	21.70	12.82	19.14	2.10	1.26	4.57	160.72
2015	53.76	46.81	22.12	12.96	19.48	2.11	1.28	4.62	163.14
2016	54.59	47.41	22.52	13.08	19.82	2.11	1.30	4.67	165.51
2017	55.51	48.07	22.97	13.22	20.20	2.12	1.33	4.73	168.14
2018	56.34	48.66	23.39	13.35	20.55	2.12	1.35	4.78	170.52
2019	57.17	49.24	23.80	13.47	20.89	2.12	1.37	4.83	172.90
2020	58.01	49.83	24.22	13.60	21.24	2.12	1.39	4.88	175.28

Note: PCUs are estimated here using a factor of 2 for rigid trucks and buses, and 3 for articulated trucks.

Sources: BTRE estimates, BTRE (2002), BTE (1999).

### **Summary of projected VKT growth for Australia capital cities to 2020**

**TABLE 1.36    BASE CASE PROJECTIONS OF PASSENGER CAR TRAVEL FOR  
AUSTRALIAN METROPOLITAN AREAS, 1990-2020**  
*(billion kilometres)*

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	23.49	22.57	9.04	6.50	7.99	1.13	0.39	2.32	73.43
1991	23.66	22.62	9.12	6.62	8.01	1.11	0.42	2.30	73.84
1992	23.87	22.89	9.38	6.69	8.24	1.15	0.45	2.41	75.07
1993	24.48	23.49	9.59	6.86	8.46	1.18	0.45	2.47	76.98
1994	24.98	23.99	9.78	6.99	8.64	1.20	0.46	2.52	78.56
1995	26.06	25.04	10.19	7.29	9.02	1.26	0.48	2.63	81.96
1996	26.80	25.78	10.47	7.49	9.28	1.29	0.49	2.70	84.30
1997	27.13	26.06	10.57	7.56	9.38	1.31	0.50	2.72	85.21
1998	27.45	26.82	10.76	7.93	9.46	1.28	0.52	2.70	86.92
1999	28.05	27.59	11.21	8.00	9.68	1.35	0.53	2.80	89.21
2000	28.93	28.09	11.29	8.21	9.97	1.39	0.55	2.82	91.24
2001	28.92	28.10	11.31	8.16	10.00	1.37	0.55	2.80	91.21
2002	29.60	28.77	11.61	8.31	10.25	1.38	0.56	2.85	93.33
2003	30.70	29.80	12.10	8.56	10.66	1.41	0.59	2.95	96.78
2004	31.78	30.79	12.57	8.82	11.06	1.45	0.61	3.05	100.12
2005	32.75	31.68	13.01	9.04	11.42	1.48	0.63	3.14	103.14
2006	33.32	32.19	13.29	9.15	11.65	1.48	0.64	3.18	104.91
2007	33.90	32.69	13.57	9.26	11.88	1.49	0.66	3.22	106.67
2008	34.46	33.19	13.85	9.37	12.10	1.50	0.67	3.26	108.40
2009	35.00	33.66	14.11	9.47	12.31	1.51	0.68	3.30	110.04
2010	35.52	34.11	14.38	9.56	12.52	1.51	0.69	3.34	111.63
2011	36.00	34.51	14.62	9.64	12.72	1.51	0.70	3.37	113.07
2012	36.46	34.90	14.86	9.71	12.91	1.51	0.72	3.40	114.46
2013	36.90	35.26	15.09	9.78	13.09	1.52	0.73	3.42	115.78
2014	37.32	35.60	15.32	9.85	13.26	1.52	0.74	3.45	117.05
2015	37.73	35.94	15.54	9.91	13.43	1.52	0.75	3.47	118.28
2016	38.12	36.25	15.75	9.96	13.60	1.51	0.76	3.50	119.44
2017	38.50	36.55	15.96	10.01	13.76	1.51	0.77	3.52	120.58
2018	38.87	36.84	16.16	10.06	13.92	1.51	0.78	3.54	121.68
2019	39.23	37.12	16.37	10.11	14.07	1.50	0.79	3.55	122.74
2020	39.59	37.39	16.56	10.15	14.22	1.50	0.80	3.57	123.77

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.37 BASE CASE PROJECTIONS OF LCV TRAVEL FOR AUSTRALIAN METROPOLITAN AREAS, 1990-2020

(billion kilometres)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	4.44	2.80	1.65	0.96	1.63	0.19	0.16	0.38	12.20
1991	4.20	2.65	1.56	0.91	1.55	0.18	0.15	0.36	11.56
1992	4.24	2.67	1.59	0.91	1.57	0.18	0.15	0.37	11.67
1993	4.53	2.83	1.71	0.96	1.68	0.19	0.16	0.39	12.46
1994	4.59	2.87	1.75	0.97	1.72	0.19	0.17	0.40	12.65
1995	4.81	3.00	1.86	1.01	1.81	0.20	0.18	0.42	13.29
1996	5.24	3.25	2.05	1.09	1.99	0.21	0.19	0.46	14.49
1997	5.38	3.34	2.12	1.11	2.05	0.22	0.20	0.48	14.89
1998	5.49	3.41	2.17	1.13	2.10	0.22	0.20	0.49	15.22
1999	5.79	3.59	2.30	1.18	2.22	0.23	0.21	0.52	16.03
2000	5.73	3.56	2.28	1.16	2.20	0.22	0.20	0.52	15.88
2001	6.09	3.78	2.42	1.22	2.34	0.23	0.21	0.55	16.85
2002	6.43	4.00	2.56	1.28	2.48	0.24	0.23	0.58	17.79
2003	6.69	4.16	2.68	1.33	2.58	0.25	0.23	0.61	18.53
2004	6.96	4.33	2.79	1.38	2.69	0.25	0.24	0.63	19.26
2005	7.27	4.52	2.92	1.43	2.81	0.26	0.25	0.66	20.12
2006	7.52	4.67	3.03	1.47	2.91	0.26	0.25	0.68	20.79
2007	7.81	4.85	3.16	1.53	3.03	0.27	0.26	0.70	21.60
2008	8.07	5.01	3.27	1.57	3.13	0.28	0.27	0.72	22.32
2009	8.34	5.17	3.39	1.62	3.24	0.28	0.27	0.74	23.06
2010	8.67	5.37	3.53	1.67	3.37	0.29	0.28	0.77	23.95
2011	8.95	5.54	3.65	1.72	3.48	0.29	0.29	0.79	24.72
2012	9.24	5.72	3.78	1.77	3.60	0.30	0.30	0.82	25.52
2013	9.54	5.90	3.91	1.82	3.72	0.30	0.30	0.84	26.34
2014	9.85	6.09	4.05	1.87	3.84	0.31	0.31	0.87	27.18
2015	10.17	6.28	4.19	1.92	3.97	0.31	0.32	0.89	28.05
2016	10.49	6.48	4.33	1.98	4.10	0.32	0.32	0.92	28.94
2017	10.88	6.72	4.50	2.04	4.26	0.32	0.33	0.95	30.01
2018	11.23	6.93	4.65	2.10	4.40	0.33	0.34	0.98	30.95
2019	11.59	7.14	4.81	2.16	4.54	0.34	0.35	1.01	31.93
2020	11.95	7.36	4.97	2.22	4.69	0.34	0.35	1.04	32.93

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.38 BASE CASE PROJECTIONS OF RIGID TRUCK TRAVEL FOR AUSTRALIAN METROPOLITAN AREAS, 1990-2020

(billion kilometres)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	1.54	1.18	0.49	0.28	0.44	0.09	0.05	0.06	4.13
1991	1.45	1.11	0.46	0.26	0.41	0.09	0.05	0.06	3.89
1992	1.42	1.08	0.46	0.26	0.40	0.09	0.05	0.05	3.80
1993	1.40	1.06	0.46	0.25	0.40	0.08	0.04	0.05	3.75
1994	1.41	1.07	0.46	0.25	0.41	0.08	0.05	0.05	3.77
1995	1.45	1.10	0.48	0.26	0.42	0.09	0.05	0.06	3.90
1996	1.44	1.09	0.49	0.25	0.42	0.09	0.05	0.06	3.89
1997	1.44	1.08	0.49	0.25	0.42	0.09	0.05	0.06	3.87
1998	1.41	1.06	0.48	0.24	0.41	0.08	0.05	0.06	3.79
1999	1.42	1.07	0.48	0.24	0.42	0.08	0.05	0.06	3.82
2000	1.38	1.04	0.47	0.23	0.41	0.08	0.05	0.06	3.73
2001	1.40	1.05	0.48	0.24	0.41	0.08	0.05	0.06	3.76
2002	1.45	1.09	0.50	0.24	0.43	0.08	0.05	0.06	3.90
2003	1.45	1.09	0.50	0.24	0.43	0.08	0.05	0.06	3.91
2004	1.48	1.11	0.51	0.25	0.44	0.09	0.05	0.06	3.99
2005	1.48	1.12	0.51	0.25	0.44	0.09	0.05	0.07	4.00
2006	1.50	1.13	0.52	0.25	0.45	0.09	0.05	0.07	4.05
2007	1.53	1.15	0.53	0.25	0.46	0.09	0.05	0.07	4.12
2008	1.55	1.16	0.54	0.25	0.46	0.09	0.05	0.07	4.17
2009	1.57	1.18	0.55	0.26	0.47	0.09	0.05	0.07	4.22
2010	1.59	1.20	0.56	0.26	0.48	0.09	0.05	0.07	4.29
2011	1.61	1.21	0.57	0.26	0.48	0.09	0.05	0.07	4.33
2012	1.63	1.22	0.57	0.26	0.49	0.09	0.05	0.07	4.38
2013	1.64	1.23	0.58	0.26	0.49	0.08	0.05	0.07	4.42
2014	1.66	1.24	0.59	0.26	0.50	0.08	0.05	0.07	4.46
2015	1.67	1.25	0.59	0.27	0.50	0.08	0.05	0.07	4.50
2016	1.69	1.26	0.60	0.27	0.51	0.08	0.05	0.07	4.53
2017	1.71	1.28	0.61	0.27	0.52	0.08	0.05	0.07	4.59
2018	1.72	1.29	0.61	0.27	0.52	0.08	0.05	0.07	4.63
2019	1.74	1.30	0.62	0.27	0.52	0.08	0.05	0.07	4.66
2020	1.75	1.31	0.63	0.27	0.53	0.08	0.05	0.07	4.69

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.39 BASE CASE PROJECTIONS OF ARTICULATED TRUCK TRAVEL FOR AUSTRALIAN METROPOLITAN AREAS, 1990-2020  
*(billion kilometres)*

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.221	0.201	0.090	0.056	0.093	0.011	0.010	0.004	0.686
1991	0.208	0.189	0.084	0.053	0.087	0.010	0.009	0.004	0.644
1992	0.215	0.195	0.088	0.055	0.091	0.011	0.009	0.004	0.668
1993	0.224	0.203	0.093	0.056	0.095	0.011	0.010	0.004	0.697
1994	0.240	0.217	0.100	0.060	0.102	0.012	0.010	0.004	0.746
1995	0.261	0.235	0.110	0.065	0.112	0.013	0.011	0.005	0.813
1996	0.276	0.248	0.118	0.068	0.119	0.014	0.012	0.005	0.860
1997	0.291	0.261	0.125	0.071	0.126	0.014	0.013	0.005	0.906
1998	0.302	0.270	0.130	0.073	0.131	0.014	0.013	0.006	0.940
1999	0.325	0.291	0.140	0.078	0.142	0.015	0.014	0.006	1.011
2000	0.326	0.293	0.141	0.078	0.143	0.015	0.014	0.006	1.016
2001	0.332	0.298	0.144	0.079	0.145	0.015	0.014	0.006	1.033
2002	0.348	0.313	0.152	0.082	0.153	0.016	0.015	0.007	1.084
2003	0.354	0.318	0.154	0.083	0.155	0.016	0.015	0.007	1.101
2004	0.367	0.329	0.161	0.086	0.161	0.016	0.015	0.007	1.142
2005	0.383	0.344	0.168	0.089	0.169	0.016	0.016	0.007	1.192
2006	0.400	0.359	0.176	0.093	0.176	0.017	0.016	0.008	1.244
2007	0.420	0.376	0.185	0.097	0.185	0.017	0.017	0.008	1.304
2008	0.438	0.392	0.193	0.101	0.193	0.018	0.017	0.008	1.360
2009	0.457	0.409	0.202	0.105	0.202	0.018	0.018	0.009	1.419
2010	0.479	0.428	0.212	0.109	0.212	0.019	0.019	0.009	1.487
2011	0.499	0.446	0.222	0.113	0.221	0.020	0.019	0.009	1.549
2012	0.520	0.464	0.232	0.118	0.230	0.020	0.020	0.010	1.613
2013	0.541	0.483	0.242	0.122	0.240	0.021	0.020	0.010	1.680
2014	0.564	0.503	0.252	0.127	0.250	0.021	0.021	0.010	1.749
2015	0.587	0.524	0.263	0.131	0.261	0.022	0.022	0.011	1.821
2016	0.611	0.545	0.275	0.136	0.272	0.022	0.022	0.011	1.896
2017	0.640	0.570	0.288	0.142	0.285	0.023	0.023	0.012	1.983
2018	0.666	0.593	0.301	0.147	0.297	0.024	0.024	0.012	2.063
2019	0.693	0.616	0.314	0.153	0.309	0.024	0.025	0.013	2.146
2020	0.720	0.640	0.327	0.158	0.322	0.025	0.025	0.013	2.230

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.40 BASE CASE PROJECTIONS OF BUS TRAVEL FOR AUSTRALIAN METROPOLITAN AREAS, 1990-2020

(billion kilometres)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.189	0.136	0.085	0.062	0.070	0.017	0.013	0.020	0.594
1991	0.190	0.137	0.086	0.063	0.071	0.017	0.013	0.021	0.598
1992	0.192	0.137	0.088	0.063	0.072	0.017	0.013	0.021	0.604
1993	0.188	0.134	0.088	0.061	0.071	0.017	0.013	0.021	0.593
1994	0.197	0.140	0.093	0.064	0.075	0.018	0.013	0.021	0.620
1995	0.202	0.143	0.096	0.065	0.077	0.018	0.014	0.022	0.638
1996	0.209	0.148	0.100	0.066	0.081	0.018	0.015	0.023	0.660
1997	0.219	0.154	0.105	0.069	0.085	0.019	0.015	0.023	0.690
1998	0.228	0.161	0.111	0.071	0.089	0.019	0.016	0.024	0.720
1999	0.236	0.167	0.114	0.073	0.092	0.020	0.017	0.025	0.743
2000	0.250	0.177	0.122	0.077	0.097	0.021	0.018	0.026	0.788
2001	0.247	0.174	0.120	0.075	0.096	0.020	0.018	0.026	0.776
2002	0.250	0.177	0.123	0.076	0.098	0.020	0.018	0.026	0.788
2003	0.257	0.181	0.126	0.077	0.101	0.020	0.019	0.026	0.808
2004	0.260	0.183	0.129	0.078	0.103	0.020	0.019	0.027	0.819
2005	0.264	0.185	0.131	0.078	0.104	0.020	0.020	0.027	0.830
2006	0.268	0.188	0.134	0.079	0.106	0.020	0.020	0.027	0.842
2007	0.271	0.190	0.136	0.079	0.108	0.020	0.021	0.028	0.853
2008	0.275	0.192	0.139	0.080	0.110	0.020	0.021	0.028	0.865
2009	0.278	0.194	0.142	0.080	0.112	0.021	0.022	0.028	0.876
2010	0.285	0.198	0.146	0.082	0.115	0.021	0.022	0.029	0.897
2011	0.289	0.200	0.148	0.082	0.117	0.021	0.023	0.029	0.909
2012	0.292	0.202	0.151	0.083	0.118	0.021	0.023	0.029	0.920
2013	0.296	0.204	0.154	0.083	0.120	0.021	0.024	0.030	0.932
2014	0.300	0.206	0.156	0.084	0.122	0.021	0.024	0.030	0.943
2015	0.304	0.208	0.159	0.084	0.124	0.021	0.025	0.030	0.955
2016	0.307	0.210	0.162	0.084	0.126	0.021	0.025	0.030	0.966
2017	0.314	0.215	0.166	0.086	0.129	0.021	0.026	0.031	0.988
2018	0.318	0.217	0.169	0.086	0.131	0.021	0.026	0.031	1.000
2019	0.322	0.219	0.172	0.087	0.133	0.021	0.027	0.031	1.011
2020	0.327	0.222	0.175	0.088	0.135	0.021	0.027	0.032	1.028

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.41 BASE CASE PROJECTIONS OF MOTORCYCLE TRAVEL FOR AUSTRALIAN METROPOLITAN AREAS, 1990-2020

(billion kilometres)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.294	0.192	0.163	0.067	0.068	0.011	0.009	0.034	0.837
1991	0.278	0.181	0.156	0.063	0.065	0.010	0.008	0.033	0.793
1992	0.274	0.178	0.156	0.062	0.064	0.010	0.008	0.033	0.783
1993	0.270	0.174	0.156	0.061	0.063	0.010	0.008	0.032	0.774
1994	0.266	0.171	0.156	0.060	0.063	0.009	0.008	0.032	0.764
1995	0.262	0.168	0.156	0.058	0.062	0.009	0.008	0.031	0.755
1996	0.271	0.173	0.163	0.060	0.065	0.009	0.009	0.032	0.781
1997	0.271	0.173	0.164	0.059	0.065	0.009	0.009	0.032	0.781
1998	0.270	0.173	0.165	0.059	0.066	0.009	0.009	0.031	0.781
1999	0.270	0.173	0.165	0.058	0.066	0.009	0.009	0.031	0.781
2000	0.273	0.174	0.167	0.059	0.067	0.009	0.009	0.032	0.789
2001	0.275	0.176	0.169	0.059	0.067	0.009	0.009	0.032	0.796
2002	0.277	0.178	0.172	0.059	0.068	0.009	0.009	0.032	0.803
2003	0.279	0.179	0.174	0.059	0.069	0.009	0.009	0.032	0.810
2004	0.282	0.181	0.176	0.059	0.070	0.009	0.009	0.032	0.817
2005	0.284	0.182	0.178	0.060	0.071	0.009	0.009	0.032	0.824
2006	0.286	0.183	0.180	0.060	0.071	0.009	0.009	0.032	0.830
2007	0.288	0.185	0.183	0.060	0.072	0.009	0.009	0.032	0.837
2008	0.290	0.186	0.185	0.060	0.073	0.009	0.009	0.032	0.844
2009	0.292	0.188	0.187	0.060	0.074	0.009	0.009	0.032	0.850
2010	0.294	0.189	0.189	0.060	0.074	0.008	0.009	0.032	0.857
2011	0.296	0.190	0.191	0.061	0.075	0.008	0.010	0.032	0.863
2012	0.298	0.191	0.193	0.061	0.076	0.008	0.010	0.032	0.868
2013	0.299	0.193	0.195	0.061	0.076	0.008	0.010	0.032	0.874
2014	0.301	0.194	0.197	0.061	0.077	0.008	0.010	0.032	0.880
2015	0.303	0.195	0.199	0.061	0.078	0.008	0.010	0.032	0.886
2016	0.305	0.196	0.201	0.061	0.078	0.008	0.010	0.031	0.891
2017	0.306	0.197	0.203	0.061	0.079	0.008	0.010	0.031	0.896
2018	0.308	0.198	0.205	0.061	0.080	0.008	0.010	0.031	0.902
2019	0.309	0.199	0.207	0.061	0.080	0.008	0.010	0.031	0.907
2020	0.311	0.200	0.209	0.062	0.081	0.008	0.010	0.031	0.913

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

### National totals by state

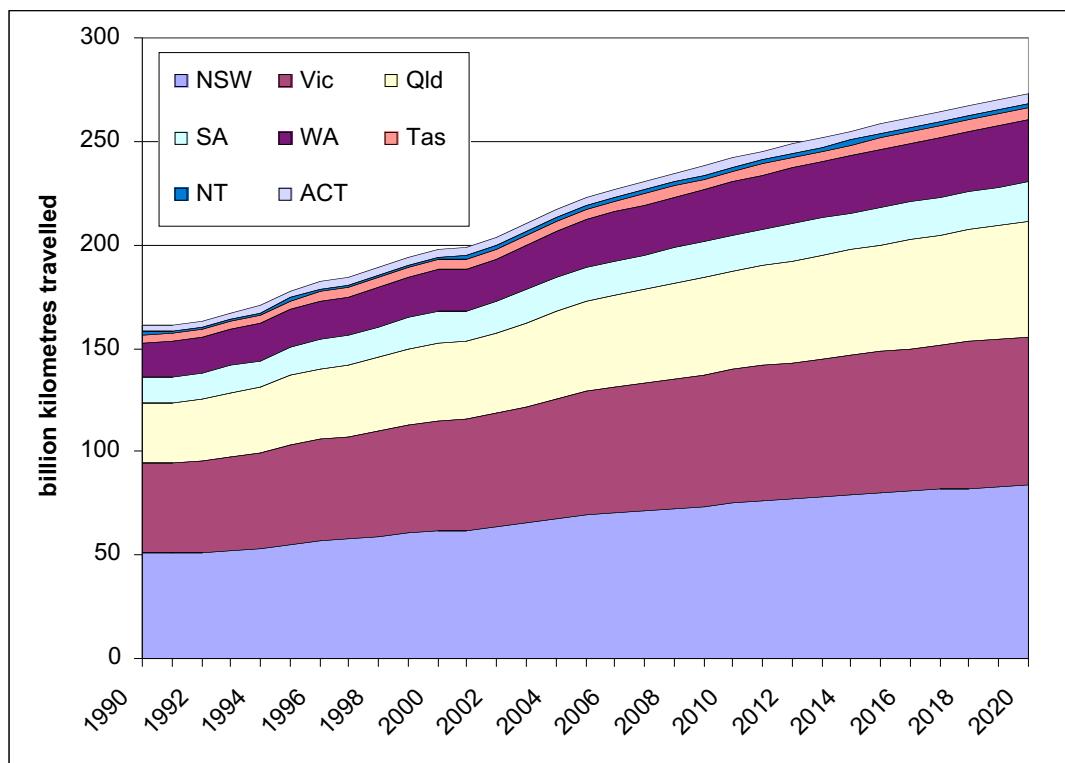
TABLE 1.42 BASE CASE PROJECTIONS OF TOTAL MOTOR VEHICLE TRAVEL FOR AUSTRALIA, 1990-2020

(billion kilometres)

Year	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Total
1990	50.71	43.52	29.10	12.69	16.82	3.78	1.35	2.82	160.79
1991	50.81	43.42	29.33	12.81	16.85	3.69	1.36	2.78	161.05
1992	51.20	43.82	30.25	12.85	17.19	3.77	1.42	2.89	163.39
1993	52.23	44.95	31.27	13.07	17.44	3.84	1.45	2.97	167.23
1994	53.10	45.84	32.02	13.23	17.71	3.88	1.48	3.03	170.29
1995	55.27	47.79	33.77	13.65	18.41	4.03	1.56	3.16	177.63
1996	56.77	48.92	34.63	13.89	18.80	4.19	1.61	3.28	182.08
1997	57.63	49.43	34.97	13.96	18.89	4.28	1.60	3.32	184.08
1998	58.96	50.94	35.88	14.65	19.28	4.31	1.64	3.31	188.97
1999	60.42	52.33	37.22	14.71	19.57	4.57	1.68	3.45	193.95
2000	61.94	53.23	37.48	15.16	20.18	4.66	1.69	3.46	197.80
2001	61.99	53.32	37.85	15.07	20.27	4.61	1.70	3.48	198.30
2002	63.49	54.68	38.92	15.38	20.84	4.67	1.75	3.56	203.29
2003	65.48	56.48	40.32	15.82	21.64	4.78	1.81	3.68	210.02
2004	67.50	58.29	41.72	16.27	22.42	4.89	1.87	3.81	216.77
2005	69.32	59.86	43.01	16.64	23.14	4.98	1.93	3.92	222.80
2006	70.43	60.85	43.87	16.85	23.64	5.02	1.97	3.99	226.62
2007	71.60	61.86	44.77	17.06	24.16	5.06	2.01	4.06	230.59
2008	72.69	62.81	45.62	17.26	24.67	5.09	2.05	4.12	234.31
2009	73.73	63.71	46.44	17.44	25.16	5.12	2.09	4.18	237.88
2010	74.89	64.65	47.41	17.62	25.67	5.15	2.13	4.25	241.79
2011	75.90	65.49	48.27	17.78	26.14	5.18	2.17	4.30	245.23
2012	76.89	66.28	49.12	17.93	26.60	5.20	2.21	4.36	248.59
2013	77.84	67.04	49.96	18.06	27.06	5.21	2.25	4.41	251.83
2014	78.78	67.77	50.79	18.19	27.51	5.22	2.28	4.46	255.01
2015	79.70	68.48	51.61	18.31	27.96	5.23	2.32	4.51	258.12
2016	80.59	69.14	52.42	18.42	28.40	5.24	2.35	4.56	261.12
2017	81.57	69.85	53.30	18.54	28.87	5.25	2.39	4.62	264.38
2018	82.46	70.45	54.16	18.63	29.31	5.25	2.43	4.67	267.34
2019	83.34	71.00	55.01	18.70	29.74	5.24	2.46	4.71	270.21
2020	84.20	71.52	55.87	18.77	30.17	5.23	2.50	4.76	273.02

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

**Figure 1.8 Base case projected growth in motor vehicle travel for Australian States and Territories, 1990 - 2020**



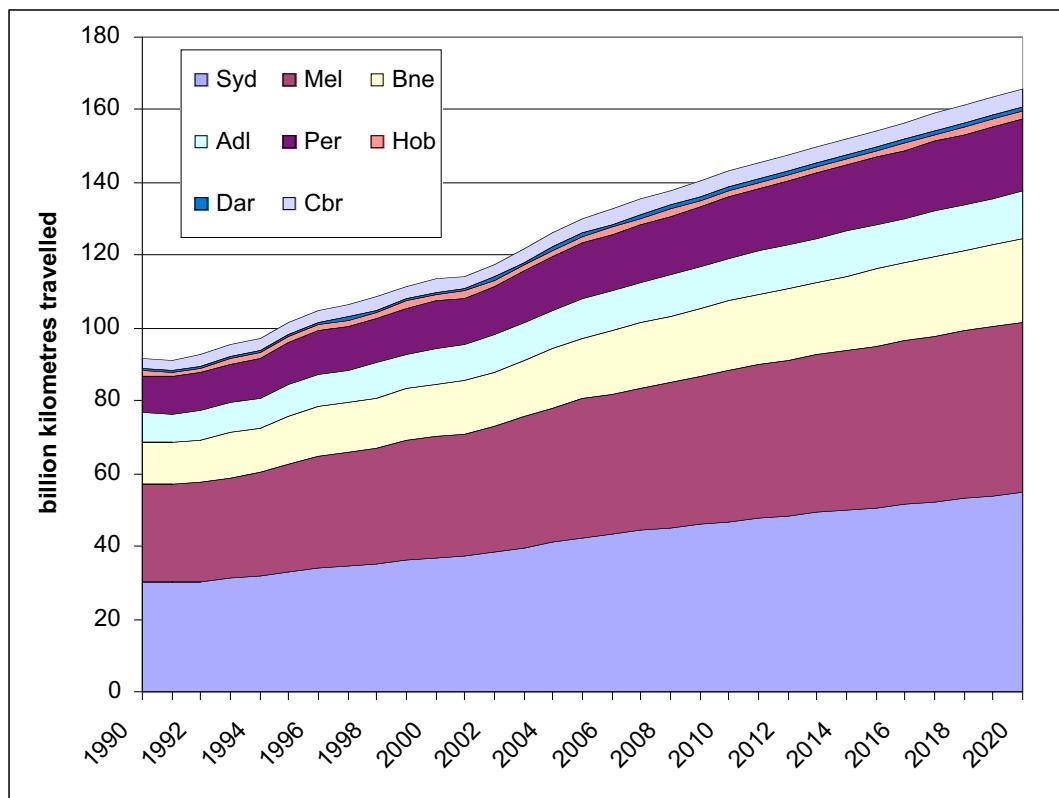
Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.43 BASE CASE PROJECTIONS OF TOTAL MOTOR VEHICLE TRAVEL FOR AUSTRALIAN METROPOLITAN AREAS, 1990-2020  
*(billion kilometres)*

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	30.17	27.07	11.51	7.92	10.30	1.45	0.64	2.82	91.88
1991	29.99	26.89	11.47	7.96	10.19	1.41	0.65	2.78	91.33
1992	30.21	27.14	11.76	8.03	10.44	1.45	0.68	2.89	92.60
1993	31.09	27.90	12.10	8.25	10.77	1.49	0.70	2.97	95.26
1994	31.68	28.45	12.34	8.39	11.00	1.52	0.71	3.03	97.11
1995	33.05	29.68	12.90	8.74	11.50	1.58	0.74	3.16	101.35
1996	34.23	30.69	13.39	9.03	11.96	1.64	0.77	3.28	104.98
1997	34.73	31.07	13.56	9.12	12.12	1.65	0.78	3.32	106.35
1998	35.15	31.90	13.82	9.51	12.27	1.63	0.80	3.31	108.38
1999	36.09	32.88	14.41	9.63	12.62	1.70	0.82	3.45	111.60
2000	36.90	33.34	14.47	9.82	12.89	1.74	0.84	3.46	113.44
2001	37.26	33.58	14.65	9.82	13.06	1.72	0.85	3.48	114.43
2002	38.35	34.53	15.12	10.05	13.47	1.75	0.88	3.56	117.70
2003	39.74	35.73	15.73	10.35	14.00	1.79	0.91	3.68	121.94
2004	41.12	36.92	16.34	10.66	14.52	1.83	0.94	3.81	126.15
2005	42.43	38.03	16.92	10.94	15.02	1.87	0.97	3.92	130.10
2006	43.29	38.72	17.33	11.11	15.36	1.88	0.99	3.99	132.67
2007	44.21	39.44	17.76	11.28	15.72	1.90	1.02	4.06	135.38
2008	45.08	40.13	18.17	11.43	16.07	1.91	1.04	4.12	137.95
2009	45.94	40.80	18.58	11.58	16.41	1.92	1.05	4.18	140.47
2010	46.84	41.49	19.01	11.74	16.77	1.93	1.08	4.25	143.11
2011	47.64	42.10	19.40	11.87	17.10	1.94	1.10	4.30	145.44
2012	48.43	42.70	19.79	12.01	17.42	1.95	1.11	4.36	147.76
2013	49.21	43.27	20.17	12.13	17.74	1.95	1.13	4.41	150.02
2014	49.99	43.84	20.55	12.25	18.05	1.96	1.15	4.46	152.26
2015	50.76	44.40	20.94	12.37	18.37	1.96	1.17	4.51	154.49
2016	51.52	44.94	21.31	12.49	18.68	1.97	1.19	4.56	156.67
2017	52.36	45.53	21.72	12.62	19.03	1.97	1.21	4.62	159.05
2018	53.12	46.06	22.11	12.73	19.34	1.97	1.23	4.67	161.22
2019	53.88	46.59	22.49	12.84	19.66	1.97	1.24	4.71	163.39
2020	54.65	47.12	22.87	12.95	19.97	1.97	1.26	4.76	165.56

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

**Figure 1.9 Base case projected growth in motor vehicle travel for Australian capital cities, 1990 - 2020**



Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE 1.44 BASE CASE PROJECTIONS OF TOTAL MOTOR VEHICLE TRAVEL FOR AUSTRALIAN NON-METROPOLITAN AREAS, 1990-2020

(billion kilometres)

Year	NSW	Vic	Qld	SA	WA	Tas	NT	Total
1990	20.54	16.45	17.58	4.77	6.53	2.33	0.71	68.91
1991	20.82	16.54	17.87	4.85	6.66	2.28	0.71	69.72
1992	20.99	16.67	18.50	4.82	6.75	2.33	0.74	70.79
1993	21.14	17.05	19.18	4.82	6.67	2.35	0.76	71.97
1994	21.42	17.39	19.68	4.84	6.71	2.36	0.77	73.18
1995	22.22	18.10	20.87	4.90	6.90	2.45	0.82	76.28
1996	22.54	18.23	21.23	4.86	6.85	2.55	0.84	77.10
1997	22.90	18.36	21.41	4.84	6.77	2.62	0.83	77.74
1998	23.82	19.04	22.06	5.14	7.02	2.68	0.84	80.60
1999	24.33	19.45	22.81	5.08	6.95	2.87	0.86	82.35
2000	25.04	19.89	23.01	5.35	7.29	2.92	0.85	84.36
2001	24.73	19.74	23.21	5.25	7.21	2.88	0.85	83.87
2002	25.14	20.15	23.81	5.33	7.37	2.92	0.87	85.59
2003	25.75	20.75	24.59	5.47	7.64	2.99	0.90	88.08
2004	26.38	21.37	25.38	5.60	7.90	3.06	0.93	90.62
2005	26.89	21.83	26.09	5.70	8.12	3.11	0.96	92.70
2006	27.13	22.13	26.54	5.74	8.28	3.14	0.98	93.94
2007	27.39	22.42	27.01	5.79	8.44	3.16	1.00	95.21
2008	27.60	22.68	27.45	5.82	8.60	3.18	1.02	96.36
2009	27.79	22.92	27.86	5.85	8.75	3.20	1.04	97.41
2010	28.05	23.16	28.40	5.88	8.90	3.22	1.06	98.68
2011	28.26	23.39	28.87	5.91	9.05	3.24	1.08	99.78
2012	28.46	23.59	29.34	5.92	9.19	3.25	1.09	100.83
2013	28.63	23.77	29.79	5.93	9.32	3.26	1.11	101.81
2014	28.79	23.93	30.23	5.94	9.46	3.26	1.13	102.75
2015	28.94	24.08	30.67	5.94	9.59	3.27	1.15	103.63
2016	29.07	24.20	31.11	5.93	9.72	3.27	1.17	104.46
2017	29.21	24.32	31.57	5.92	9.85	3.28	1.19	105.34
2018	29.34	24.38	32.05	5.90	9.97	3.27	1.20	106.12
2019	29.46	24.41	32.53	5.86	10.08	3.27	1.22	106.82
2020	29.56	24.40	32.99	5.82	10.19	3.26	1.24	107.46

Note: For simplicity, all VKT within the ACT has been assigned to 'metropolitan' travel.

Sources: BTRE estimates, BTRE (2002), BTE(1999), ABS (2002 and earlier).



## **CHAPTER 2 BASE CASE PROJECTIONS OF MOTOR VEHICLE FUEL USE FOR NATIONAL AND METROPOLITAN TRAVEL TO 2020**

The average rated fuel intensity of Australian new car sales - including 4-wheel drive All Terrain Wagons (ATWs) - is projected, in the base case, to improve by close to 20 per cent between 2000 and 2020.

Rated fuel intensity values (in L/100km) are generally measured on chassis dynamometers, where the vehicles are driven over standard drive cycle tests. Actual on-road driving, particularly for urban traffic conditions, typically involves higher levels of deceleration and acceleration, and more stop-start situations, than the standard drive cycles allow for. Therefore, dynamometer values tend to underestimate on-road fuel consumption. For example, standard NAFC (*National Average Fuel Consumption*) dynamometer values for new cars will typically understate the fuel intensity (L/100km) those cars will obtain in 'real-world' driving by around 20 per cent.

Since cars remain as part of the fleet for lengthy periods (eg half of the vehicles sold in a particular model year will generally still be on the road 20 years later), fuel efficiency improvements to new vehicles only gradually affect the overall vehicle fleet performance over time. Coupled with this inertia in fleet characteristics, given that motor vehicles are such durable goods, are the effects of vehicle deterioration as they age, and of rising traffic congestion levels tending to further increase fuel consumption rates. These effects result in the base case scenario exhibiting only a slight improvement in average car fleet intensity (with national on-road L/100km projected to decline by around 5 per cent by 2020 – see table 2.18).

Due to increasing urban population levels (and consequent demand for travel), increasing congestion levels, and an increasing proportion of total vehicle travel from heavier commercial vehicles, total metropolitan fuel consumption is projected to rise strongly (at around 2.2 per cent per annum between 2000 and 2020).

TABLE 2.1 BASE CASE PROJECTIONS OF NEW PASSENGER CAR INTENSITY,  
1990-2020

Year	Rated Fuel Consumption for 'standard' passenger cars (L/100km on NAFC test)	Rated Fuel Consumption for 4WD passenger vehicles (ATWs) (L/100km on NAFC test)	Assumed percentage of new passenger vehicle sales accounted for by ATWs	Weighted average new passenger car fuel intensity (L/100km on NAFC test)
1990	8.65	12.98	8.1%	9.00
1991	8.42	12.82	8.4%	8.79
1992	8.41	12.89	8.9%	8.81
1993	8.45	12.36	10.0%	8.85
1994	8.51	12.12	11.1%	8.90
1995	8.44	12.26	8.5%	8.77
1996	8.33	12.35	8.5%	8.67
1997	8.32	12.25	8.4%	8.65
1998	8.14	11.69	13.3%	8.61
1999	8.11	11.59	15.1%	8.63
2000	8.11	11.24	16.1%	8.62
2001	7.99	11.41	16.8%	8.57
2002	7.90	11.22	17.4%	8.48
2003	7.80	11.02	18.0%	8.38
2004	7.71	10.83	18.7%	8.29
2005	7.61	10.64	19.3%	8.20
2006	7.52	10.44	19.9%	8.10
2007	7.42	10.25	20.6%	8.01
2008	7.33	10.06	21.2%	7.91
2009	7.24	9.86	21.9%	7.81
2010	7.14	9.67	22.5%	7.71
2011	7.08	9.55	22.8%	7.64
2012	7.01	9.42	23.0%	7.57
2013	6.95	9.30	23.3%	7.49
2014	6.88	9.18	23.5%	7.42
2015	6.82	9.05	23.8%	7.35
2016	6.75	8.93	24.0%	7.27
2017	6.69	8.80	24.3%	7.20
2018	6.62	8.68	24.5%	7.13
2019	6.56	8.56	24.8%	7.05
2020	6.49	8.43	25.0%	6.98

Notes: NAFC - 'National Average Fuel Consumption', and refers to dynamometer cycle testing (as opposed to actual on-road fuel intensity).

ATWs – All Terrain Wagons

Source: BTRE estimates, BTE (2002).



TABLE 2.2    BASE CASE PROJECTIONS OF NEW LIGHT COMMERCIAL VEHICLE INTENSITY, 1990-2020  
 (L/100km)

Year	Rated Fuel Consumption for LCVs (L/100km on NAFC test)	Assumed percentage of new LCV sales accounted for by 4WD vehicles
1990	10.08	27.0%
1991	10.08	27.0%
1992	10.25	31.2%
1993	10.58	39.5%
1994	10.40	35.0%
1995	10.35	33.8%
1996	10.34	33.6%
1997	10.41	35.2%
1998	10.48	37.0%
1999	10.51	37.9%
2000	10.55	38.6%
2001	10.56	39.0%
2002	10.55	39.4%
2003	10.55	39.8%
2004	10.54	40.2%
2005	10.53	40.6%
2006	10.52	41.0%
2007	10.52	41.4%
2008	10.51	41.8%
2009	10.50	42.3%
2010	10.49	42.7%
2011	10.48	43.1%
2012	10.46	43.5%
2013	10.45	44.0%
2014	10.43	44.4%
2015	10.42	44.9%
2016	10.40	45.3%
2017	10.39	45.8%
2018	10.37	46.2%
2019	10.36	46.7%
2020	10.34	47.2%

*Notes:* NAFC - 'National Average Fuel Consumption', and refers to dynamometer cycle testing (as opposed to actual on-road fuel intensity).

*Source:* BTRE estimates, BTE (2002).

TABLE 2.3      BASE CASE PROJECTIONS OF ON-ROAD PASSENGER CAR FUEL INTENSITY TRENDS BY AGE OF VEHICLE, 1990-2020  
 (L/100km)

Age of vehicle (years)	Fin. Year						
	1990	1995	2000	2005	2010	2015	2020
New	10.80	10.52	10.32	9.74	9.10	8.56	8.02
1	11.10	10.69	10.36	9.87	9.23	8.67	8.13
2	11.20	10.72	10.44	10.09	9.45	8.86	8.32
3	11.70	10.78	10.59	10.32	9.68	9.06	8.51
4	11.60	10.87	10.72	10.55	9.91	9.26	8.71
5	11.63	11.24	10.95	10.74	10.14	9.47	8.91
6	11.58	11.67	11.23	10.89	10.37	9.70	9.11
7	11.68	11.77	11.27	10.97	10.61	9.93	9.31
8	11.80	12.30	11.33	11.13	10.84	10.17	9.52
9	12.60	12.19	11.42	11.27	11.08	10.41	9.73
10	12.80	12.23	11.81	11.51	11.28	10.65	9.95
11	12.90	12.17	12.26	11.80	11.44	10.90	10.19
12	13.00	12.16	12.25	11.72	11.42	11.04	10.34
13	13.08	12.16	12.67	11.67	11.47	11.17	10.48
14	13.10	12.85	12.44	11.65	11.50	11.31	10.62
15	12.67	12.93	12.35	11.93	11.62	11.40	10.76
16	12.60	12.90	12.17	12.26	11.80	11.44	10.90
17	13.00	13.00	12.16	12.25	11.72	11.42	11.04
18	12.70	13.08	12.16	12.67	11.67	11.47	11.17
19	13.00	13.03	12.79	12.37	11.59	11.44	11.25
20	12.90	12.54	12.80	12.22	11.81	11.51	11.28
Over 20 (pre-1986 new)	12.80	12.67	12.72	12.34	12.31	12.31	12.31
Over 20 (post-1986 new)					12.19	11.76	11.44

Notes: Values in table refer to average on-road driving in uncongested conditions.

'Passenger car' results in all tables include ATWs (unless explicitly noted otherwise).

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

TABLE 2.4      BASE CASE PROJECTIONS OF ON-ROAD LCV FUEL INTENSITY  
TRENDS BY AGE OF VEHICLE, 1990-2020  
(L/100km)

Age of vehicle (years)	Fin. Year						
	1990	1995	2000	2005	2010	2015	2020
New	12.60	12.42	12.62	12.51	12.38	12.14	11.89
1	12.71	12.54	12.68	12.60	12.47	12.25	12.00
2	12.81	12.82	12.70	12.69	12.56	12.36	12.11
3	12.92	12.48	12.68	12.78	12.65	12.47	12.22
4	13.02	12.34	12.66	12.87	12.74	12.58	12.33
5	13.13	12.92	12.73	12.94	12.83	12.69	12.44
6	13.23	13.03	12.86	13.00	12.92	12.78	12.55
7	13.34	13.13	13.15	13.02	13.01	12.88	12.67
8	13.44	13.24	12.80	13.00	13.11	12.97	12.78
9	13.55	13.35	12.65	12.98	13.20	13.06	12.90
10	13.65	13.46	13.24	13.06	13.27	13.15	13.02
11	14.07	13.56	13.35	13.18	13.33	13.25	13.11
12	14.28	13.67	13.47	13.48	13.35	13.34	13.20
13	14.49	13.78	13.58	13.12	13.33	13.44	13.30
14	14.70	13.89	13.69	12.97	13.31	13.53	13.39
15	14.91	13.99	13.80	13.58	13.39	13.60	13.49
16	15.12	14.43	13.91	13.69	13.52	13.66	13.58
17	15.33	14.64	14.02	13.81	13.82	13.69	13.68
18	15.50	14.86	14.13	13.92	13.45	13.66	13.78
19	15.50	15.07	14.24	14.03	13.30	13.65	13.88
20	15.50	15.29	14.35	14.14	13.92	13.72	13.95
Over 20 (pre-1986 new)	15.50	15.57	15.23	14.72	14.65	14.65	14.65
Over 20 (post-1986 new)					14.09	13.89	13.89

Notes: Values in table refer to average on-road driving in uncongested conditions.

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

L/100km for new heavy vehicles are projected to remain essentially constant – as vehicle size, and average loads carried, are forecast to increase over the projection period, serving to counterbalance any underlying technical improvements in engine fuel efficiency.

Motorcycles only account for a minor proportion of total vehicle fuel consumption, so have not been modelled with fuel intensity varying by road type, State, vehicle age and driving conditions – but have simply been assigned a constant intensity of 6 L/100km (see table 2.8). For the projections, this simplifying assumption is equivalent to having any projected improvements to

motorcycle engine efficiency being balanced by the effects of future urban congestion and by sales moving to higher performance models over time.

TABLE 2.5      BASE CASE PROJECTIONS OF ON-ROAD RIGID TRUCK FUEL INTENSITY TRENDS BY AGE OF VEHICLE, 1990-2020  
(L/100km)

Age of vehicle (years)	Fin. Year						
	1990	1995	2000	2005	2010	2015	2020
New	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1	26.2	26.1	26.1	26.1	26.1	26.1	26.1
2	26.4	26.2	26.2	26.2	26.2	26.2	26.2
3	26.5	26.3	26.3	26.3	26.3	26.3	26.3
4	26.5	26.4	26.4	26.4	26.4	26.4	26.4
5	26.5	26.5	26.5	26.5	26.5	26.5	26.5
6	26.5	26.7	26.6	26.6	26.6	26.6	26.6
7	26.5	26.9	26.7	26.7	26.7	26.7	26.7
8	26.5	27.0	26.8	26.8	26.8	26.8	26.8
9	26.5	27.0	27.0	27.0	27.0	27.0	27.0
10	26.5	27.0	27.1	27.1	27.1	27.1	27.1
11	26.8	27.0	27.3	27.2	27.2	27.2	27.2
12	27.2	27.0	27.5	27.3	27.3	27.3	27.3
13	27.3	27.0	27.6	27.4	27.4	27.4	27.4
14	27.5	27.0	27.6	27.5	27.5	27.5	27.5
15	28.0	27.0	27.6	27.6	27.6	27.6	27.6
16	28.5	27.3	27.6	27.8	27.7	27.7	27.7
17	29.2	27.7	27.6	28.0	27.8	27.8	27.8
18	29.5	27.9	27.6	28.1	27.9	27.9	27.9
19	30.0	28.1	27.6	28.1	28.0	28.0	28.0
20	33.0	28.6	27.6	28.1	28.2	28.2	28.2
Over 20 (pre-1986 new)	35.0	32.8	30.6	29.6	29.5	29.5	29.5
Over 20 (post-1986 new)					28.4	28.3	28.3

Notes: Values in table refer to average on-road driving in uncongested conditions.

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

TABLE 2.6      BASE CASE PROJECTIONS OF ON-ROAD ARTICULATED TRUCK FUEL INTENSITY TRENDS BY AGE OF VEHICLE, 1990-2020  
 (L/100km)

Age of vehicle (years)	Fin. Year						
	1990	1995	2000	2005	2010	2015	2020
New	48.7	53.0	54.0	54.0	54.0	54.0	54.0
1	48.7	53.2	54.2	54.2	54.2	54.2	54.2
2	48.7	52.4	54.4	54.4	54.4	54.4	54.4
3	50.8	50.6	53.6	54.7	54.7	54.7	54.7
4	50.8	49.8	53.9	54.9	54.9	54.9	54.9
5	50.8	49.7	54.1	55.1	55.1	55.1	55.1
6	50.8	49.7	54.3	55.3	55.3	55.3	55.3
7	52.8	49.7	53.5	55.5	55.5	55.5	55.5
8	52.8	51.8	51.6	54.7	55.8	55.8	55.8
9	52.8	51.8	50.8	54.9	56.0	56.0	56.0
10	52.8	51.8	50.7	55.2	56.2	56.2	56.2
11	52.8	51.8	50.7	55.4	56.4	56.4	56.4
12	50.9	53.9	50.7	54.6	56.6	56.6	56.6
13	50.9	53.9	52.9	52.7	55.8	56.9	56.9
14	50.9	53.9	52.9	51.8	56.0	57.1	57.1
15	50.9	53.9	52.9	51.7	56.3	57.3	57.3
16	50.9	53.9	52.9	51.7	56.5	57.6	57.6
17	49.2	51.9	55.0	51.7	55.7	57.8	57.8
18	49.2	51.9	55.0	53.9	53.7	56.9	58.0
19	49.2	51.9	55.0	53.9	52.9	57.2	58.3
20	49.2	51.9	55.0	53.9	52.7	57.4	58.5
Over 20 (pre-1986 new)	50.0	50.2	51.9	53.2	53.3	53.3	53.3
Over 20 (post-1986 new)					53.2	55.2	57.5

Notes: Values in table refer to average on-road driving in uncongested conditions.

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

TABLE 2.7      BASE CASE PROJECTIONS OF ON-ROAD BUS FUEL INTENSITY  
TRENDS BY AGE OF VEHICLE, 1990-2020  
(L/100km)

Age of vehicle (years)	Fin. Year						
	1990	1995	2000	2005	2010	2015	2020
New	22.0	22.0	22.0	22.0	22.0	22.0	22.0
1	25.0	22.1	22.1	22.1	22.1	22.1	22.1
2	26.4	22.2	22.2	22.2	22.2	22.2	22.2
3	26.5	22.3	22.3	22.3	22.3	22.3	22.3
4	26.5	22.4	22.4	22.4	22.4	22.4	22.4
5	26.5	22.4	22.4	22.4	22.4	22.4	22.4
6	26.5	25.5	22.5	22.5	22.5	22.5	22.5
7	26.5	26.9	22.6	22.6	22.6	22.6	22.6
8	26.5	27.0	22.7	22.7	22.7	22.7	22.7
9	26.5	27.0	22.8	22.8	22.8	22.8	22.8
10	26.5	27.0	22.9	22.9	22.9	22.9	22.9
11	26.8	27.0	26.0	23.0	23.0	23.0	23.0
12	27.2	27.0	27.5	23.1	23.1	23.1	23.1
13	27.3	27.0	27.6	23.2	23.2	23.2	23.2
14	27.5	27.0	27.6	23.3	23.3	23.3	23.3
15	28.0	27.0	27.6	23.4	23.4	23.4	23.4
16	28.5	27.3	27.6	26.5	23.5	23.5	23.5
17	29.2	27.7	27.6	28.0	23.5	23.5	23.5
18	29.5	27.9	27.6	28.1	23.6	23.6	23.6
19	30.0	28.1	27.6	28.1	23.7	23.7	23.7
20	33.0	28.6	27.6	28.1	23.8	23.8	23.8
Over 20 (pre-1986 new)	35.0	30.1	28.5	28.1	28.1	28.1	28.1
Over 20 (post-1986 new)					28.1	25.0	24.3

Notes: Values in table refer to average on-road driving in uncongested conditions.

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

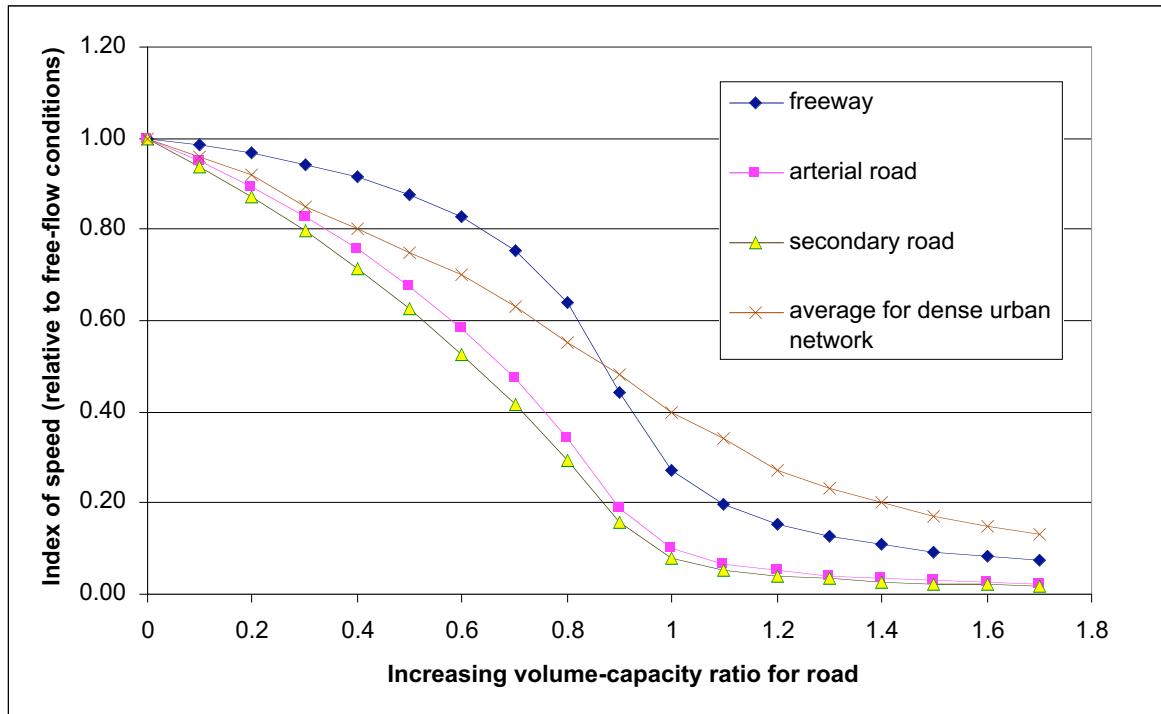
TABLE 2.8      ON-ROAD MOTORCYCLE FUEL INTENSITY BY AGE OF VEHICLE

Age of vehicle (model year)	L/100km
1979 and earlier	7.1
1980 to 1989	6.1
1990 and after	5.9
All years	6.0

Note: Year 2000 data.

Source: ABS (2001).

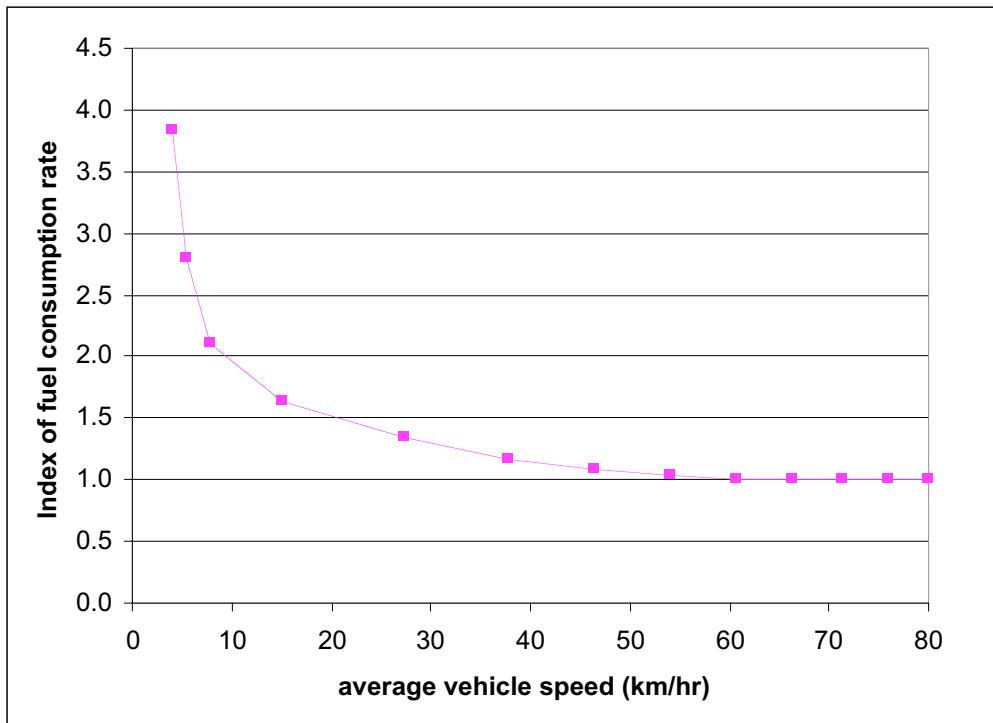
FIGURE 2.1 TYPICAL RESPONSE CURVES FOR AVERAGE VEHICLE SPEEDS UNDER INCREASING TRAFFIC CONGESTION, BY ROAD TYPE



As traffic levels increase, congestion on urban roads will tend to decrease average speeds and increase overall vehicle delay time, fuel consumption and rates of pollutant emissions. The effect that rising traffic volumes will have is dependent on a variety of factors – including the type of road, the vehicle mix using it (see figure I.1), and its current volume-capacity ratio (figure 2.1). The overall response of city-wide fuel consumption to rising amounts of travel will be the sum of different effects for all the different roadway types (eg freeways, arterial roads, CBD streets and local roads), at differing times of day (eg AM peak versus inter-peak versus off-peak traffic volumes), and from differing initial congestion levels (eg CBD versus inner city area versus suburban conditions).

The congestion calculations for this study are based on city network modelling done by the Bureau (BTCE 1996a, BTCE 1996b – chp. 18) to analyse the possible effects on congestion of implementing road pricing policies in Australian metropolitan areas.

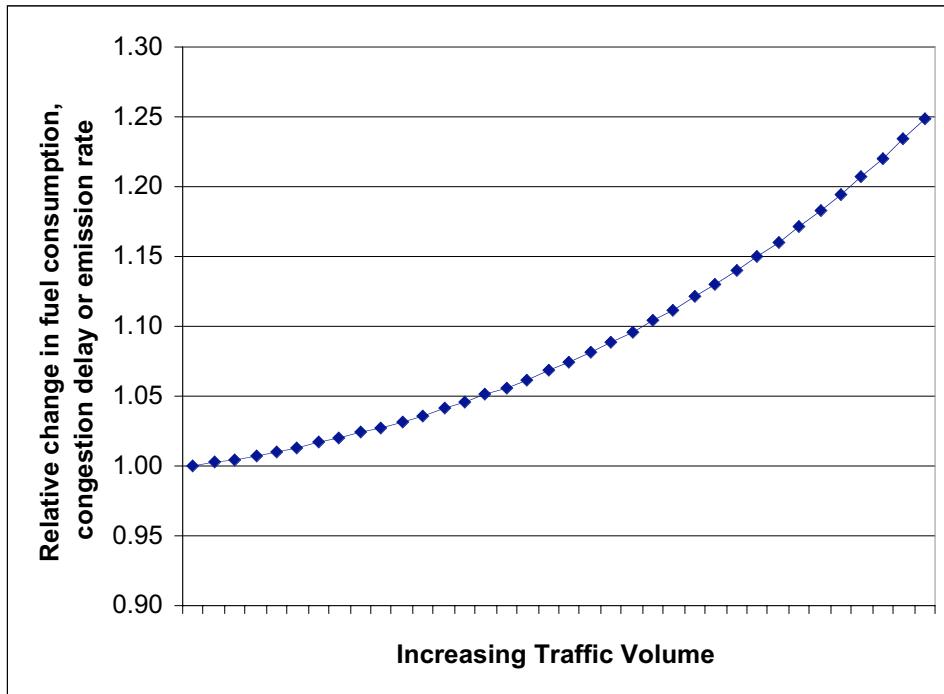
**Figure 2.2 Typical response curve for average car fuel consumption to variation in vehicle speed**



Using the results of Bureau reports 92, 94 and 107, an aggregate congestion response curve was derived - summing speed dependent curves (such as figure 2.2 and figure I.2) over each major road type, time period (AM peak, PM peak, inter-peak and off peak travel) and Australian capital city. The aggregate functional form estimated for the average city-wide response of increasing VKT (over the entire dense urban network) is shown in figure 2.3 – where, essentially, an increase in total urban car travel of 50 per cent will result in total car fuel consumption being around 20 per cent higher (than it would have been in the absence of the increase to the traffic congestion level).

Since diesel engines tend to cope with transient driving conditions better than petrol engines, and since commercial vehicles will tend to operate more uniformly throughout the day than for car traffic, it is assumed that for heavy commercial vehicles the effects of future increases to urban congestion will be roughly half of that experienced by cars.

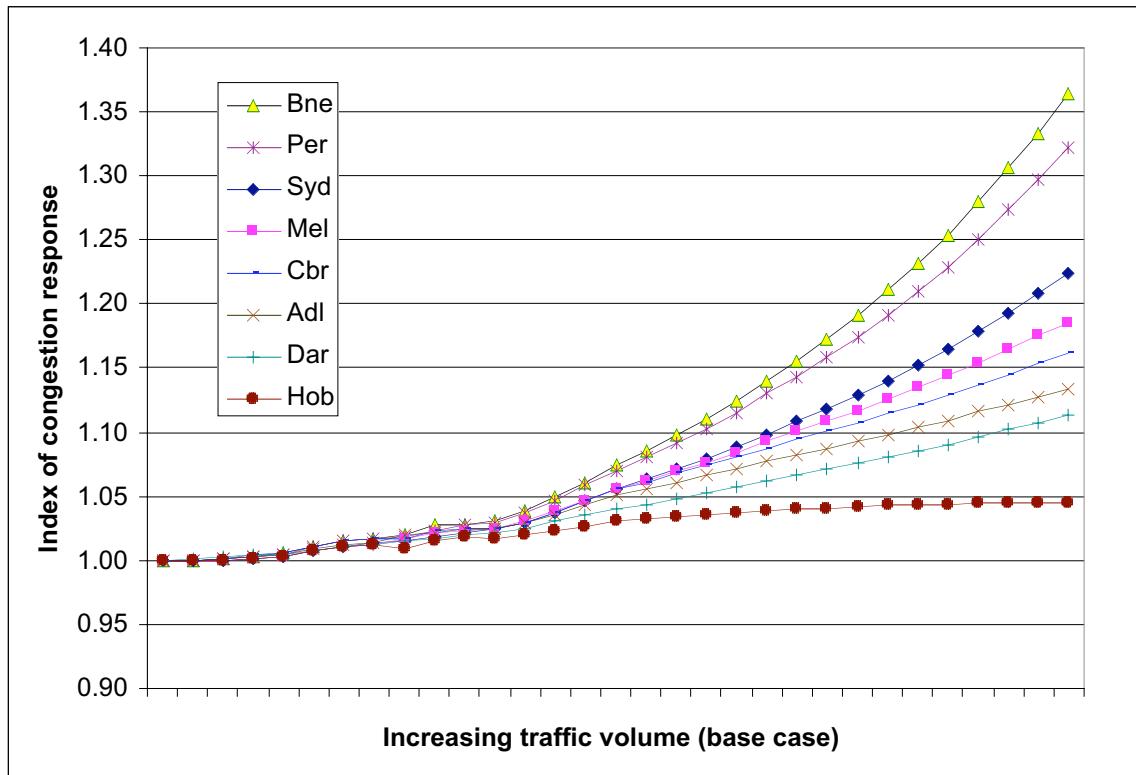
**Figure 2.3 Assumed functional form for response of vehicle fuel consumption to increasing traffic congestion – urban network average**



The base case has a projected increase in total Australian metropolitan traffic levels (in terms of passenger car equivalent units - PCUs) of 47 per cent between 2000 and 2020. Projected total PCU increases vary considerably between the different State and Territory capitals (see table 1.35) – with the resulting city by city congestion curves given in figure 2.4.

The effects of future congestion levels on fuel consumption and emission outputs are very difficult to estimate precisely – given the complexity of their dependence on exact vehicle operating conditions and state of the road network (including unknowns such as future levels of extra road provision). Since the congestion factors are one of the most approximate parts of the study's analysis, sensitivity tests (of the effects of varying the strength of the congestion factors) are presented in Chapter 5.

**Figure 2.4 Application of functional form to base case increases in metropolitan traffic levels (PCU), by city**



## Metropolitan Fuel Intensity

TABLE 2.9 BASE CASE PROJECTIONS OF AVERAGE FUEL INTENSITY FOR SYDNEY  
BY TYPE OF VEHICLE, 1990-2020  
(L/100km)

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motorcycles
1990	12.12	13.69	26.76	48.44	28.97	6.00
1991	12.06	13.62	26.77	48.23	28.47	6.00
1992	12.01	13.55	26.77	48.08	27.95	6.00
1993	11.98	13.53	26.81	48.11	27.61	6.00
1994	11.94	13.51	26.86	48.25	27.36	6.00
1995	11.93	13.52	26.95	48.55	27.15	6.00
1996	11.90	13.52	27.05	48.78	26.99	6.00
1997	11.85	13.50	27.13	48.88	26.80	6.00
1998	11.79	13.50	27.16	49.00	26.65	6.00
1999	11.71	13.48	27.14	49.23	26.53	6.00
2000	11.68	13.49	27.19	49.40	26.43	6.00
2001	11.69	13.56	27.34	49.61	26.29	6.00
2002	11.67	13.60	27.43	49.92	26.21	6.00
2003	11.69	13.66	27.53	50.26	26.18	6.00
2004	11.68	13.69	27.58	50.60	26.20	6.00
2005	11.71	13.74	27.70	50.94	26.24	6.00
2006	11.70	13.78	27.79	51.18	26.12	6.00
2007	11.70	13.83	27.89	51.42	26.31	6.00
2008	11.71	13.87	28.00	51.65	26.37	6.00
2009	11.71	13.92	28.11	51.87	26.44	6.00
2010	11.72	13.97	28.24	52.11	26.54	6.00
2011	11.72	14.01	28.36	52.32	26.64	6.00
2012	11.73	14.06	28.48	52.61	26.75	6.00
2013	11.73	14.10	28.61	52.90	26.86	6.00
2014	11.73	14.14	28.75	53.20	26.97	6.00
2015	11.74	14.18	28.90	53.49	27.10	6.00
2016	11.74	14.22	29.04	53.79	27.22	6.00
2017	11.76	14.27	29.22	54.13	27.37	6.00
2018	11.77	14.32	29.39	54.45	27.52	6.00
2019	11.78	14.37	29.57	54.79	27.67	6.00
2020	11.79	14.42	29.76	55.14	27.83	6.00

Notes: City-wide average values – including congested and uncongested driving conditions.

Values for light vehicles are in litres of gasoline equivalent consumption per 100 kilometres, and for heavy vehicles in litres of diesel equivalent.

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

TABLE 2.10 BASE CASE PROJECTIONS OF AVERAGE FUEL INTENSITY FOR MELBOURNE BY TYPE OF VEHICLE, 1990-2020  
(L/100km)

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motorcycles
1990	12.13	13.70	27.86	48.44	28.97	6.00
1991	12.07	13.64	27.86	48.23	28.47	6.00
1992	12.02	13.56	27.86	48.08	27.95	6.00
1993	11.99	13.55	27.91	48.11	27.61	6.00
1994	11.96	13.52	27.96	48.25	27.36	6.00
1995	11.94	13.54	28.05	48.56	27.16	6.00
1996	11.91	13.54	28.16	48.78	26.99	6.00
1997	11.85	13.51	28.23	48.87	26.80	6.00
1998	11.82	13.53	28.30	49.06	26.68	6.00
1999	11.75	13.52	28.30	49.31	26.58	6.00
2000	11.71	13.51	28.32	49.44	26.45	6.00
2001	11.71	13.58	28.47	49.64	26.31	6.00
2002	11.70	13.62	28.56	49.94	26.22	6.00
2003	11.71	13.68	28.66	50.28	26.19	6.00
2004	11.70	13.70	28.71	50.62	26.21	6.00
2005	11.72	13.76	28.83	50.94	26.24	6.00
2006	11.70	13.79	28.91	51.16	26.12	6.00
2007	11.70	13.83	29.00	51.38	26.29	6.00
2008	11.69	13.87	29.10	51.58	26.33	6.00
2009	11.68	13.91	29.20	51.77	26.39	6.00
2010	11.67	13.95	29.31	51.97	26.47	6.00
2011	11.65	13.98	29.41	52.14	26.54	6.00
2012	11.64	14.01	29.52	52.39	26.63	6.00
2013	11.62	14.04	29.63	52.63	26.72	6.00
2014	11.60	14.06	29.74	52.87	26.81	6.00
2015	11.58	14.09	29.86	53.10	26.90	6.00
2016	11.55	14.11	29.97	53.33	26.99	6.00
2017	11.53	14.14	30.11	53.59	27.10	6.00
2018	11.50	14.17	30.24	53.84	27.21	6.00
2019	11.47	14.20	30.38	54.09	27.31	6.00
2020	11.43	14.22	30.52	54.34	27.42	6.00

Note: City-wide average values – including congested and uncongested driving conditions.

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

TABLE 2.11 BASE CASE PROJECTIONS OF AVERAGE FUEL INTENSITY FOR BRISBANE BY TYPE OF VEHICLE, 1990-2020

(L/100km)

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motor cycles
1990	11.95	13.50	27.31	48.44	28.97	6.00
1991	11.89	13.43	27.32	48.23	28.47	6.00
1992	11.85	13.37	27.34	48.13	27.98	6.00
1993	11.83	13.36	27.40	48.17	27.65	6.00
1994	11.80	13.34	27.45	48.32	27.40	6.00
1995	11.80	13.36	27.55	48.65	27.21	6.00
1996	11.78	13.37	27.68	48.91	27.06	6.00
1997	11.73	13.34	27.75	49.00	26.87	6.00
1998	11.68	13.36	27.81	49.17	26.74	6.00
1999	11.65	13.37	27.85	49.50	26.68	6.00
2000	11.59	13.35	27.84	49.58	26.53	6.00
2001	11.60	13.42	28.01	49.82	26.40	6.00
2002	11.61	13.48	28.13	50.17	26.34	6.00
2003	11.65	13.55	28.27	50.58	26.34	6.00
2004	11.68	13.60	28.36	51.00	26.40	6.00
2005	11.74	13.68	28.54	51.42	26.49	6.00
2006	11.78	13.74	28.67	51.74	26.41	6.00
2007	11.82	13.81	28.82	52.08	26.65	6.00
2008	11.87	13.88	28.99	52.40	26.75	6.00
2009	11.93	13.95	29.16	52.74	26.88	6.00
2010	12.00	14.04	29.36	53.10	27.04	6.00
2011	12.06	14.11	29.55	53.42	27.20	6.00
2012	12.13	14.19	29.75	53.85	27.38	6.00
2013	12.20	14.26	29.96	54.29	27.57	6.00
2014	12.29	14.34	30.19	54.74	27.76	6.00
2015	12.38	14.43	30.43	55.20	27.96	6.00
2016	12.47	14.51	30.68	55.67	28.18	6.00
2017	12.59	14.62	30.97	56.22	28.43	6.00
2018	12.71	14.71	31.25	56.75	28.68	6.00
2019	12.82	14.82	31.55	57.30	28.94	6.00
2020	12.95	14.92	31.87	57.89	29.21	6.00

Note: City-wide average values – including congested and uncongested driving conditions.

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

TABLE 2.12 BASE CASE PROJECTIONS OF AVERAGE FUEL INTENSITY FOR  
ADELAIDE BY TYPE OF VEHICLE, 1990-2020  
(L/100km)

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motor cycles
1990	12.31	13.91	28.68	52.89	28.97	6.00
1991	12.25	13.84	28.69	52.67	28.47	6.00
1992	12.21	13.77	28.70	52.53	27.97	6.00
1993	12.18	13.76	28.75	52.56	27.63	6.00
1994	12.14	13.73	28.80	52.72	27.38	6.00
1995	12.13	13.75	28.89	53.05	27.17	6.00
1996	12.10	13.75	29.00	53.29	27.01	6.00
1997	12.04	13.71	29.07	53.37	26.81	6.00
1998	12.03	13.76	29.18	53.66	26.73	6.00
1999	11.93	13.72	29.13	53.84	26.58	6.00
2000	11.90	13.72	29.17	54.02	26.47	6.00
2001	11.88	13.78	29.31	54.20	26.31	6.00
2002	11.86	13.82	29.38	54.49	26.20	6.00
2003	11.85	13.86	29.46	54.82	26.15	6.00
2004	11.83	13.88	29.49	55.15	26.15	6.00
2005	11.83	13.93	29.60	55.46	26.16	6.00
2006	11.80	13.95	29.66	55.66	26.02	6.00
2007	11.78	13.97	29.72	55.85	26.17	6.00
2008	11.74	14.00	29.79	56.01	26.19	6.00
2009	11.71	14.02	29.86	56.16	26.22	6.00
2010	11.68	14.05	29.94	56.32	26.27	6.00
2011	11.63	14.06	30.01	56.43	26.31	6.00
2012	11.59	14.08	30.09	56.63	26.37	6.00
2013	11.54	14.09	30.16	56.82	26.43	6.00
2014	11.48	14.10	30.24	57.01	26.48	6.00
2015	11.43	14.11	30.31	57.19	26.53	6.00
2016	11.37	14.11	30.39	57.35	26.59	6.00
2017	11.31	14.12	30.49	57.55	26.65	6.00
2018	11.25	14.12	30.57	57.73	26.72	6.00
2019	11.17	14.13	30.66	57.90	26.78	6.00
2020	11.10	14.13	30.76	58.08	26.85	6.00

Note: City-wide average values – including congested and uncongested driving conditions.

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

TABLE 2.13 BASE CASE PROJECTIONS OF AVERAGE FUEL INTENSITY FOR PERTH  
BY TYPE OF VEHICLE, 1990-2020  
(L/100km)

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motor cycles
1990	12.13	13.70	27.04	53.39	28.97	6.00
1991	12.07	13.64	27.05	53.16	28.47	6.00
1992	12.03	13.57	27.06	53.02	27.97	6.00
1993	12.01	13.56	27.11	53.07	27.64	6.00
1994	11.97	13.54	27.17	53.24	27.39	6.00
1995	11.97	13.56	27.27	53.59	27.20	6.00
1996	11.95	13.57	27.39	53.88	27.05	6.00
1997	11.90	13.54	27.47	53.99	26.87	6.00
1998	11.84	13.55	27.50	54.13	26.72	6.00
1999	11.78	13.54	27.50	54.41	26.61	6.00
2000	11.75	13.54	27.55	54.60	26.51	6.00
2001	11.77	13.62	27.72	54.87	26.39	6.00
2002	11.77	13.67	27.83	55.25	26.32	6.00
2003	11.80	13.74	27.95	55.68	26.32	6.00
2004	11.83	13.79	28.04	56.12	26.37	6.00
2005	11.88	13.86	28.20	56.56	26.44	6.00
2006	11.90	13.92	28.32	56.89	26.35	6.00
2007	11.94	13.98	28.46	57.23	26.57	6.00
2008	11.97	14.04	28.60	57.56	26.66	6.00
2009	12.01	14.11	28.75	57.89	26.77	6.00
2010	12.07	14.18	28.93	58.25	26.91	6.00
2011	12.11	14.25	29.10	58.57	27.06	6.00
2012	12.16	14.32	29.28	58.99	27.21	6.00
2013	12.21	14.38	29.46	59.43	27.38	6.00
2014	12.27	14.45	29.66	59.87	27.55	6.00
2015	12.34	14.52	29.87	60.32	27.72	6.00
2016	12.40	14.60	30.09	60.78	27.91	6.00
2017	12.50	14.68	30.34	61.31	28.14	6.00
2018	12.57	14.77	30.59	61.83	28.35	6.00
2019	12.66	14.85	30.85	62.36	28.58	6.00
2020	12.75	14.94	31.12	62.92	28.81	6.00

Note: City-wide average values – including congested and uncongested driving conditions.

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

TABLE 2.14 BASE CASE PROJECTIONS OF AVERAGE FUEL INTENSITY FOR HOBART  
BY TYPE OF VEHICLE, 1990-2020  
(L/100km)

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motor cycles
1990	11.89	13.43	26.22	48.44	28.97	6.00
1991	11.83	13.36	26.23	48.23	28.47	6.00
1992	11.78	13.29	26.22	48.08	27.95	6.00
1993	11.75	13.27	26.26	48.09	27.60	6.00
1994	11.71	13.25	26.31	48.23	27.35	6.00
1995	11.69	13.26	26.38	48.53	27.14	6.00
1996	11.66	13.26	26.48	48.75	26.97	6.00
1997	11.60	13.23	26.54	48.82	26.77	6.00
1998	11.51	13.20	26.52	48.84	26.56	6.00
1999	11.45	13.20	26.53	49.12	26.47	6.00
2000	11.41	13.20	26.56	49.26	26.36	6.00
2001	11.38	13.24	26.66	49.39	26.17	6.00
2002	11.34	13.26	26.69	49.60	26.04	6.00
2003	11.30	13.28	26.73	49.82	25.95	6.00
2004	11.25	13.28	26.71	50.04	25.91	6.00
2005	11.21	13.30	26.76	50.23	25.87	6.00
2006	11.15	13.30	26.77	50.32	25.69	6.00
2007	11.09	13.30	26.78	50.41	25.79	6.00
2008	11.02	13.30	26.80	50.47	25.76	6.00
2009	10.95	13.30	26.81	50.51	25.75	6.00
2010	10.88	13.30	26.83	50.55	25.74	6.00
2011	10.80	13.29	26.84	50.56	25.74	6.00
2012	10.71	13.27	26.85	50.63	25.74	6.00
2013	10.62	13.26	26.86	50.70	25.75	6.00
2014	10.53	13.24	26.87	50.76	25.74	6.00
2015	10.43	13.21	26.88	50.80	25.73	6.00
2016	10.33	13.19	26.89	50.83	25.73	6.00
2017	10.23	13.16	26.91	50.88	25.73	6.00
2018	10.11	13.13	26.92	50.91	25.73	6.00
2019	10.00	13.10	26.93	50.94	25.72	6.00
2020	9.88	13.07	26.94	50.96	25.72	6.00

Note: City-wide average values – including congested and uncongested driving conditions.

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

TABLE 2.15 BASE CASE PROJECTIONS OF AVERAGE FUEL INTENSITY FOR DARWIN  
BY TYPE OF VEHICLE, 1990-2020  
(L/100km)

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motorcycles
1990	11.89	13.64	26.49	54.37	28.97	6.00
1991	11.83	13.57	26.51	54.16	28.48	6.00
1992	11.81	13.52	26.55	54.07	28.01	6.00
1993	11.78	13.50	26.58	54.09	27.66	6.00
1994	11.73	13.47	26.62	54.22	27.39	6.00
1995	11.71	13.47	26.68	54.51	27.16	6.00
1996	11.67	13.47	26.77	54.75	26.99	6.00
1997	11.61	13.43	26.83	54.83	26.79	6.00
1998	11.56	13.45	26.88	55.00	26.65	6.00
1999	11.47	13.42	26.84	55.21	26.51	6.00
2000	11.43	13.41	26.86	55.35	26.38	6.00
2001	11.43	13.48	27.01	55.59	26.24	6.00
2002	11.41	13.51	27.08	55.88	26.14	6.00
2003	11.39	13.54	27.13	56.18	26.07	6.00
2004	11.34	13.54	27.12	56.44	26.03	6.00
2005	11.32	13.57	27.19	56.69	26.01	6.00
2006	11.27	13.59	27.23	56.86	25.86	6.00
2007	11.24	13.61	27.28	57.04	26.00	6.00
2008	11.20	13.63	27.33	57.17	26.00	6.00
2009	11.15	13.64	27.38	57.31	26.02	6.00
2010	11.11	13.66	27.45	57.44	26.06	6.00
2011	11.07	13.68	27.50	57.55	26.10	6.00
2012	11.01	13.69	27.56	57.74	26.15	6.00
2013	10.96	13.70	27.62	57.92	26.20	6.00
2014	10.91	13.70	27.69	58.10	26.25	6.00
2015	10.85	13.71	27.76	58.27	26.29	6.00
2016	10.79	13.71	27.82	58.43	26.35	6.00
2017	10.73	13.72	27.91	58.63	26.42	6.00
2018	10.67	13.72	27.99	58.81	26.48	6.00
2019	10.60	13.72	28.07	58.99	26.54	6.00
2020	10.53	13.73	28.16	59.17	26.60	6.00

Note: City-wide average values – including congested and uncongested driving conditions.

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

TABLE 2.16 BASE CASE PROJECTIONS OF AVERAGE FUEL INTENSITY FOR  
CANBERRA, BY TYPE OF VEHICLE, 1990-2020  
(L/100km)

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motor cycles
1990	11.64	14.04	27.86	46.96	28.97	6.00
1991	11.59	13.97	27.86	46.76	28.47	6.00
1992	11.56	13.92	27.90	46.67	27.99	6.00
1993	11.54	13.91	27.96	46.72	27.66	6.00
1994	11.51	13.88	28.01	46.86	27.41	6.00
1995	11.50	13.90	28.11	47.17	27.21	6.00
1996	11.48	13.91	28.23	47.41	27.06	6.00
1997	11.43	13.88	28.31	47.50	26.87	6.00
1998	11.35	13.87	28.31	47.57	26.69	6.00
1999	11.31	13.87	28.33	47.87	26.61	6.00
2000	11.25	13.86	28.33	47.95	26.47	6.00
2001	11.25	13.92	28.48	48.13	26.31	6.00
2002	11.22	13.96	28.55	48.40	26.21	6.00
2003	11.23	14.01	28.65	48.72	26.18	6.00
2004	11.23	14.04	28.71	49.07	26.21	6.00
2005	11.25	14.10	28.83	49.37	26.23	6.00
2006	11.23	14.13	28.90	49.56	26.10	6.00
2007	11.21	14.16	28.98	49.76	26.26	6.00
2008	11.19	14.19	29.06	49.93	26.29	6.00
2009	11.17	14.22	29.14	50.09	26.33	6.00
2010	11.15	14.26	29.24	50.25	26.40	6.00
2011	11.12	14.28	29.32	50.38	26.46	6.00
2012	11.09	14.30	29.41	50.59	26.53	6.00
2013	11.06	14.32	29.50	50.79	26.61	6.00
2014	11.02	14.34	29.59	50.99	26.67	6.00
2015	10.99	14.36	29.68	51.18	26.74	6.00
2016	10.94	14.37	29.78	51.36	26.81	6.00
2017	10.91	14.39	29.89	51.58	26.91	6.00
2018	10.86	14.41	30.00	51.77	26.99	6.00
2019	10.81	14.42	30.11	51.97	27.07	6.00
2020	10.76	14.44	30.23	52.17	27.16	6.00

Note: City-wide average values – including congested and uncongested driving conditions.

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

TABLE 2.17 BASE CASE PROJECTIONS OF AVERAGE FUEL INTENSITY FOR AUSTRALIAN METROPOLITAN TRAVEL, 1990-2020  
(L/100km)

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motorcycles
1990	12.10	13.69	27.30	49.55	28.97	6.00
1991	12.04	13.62	27.31	49.34	28.47	6.00
1992	11.99	13.56	27.31	49.20	27.96	6.00
1993	11.97	13.54	27.36	49.23	27.63	6.00
1994	11.93	13.52	27.41	49.38	27.37	6.00
1995	11.92	13.53	27.50	49.70	27.17	6.00
1996	11.89	13.53	27.61	49.94	27.02	6.00
1997	11.84	13.51	27.68	50.03	26.82	6.00
1998	11.79	13.52	27.73	50.19	26.69	6.00
1999	11.72	13.51	27.72	50.45	26.58	6.00
2000	11.69	13.51	27.75	50.59	26.46	6.00
2001	11.69	13.57	27.91	50.81	26.32	6.00
2002	11.68	13.62	28.00	51.13	26.24	6.00
2003	11.69	13.68	28.10	51.48	26.21	6.00
2004	11.70	13.71	28.16	51.85	26.24	6.00
2005	11.72	13.77	28.29	52.19	26.28	6.00
2006	11.72	13.81	28.38	52.45	26.17	6.00
2007	11.72	13.86	28.48	52.70	26.36	6.00
2008	11.73	13.91	28.59	52.94	26.42	6.00
2009	11.73	13.95	28.71	53.18	26.49	6.00
2010	11.75	14.01	28.84	53.43	26.59	6.00
2011	11.75	14.05	28.96	53.65	26.69	6.00
2012	11.75	14.10	29.09	53.95	26.81	6.00
2013	11.76	14.14	29.23	54.26	26.93	6.00
2014	11.76	14.19	29.37	54.57	27.04	6.00
2015	11.77	14.23	29.52	54.88	27.17	6.00
2016	11.78	14.27	29.67	55.20	27.30	6.00
2017	11.80	14.33	29.86	55.56	27.45	6.00
2018	11.81	14.38	30.03	55.90	27.60	6.00
2019	11.82	14.43	30.21	56.25	27.76	6.00
2020	11.83	14.49	30.41	56.63	27.93	6.00

Note: City-wide average values – including congested and uncongested driving conditions.

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

## National Fuel Intensity Trends

TABLE 2.18 BASE CASE PROJECTIONS OF AVERAGE FUEL INTENSITY FOR ALL AUSTRALIAN TRAVEL BY TYPE OF VEHICLE, 1990-2020

(L/100km)

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motorcycles
1990	12.02	13.58	27.12	50.54	25.92	6.00
1991	11.96	13.50	27.14	50.56	25.57	6.00
1992	11.91	13.43	27.13	50.63	25.16	6.00
1993	11.87	13.41	27.15	50.85	24.79	6.00
1994	11.83	13.38	27.17	51.17	24.55	6.00
1995	11.75	13.37	27.22	51.59	24.33	6.00
1996	11.71	13.37	27.29	51.94	24.15	6.00
1997	11.65	13.33	27.33	52.19	23.99	6.00
1998	11.59	13.33	27.35	52.55	23.88	6.00
1999	11.52	13.32	27.34	52.88	23.75	6.00
2000	11.47	13.31	27.34	53.20	23.62	6.00
2001	11.44	13.34	27.43	53.48	23.48	6.00
2002	11.41	13.37	27.48	53.77	23.37	6.00
2003	11.39	13.41	27.53	54.05	23.32	6.00
2004	11.36	13.42	27.54	54.31	23.28	6.00
2005	11.34	13.46	27.61	54.54	23.26	6.00
2006	11.31	13.48	27.66	54.74	23.12	6.00
2007	11.29	13.51	27.72	54.90	23.24	6.00
2008	11.26	13.54	27.78	55.03	23.24	6.00
2009	11.23	13.57	27.85	55.16	23.26	6.00
2010	11.20	13.60	27.94	55.28	23.32	6.00
2011	11.17	13.63	28.01	55.37	23.36	6.00
2012	11.14	13.65	28.09	55.48	23.41	6.00
2013	11.10	13.68	28.18	55.58	23.46	6.00
2014	11.07	13.70	28.27	55.67	23.50	6.00
2015	11.04	13.73	28.37	55.75	23.56	6.00
2016	11.01	13.75	28.48	55.83	23.61	6.00
2017	10.98	13.78	28.60	55.93	23.71	6.00
2018	10.94	13.81	28.72	56.02	23.78	6.00
2019	10.91	13.84	28.86	56.11	23.85	6.00
2020	10.87	13.88	29.01	56.22	23.92	6.00

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

TABLE 2.19 BASE CASE PROJECTIONS OF AVERAGE FUEL INTENSITY FOR AUSTRALIAN NON-METROPOLITAN TRAVEL, 1990-2020  
(L/100km)

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motorcycles
1990	11.90	13.45	26.84	50.73	23.70	6.00
1991	11.84	13.38	26.84	50.79	23.29	6.00
1992	11.79	13.31	26.81	50.91	22.87	6.00
1993	11.74	13.26	26.80	51.15	22.56	6.00
1994	11.69	13.22	26.81	51.52	22.33	6.00
1995	11.51	13.19	26.77	51.97	22.09	6.00
1996	11.44	13.15	26.80	52.36	21.91	6.00
1997	11.37	13.10	26.84	52.66	21.72	6.00
1998	11.29	13.10	26.86	53.04	21.58	6.00
1999	11.21	13.09	26.85	53.42	21.43	6.00
2000	11.14	13.07	26.85	53.77	21.30	6.00
2001	11.07	13.05	26.84	54.07	21.16	6.00
2002	11.00	13.05	26.83	54.37	21.02	6.00
2003	10.93	13.04	26.81	54.63	20.90	6.00
2004	10.85	13.03	26.78	54.87	20.82	6.00
2005	10.78	13.02	26.76	55.09	20.74	6.00
2006	10.70	13.01	26.75	55.28	20.57	6.00
2007	10.62	12.99	26.73	55.42	20.63	6.00
2008	10.54	12.98	26.72	55.54	20.59	6.00
2009	10.46	12.97	26.71	55.65	20.56	6.00
2010	10.37	12.96	26.70	55.74	20.54	6.00
2011	10.28	12.94	26.69	55.81	20.52	6.00
2012	10.19	12.92	26.69	55.87	20.51	6.00
2013	10.10	12.90	26.68	55.92	20.51	6.00
2014	10.00	12.87	26.68	55.96	20.49	6.00
2015	9.90	12.84	26.68	55.99	20.48	6.00
2016	9.80	12.81	26.68	56.01	20.47	6.00
2017	9.70	12.78	26.68	56.03	20.46	6.00
2018	9.59	12.75	26.69	56.05	20.46	6.00
2019	9.47	12.72	26.69	56.07	20.45	6.00
2020	9.36	12.69	26.70	56.09	20.45	6.00

Sources: BTRE estimates, BTRE (2002), BTE (2002), ABS (2003 and earlier).

## Fuel Consumption

TABLE 2.20 POTENTIAL FUEL MIX FOR BASE CASE PROJECTIONS OF TOTAL PASSENGER CAR FUEL CONSUMPTION, 1990-2020

(million litres)

Year	LP/LRP	ULP	PULP	ADO	LPG	NG	Ethanol	Total
1990	10170.5	3644.7	148.2	350.0	746.8	0.3	0.0	15060.5
1991	9336.8	4442.9	174.4	420.0	670.0	1.0	0.0	15045.1
1992	8728.6	5055.1	205.2	440.0	838.0	2.3	2.0	15271.1
1993	8163.5	5837.7	241.4	450.0	920.0	2.5	3.0	15618.0
1994	7486.8	6681.9	284.0	460.0	950.0	2.8	4.0	15869.4
1995	6942.8	7672.6	334.1	490.0	980.0	3.0	5.0	16427.5
1996	6191.8	8646.1	393.0	500.0	1100.0	4.0	7.0	16841.9
1997	5449.2	9218.4	462.4	510.0	1300.0	5.0	10.0	16955.0
1998	4803.5	9889.9	544.0	540.0	1400.0	6.0	20.0	17203.4
1999	4150.0	10739.3	612.0	570.0	1427.8	7.0	30.0	17536.1
2000	3540.7	11461.1	688.5	620.0	1456.2	8.0	35.0	17809.5
2001	2932.3	11875.2	774.6	650.0	1450.0	9.0	40.0	17731.0
2002	2456.0	12592.5	871.4	670.0	1400.0	10.0	45.0	18044.8
2003	2081.4	13407.8	980.3	680.0	1450.0	11.9	47.3	18658.7
2004	1756.3	14134.4	1102.8	691.2	1478.0	14.1	49.7	19226.6
2005	1464.5	14770.3	1240.7	702.7	1506.6	16.7	52.2	19753.7
2006	1208.5	15083.4	1395.8	714.3	1535.8	19.9	54.9	20012.5
2007	1018.3	15314.1	1570.3	726.1	1565.4	23.6	57.7	20275.4
2008	855.1	15484.5	1766.5	738.1	1595.7	28.0	60.6	20528.5
2009	727.2	15576.1	1987.4	750.3	1626.6	33.2	63.7	20764.4
2010	618.0	15612.8	2235.8	762.7	1658.0	39.5	66.9	20993.7
2011	472.0	15609.5	2515.3	775.3	1690.1	46.9	70.3	21179.3
2012	355.7	15532.0	2829.7	788.1	1722.8	55.6	73.9	21357.8
2013	263.8	15368.7	3183.4	801.1	1756.1	66.0	77.6	21516.7
2014	191.6	15133.7	3581.3	814.4	1790.0	78.4	81.6	21671.0
2015	135.4	14817.7	4028.9	827.9	1824.7	93.1	85.7	21813.4
2016	114.8	14388.8	4532.6	841.5	1859.9	110.5	90.1	21938.2
2017	97.6	13899.0	5099.1	855.5	1895.9	131.2	94.6	22073.0
2018	83.1	13304.9	5736.5	869.6	1932.6	155.8	99.4	22181.9
2019	70.9	12613.9	6453.6	884.0	1969.9	185.0	104.5	22281.8
2020	60.8	11655.4	7446.9	900.0	1976.3	219.6	109.8	22368.7

Notes: LP/LRP = leaded petrol / lead replacement petrol (all sales in this category after 2001 are LRP).

ULP = unleaded petrol.

PULP = premium unleaded petrol (including sales of super premium - SPULP, and assuming half of all cars sold after 2006 will be run on premium fuels).

ADO – automotive diesel oil.

LPG – liquefied petroleum gas.

NG – natural gas (generally used as compressed natural gas – CNG), in litres of gasoline equivalent.

Ethanol – typically sold as E10, a blend of 10% ethanol and 90% petrol.

Source: BTRE estimates.

Table 2.20 presents a possible breakdown, by fuel type, of total projected fuel consumption for cars - under the assumption that half of new cars sold after 2006 will require premium petrol. If all Euro 3 standard cars happen to require premium fuels, then 2020 sales of PULP could end up being double that given in the table – and make up the bulk of total petrol (ie automotive gasoline) sales. Alternatively, if all Euro 3 certified cars (ie bought after 2006) run adequately on existing RON petrol, and the price differential between normal ULP and premium blends remains significant, then sales of PULP could remain as only a minor share of total fuel demand. The scenario for table 2.20 also assumes that LRP will continue to be supplied to the declining portion of the fleet bought before 1986. However, it is possible that producers will not always supply such fuels if demand becomes too small (eg LRP will probably form less than 1 per cent of total car fuel demand by 2015).

Table 2.21 Base case Projections of total passenger car energy consumption, 1990-2020

Year	<i>LP/LRP</i>	<i>ULP/PULP</i>	<i>Total petrol</i>	<i>ADO</i>	<i>LPG</i>	<i>NG</i>	<i>Ethanol</i>	<i>Total</i>
1990	347.8	129.7	477.5	13.5	19.2	0.0	0.0	510.3
1991	319.3	157.9	477.2	16.2	17.2	0.0	0.0	510.7
1992	298.5	179.9	478.4	17.0	21.5	0.1	0.0	517.1
1993	279.2	207.9	487.1	17.4	23.6	0.1	0.1	528.3
1994	256.0	238.2	494.3	17.8	24.4	0.1	0.1	536.6
1995	237.4	273.8	511.3	18.9	25.2	0.1	0.1	555.6
1996	211.8	309.1	520.9	19.3	28.3	0.1	0.2	568.8
1997	186.4	331.1	517.4	19.7	33.4	0.2	0.2	570.9
1998	164.3	356.8	521.1	20.8	36.0	0.2	0.5	578.6
1999	141.9	388.2	530.1	22.0	36.7	0.2	0.7	589.8
2000	121.1	415.5	536.6	23.9	37.4	0.3	0.8	599.1
2001	100.3	432.6	532.9	25.1	37.3	0.3	0.9	596.5
2002	84.0	460.5	544.5	25.9	36.0	0.3	1.1	607.7
2003	71.2	492.1	563.3	26.2	37.3	0.4	1.1	628.3
2004	60.1	521.1	581.2	26.7	38.0	0.5	1.2	647.5
2005	50.1	547.6	597.7	27.1	38.7	0.6	1.2	665.3
2006	41.3	563.6	604.9	27.6	39.5	0.7	1.3	673.9
2007	34.8	577.4	612.3	28.0	40.2	0.8	1.3	682.7
2008	29.2	590.0	619.2	28.5	41.0	1.0	1.4	691.1
2009	24.9	600.7	625.5	29.0	41.8	1.1	1.5	698.9
2010	21.1	610.4	631.6	29.4	42.6	1.3	1.6	706.5
2011	16.1	619.9	636.0	29.9	43.4	1.6	1.6	712.6
2012	12.2	628.0	640.1	30.4	44.3	1.9	1.7	718.5
2013	9.0	634.5	643.5	30.9	45.1	2.3	1.8	723.6
2014	6.6	640.1	646.6	31.4	46.0	2.7	1.9	728.6
2015	4.6	644.6	649.2	32.0	46.9	3.2	2.0	733.2
2016	3.9	647.1	651.0	32.5	47.8	3.8	2.1	737.2
2017	3.3	649.7	653.1	33.0	48.7	4.5	2.2	741.5
2018	2.8	651.2	654.1	33.6	49.7	5.3	2.3	744.9
2019	2.4	652.1	654.5	34.1	50.6	6.3	2.4	748.1
2020	2.1	653.3	655.4	34.7	50.8	7.5	2.6	751.0

Notes: LP/LRP = leaded petrol / lead replacement petrol (all sales in this category after 2001 are LRP).

ULP/PULP = unleaded petrol / premium unleaded petrol.

ADO – automotive diesel oil.

LPG – liquefied petroleum gas.

NG – natural gas.

For simplicity, total motor vehicle sales of ethanol (as E10) have been allocated to car fuel use.

Source: BTRE estimates.

TABLE 2.22 BASE CASE PROJECTIONS OF TOTAL LIGHT COMMERCIAL VEHICLE ENERGY CONSUMPTION, 1990-2020  
*(petajoules)*

Year	LP/LRP	ULP/PULP	Total petrol	ADO	LPG	NG	Total
1990	73.9	3.7	77.7	22.4	4.7	0.1	104.8
1991	67.9	8.7	76.6	23.7	5.9	0.1	106.2
1992	62.2	12.6	74.9	24.8	7.5	0.1	107.3
1993	57.2	16.2	73.4	26.0	9.2	0.1	108.8
1994	51.2	19.9	71.1	27.0	10.9	0.2	109.2
1995	48.9	23.4	72.4	29.3	13.2	0.3	115.2
1996	44.6	28.1	72.7	30.8	13.2	0.3	117.0
1997	39.6	33.2	72.8	32.2	13.2	0.3	118.5
1998	38.1	38.4	76.5	35.2	13.8	0.4	125.9
1999	35.1	41.7	76.8	38.2	14.7	0.4	130.0
2000	30.7	46.2	76.9	39.8	15.5	0.4	132.6
2001	27.5	50.9	78.4	42.0	16.3	0.4	137.1
2002	25.4	55.2	80.6	44.8	17.2	0.5	143.1
2003	23.1	59.1	82.2	47.4	18.0	0.5	148.1
2004	20.8	62.6	83.4	49.9	18.8	0.5	152.7
2005	18.8	66.1	84.8	52.8	19.7	0.6	157.9
2006	16.9	68.7	85.5	55.3	20.4	0.6	161.9
2007	15.5	71.0	86.5	58.2	21.3	0.6	166.7
2008	14.7	72.4	87.1	61.0	22.1	0.7	170.8
2009	13.8	73.6	87.4	63.8	22.9	0.8	174.9
2010	13.0	75.5	88.5	67.4	23.9	1.0	180.8
2011	10.9	78.0	88.9	70.8	24.9	1.3	185.8
2012	8.9	80.3	89.1	74.3	25.8	1.6	190.9
2013	7.0	82.2	89.2	78.0	26.8	2.0	196.0
2014	5.4	83.7	89.1	81.9	27.8	2.5	201.3
2015	3.9	84.8	88.7	85.9	28.9	3.1	206.6
2016	3.4	84.7	88.1	90.0	29.9	3.9	212.0
2017	2.8	84.8	87.6	94.9	31.2	4.9	218.5
2018	2.1	84.3	86.4	99.6	32.4	6.1	224.4
2019	1.5	83.3	84.8	104.5	33.6	7.6	230.4
2020	0.7	81.2	81.9	109.6	35.5	9.5	236.5

Notes: LP/LRP = leaded petrol / lead replacement petrol (all sales in this category after 2001 are LRP).

ULP/PULP = unleaded petrol / premium unleaded petrol.

ADO – automotive diesel oil.

LPG – liquefied petroleum gas.

NG – natural gas.

Source: BTRE estimates.

TABLE 2.23 BASE CASE PROJECTIONS OF TOTAL RIGID TRUCK ENERGY CONSUMPTION, 1990-2020

(petajoules)

Year	LP/LRP	ULP/PULP	Total petrol	ADO	LPG	NG	Total
1990	6.5	0.3	6.8	62.3	2.1	0.000	71.1
1991	6.2	0.3	6.4	55.7	2.1	0.001	64.2
1992	5.8	0.3	6.1	54.9	2.1	0.001	63.0
1993	5.5	0.3	5.8	54.9	2.1	0.001	62.8
1994	5.1	0.3	5.5	57.9	2.1	0.002	65.4
1995	4.8	0.4	5.1	59.3	2.1	0.002	66.5
1996	4.4	0.4	4.8	60.8	2.0	0.002	67.7
1997	4.1	0.4	4.5	62.9	2.0	0.003	69.4
1998	3.5	0.4	3.9	65.3	1.9	0.003	71.1
1999	3.0	0.4	3.4	66.6	1.7	0.003	71.7
2000	2.5	0.4	3.0	67.9	1.4	0.004	72.2
2001	2.1	0.5	2.6	67.9	1.5	0.014	72.0
2002	1.7	0.5	2.2	70.0	1.7	0.024	73.9
2003	1.4	0.5	1.9	70.6	1.8	0.035	74.3
2004	1.1	0.5	1.6	72.7	1.9	0.045	76.2
2005	0.9	0.5	1.4	73.1	1.9	0.047	76.5
2006	0.5	0.5	1.1	74.1	2.0	0.049	77.2
2007	0.3	0.6	0.9	75.2	2.0	0.052	78.2
2008	0.2	0.6	0.8	75.9	2.0	0.055	78.7
2009	0.1	0.6	0.7	76.5	2.0	0.059	79.2
2010	0.0	0.6	0.6	77.4	2.0	0.064	80.1
2011	0.0	0.6	0.6	78.0	2.1	0.068	80.8
2012	0.0	0.6	0.6	78.5	2.1	0.075	81.3
2013	0.0	0.7	0.7	78.9	2.1	0.082	81.7
2014	0.0	0.7	0.7	79.3	2.1	0.090	82.2
2015	0.0	0.7	0.7	79.6	2.2	0.118	82.6
2016	0.0	0.7	0.7	80.0	2.2	0.153	83.0
2017	0.0	0.7	0.7	80.7	2.2	0.199	83.8
2018	0.0	0.8	0.8	80.9	2.2	0.258	84.1
2019	0.0	0.8	0.8	80.9	2.2	0.336	84.2
2020	0.0	0.8	0.8	80.8	2.3	0.437	84.2

Notes: LP/LRP = leaded petrol / lead replacement petrol (all sales in this category after 2001 are LRP).

ULP/PULP = unleaded petrol / premium unleaded petrol.

ADO – automotive diesel oil.

LPG – liquefied petroleum gas.

NG – natural gas.

Source: BTRE estimates.

TABLE 2.24 BASE CASE PROJECTIONS OF TOTAL ARTICULATED TRUCK ENERGY CONSUMPTION, 1990-2020

(petajoules)

Year	LP/LRP	ULP/PULP	Total petrol	ADO	LPG	NG	Total
1990	0.06	0.01	0.07	80.87	0.005	0.00	80.95
1991	0.05	0.01	0.06	79.39	0.005	0.00	79.45
1992	0.04	0.01	0.05	80.75	0.005	0.00	80.81
1993	0.04	0.01	0.05	88.70	0.005	0.00	88.75
1994	0.03	0.01	0.04	91.29	0.005	0.00	91.33
1995	0.02	0.01	0.03	97.84	0.005	0.00	97.88
1996	0.02	0.01	0.03	99.27	0.004	0.00	99.30
1997	0.01	0.01	0.02	101.85	0.002	0.00	101.87
1998	0.00	0.01	0.01	110.63	0.001	0.00	110.64
1999	0.00	0.01	0.01	115.14	0.001	0.00	115.15
2000	0.00	0.01	0.01	117.21	0.001	0.00	117.23
2001	0.00	0.01	0.01	117.22	0.001	0.01	117.24
2002	0.00	0.01	0.01	122.01	0.001	0.02	122.04
2003	0.00	0.01	0.01	125.02	0.001	0.03	125.06
2004	0.00	0.01	0.01	130.35	0.001	0.04	130.41
2005	0.00	0.01	0.01	133.89	0.001	0.04	133.94
2006	0.00	0.01	0.01	138.48	0.001	0.04	138.54
2007	0.00	0.01	0.01	143.48	0.001	0.05	143.54
2008	0.00	0.01	0.01	147.90	0.001	0.05	147.96
2009	0.00	0.01	0.01	152.38	0.001	0.05	152.44
2010	0.00	0.01	0.01	157.76	0.001	0.05	157.83
2011	0.00	0.01	0.01	162.75	0.001	0.06	162.81
2012	0.00	0.01	0.01	167.73	0.001	0.06	167.80
2013	0.00	0.01	0.01	172.80	0.001	0.06	172.87
2014	0.00	0.01	0.01	177.96	0.001	0.07	178.04
2015	0.00	0.01	0.01	183.17	0.001	0.08	183.26
2016	0.00	0.01	0.01	188.38	0.001	0.08	188.47
2017	0.00	0.01	0.01	194.54	0.001	0.09	194.64
2018	0.00	0.01	0.01	199.63	0.001	0.10	199.74
2019	0.00	0.01	0.01	204.55	0.001	0.11	204.67
2020	0.00	0.01	0.01	209.38	0.001	0.12	209.51

Notes: LP/LRP = leaded petrol / lead replacement petrol (all sales in this category after 2001 are LRP).

ULP/PULP = unleaded petrol / premium unleaded petrol.

ADO – automotive diesel oil.

LPG – liquefied petroleum gas.

NG – natural gas.

Source: BTRE estimates.

TABLE 2.25 BASE CASE PROJECTIONS OF TOTAL BUS ENERGY CONSUMPTION,  
1990-2020

Year	LP/LRP	ULP/PULP	Total petrol	(petajoules)			
				ADO	LPG	NG	Total
1990	0.68	0.07	0.75	13.39	0.0003	0.00	14.14
1991	0.62	0.14	0.75	12.59	0.0003	0.07	13.42
1992	0.55	0.21	0.75	12.14	0.0003	0.14	13.03
1993	0.48	0.27	0.75	11.94	0.0003	0.21	12.90
1994	0.41	0.34	0.75	12.35	0.0003	0.24	13.34
1995	0.34	0.41	0.75	12.59	0.0003	0.27	13.62
1996	0.27	0.48	0.75	12.89	0.0003	0.34	13.99
1997	0.21	0.55	0.75	13.19	0.0003	0.41	14.36
1998	0.14	0.62	0.75	13.52	0.0003	0.48	14.75
1999	0.07	0.68	0.75	13.82	0.0003	0.55	15.12
2000	0.07	0.68	0.75	14.59	0.0003	0.62	15.96
2001	0.06	0.68	0.74	13.94	0.0003	0.96	15.64
2002	0.05	0.68	0.73	13.76	0.0003	1.30	15.79
2003	0.04	0.68	0.72	13.61	0.0003	1.64	15.98
2004	0.03	0.68	0.71	13.48	0.0003	1.98	16.18
2005	0.02	0.68	0.71	13.59	0.0003	2.08	16.39
2006	0.02	0.68	0.70	13.62	0.0003	2.19	16.51
2007	0.00	0.68	0.68	13.84	0.0003	2.30	16.82
2008	0.00	0.68	0.68	13.95	0.0003	2.41	17.05
2009	0.00	0.68	0.68	14.07	0.0003	2.53	17.28
2010	0.00	0.68	0.68	14.21	0.0003	2.66	17.55
2011	0.00	0.68	0.68	14.33	0.0004	2.79	17.81
2012	0.00	0.68	0.68	14.46	0.0004	2.93	18.07
2013	0.00	0.68	0.68	14.58	0.0004	3.08	18.34
2014	0.00	0.68	0.68	14.68	0.0004	3.23	18.60
2015	0.00	0.68	0.68	14.79	0.0004	3.39	18.87
2016	0.00	0.68	0.68	14.89	0.0004	3.56	19.14
2017	0.00	0.68	0.68	15.03	0.0004	3.74	19.45
2018	0.00	0.68	0.68	15.12	0.0004	3.93	19.74
2019	0.00	0.68	0.68	15.22	0.0005	4.12	20.02
2020	0.00	0.68	0.68	15.39	0.0005	4.33	20.41

Notes: LP/LRP = leaded petrol / lead replacement petrol (all sales in this category after 2001 are LRP).

ULP/PULP = unleaded petrol / premium unleaded petrol.

ADO – automotive diesel oil.

LPG – liquefied petroleum gas.

NG – natural gas.

Source: BTRE estimates.

TABLE 2.26 BASE CASE PROJECTIONS OF TOTAL  
MOTORCYCLE ENERGY CONSUMPTION,  
1990-2020  
(petajoules)

<i>Year</i>	<i>Petrol</i>
1990	3.49
1991	3.30
1992	3.26
1993	3.22
1994	3.18
1995	3.14
1996	3.25
1997	3.25
1998	3.25
1999	3.25
2000	3.28
2001	3.31
2002	3.34
2003	3.37
2004	3.40
2005	3.43
2006	3.46
2007	3.49
2008	3.51
2009	3.54
2010	3.57
2011	3.59
2012	3.62
2013	3.64
2014	3.66
2015	3.69
2016	3.71
2017	3.73
2018	3.76
2019	3.78
2020	3.80

*Source:* BTRE estimates.

TABLE 2.27 BASE CASE PROJECTIONS OF TOTAL MOTOR VEHICLE ENERGY CONSUMPTION BY FUEL TYPE, 1990-2020  
*(petajoules)*

Year	Petrol	ADO	LPG	NG	Ethanol	Total
1990	566.30	192.46	25.94	0.06	0.00	784.76
1991	564.35	187.62	25.16	0.17	0.00	777.30
1992	563.50	189.54	31.12	0.30	0.05	784.50
1993	570.32	198.92	34.93	0.42	0.07	804.65
1994	574.83	206.20	37.34	0.56	0.09	819.03
1995	592.72	217.97	40.40	0.67	0.12	851.87
1996	602.46	223.10	43.49	0.79	0.16	869.99
1997	598.78	229.82	48.59	0.90	0.23	878.32
1998	605.53	245.46	51.71	1.04	0.47	904.21
1999	614.38	255.73	53.02	1.17	0.70	925.00
2000	620.49	263.36	54.38	1.29	0.82	940.34
2001	617.94	266.15	55.08	1.71	0.94	941.82
2002	631.37	276.50	54.86	2.14	1.05	965.93
2003	651.41	282.89	57.09	2.60	1.11	995.11
2004	670.30	293.13	58.73	3.07	1.16	1026.39
2005	688.05	300.48	60.36	3.30	1.22	1053.40
2006	695.68	309.14	61.87	3.54	1.28	1071.52
2007	703.90	318.77	63.51	3.82	1.35	1091.35
2008	711.28	327.20	65.09	4.13	1.42	1109.11
2009	717.87	335.69	66.70	4.59	1.49	1126.35
2010	724.93	346.20	68.57	5.15	1.57	1146.42
2011	729.82	355.80	70.36	5.79	1.64	1163.42
2012	734.24	365.41	72.18	6.56	1.73	1180.12
2013	737.73	375.20	74.05	7.47	1.82	1196.27
2014	740.75	385.23	75.96	8.56	1.91	1212.41
2015	743.02	395.42	77.92	9.88	2.01	1228.24
2016	744.26	405.79	79.92	11.45	2.11	1243.52
2017	745.84	418.18	82.12	13.38	2.21	1261.73
2018	745.67	428.78	84.27	15.68	2.33	1276.72
2019	744.54	439.25	86.46	18.47	2.44	1291.17
2020	742.55	449.87	88.60	21.86	2.57	1305.44

Notes: ADO – automotive diesel oil.

LPG – liquefied petroleum gas.

NG – natural gas.

Source: BTRE estimates.

TABLE 2.28 BASE CASE PROJECTIONS OF NATIONAL MOTOR VEHICLE ENERGY CONSUMPTION BY TYPE OF VEHICLE, 1990-2020  
*(petajoules)*

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	510.3	104.8	71.1	80.9	14.1	3.5	784.8
1991	510.7	106.2	64.2	79.5	13.4	3.3	777.3
1992	517.1	107.3	63.0	80.8	13.0	3.3	784.5
1993	528.3	108.8	62.8	88.8	12.9	3.2	804.7
1994	536.6	109.2	65.4	91.3	13.3	3.2	819.0
1995	555.6	115.2	66.5	97.9	13.6	3.1	851.9
1996	568.8	117.0	67.7	99.3	14.0	3.3	870.0
1997	570.9	118.5	69.4	101.9	14.4	3.3	878.3
1998	578.6	125.9	71.1	110.6	14.7	3.3	904.2
1999	589.8	130.0	71.7	115.2	15.1	3.3	925.0
2000	599.1	132.6	72.2	117.2	16.0	3.3	940.3
2001	596.5	137.1	72.0	117.2	15.6	3.3	941.8
2002	607.7	143.1	73.9	122.0	15.8	3.3	965.9
2003	628.3	148.1	74.3	125.1	16.0	3.4	995.1
2004	647.5	152.7	76.2	130.4	16.2	3.4	1026.4
2005	665.3	157.9	76.5	133.9	16.4	3.4	1053.4
2006	673.9	161.9	77.2	138.5	16.5	3.5	1071.5
2007	682.7	166.7	78.2	143.5	16.8	3.5	1091.3
2008	691.1	170.8	78.7	148.0	17.0	3.5	1109.1
2009	698.9	174.9	79.2	152.4	17.3	3.5	1126.3
2010	706.5	180.8	80.1	157.8	17.6	3.6	1146.4
2011	712.6	185.8	80.8	162.8	17.8	3.6	1163.4
2012	718.5	190.9	81.3	167.8	18.1	3.6	1180.1
2013	723.6	196.0	81.7	172.9	18.3	3.6	1196.3
2014	728.6	201.3	82.2	178.0	18.6	3.7	1212.4
2015	733.2	206.6	82.6	183.3	18.9	3.7	1228.2
2016	737.2	212.0	83.0	188.5	19.1	3.7	1243.5
2017	741.5	218.5	83.8	194.6	19.5	3.7	1261.7
2018	744.9	224.4	84.1	199.7	19.7	3.8	1276.7
2019	748.1	230.4	84.2	204.7	20.0	3.8	1291.2
2020	751.0	236.5	84.2	209.5	20.4	3.8	1305.4

Sources: BTRE estimates, BTRE (2002), BTE (1999).

**Figure 2.5 Base case projections of national motor vehicle energy consumption by type of vehicle, 1990-2020**

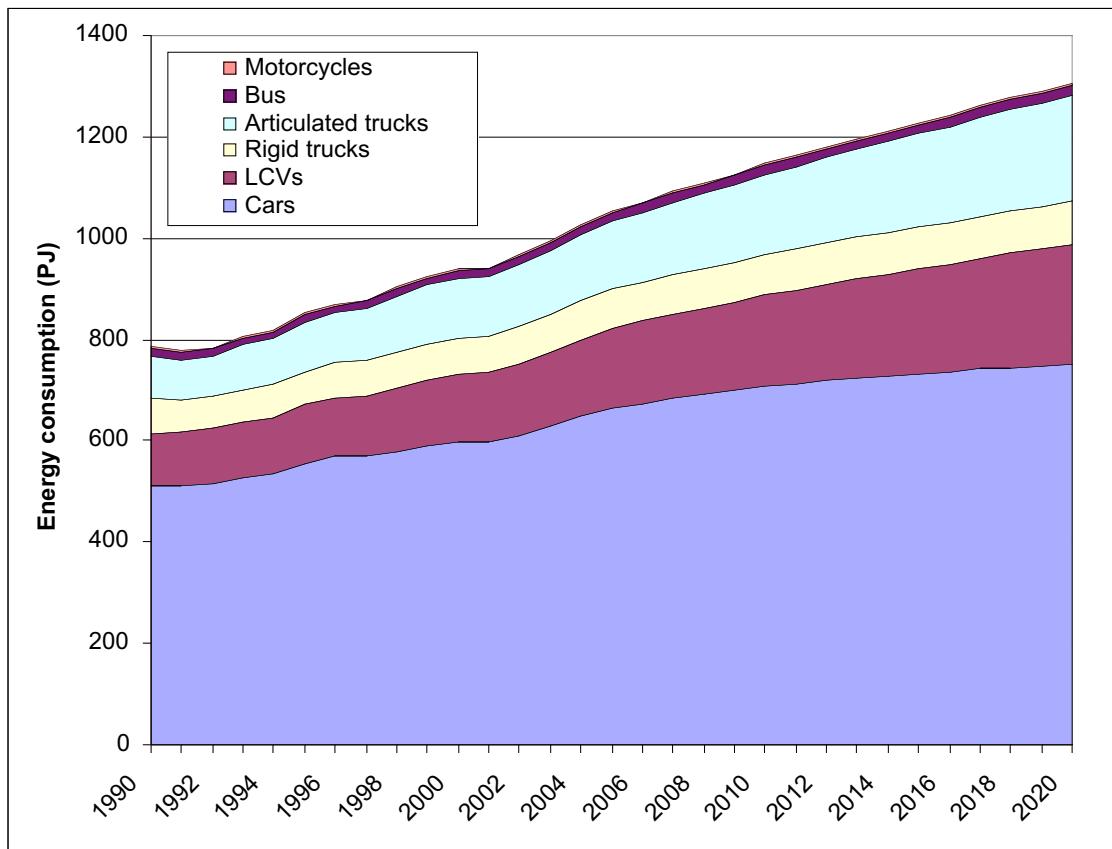


TABLE 2.29 BASE CASE PROJECTIONS OF METROPOLITAN ENERGY CONSUMPTION  
BY TYPE OF VEHICLE, 1990-2020  
(petajoules)

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	303.8	57.1	43.5	13.1	6.6	1.7	425.9
1991	304.0	53.9	41.0	12.3	6.6	1.6	419.4
1992	307.9	54.1	40.1	12.7	6.5	1.6	422.9
1993	315.0	57.7	39.6	13.2	6.3	1.6	433.5
1994	320.5	58.5	39.9	14.2	6.5	1.6	441.3
1995	334.1	61.5	41.4	15.6	6.7	1.5	460.8
1996	342.9	67.1	41.4	16.6	6.9	1.6	476.5
1997	345.0	68.8	41.3	17.5	7.1	1.6	481.3
1998	350.5	70.4	40.6	18.2	7.4	1.6	488.7
1999	357.7	74.1	40.9	19.7	7.6	1.6	501.6
2000	364.6	73.3	40.0	19.8	8.0	1.6	507.4
2001	364.6	78.2	40.5	20.2	7.9	1.6	513.2
2002	372.8	82.9	42.2	21.4	8.0	1.6	528.9
2003	387.1	86.7	42.4	21.9	8.2	1.7	547.9
2004	400.5	90.3	43.3	22.9	8.3	1.7	566.9
2005	413.5	94.7	43.6	24.0	8.4	1.7	586.0
2006	420.4	98.2	44.3	25.2	8.5	1.7	598.4
2007	427.7	102.4	45.3	26.5	8.7	1.7	612.3
2008	434.7	106.1	46.0	27.8	8.8	1.7	625.3
2009	441.5	110.1	46.8	29.1	9.0	1.7	638.2
2010	448.4	114.7	47.7	30.7	9.2	1.8	652.5
2011	454.2	118.8	48.4	32.1	9.4	1.8	664.7
2012	460.0	123.0	49.1	33.6	9.5	1.8	677.1
2013	465.5	127.4	49.8	35.2	9.7	1.8	689.3
2014	470.9	131.9	50.5	36.8	9.8	1.8	701.8
2015	476.2	136.5	51.2	38.6	10.0	1.8	714.3
2016	481.1	141.3	51.9	40.4	10.2	1.8	726.7
2017	486.6	147.1	52.9	42.5	10.5	1.8	741.4
2018	491.4	152.2	53.6	44.5	10.7	1.9	754.2
2019	496.1	157.6	54.3	46.6	10.8	1.9	767.3
2020	500.8	163.1	55.0	48.7	11.1	1.9	780.6

Sources: BTRE estimates, BTRE (2002), BTE(1999).

**Figure 2.6 Base case projections of metropolitan motor vehicle energy consumption by type of vehicle, 1990-2020**

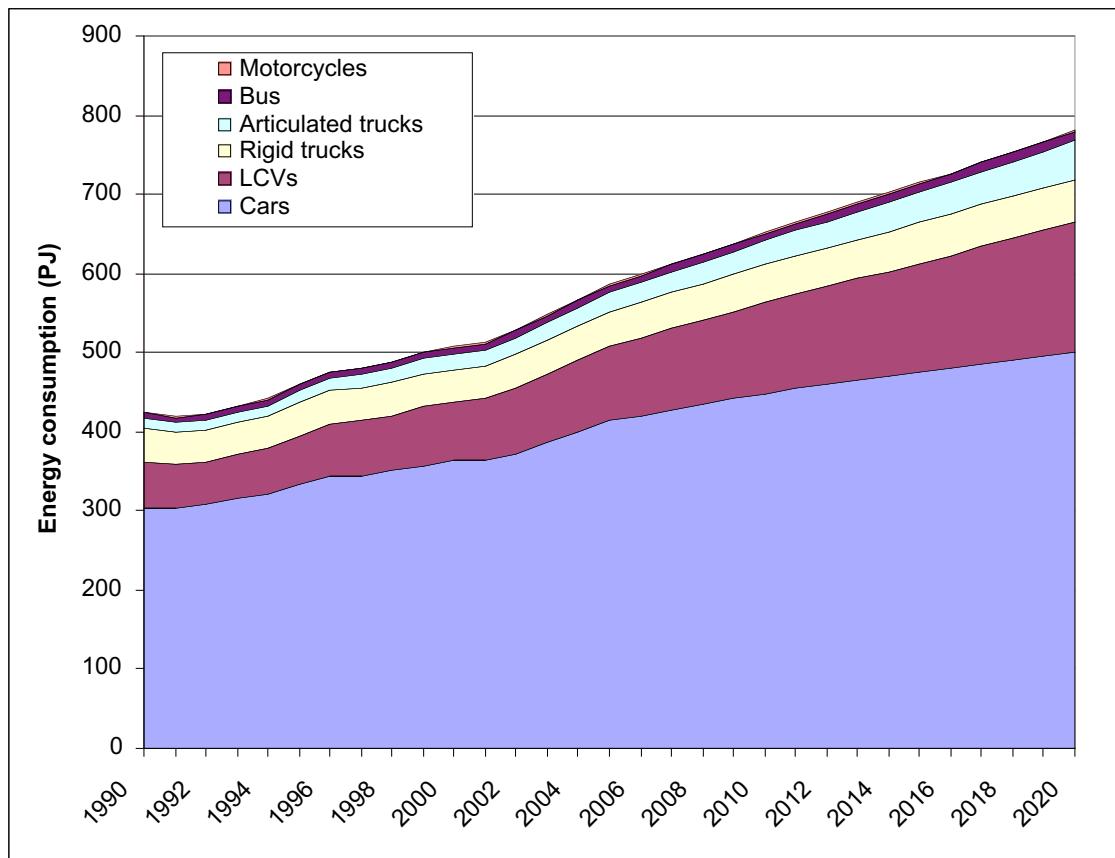


TABLE 2.30 BASE CASE PROJECTIONS OF NON-METROPOLITAN ENERGY CONSUMPTION BY TYPE OF VEHICLE, 1990-2020  
(petajoules)

Year	Cars	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	206.5	47.7	27.6	67.8	7.5	1.8	358.8
1991	206.7	52.3	23.2	67.2	6.8	1.7	357.9
1992	209.2	53.2	23.0	68.1	6.5	1.7	361.6
1993	213.2	51.0	23.2	75.5	6.6	1.6	371.2
1994	216.1	50.7	25.5	77.1	6.8	1.6	377.8
1995	221.5	53.6	25.1	82.3	6.9	1.6	391.1
1996	225.8	49.9	26.3	82.7	7.1	1.6	393.5
1997	225.9	49.7	28.1	84.4	7.2	1.6	397.0
1998	228.1	55.5	30.5	92.4	7.3	1.6	415.5
1999	232.1	56.0	30.8	95.5	7.5	1.6	423.4
2000	234.4	59.2	32.3	97.4	7.9	1.7	432.9
2001	231.9	58.9	31.5	97.0	7.8	1.7	428.7
2002	234.9	60.2	31.8	100.6	7.8	1.7	437.1
2003	241.2	61.4	31.8	103.2	7.8	1.7	447.2
2004	247.0	62.3	32.9	107.5	7.9	1.7	459.4
2005	251.8	63.1	32.8	109.9	8.0	1.7	467.4
2006	253.5	63.6	32.9	113.4	8.0	1.8	473.1
2007	255.0	64.3	32.9	117.0	8.1	1.8	479.1
2008	256.4	64.6	32.7	120.2	8.2	1.8	483.9
2009	257.4	64.9	32.5	123.3	8.3	1.8	488.2
2010	258.1	66.1	32.4	127.2	8.3	1.8	493.9
2011	258.4	67.0	32.3	130.7	8.4	1.8	498.7
2012	258.4	67.9	32.1	134.2	8.6	1.8	503.0
2013	258.2	68.7	31.9	137.7	8.7	1.8	506.9
2014	257.7	69.4	31.7	141.2	8.8	1.9	510.6
2015	257.1	70.1	31.3	144.7	8.9	1.9	513.9
2016	256.1	70.7	31.1	148.1	9.0	1.9	516.8
2017	255.0	71.5	30.9	152.1	9.0	1.9	520.4
2018	253.6	72.2	30.5	155.2	9.1	1.9	522.5
2019	252.0	72.8	29.9	158.1	9.2	1.9	523.9
2020	250.2	73.3	29.2	160.8	9.3	1.9	524.8

Sources: BTRE estimates, BTRE (2002), BTE (1999).

## Metropolitan fuel consumption by city

TABLE 2.31 BASE CASE PROJECTIONS OF METROPOLITAN FUEL USE BY PASSENGER CARS TO 2020

(million litres of gasoline equivalent)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	2846	2737	1079	800	970	134	47	270	8883
1991	2852	2730	1084	810	966	131	49	267	8889
1992	2866	2750	1112	816	991	135	53	279	9002
1993	2932	2817	1135	835	1015	138	54	285	9211
1994	2983	2868	1154	849	1034	141	54	290	9372
1995	3108	2991	1202	884	1079	147	56	302	9769
1996	3189	3071	1233	906	1110	151	57	310	10027
1997	3214	3089	1239	910	1116	152	58	311	10088
1998	3235	3169	1257	954	1121	148	60	307	10249
1999	3285	3242	1306	954	1140	154	60	317	10460
2000	3379	3288	1308	977	1171	159	62	318	10661
2001	3380	3290	1312	969	1176	156	63	315	10662
2002	3456	3365	1348	985	1206	157	64	320	10900
2003	3588	3488	1410	1015	1258	160	67	331	11317
2004	3712	3602	1469	1043	1308	163	69	343	11710
2005	3833	3712	1528	1070	1357	165	71	353	12090
2006	3899	3768	1565	1080	1386	165	73	357	12293
2007	3967	3824	1604	1091	1418	165	74	361	12505
2008	4034	3879	1644	1100	1449	165	75	365	12711
2009	4099	3931	1683	1109	1479	165	76	369	12910
2010	4164	3981	1725	1116	1511	164	77	372	13111
2011	4220	4022	1763	1121	1540	163	78	375	13282
2012	4275	4061	1802	1125	1570	162	79	377	13451
2013	4327	4096	1841	1128	1598	161	80	379	13610
2014	4379	4129	1882	1131	1628	160	80	380	13769
2015	4430	4160	1923	1132	1657	158	81	382	13923
2016	4477	4187	1964	1132	1687	156	82	382	14067
2017	4530	4215	2010	1133	1719	154	82	384	14227
2018	4576	4237	2054	1132	1750	152	83	384	14368
2019	4621	4257	2099	1129	1781	150	83	384	14505
2020	4666	4275	2145	1127	1812	148	84	384	14642

Sources: BTRE estimates.

TABLE 2.32      BASE CASE PROJECTIONS OF METROPOLITAN FUEL USE BY LCVS  
TO 2020

(million litres of gasoline equivalent)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	607.3	383.2	222.3	133.0	224.0	25.0	22.1	54.0	1670.9
1991	572.5	361.3	209.6	125.4	211.2	23.6	20.8	50.9	1575.4
1992	574.7	361.5	212.4	125.2	213.1	23.5	20.9	51.1	1582.5
1993	612.3	384.0	228.6	132.5	228.3	24.9	22.3	54.6	1687.5
1994	619.8	387.6	233.9	133.3	232.5	25.1	22.6	55.4	1710.1
1995	650.8	405.9	248.8	139.0	245.8	26.2	23.8	58.5	1798.8
1996	708.0	440.4	274.6	150.2	269.5	28.4	26.0	64.1	1961.1
1997	726.1	450.7	282.4	152.4	277.5	28.6	26.3	66.5	2010.6
1998	741.7	461.6	290.2	155.1	284.6	28.8	26.6	68.5	2057.1
1999	780.7	486.0	306.9	161.5	300.5	29.8	27.8	72.4	2165.5
2000	773.5	481.4	303.9	158.7	298.4	29.0	27.3	71.9	2144.2
2001	825.2	513.7	325.1	168.0	319.1	30.4	29.0	76.9	2287.4
2002	874.2	544.5	345.7	177.1	338.8	31.7	30.5	81.4	2423.9
2003	914.1	569.3	363.0	184.2	355.0	32.7	31.6	85.0	2535.0
2004	952.4	592.8	379.7	191.0	370.7	33.4	32.5	88.3	2640.9
2005	999.2	621.4	400.0	199.3	389.8	34.5	33.8	92.4	2770.3
2006	1036.0	643.8	416.4	205.6	405.1	35.2	34.6	95.5	2872.1
2007	1079.9	670.4	435.8	213.1	423.2	36.0	35.7	99.2	2993.4
2008	1119.9	694.5	453.9	219.8	439.9	36.7	36.6	102.4	3103.8
2009	1161.4	719.5	472.7	226.7	457.3	37.4	37.5	105.8	3218.2
2010	1211.0	749.3	495.2	234.9	478.0	38.2	38.6	109.8	3355.1
2011	1254.2	775.0	515.2	241.9	496.4	38.9	39.6	113.4	3474.5
2012	1298.9	801.5	536.0	249.0	515.4	39.5	40.5	117.0	3597.8
2013	1345.0	828.7	557.7	256.3	535.1	40.1	41.4	120.6	3724.8
2014	1392.6	856.6	580.3	263.7	555.6	40.7	42.3	124.4	3856.2
2015	1441.8	885.4	603.9	271.4	576.9	41.3	43.3	128.2	3992.1
2016	1492.2	914.6	628.2	279.1	598.8	41.9	44.3	132.1	4131.2
2017	1553.2	950.0	657.5	288.5	625.3	42.8	45.5	137.1	4299.8
2018	1607.8	981.4	684.4	296.7	649.3	43.3	46.5	141.3	4450.7
2019	1664.5	1013.8	712.6	305.1	674.4	43.9	47.5	145.6	4607.3
2020	1723.5	1047.3	742.1	313.7	700.6	44.5	48.5	150.1	4770.4

Sources: BTRE estimates.

TABLE 2.33      BASE CASE PROJECTIONS OF METROPOLITAN FUEL USE BY RIGID TRUCKS TO 2020

(million litres of ADO equivalent)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	412.2	328.2	134.5	80.1	118.2	24.8	13.1	16.4	1127.6
1991	388.4	309.3	126.7	75.5	111.3	23.4	12.3	15.5	1062.6
1992	379.5	301.2	125.0	73.4	109.3	22.7	12.0	15.2	1038.3
1993	374.8	296.6	124.7	72.0	108.6	22.3	11.9	15.0	1026.0
1994	377.5	297.9	127.0	72.0	110.1	22.4	12.0	15.2	1034.1
1995	390.7	307.5	133.1	74.1	114.7	23.0	12.4	15.8	1071.4
1996	390.5	306.6	135.0	73.6	115.5	23.1	12.6	16.0	1073.0
1997	389.9	305.3	135.1	72.6	115.8	22.9	12.6	16.4	1070.7
1998	382.4	300.3	133.3	71.0	114.0	22.4	12.3	16.4	1052.1
1999	384.7	302.2	134.7	70.6	115.1	22.4	12.4	16.7	1058.8
2000	376.3	295.6	131.8	68.5	112.8	21.7	12.2	16.5	1035.5
2001	381.5	299.7	133.9	69.0	114.7	21.9	12.4	17.0	1050.1
2002	396.7	311.8	139.8	71.3	119.5	22.6	13.0	17.8	1092.4
2003	399.1	313.7	141.2	71.4	120.5	22.7	13.1	18.1	1099.7
2004	407.2	319.8	144.6	72.5	123.2	23.0	13.3	18.6	1122.2
2005	410.1	321.9	146.3	72.6	124.4	23.0	13.4	18.9	1130.7
2006	416.9	326.9	149.3	73.4	126.7	23.0	13.5	19.2	1148.9
2007	426.0	333.7	153.2	74.6	129.8	23.1	13.6	19.5	1173.5
2008	433.0	338.8	156.4	75.4	132.2	23.0	13.7	19.8	1192.3
2009	440.0	343.9	159.6	76.2	134.6	23.0	13.8	20.0	1211.2
2010	449.6	351.0	163.8	77.4	137.9	23.1	13.9	20.3	1237.0
2011	456.2	355.7	167.0	78.1	140.3	23.0	13.9	20.6	1254.9
2012	463.0	360.5	170.3	78.8	142.8	22.9	14.0	20.8	1272.9
2013	469.7	365.2	173.6	79.4	145.3	22.8	14.0	21.0	1291.0
2014	476.6	369.9	177.0	80.1	147.8	22.6	14.0	21.2	1309.3
2015	483.4	374.6	180.4	80.8	150.3	22.5	14.1	21.5	1327.5
2016	490.1	379.1	183.9	81.3	152.8	22.4	14.1	21.7	1345.3
2017	499.6	385.6	188.5	82.4	156.3	22.3	14.2	22.0	1370.9
2018	506.4	390.1	192.1	82.9	159.0	22.2	14.2	22.2	1389.0
2019	513.2	394.5	195.8	83.5	161.6	22.0	14.2	22.4	1407.2
2020	520.1	398.8	199.6	84.0	164.3	21.8	14.2	22.6	1425.4

Sources: BTRE estimates.

TABLE 2.34      BASE CASE PROJECTIONS OF METROPOLITAN FUEL USE BY ARTICULATED TRUCKS TO 2020

(million litres of ADO equivalent)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	107.2	97.5	43.4	29.8	49.5	5.4	5.2	1.9	340.0
1991	100.1	91.1	40.5	27.9	46.3	5.1	4.9	1.8	317.6
1992	103.6	94.0	42.3	28.7	48.1	5.2	5.1	1.8	328.8
1993	108.0	97.7	44.6	29.7	50.5	5.4	5.3	1.9	343.0
1994	115.9	104.5	48.4	31.7	54.5	5.8	5.7	2.1	368.4
1995	126.9	114.1	53.6	34.4	60.1	6.3	6.2	2.3	403.9
1996	134.6	120.8	57.7	36.3	64.2	6.6	6.6	2.4	429.4
1997	142.3	127.3	61.2	38.0	68.1	6.9	6.9	2.6	453.3
1998	147.9	132.7	64.0	39.3	71.1	7.0	7.1	2.7	471.8
1999	159.8	143.4	69.4	42.0	77.1	7.5	7.6	3.0	509.8
2000	161.2	144.7	70.0	42.0	77.9	7.4	7.7	3.0	513.9
2001	164.6	147.7	71.7	42.6	79.8	7.4	7.8	3.1	524.6
2002	173.9	156.1	76.0	44.7	84.4	7.7	8.1	3.2	554.3
2003	177.8	159.7	78.0	45.5	86.5	7.8	8.3	3.3	566.9
2004	185.8	166.7	81.9	47.3	90.6	8.0	8.5	3.4	592.3
2005	195.2	175.1	86.4	49.5	95.5	8.3	8.9	3.6	622.4
2006	204.7	183.4	91.0	51.6	100.3	8.5	9.2	3.8	652.5
2007	215.7	193.1	96.3	54.1	106.0	8.8	9.6	4.0	687.5
2008	226.1	202.1	101.3	56.4	111.3	9.1	9.9	4.1	720.3
2009	236.8	211.6	106.6	58.7	116.9	9.3	10.3	4.3	754.5
2010	249.4	222.5	112.8	61.5	123.4	9.7	10.7	4.5	794.5
2011	260.9	232.5	118.5	63.9	129.4	9.9	11.1	4.7	830.9
2012	273.4	243.2	124.7	66.6	135.9	10.2	11.4	4.9	870.3
2013	286.3	254.4	131.3	69.3	142.8	10.5	11.8	5.1	911.5
2014	299.9	266.0	138.2	72.2	149.9	10.8	12.3	5.3	954.6
2015	314.1	278.1	145.4	75.1	157.5	11.0	12.7	5.6	999.6
2016	328.8	290.6	153.0	78.1	165.4	11.3	13.1	5.8	1046.2
2017	346.2	305.4	162.0	81.7	174.7	11.7	13.6	6.1	1101.4
2018	362.6	319.1	170.6	85.0	183.5	12.0	14.1	6.4	1153.2
2019	379.7	333.4	179.7	88.4	192.8	12.3	14.6	6.6	1207.4
2020	397.2	348.0	189.1	91.9	202.3	12.6	15.0	6.9	1262.9

Sources: BTRE estimates.

TABLE 2.35      BASE CASE PROJECTIONS OF METROPOLITAN FUEL USE BY BUSES  
TO 2020

(million litres of ADO equivalent)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	54.9	39.5	24.6	18.1	20.4	5.0	3.7	5.9	172.0
1991	54.2	38.9	24.6	17.8	20.2	4.9	3.7	5.9	170.3
1992	53.7	38.4	24.6	17.6	20.1	4.8	3.7	5.8	168.8
1993	52.0	37.1	24.3	17.0	19.6	4.7	3.6	5.7	163.9
1994	53.8	38.2	25.4	17.4	20.4	4.8	3.7	5.9	169.6
1995	54.9	38.9	26.2	17.6	21.0	4.9	3.8	6.0	173.4
1996	56.5	39.9	27.2	17.9	21.8	4.9	3.9	6.1	178.3
1997	58.6	41.4	28.3	18.4	22.7	5.0	4.1	6.3	185.0
1998	60.8	43.1	29.6	19.0	23.7	5.1	4.3	6.4	192.1
1999	62.5	44.3	30.5	19.4	24.4	5.2	4.5	6.6	197.4
2000	66.1	46.8	32.3	20.3	25.8	5.4	4.8	6.9	208.4
2001	64.9	45.9	31.7	19.7	25.4	5.2	4.7	6.7	204.3
2002	65.6	46.4	32.3	19.8	25.8	5.2	4.8	6.8	206.6
2003	67.2	47.4	33.3	20.2	26.5	5.3	4.9	6.9	211.7
2004	68.2	48.0	34.0	20.3	27.1	5.3	5.0	7.0	214.9
2005	69.2	48.6	34.8	20.5	27.6	5.3	5.1	7.1	218.2
2006	69.9	49.0	35.4	20.5	28.0	5.2	5.2	7.1	220.3
2007	71.3	49.8	36.3	20.7	28.7	5.3	5.4	7.3	224.9
2008	72.5	50.5	37.2	20.9	29.3	5.3	5.5	7.3	228.4
2009	73.6	51.1	38.0	21.0	29.9	5.3	5.6	7.4	232.0
2010	75.7	52.4	39.4	21.4	30.9	5.4	5.8	7.6	238.5
2011	76.9	53.1	40.4	21.6	31.5	5.4	5.9	7.7	242.5
2012	78.2	53.9	41.3	21.8	32.2	5.4	6.0	7.8	246.6
2013	79.6	54.6	42.4	21.9	32.9	5.4	6.2	7.9	250.8
2014	80.9	55.3	43.4	22.1	33.6	5.4	6.3	7.9	255.0
2015	82.2	56.1	44.5	22.3	34.4	5.4	6.5	8.0	259.3
2016	83.6	56.8	45.6	22.5	35.1	5.4	6.6	8.1	263.7
2017	86.0	58.2	47.2	22.9	36.3	5.5	6.8	8.3	271.3
2018	87.5	59.0	48.4	23.1	37.1	5.5	7.0	8.4	276.0
2019	89.0	59.8	49.7	23.2	38.0	5.5	7.1	8.5	280.8
2020	91.0	60.8	51.2	23.5	39.0	5.5	7.3	8.6	287.0

Sources: BTRE estimates.

TABLE 2.36      BASE CASE PROJECTIONS OF METROPOLITAN FUEL USE BY  
MOTORCYCLES TO 2020  
*(million litres of gasoline equivalent)*

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	17.63	11.49	9.79	4.01	4.09	0.63	0.53	2.05	50.22
1991	16.67	10.84	9.35	3.79	3.88	0.59	0.50	1.96	47.58
1992	16.43	10.65	9.34	3.72	3.83	0.58	0.49	1.95	47.01
1993	16.18	10.45	9.38	3.65	3.79	0.57	0.49	1.93	46.43
1994	15.95	10.24	9.38	3.57	3.76	0.56	0.49	1.90	45.86
1995	15.72	10.06	9.36	3.49	3.73	0.55	0.49	1.88	45.27
1996	16.26	10.38	9.77	3.58	3.88	0.56	0.51	1.93	46.87
1997	16.25	10.36	9.83	3.55	3.91	0.55	0.52	1.91	46.87
1998	16.23	10.36	9.87	3.53	3.93	0.54	0.52	1.89	46.86
1999	16.22	10.35	9.90	3.51	3.94	0.54	0.52	1.88	46.86
2000	16.37	10.46	10.04	3.51	4.00	0.53	0.53	1.89	47.33
2001	16.50	10.56	10.16	3.52	4.05	0.53	0.53	1.90	47.76
2002	16.63	10.65	10.30	3.53	4.09	0.53	0.54	1.91	48.18
2003	16.76	10.75	10.43	3.54	4.14	0.53	0.54	1.91	48.60
2004	16.89	10.83	10.56	3.56	4.18	0.53	0.55	1.91	49.01
2005	17.02	10.92	10.70	3.57	4.23	0.52	0.55	1.91	49.43
2006	17.15	11.00	10.83	3.58	4.28	0.52	0.55	1.91	49.83
2007	17.27	11.09	10.96	3.59	4.32	0.52	0.56	1.91	50.23
2008	17.40	11.17	11.09	3.61	4.37	0.51	0.56	1.91	50.62
2009	17.52	11.25	11.22	3.62	4.41	0.51	0.57	1.91	51.02
2010	17.65	11.34	11.36	3.63	4.46	0.51	0.57	1.91	51.41
2011	17.75	11.41	11.48	3.64	4.50	0.50	0.57	1.91	51.76
2012	17.86	11.48	11.60	3.64	4.54	0.50	0.58	1.90	52.10
2013	17.96	11.55	11.72	3.65	4.58	0.50	0.58	1.90	52.45
2014	18.07	11.62	11.84	3.66	4.63	0.49	0.58	1.90	52.79
2015	18.17	11.69	11.97	3.66	4.67	0.49	0.59	1.89	53.14
2016	18.27	11.76	12.09	3.67	4.71	0.48	0.59	1.89	53.46
2017	18.37	11.83	12.20	3.68	4.75	0.48	0.59	1.88	53.79
2018	18.47	11.89	12.32	3.68	4.79	0.48	0.60	1.88	54.11
2019	18.57	11.96	12.44	3.69	4.83	0.47	0.60	1.87	54.44
2020	18.67	12.03	12.56	3.69	4.87	0.47	0.60	1.87	54.76

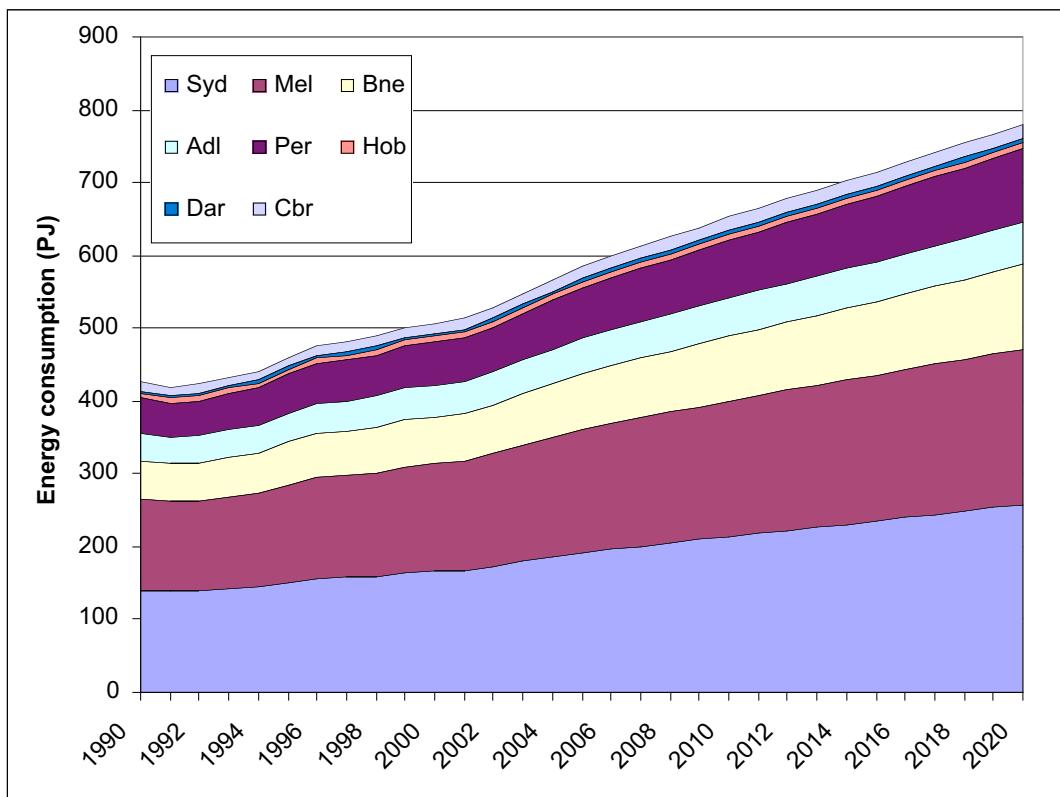
Sources: BTRE estimates.

TABLE 2.37      BASE CASE PROJECTIONS OF METROPOLITAN ENERGY USE BY ALL MOTOR VEHICLES TO 2020

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	140.9	125.1	52.7	37.0	48.2	6.8	3.2	12.1	425.9
1991	138.6	123.0	52.0	36.8	47.3	6.6	3.2	11.8	419.4
1992	138.9	123.5	53.0	36.9	48.2	6.7	3.3	12.2	422.9
1993	142.4	126.5	54.4	37.8	49.6	6.9	3.4	12.6	433.5
1994	144.9	128.7	55.5	38.4	50.6	7.0	3.5	12.8	441.3
1995	151.2	134.3	58.2	40.0	53.0	7.3	3.6	13.3	460.8
1996	156.3	138.5	60.4	41.2	55.1	7.5	3.8	13.8	476.5
1997	158.1	139.7	61.0	41.4	55.8	7.5	3.8	14.0	481.3
1998	159.4	142.9	62.0	43.0	56.3	7.4	3.9	13.9	488.7
1999	163.0	146.8	64.6	43.4	57.8	7.7	4.0	14.4	501.6
2000	165.9	148.1	64.5	44.0	58.8	7.8	4.0	14.4	507.4
2001	168.0	149.5	65.5	44.1	59.8	7.7	4.1	14.5	513.2
2002	173.2	153.9	67.9	45.1	61.8	7.8	4.3	14.9	528.9
2003	179.4	159.2	70.7	46.4	64.3	8.0	4.4	15.4	547.9
2004	185.6	164.5	73.6	47.7	66.8	8.1	4.5	15.9	566.9
2005	191.9	169.6	76.6	49.0	69.4	8.3	4.7	16.4	586.0
2006	196.1	172.8	78.8	49.7	71.3	8.3	4.8	16.7	598.4
2007	200.7	176.4	81.2	50.5	73.3	8.3	4.9	17.0	612.3
2008	205.1	179.6	83.5	51.2	75.3	8.4	5.0	17.3	625.3
2009	209.5	182.8	85.9	51.8	77.2	8.4	5.0	17.5	638.2
2010	214.3	186.3	88.5	52.5	79.5	8.4	5.1	17.8	652.5
2011	218.5	189.2	90.9	53.1	81.4	8.4	5.2	18.0	664.7
2012	222.7	192.1	93.4	53.6	83.5	8.4	5.3	18.2	677.1
2013	226.9	194.8	95.9	54.1	85.5	8.4	5.4	18.5	689.3
2014	231.1	197.6	98.4	54.5	87.6	8.4	5.5	18.7	701.8
2015	235.4	200.3	101.1	55.0	89.8	8.3	5.6	18.9	714.3
2016	239.6	202.9	103.8	55.4	92.0	8.3	5.6	19.0	726.7
2017	244.6	206.0	107.0	56.0	94.5	8.3	5.7	19.3	741.4
2018	249.0	208.5	109.9	56.3	96.9	8.2	5.8	19.5	754.2
2019	253.5	211.1	113.0	56.7	99.3	8.2	5.9	19.6	767.3
2020	258.1	213.6	116.2	57.1	101.8	8.1	6.0	19.8	780.6

Sources: BTRE estimates.

**Figure 2.7 Base case projections of metropolitan motor vehicle energy consumption by city, 1990-2020**



## CHAPTER 3 POLLUTANT VEHICLE EMISSION PROJECTIONS BY STATE AND TERRITORY FOR METROPOLITAN AND NON-METROPOLITAN AREAS

The estimation of pollutant emissions from motor vehicles is typically quite complex, since emission levels depend on a wide variety of factors, including:

- amount and type of vehicle activity (by vehicles of varying sizes);
- exact class of vehicle and the type of pollution control equipment fitted;
- the type of fuel used and the average rates of fuel consumption;
- the condition of the vehicle (especially the vehicle age and average level of maintenance);
- vehicle operating characteristics (such as average driver behaviour, weather conditions, road type and traffic levels).

Specifically, detailed estimation methods can require information on a diverse range of factors, such as:

- the average utilisation rates for the different vehicle types (by area of operation);
- the different average emission rates for vehicles manufactured in different years (typically derived using dynamometer cycle tests);
- the differences in emission performance over the different dynamometer cycle tests used for certifying new vehicles to the various emission standards (eg data provided by the DOTARS 2001 *Comparative Vehicle Emissions Study*);
- the typical difference between emission rates derived for tests over such certification cycles and *actual on-road* emission rates (eg using comparative results of vehicle tests over the Watson AUC – Australian Urban Cycle – and the various certification cycles);
- average rates of deterioration in emissions performance (for each pollutant species) as vehicles age (eg data provided by the FORS 1996 study on in-service vehicle testing);

- dependence of emission rates of congestion levels (and resulting variation in average vehicle speeds and amount of stop-start driving conditions);
- the specifications of the fuels the vehicles are using (especially with regard to parameters such as sulphur, lead and benzene content);
- the effects of heightened emission output for cold engine starts (especially for catalyst equipped vehicles);
- likely penetration rates for future technology improvements (especially to emission control equipment); and
- the contribution to average emission rates from gross polluting vehicles. For example, the FORS In-Service Vehicle Emissions Study found that the emission gains from servicing vehicle fleets (tuning and other maintenance) were not distributed uniformly across the tested vehicles. Typically, around 80 per cent of the total emission reductions available from tuning the entire sample fleet were delivered after tuning the worst 20 per cent of the vehicles (FORS 1996).

### **Base case projections**

Under the base case assumptions concerning future vehicle travel demand (see chapter 1 and appendix 1), fuel efficiency (see chapter 2), future vehicle design and fuel standards (see appendix tables I.8 to I.10c) and vehicle fleet emission characteristics (eg see appendix figures I.4 to I.10), total fleet emissions are generally expected to decline steadily over the next 20 years, but still remain at significant levels.

With the introduction of Lead Replacement Petrol (LRP), metropolitan emissions of lead due to motor vehicle fuel consumption are now at low levels (with projected output of around 14 tonnes annually being only 0.6 per cent the level emitted in 1990 – table 3.1).

Total metropolitan emissions of sulfur oxides ( $\text{SO}_x$  – table 3.2) from motor vehicles are also projected to decline strongly - following the reductions in fuel sulfur content with the new fuel standards (see tables I.8 and I.9) - falling by over 50 per cent between 2000 and 2020. Emission levels will still however remain significant (at around 3.6 thousand tonnes per annum in 2020) unless standards on fuel sulfur content are tightened further than currently specified (ie at 150 ppm for petrol and 50 ppm for diesel by 2006).

Metropolitan emissions of carbon monoxide (CO) are projected to decline by around 38 per cent by 2020, reaching levels of about 1.5 million tonnes per annum.

Projected emissions of nitrogen oxides ( $\text{NO}_x$ ) decline less, in the base case, than CO emissions – decreasing by around 23 per cent between 2000 and 2020 (to a level of about 205 thousand tonnes per annum for metropolitan Australia).

A wide range of volatile organic compounds (VOCs) are emitted from vehicle exhausts and from vehicle fuel evaporation. Emissions of metropolitan VOCs (total – ie the sum of exhaust and evaporative VOCs, for all gaseous species emitted) are projected to decline by around 21 per cent between 2000 and 2020 (with 2020 emissions of about 278 thousand tonnes per annum). Exhaust emissions of VOCs are projected to decline at a faster rate than total VOC output (down by 38 per cent over 2000-2020), since:

- this study assumes evaporative running (and resting) losses are substantial (eg averaging, over the different seasons, between 0.4 and 0.9 g/km for petrol cars, depending on the driving conditions); and
- the new ADRs do not significantly tighten standards for evaporative emissions, so it assumed that fleet decreases in evaporative VOC levels will not be as large as for exhaust emissions.

If future vehicle models happen to have substantially lower evaporative emissions than current vehicles, the trend decreases in fleet emissions of total VOCs will likely be similar to that projected for (base case) CO emissions.

The results given here (eg tables 3.5 to 3.7) relate to direct emissions from vehicle operation. The inclusion of VOC emissions from vehicle re-fuelling (and other evaporative losses from Service stations) would probably add around 10-15 per cent to the estimated VOC totals. Inclusion of all vehicle-related activities that generate significant VOC losses (such as Service stations and other fuel storage, automotive refinishing and petroleum refining) could increase the estimated VOC totals by the order of 25 per cent.

The base case projections for metropolitan emissions of particulate matter (PM) from motor vehicle exhausts (for all particle sizes) do not exhibit the declines evident for projections of other major pollutants. Base case projections of PM emissions (table 3.8) remain essentially stable over the projection period. Emissions of particulate matter from heavy vehicles should decline substantially following introduction of future vehicle design and fuel standards, but petrol car PM emissions are unregulated in the new standards and are therefore assumed to not exhibit emission rate declines of the magnitudes forecast for diesel vehicles.

The PM projections are probably the part of the analysis with the greatest uncertainty – since there has not been anywhere near the same amount of vehicle testing for PM emissions as for emissions of CO, NOx and VOCs. The (base case) modelled result of total metropolitan PM emissions being stable over the next 20 years is sensitive to several assumptions, due to a paucity of data on the details of average fleet PM production:

- average PM rates for petrol vehicles are not well known even for current vehicle fleets, let alone for models meeting future design standards – and

- more testing, both of new cars and in-service vehicles, would be useful in improving the accuracy of fleet PM estimation;
- emission deterioration rates over time are even more uncertain for PM emissions than for other major pollutants – another issue requiring more vehicle testing; and
  - the percentage of the fleet that are '*smokers*' (ie vehicles with visible exhaust smoke) is a crucial input – since smoking vehicles typically have average PM emission rates over 10 times as high as non-smoking vehicles.

Inspection and maintenance campaigns, or roadside monitoring devices (aimed at identifying 'gross polluting' vehicles), could be useful in improving estimates of the percentage and distribution of 'smokers' within the Australian vehicle fleet. The California Air Resources Board (CARB) has done testing which: "determined that at any given time, 2% of all vehicles in California are smoking vehicles. While this study quantifies the number of smoking vehicles overall, it does not assess how this 2% is distributed throughout the fleet" (see [www.arb.ca.gov/msei/on-road/downloads/tsd/TotalPM\\_Emfac00.pdf](http://www.arb.ca.gov/msei/on-road/downloads/tsd/TotalPM_Emfac00.pdf)).

Due to lack of data on the fleet distribution of smoking vehicles, this study has assumed that 2 per cent of each model year in the fleet (after reaching two years of age) are 'smokers'. If the 'smokers' are actually concentrated amongst the older vehicles in the fleet – which tend to have lower average utilisations – then the PM emission estimates (eg table 3.8 values) would be slightly reduced.

As an example of the sensitivity of the projected PM total to the input assumptions:

- if PM emissions (averaged over all Australian driving conditions) from cars meeting Euro 2 emission standards (and beyond) are as low as rates given by the UK National Atmospheric Emissions Inventory database (see [www.naei.org.uk/other/vehicle\\_emissions\\_v7.xls](http://www.naei.org.uk/other/vehicle_emissions_v7.xls));
- if deterioration rates for PM emissions from catalyst-equipped cars (eg see appendix figure I.11) are not as high as the base case assumptions (eg see section 2 of chapter 5); and
- if smoking vehicles were not a significant occurrence (eg see section 3 of chapter 5);

then estimated metropolitan PM emissions for 2020 would be reduced by the order of 40 per cent.

PM emission estimates (such as given in tables 3.8 to 3.11) are direct emissions from vehicles – that is, they include exhaust emissions of particulate matter (including output of elemental carbon, the soluble organic fraction and exhaust sulphates), and particulates generated by vehicle brake and tyre wear. Primary particles (ie those emitted directly into the atmosphere by combustion processes) are generally very small in size - typically less than  $2.5\mu\text{m}$  in diameter and often less than  $1\mu\text{m}$ . For this study, it is estimated that around 90 per cent of total PM emissions from motor vehicle exhaust are less than  $1\mu\text{m}$  in size.

The estimates given here do not include secondary particles – that is, those formed in the atmosphere from chemical reactions involving motor vehicle emissions (such as sulphates forming from SO<sub>x</sub> emissions and nitrates from NO<sub>x</sub> emissions). Secondary particles are also generally less than 2.5µm in diameter, and may account for pollutant levels of a similar magnitude to that of the direct PM emissions.

Since total particulate emissions are primarily from non-combustion sources, direct PM emissions from motor vehicles comprise only a minor proportion of the total suspended particle (TSP) mass for urban air. However, particulate output from most non-combustion sources is relatively coarse (ie a sizeable amount of the particles are larger than 10µm), so motor vehicles account for a significant proportion of the fine component of urban PM concentrations (such as PM2.5 and smaller) – for which the health impacts are typically the most important.

The PM estimates in this study also do not include ‘fugitive dust’ – specifically, ‘*road dust*’ produced as motor vehicle movement gradually pulverises road pavement surfaces and stirs up any suspendable dirt (and other deposited material) on the road. Motor vehicle traffic produces considerable amounts of road dust, perhaps accounting for a particulate load, in the immediate vicinity of the roadway, of 5-10 times that from exhaust PM emissions. However, like most non-combustion PM sources, road dust is relatively coarse compared to vehicle exhaust PM (eg emission inventories by the USEPA imply that only around 20 per cent of road dust TSP is PM10, and that only 25 per cent of the PM10 generated as road dust is also below 2.5µm). USEPA studies have found that even though road dust levels are often high in the vicinity of the roadway, the levels are typically concentrated within 2 metres of the surface, and the material does not typically disperse as widely as other PM from vehicles.

Emissions of particularly toxic VOCs (a variety of which have been estimated separately in this study by applying speciation factors to total VOC output) are projected to decline in line with the downward trend in VOC totals. For example, with future trends in vehicle emission and fuel formulation standards, metropolitan acetaldehyde emissions are forecast to decline by about 28 per cent between 2000 and 2020 – yet still be at a significant level of 2.3 thousand tonnes per annum in 2020. Emissions of formaldehyde (another reactive carbonyl VOC) are projected to decrease by around 33 per cent (to 3.2 thousand tonnes per annum by 2020). Emissions of all carbonyl species from metropolitan motor vehicles are forecast to decline by 32 per cent over 2000-2020 (with 2020 emissions of 9.6 thousand tonnes).

Declines (between 2000 and 2020, for metropolitan levels) are also projected for the following toxic emission species:

- benzene down by 51 per cent, to 4.9 thousand tonnes in 2020;
- toluene down by 33 per cent, to 12.2 thousand tonnes in 2020;
- xylene (total of o, m and p isomer emissions) also down by 33 per cent, to 10.2 thousand tonnes in 2020;
- total polycyclic aromatic hydrocarbon (PAH) species (aggregate of semi-volatile releases, as a component of total VOC emissions, and particle-bound releases, as a component of total PM emissions) down by 28 per cent, to

- 536 tonnes in 2020 (primarily comprising emissions of compounds such as naphthalene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, pyrene, benzo(k)fluoranthene, fluorene, acenaphthene, acenaphthalene, chrysene, anthracene, benzo(ghi)perylene, fluoranthene and phenanthrene);
- 1,3-butadiene down by 32 per cent, to 882 tonnes in 2020;
  - 2020 emissions of acetone down by 29 per cent (to 1.2 thousand tonnes), of acrolein down by 40 per cent (to 280 tonnes), of acetylene down by 39 per cent (to 2.5 thousand tonnes), of cyclohexane down by 27 per cent (to 220 tonnes), of ethylbenzene down by 36 per cent (to 1.7 thousand tonnes), of n-Hexane down by 18 per cent (to 3.4 thousand tonnes), and of styrene down by 37 per cent (to 330 tonnes).

Ozone ( $O_3$ ) is not emitted directly by motor vehicles but is a secondary pollutant that forms in ambient air (in the presence of sunlight) due to chemical reactions between NOx, CO and reactive VOC emissions. The accurate estimation of metropolitan ozone levels due to vehicle emissions of such *ozone-preursors* would require network models of each city (taking in account the relevant traffic conditions, meteorological conditions and topographical effects), which is beyond the scope of this study. Table 3.20 presents estimates of the *ozone reactivity* of the vehicle VOC projections. That is, the estimates refer to how much ozone would typically be produced under stable conditions (for weather and NOx concentrations) from the projected volume of VOC emissions - using values for the average reactivity of major VOC species (in terms of grams of  $O_3$  produced per gram of VOC emitted – based on Hoekman 1992).

In many urban areas, the rate of such VOC conversion (to form ozone) depends much more strongly on the ambient NOx concentrations than upon those of the VOCs. Under these conditions, a reduction in VOC *emission levels* and *reactivity* (as given in table in 3.20) need not lead to a reduction in *actual ozone formation*. Typically, the only sure way of reducing ozone formation rates is to reduce emissions of both NOx and the reactive compounds.

Figures 3.1 to 3.4 show the contributions to total metropolitan emissions (for CO, NOx, VOCs and PM respectively) from the different vehicle types – with cars the single largest contributor for each of the major pollutant types. This is essentially due to cars being the major component of most urban traffic streams, and despite the fact that average emission rates for most pollutants (in grams emitted per kilometre of travel) across the light vehicle fleet will typically be lower than those across the heavy vehicle fleet (eg for PM, compare figures I.9 and I.10).

Obviously, the downward trends projected in the base case will only be obtained if the emission-control technology embodied in future motor vehicle fleets (particularly for new models designed to meet the tightened emission standards) does not suffer high rates of equipment failure (see chapter 5 – section 5.2 – for sensitivity analysis of the projection results with respect to varying equipment deterioration rates). Further research in this area (such as more in-service vehicle testing or more roadside emission sensing) is warranted if emission trend estimation processes are to be improved.

Of course, the trend values presented in this report - which refer to the mass of pollutant emission outputs directly from vehicles – are not completely comparable to trends in the actual concentrations of those pollutants recorded in the atmosphere. To calculate the impact that estimated vehicle emission levels would have on urban air quality (eg for the purposes of human exposure assessment) would typically also require data on:

- background air concentrations of the relevant pollutants;
- emissions from non-vehicular sources (which for some pollutants, such as PM, are very significant);
- the spatial distribution of emission sources (which, for vehicle emissions, often requires techniques such as road network and trip assignment models); and
- the relationships between emission output levels and the resulting ambient air concentrations, for the particular city's landscape (using techniques such as gas dispersion models and smog formation chemistry models).

Underlying the projected trends in total emission output are the base case VKT trends – which, for metropolitan regions include:

- not only increasing travel levels through already heavily-trafficked areas; but also
- higher levels of travel on existing roads that currently have low usage; and
- traffic expanding into new areas (as the cities' population levels and urban boundaries grow over time).

Therefore, even if (over the projection period) there is a trend decrease in a city's total emission estimate for a particular pollutant, it does not mean this decrease will be uniformly distributed across the city's environment. If a particular section of the road network has highly elevated traffic levels in the future, then that area will probably have increasing ambient pollutant concentrations – even with the average emission *rate* (g/km travelled) of the vehicles improving over time (as improved emission technology penetrates an increasing portion of the fleet).

Equivalently (given these improving trends in emissions rates), areas for which future traffic levels remain similar to current levels will tend to exhibit even faster decreases in local air pollution (from vehicles) than implied by the estimated trends in total metropolitan emissions.

Another complicating factor when interpreting total emission trends relates to the effects of cold vehicle starts on emission output (eg see chapter 5 - section 5.5, and appendix figure I.11). For many short car trips, up to half of the pollutant emissions generated are caused by cold start conditions (ie after starting the trip with a cold engine, and before the car's catalytic converter has reached full operating temperature). Figures 3.5 to 3.7 give estimates of the projected trends in average car emission rates for stabilised driving conditions (ie rates that do not include allowance for cold start and high congestion conditions). These rates should be roughly representative of a typical metropolitan arterial road, for which:

- the traffic flows relatively freely;
- the traffic streams consist mostly of cars; and

- the vehicles have generally been travelling for a long enough period to have allowed catalytic converters to reach full operating conditions.

## METROPOLITAN POLLUTANT EMISSIONS BY CITY

TABLE 3.1 BASE CASE PROJECTIONS OF METROPOLITAN LEAD EMISSIONS BY MOTOR VEHICLES TO 2020

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	748.67	672.73	282.23	200.88	257.67	34.71	15.26	69.53	2281.68
1991	680.70	611.49	257.03	184.79	232.99	30.90	14.22	62.50	2074.61
1992	630.20	567.71	242.47	171.38	219.40	29.24	13.67	59.83	1933.90
1993	519.60	467.56	199.90	140.99	181.40	24.08	11.25	49.32	1594.10
1994	408.56	368.13	157.37	110.77	142.95	18.94	8.79	38.79	1254.30
1995	255.86	230.45	98.76	69.22	89.78	11.85	5.50	24.30	785.71
1996	232.08	208.08	89.83	62.47	81.79	10.72	5.04	22.04	712.04
1997	206.09	184.31	79.62	55.15	72.58	9.48	4.47	19.56	631.25
1998	182.45	165.40	71.03	50.41	64.28	8.13	4.04	17.06	562.78
1999	120.82	109.68	47.93	32.79	42.73	5.47	2.68	11.47	373.57
2000	90.95	81.72	35.34	24.58	32.14	4.11	2.01	8.46	279.31
2001	36.15	32.35	14.09	9.66	12.84	1.60	0.81	3.35	110.84
2002	5.65	5.15	2.21	1.53	2.01	0.25	0.12	0.52	17.44
2003	5.55	5.05	2.19	1.49	1.98	0.24	0.12	0.51	17.13
2004	5.10	4.65	2.02	1.36	1.82	0.22	0.11	0.47	15.75
2005	5.09	4.64	2.03	1.35	1.83	0.21	0.11	0.47	15.73
2006	5.03	4.57	2.02	1.33	1.81	0.21	0.11	0.46	15.53
2007	4.77	4.34	1.93	1.25	1.73	0.19	0.10	0.43	14.74
2008	4.78	4.34	1.95	1.25	1.74	0.19	0.10	0.43	14.78
2009	4.80	4.35	1.97	1.24	1.75	0.19	0.10	0.43	14.83
2010	4.82	4.36	2.00	1.24	1.77	0.18	0.10	0.43	14.90
2011	4.81	4.33	2.01	1.22	1.78	0.18	0.10	0.43	14.86
2012	4.80	4.32	2.02	1.21	1.78	0.18	0.10	0.42	14.83
2013	4.79	4.30	2.04	1.20	1.79	0.17	0.10	0.42	14.80
2014	4.78	4.28	2.05	1.19	1.79	0.17	0.10	0.42	14.78
2015	4.77	4.26	2.07	1.17	1.80	0.17	0.10	0.41	14.75
2016	4.77	4.24	2.08	1.16	1.81	0.16	0.10	0.41	14.73
2017	4.77	4.22	2.11	1.15	1.82	0.16	0.09	0.41	14.72
2018	4.75	4.19	2.12	1.13	1.83	0.15	0.09	0.40	14.66
2019	4.72	4.14	2.13	1.11	1.83	0.15	0.09	0.39	14.56
2020	4.66	4.08	2.13	1.09	1.82	0.14	0.09	0.39	14.40

Sources: BTRE estimates.

TABLE 3.2 BASE CASE PROJECTIONS OF METROPOLITAN SO<sub>x</sub> EMISSIONS BY MOTOR VEHICLES TO 2020

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	4530	3820	1662	1118	1543	236	133	323	13366
1991	4140	3493	1523	1031	1408	214	122	296	12227
1992	3879	3270	1449	965	1337	201	116	283	11500
1993	3704	3111	1390	917	1284	191	111	270	10979
1994	3522	2950	1330	867	1229	182	107	254	10440
1995	3456	2889	1315	847	1214	177	106	248	10253
1996	3339	2778	1283	813	1183	171	104	241	9911
1997	3195	2649	1229	773	1137	162	99	231	9476
1998	3046	2550	1181	750	1088	151	95	220	9082
1999	2819	2374	1108	689	1012	140	87	208	8437
2000	2487	2094	968	610	894	122	75	185	7434
2001	2356	1984	919	574	849	113	71	176	7042
2002	2232	1880	874	540	807	105	67	167	6671
2003	1786	1530	704	440	646	82	50	140	5378
2004	1484	1295	588	373	536	66	39	122	4503
2005	1233	1083	492	312	447	54	31	103	3753
2006	981	887	395	256	355	41	22	87	3024
2007	1001	902	405	259	363	41	22	88	3083
2008	1019	916	415	262	372	41	22	90	3137
2009	1036	929	426	264	380	41	23	90	3189
2010	1055	943	437	267	389	41	23	92	3246
2011	1071	953	446	268	396	41	23	92	3291
2012	1086	963	456	269	404	40	24	93	3336
2013	1100	972	466	270	412	40	24	93	3378
2014	1114	981	476	271	420	40	24	94	3420
2015	1128	989	487	272	427	40	24	94	3460
2016	1140	995	497	272	435	39	24	95	3497
2017	1155	1003	508	273	443	39	25	95	3540
2018	1166	1008	518	272	451	38	25	95	3573
2019	1176	1012	528	272	458	38	25	95	3604
2020	1186	1016	538	271	465	37	25	95	3633

Sources: BTRE estimates.

TABLE 3.3 BASE CASE PROJECTIONS OF METROPOLITAN CO EMISSIONS BY MOTOR VEHICLES TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	907.3	822.9	342.3	244.7	311.4	42.4	18.2	83.9	2773.3	
1991	882.7	799.4	333.6	240.8	301.5	40.4	18.2	80.8	2697.3	
1992	873.9	793.0	336.6	238.8	303.8	40.8	18.8	82.8	2688.5	
1993	880.2	797.5	339.0	240.0	306.9	41.1	18.9	83.4	2706.9	
1994	871.7	790.1	336.1	237.4	304.7	40.7	18.7	82.6	2681.8	
1995	885.2	802.0	342.0	240.6	310.3	41.3	18.9	83.9	2724.1	
1996	887.5	801.5	343.9	240.3	312.3	41.3	19.1	84.2	2730.1	
1997	870.9	784.5	336.9	234.5	306.3	40.3	18.8	82.6	2674.7	
1998	845.4	773.1	329.6	235.3	297.3	38.0	18.6	78.9	2616.2	
1999	822.4	754.7	327.0	225.2	290.2	37.6	18.1	77.9	2553.1	
2000	798.8	725.2	310.9	217.9	281.6	36.4	17.5	74.2	2462.5	
2001	765.5	692.0	298.9	206.4	271.2	34.2	17.0	70.7	2355.8	
2002	751.1	676.9	294.7	200.7	267.0	33.0	16.7	68.9	2309.1	
2003	744.6	669.6	294.1	197.5	266.0	32.1	16.6	68.2	2288.8	
2004	736.8	661.3	292.9	194.2	264.3	31.3	16.4	67.5	2264.7	
2005	726.9	650.5	290.9	190.2	261.9	30.3	16.1	66.4	2233.2	
2006	708.1	631.8	285.2	183.9	256.2	29.0	15.7	64.3	2174.3	
2007	690.7	614.2	280.1	177.9	251.1	27.8	15.3	62.5	2119.6	
2008	673.2	596.7	275.0	171.9	245.8	26.6	14.8	60.5	2064.6	
2009	656.8	580.4	270.2	166.3	240.9	25.5	14.4	58.7	2013.3	
2010	641.0	564.3	265.8	160.8	236.4	24.4	14.0	57.0	1963.7	
2011	623.0	546.4	260.3	154.9	230.8	23.3	13.6	55.0	1907.4	
2012	604.3	528.1	254.6	148.9	225.1	22.1	13.1	53.0	1849.3	
2013	585.9	509.9	248.8	143.0	219.4	21.0	12.7	51.1	1791.7	
2014	568.0	492.2	243.4	137.2	213.9	20.0	12.3	49.1	1736.1	
2015	551.0	475.3	238.2	131.8	208.7	18.9	11.8	47.3	1683.1	
2016	535.0	459.2	233.4	126.6	203.8	18.0	11.4	45.6	1633.1	
2017	518.3	442.4	228.4	121.3	198.7	17.0	11.1	43.8	1581.1	
2018	510.0	433.4	227.0	118.1	196.8	16.4	10.8	42.8	1555.2	
2019	503.7	426.2	226.6	115.4	195.6	15.8	10.6	41.9	1535.8	
2020	497.1	418.6	226.0	112.7	194.3	15.3	10.4	41.0	1515.5	

Sources: BTRE estimates.

TABLE 3.4 BASE CASE PROJECTIONS OF METROPOLITAN NO<sub>x</sub> EMISSIONS BY MOTOR VEHICLES TO 2020

Year	(thousand tonnes)								
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	76.14	66.70	28.32	19.68	25.99	3.85	1.94	6.13	228.75
1991	75.43	66.12	28.14	19.74	25.67	3.74	1.93	6.08	226.86
1992	77.55	68.11	29.45	20.34	26.83	3.88	2.02	6.48	234.65
1993	79.35	69.59	30.22	20.77	27.58	3.95	2.06	6.65	240.18
1994	80.77	70.82	30.89	21.10	28.21	4.01	2.10	6.77	244.68
1995	84.18	73.78	32.35	21.94	29.54	4.17	2.19	7.07	255.21
1996	86.95	76.03	33.61	22.60	30.69	4.29	2.27	7.34	263.78
1997	87.79	76.54	33.92	22.68	31.03	4.30	2.29	7.42	265.98
1998	87.49	77.22	34.07	23.22	30.97	4.18	2.32	7.32	266.79
1999	88.08	77.94	34.87	23.02	31.32	4.25	2.34	7.47	269.28
2000	87.84	77.06	34.23	22.88	31.24	4.21	2.33	7.35	267.14
2001	86.86	75.89	33.94	22.36	31.04	4.08	2.31	7.24	263.74
2002	87.68	76.42	34.41	22.37	31.43	4.06	2.34	7.27	265.97
2003	88.41	76.92	34.91	22.41	31.84	4.02	2.36	7.33	268.20
2004	88.97	77.26	35.34	22.41	32.16	3.98	2.36	7.39	269.88
2005	88.94	77.08	35.55	22.26	32.30	3.92	2.35	7.37	269.77
2006	87.75	75.86	35.28	21.80	32.00	3.80	2.32	7.22	266.04
2007	86.52	74.61	35.01	21.33	31.69	3.69	2.28	7.07	262.19
2008	84.88	73.06	34.58	20.77	31.22	3.56	2.23	6.89	257.17
2009	83.14	71.41	34.09	20.19	30.71	3.42	2.17	6.70	251.82
2010	81.60	69.91	33.70	19.65	30.28	3.30	2.12	6.52	247.08
2011	79.77	68.17	33.18	19.05	29.74	3.17	2.07	6.33	241.47
2012	77.86	66.34	32.62	18.43	29.18	3.03	2.01	6.12	235.60
2013	75.95	64.51	32.07	17.82	28.61	2.91	1.95	5.92	229.74
2014	74.19	62.79	31.57	17.24	28.10	2.78	1.90	5.73	224.30
2015	72.61	61.20	31.15	16.71	27.65	2.67	1.85	5.55	219.40
2016	71.15	59.72	30.78	16.21	27.26	2.56	1.81	5.39	214.88
2017	69.94	58.41	30.53	15.77	26.98	2.46	1.77	5.25	211.12
2018	69.04	57.40	30.41	15.41	26.80	2.38	1.74	5.13	208.30
2019	68.38	56.59	30.40	15.10	26.71	2.30	1.72	5.03	206.22
2020	67.87	55.89	30.46	14.83	26.69	2.23	1.69	4.95	204.62

Sources: BTRE estimates.

TABLE 3.5 BASE CASE PROJECTIONS OF METROPOLITAN VOC (EXHAUST) EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	78.12	70.60	29.42	20.92	26.66	3.73	1.64	7.05	238.14
1991	74.66	67.37	28.18	20.22	25.36	3.49	1.61	6.67	227.55
1992	72.90	65.91	28.03	19.77	25.19	3.48	1.63	6.74	223.66
1993	72.47	65.45	27.88	19.61	25.12	3.45	1.62	6.70	222.30
1994	71.01	64.14	27.37	19.19	24.68	3.38	1.58	6.56	217.90
1995	71.14	64.22	27.48	19.18	24.80	3.39	1.58	6.56	218.36
1996	70.04	63.02	27.15	18.80	24.52	3.33	1.57	6.47	214.90
1997	67.73	60.77	26.22	18.07	23.70	3.20	1.52	6.25	207.46
1998	65.11	59.26	25.41	17.94	22.78	2.99	1.49	5.92	200.90
1999	62.74	57.29	24.95	17.01	22.03	2.93	1.44	5.79	194.18
2000	60.12	54.32	23.44	16.23	21.09	2.80	1.38	5.44	184.82
2001	56.76	51.07	22.20	15.14	20.00	2.59	1.32	5.10	174.18
2002	54.96	49.30	21.60	14.53	19.44	2.47	1.28	4.91	168.49
2003	53.80	48.12	21.29	14.12	19.12	2.37	1.26	4.80	164.88
2004	52.70	47.02	20.99	13.73	18.81	2.29	1.23	4.71	161.49
2005	51.58	45.88	20.68	13.34	18.50	2.20	1.20	4.59	157.97
2006	49.98	44.31	20.17	12.83	18.01	2.09	1.16	4.43	152.97
2007	48.59	42.91	19.75	12.36	17.59	2.00	1.13	4.28	148.60
2008	47.28	41.63	19.36	11.93	17.19	1.91	1.09	4.14	144.54
2009	46.08	40.45	19.00	11.53	16.83	1.82	1.06	4.01	140.80
2010	44.99	39.34	18.69	11.16	16.52	1.75	1.03	3.89	137.38
2011	43.83	38.20	18.35	10.78	16.17	1.67	1.00	3.77	133.77
2012	42.75	37.14	18.05	10.42	15.86	1.60	0.97	3.65	130.44
2013	41.74	36.13	17.77	10.08	15.57	1.53	0.95	3.54	127.31
2014	40.83	35.21	17.53	9.77	15.31	1.46	0.92	3.44	124.48
2015	40.00	34.37	17.33	9.48	15.08	1.40	0.90	3.34	121.90
2016	39.26	33.61	17.16	9.21	14.89	1.35	0.88	3.25	119.62
2017	38.58	32.87	17.03	8.96	14.73	1.30	0.86	3.17	117.49
2018	38.31	32.53	17.09	8.81	14.73	1.26	0.85	3.12	116.69
2019	38.09	32.21	17.16	8.67	14.73	1.22	0.84	3.08	116.01
2020	37.89	31.91	17.26	8.54	14.76	1.19	0.83	3.03	115.40

Sources: BTRE estimates.

TABLE 3.6 BASE CASE PROJECTIONS OF METROPOLITAN VOC (EVAPORATIVE) EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	59.41	54.23	22.80	15.87	20.38	2.82	1.17	5.73	182.40
1991	56.85	51.81	21.85	15.36	19.39	2.63	1.16	5.42	174.48
1992	55.76	50.96	21.85	15.10	19.36	2.64	1.18	5.51	172.37
1993	55.75	50.92	21.84	15.07	19.41	2.64	1.18	5.51	172.34
1994	55.08	50.38	21.60	14.88	19.22	2.61	1.16	5.44	170.36
1995	55.95	51.20	21.97	15.10	19.57	2.65	1.17	5.53	173.14
1996	56.23	51.37	22.14	15.14	19.74	2.66	1.18	5.56	174.02
1997	55.41	50.55	21.77	14.85	19.43	2.61	1.16	5.48	171.26
1998	54.36	50.44	21.53	15.10	19.04	2.48	1.16	5.28	169.40
1999	53.78	50.19	21.74	14.72	18.89	2.51	1.15	5.31	168.29
2000	53.37	49.29	21.09	14.56	18.72	2.49	1.13	5.16	165.81
2001	51.95	47.88	20.59	14.03	18.30	2.37	1.11	4.99	161.22
2002	51.72	47.62	20.60	13.87	18.28	2.32	1.11	4.93	160.45
2003	52.33	48.13	20.98	13.94	18.58	2.31	1.12	4.98	162.37
2004	52.78	48.48	21.30	13.98	18.81	2.30	1.13	5.03	163.80
2005	53.00	48.59	21.54	13.95	18.98	2.27	1.13	5.03	164.48
2006	52.52	48.04	21.48	13.72	18.88	2.21	1.11	4.96	162.92
2007	52.16	47.58	21.49	13.52	18.84	2.15	1.10	4.90	161.74
2008	51.83	47.17	21.51	13.33	18.81	2.10	1.09	4.84	160.68
2009	51.54	46.78	21.55	13.15	18.79	2.05	1.08	4.79	159.72
2010	51.42	46.52	21.67	13.00	18.84	2.01	1.08	4.75	159.30
2011	51.25	46.23	21.77	12.85	18.88	1.97	1.07	4.70	158.71
2012	51.15	46.00	21.91	12.71	18.94	1.92	1.06	4.66	158.36
2013	51.11	45.82	22.08	12.59	19.03	1.88	1.06	4.62	158.19
2014	51.15	45.70	22.30	12.48	19.15	1.85	1.05	4.59	158.28
2015	51.24	45.62	22.55	12.39	19.30	1.81	1.05	4.57	158.53
2016	51.38	45.57	22.84	12.30	19.47	1.78	1.05	4.55	158.93
2017	51.66	45.63	23.21	12.24	19.71	1.75	1.05	4.53	159.78
2018	51.92	45.67	23.57	12.17	19.94	1.72	1.05	4.52	160.54
2019	52.26	45.78	23.99	12.12	20.21	1.69	1.05	4.51	161.60
2020	52.63	45.91	24.44	12.07	20.50	1.66	1.05	4.50	162.76

Sources: BTRE estimates.

TABLE 3.7 BASE CASE PROJECTIONS OF METROPOLITAN VOC (TOTAL) EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	137.54	124.83	52.22	36.79	47.04	6.55	2.81	12.78	420.55
1991	131.51	119.18	50.03	35.58	44.75	6.12	2.76	12.09	402.03
1992	128.66	116.87	49.89	34.87	44.56	6.12	2.81	12.25	396.03
1993	128.22	116.37	49.73	34.69	44.54	6.09	2.80	12.21	394.64
1994	126.09	114.52	48.96	34.07	43.89	5.99	2.74	12.00	388.26
1995	127.09	115.42	49.46	34.28	44.37	6.04	2.76	12.10	391.51
1996	126.27	114.40	49.29	33.94	44.25	5.99	2.75	12.03	388.92
1997	123.14	111.32	47.99	32.92	43.12	5.82	2.68	11.73	378.72
1998	119.47	109.70	46.93	33.05	41.83	5.47	2.65	11.20	370.31
1999	116.53	107.48	46.69	31.73	40.92	5.44	2.59	11.10	362.47
2000	113.49	103.62	44.52	30.79	39.81	5.29	2.51	10.60	350.63
2001	108.71	98.94	42.79	29.18	38.31	4.96	2.42	10.09	335.41
2002	106.68	96.92	42.20	28.40	37.71	4.79	2.39	9.84	328.94
2003	106.13	96.25	42.27	28.06	37.70	4.68	2.38	9.78	327.24
2004	105.48	95.50	42.29	27.71	37.63	4.58	2.35	9.74	325.29
2005	104.58	94.47	42.22	27.29	37.48	4.46	2.33	9.62	322.46
2006	102.49	92.35	41.65	26.55	36.89	4.30	2.28	9.39	315.89
2007	100.74	90.50	41.23	25.88	36.42	4.15	2.23	9.18	310.34
2008	99.12	88.79	40.86	25.26	36.00	4.01	2.19	8.98	305.22
2009	97.62	87.22	40.55	24.68	35.62	3.88	2.15	8.80	300.52
2010	96.41	85.87	40.37	24.16	35.36	3.76	2.11	8.64	296.68
2011	95.08	84.43	40.12	23.62	35.05	3.63	2.07	8.47	292.48
2012	93.90	83.14	39.96	23.13	34.80	3.52	2.04	8.31	288.80
2013	92.85	81.95	39.85	22.67	34.60	3.41	2.01	8.16	285.50
2014	91.98	80.91	39.83	22.25	34.46	3.31	1.98	8.03	282.76
2015	91.24	79.99	39.88	21.86	34.38	3.22	1.95	7.91	280.43
2016	90.64	79.18	40.00	21.51	34.36	3.13	1.92	7.80	278.55
2017	90.24	78.50	40.24	21.20	34.45	3.04	1.91	7.70	277.27
2018	90.23	78.19	40.65	20.98	34.67	2.98	1.89	7.64	277.24
2019	90.35	77.99	41.15	20.79	34.95	2.91	1.88	7.59	277.60
2020	90.53	77.82	41.69	20.61	35.26	2.85	1.87	7.54	278.17

Note: VOC (total) is the sum of exhaust and evaporative VOC emissions.

Sources: BTRE estimates.

TABLE 3.8 BASE CASE PROJECTIONS OF METROPOLITAN PM (TOTAL) EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	5.11	4.27	1.88	1.27	1.74	0.26	0.15	0.39	15.08
1991	4.89	4.09	1.81	1.23	1.66	0.25	0.14	0.38	14.44
1992	4.79	4.01	1.80	1.20	1.65	0.25	0.14	0.38	14.20
1993	4.80	4.01	1.81	1.20	1.66	0.24	0.14	0.38	14.25
1994	4.81	4.01	1.83	1.20	1.67	0.24	0.14	0.38	14.28
1995	4.95	4.12	1.89	1.23	1.73	0.25	0.15	0.39	14.72
1996	5.06	4.19	1.95	1.25	1.78	0.26	0.15	0.40	15.04
1997	4.94	4.10	1.90	1.21	1.74	0.25	0.15	0.39	14.68
1998	4.85	4.07	1.88	1.22	1.71	0.24	0.15	0.38	14.50
1999	4.83	4.08	1.90	1.20	1.71	0.24	0.14	0.38	14.50
2000	4.75	4.00	1.85	1.18	1.68	0.23	0.14	0.37	14.21
2001	4.70	3.96	1.83	1.16	1.67	0.23	0.14	0.37	14.05
2002	4.76	4.01	1.87	1.16	1.70	0.23	0.14	0.37	14.24
2003	4.74	4.00	1.87	1.15	1.70	0.22	0.14	0.38	14.19
2004	4.75	4.01	1.88	1.15	1.71	0.22	0.14	0.38	14.24
2005	4.76	4.01	1.90	1.15	1.72	0.21	0.13	0.38	14.26
2006	4.69	3.96	1.88	1.13	1.70	0.21	0.13	0.38	14.06
2007	4.70	3.96	1.89	1.13	1.70	0.20	0.13	0.38	14.09
2008	4.71	3.97	1.91	1.12	1.72	0.20	0.13	0.38	14.14
2009	4.73	3.98	1.93	1.12	1.73	0.20	0.13	0.38	14.18
2010	4.75	3.99	1.95	1.12	1.74	0.19	0.13	0.38	14.25
2011	4.75	3.99	1.96	1.11	1.75	0.19	0.12	0.38	14.26
2012	4.75	3.98	1.98	1.10	1.76	0.18	0.12	0.38	14.26
2013	4.75	3.97	1.99	1.09	1.77	0.18	0.12	0.38	14.26
2014	4.76	3.96	2.01	1.09	1.78	0.18	0.12	0.37	14.26
2015	4.75	3.95	2.02	1.08	1.79	0.17	0.12	0.37	14.26
2016	4.75	3.94	2.04	1.07	1.80	0.17	0.12	0.37	14.25
2017	4.77	3.93	2.06	1.06	1.81	0.16	0.12	0.37	14.29
2018	4.77	3.92	2.09	1.05	1.83	0.16	0.11	0.37	14.30
2019	4.78	3.91	2.11	1.04	1.84	0.16	0.11	0.36	14.31
2020	4.78	3.90	2.13	1.03	1.86	0.15	0.11	0.36	14.32

Sources: BTRE estimates.

TABLE 3.9 BASE CASE PROJECTIONS OF METROPOLITAN PM10 EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	4.91	4.10	1.81	1.22	1.67	0.25	0.14	0.38	14.48
1991	4.71	3.93	1.74	1.18	1.60	0.24	0.14	0.36	13.90
1992	4.62	3.86	1.73	1.16	1.59	0.24	0.14	0.36	13.69
1993	4.64	3.87	1.75	1.16	1.61	0.24	0.14	0.36	13.76
1994	4.66	3.88	1.77	1.16	1.62	0.24	0.14	0.37	13.82
1995	4.81	3.99	1.84	1.19	1.68	0.24	0.14	0.38	14.28
1996	4.92	4.07	1.90	1.21	1.73	0.25	0.15	0.39	14.62
1997	4.81	3.98	1.85	1.18	1.69	0.24	0.14	0.38	14.29
1998	4.73	3.97	1.84	1.19	1.67	0.23	0.14	0.37	14.13
1999	4.72	3.98	1.86	1.17	1.67	0.23	0.14	0.37	14.15
2000	4.64	3.91	1.81	1.15	1.64	0.23	0.14	0.36	13.88
2001	4.60	3.87	1.79	1.13	1.63	0.22	0.14	0.36	13.74
2002	4.66	3.92	1.83	1.14	1.66	0.22	0.14	0.37	13.94
2003	4.65	3.91	1.83	1.13	1.66	0.22	0.14	0.37	13.90
2004	4.66	3.93	1.84	1.13	1.67	0.21	0.13	0.37	13.95
2005	4.67	3.93	1.86	1.13	1.68	0.21	0.13	0.37	13.99
2006	4.60	3.88	1.84	1.11	1.66	0.20	0.13	0.37	13.79
2007	4.61	3.88	1.86	1.10	1.67	0.20	0.13	0.37	13.82
2008	4.62	3.90	1.87	1.10	1.68	0.20	0.13	0.37	13.87
2009	4.64	3.91	1.89	1.10	1.70	0.19	0.12	0.37	13.92
2010	4.66	3.92	1.91	1.10	1.71	0.19	0.12	0.37	13.99
2011	4.67	3.91	1.93	1.09	1.72	0.19	0.12	0.37	14.00
2012	4.67	3.91	1.94	1.08	1.73	0.18	0.12	0.37	14.00
2013	4.67	3.90	1.96	1.07	1.74	0.18	0.12	0.37	14.00
2014	4.67	3.89	1.97	1.07	1.75	0.17	0.12	0.37	14.01
2015	4.67	3.88	1.99	1.06	1.76	0.17	0.12	0.37	14.00
2016	4.67	3.86	2.00	1.05	1.77	0.17	0.11	0.36	13.99
2017	4.68	3.86	2.03	1.04	1.78	0.16	0.11	0.36	14.03
2018	4.69	3.85	2.05	1.03	1.80	0.16	0.11	0.36	14.04
2019	4.69	3.84	2.07	1.02	1.81	0.15	0.11	0.36	14.06
2020	4.70	3.83	2.09	1.01	1.82	0.15	0.11	0.35	14.07

Sources: BTRE estimates.

TABLE 3.10 BASE CASE PROJECTIONS OF METROPOLITAN PM2.5 EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	4.57	3.80	1.68	1.13	1.56	0.24	0.13	0.35	13.47
1991	4.39	3.66	1.62	1.10	1.49	0.22	0.13	0.33	12.95
1992	4.31	3.60	1.62	1.08	1.48	0.22	0.13	0.34	12.78
1993	4.34	3.61	1.64	1.08	1.50	0.22	0.13	0.34	12.87
1994	4.37	3.63	1.66	1.09	1.52	0.22	0.13	0.34	12.95
1995	4.52	3.74	1.73	1.12	1.58	0.23	0.13	0.35	13.40
1996	4.63	3.82	1.79	1.14	1.63	0.23	0.14	0.36	13.75
1997	4.53	3.75	1.75	1.11	1.60	0.23	0.14	0.36	13.45
1998	4.46	3.74	1.73	1.12	1.58	0.22	0.13	0.35	13.32
1999	4.46	3.75	1.75	1.10	1.58	0.22	0.13	0.35	13.35
2000	4.38	3.69	1.71	1.09	1.55	0.22	0.13	0.34	13.11
2001	4.35	3.65	1.70	1.07	1.55	0.21	0.13	0.34	12.99
2002	4.41	3.71	1.73	1.07	1.57	0.21	0.13	0.35	13.18
2003	4.40	3.70	1.73	1.07	1.57	0.21	0.13	0.35	13.15
2004	4.41	3.71	1.75	1.07	1.58	0.20	0.13	0.35	13.20
2005	4.42	3.72	1.76	1.07	1.59	0.20	0.13	0.35	13.24
2006	4.36	3.67	1.75	1.05	1.58	0.19	0.12	0.35	13.06
2007	4.36	3.68	1.76	1.04	1.58	0.19	0.12	0.35	13.09
2008	4.38	3.69	1.78	1.04	1.60	0.19	0.12	0.35	13.14
2009	4.39	3.70	1.79	1.04	1.61	0.18	0.12	0.35	13.18
2010	4.42	3.71	1.81	1.04	1.62	0.18	0.12	0.35	13.25
2011	4.42	3.71	1.83	1.03	1.63	0.18	0.12	0.35	13.26
2012	4.42	3.70	1.84	1.02	1.64	0.17	0.11	0.35	13.26
2013	4.43	3.69	1.85	1.02	1.65	0.17	0.11	0.35	13.27
2014	4.43	3.69	1.87	1.01	1.66	0.16	0.11	0.35	13.27
2015	4.43	3.67	1.88	1.00	1.67	0.16	0.11	0.35	13.27
2016	4.43	3.66	1.90	0.99	1.67	0.16	0.11	0.34	13.26
2017	4.44	3.66	1.92	0.98	1.69	0.15	0.11	0.34	13.30
2018	4.44	3.65	1.94	0.98	1.70	0.15	0.11	0.34	13.31
2019	4.45	3.64	1.96	0.97	1.72	0.15	0.11	0.34	13.32
2020	4.45	3.63	1.98	0.96	1.73	0.14	0.11	0.34	13.33

Sources: BTRE estimates.

TABLE 3.11 BASE CASE PROJECTIONS OF METROPOLITAN PM1.0 EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	4.46	3.71	1.64	1.10	1.52	0.23	0.13	0.34	13.13
1991	4.28	3.56	1.58	1.07	1.45	0.22	0.13	0.33	12.61
1992	4.20	3.50	1.57	1.05	1.44	0.22	0.13	0.33	12.43
1993	4.22	3.50	1.59	1.05	1.46	0.22	0.13	0.33	12.49
1994	4.24	3.51	1.61	1.05	1.47	0.22	0.13	0.33	12.56
1995	4.38	3.62	1.67	1.08	1.53	0.22	0.13	0.34	12.97
1996	4.48	3.69	1.73	1.10	1.58	0.23	0.14	0.35	13.29
1997	4.38	3.61	1.69	1.07	1.54	0.22	0.13	0.34	12.99
1998	4.30	3.60	1.67	1.07	1.52	0.21	0.13	0.33	12.85
1999	4.30	3.61	1.69	1.06	1.52	0.21	0.13	0.34	12.86
2000	4.22	3.54	1.64	1.04	1.49	0.21	0.13	0.33	12.60
2001	4.18	3.50	1.63	1.02	1.49	0.20	0.13	0.33	12.47
2002	4.24	3.55	1.66	1.03	1.51	0.20	0.13	0.33	12.64
2003	4.21	3.54	1.66	1.02	1.51	0.20	0.12	0.33	12.59
2004	4.22	3.54	1.67	1.02	1.51	0.19	0.12	0.33	12.62
2005	4.22	3.55	1.68	1.02	1.52	0.19	0.12	0.34	12.64
2006	4.16	3.49	1.66	1.00	1.50	0.18	0.12	0.33	12.45
2007	4.16	3.49	1.68	0.99	1.51	0.18	0.12	0.33	12.46
2008	4.17	3.50	1.69	0.99	1.52	0.18	0.11	0.33	12.50
2009	4.18	3.51	1.70	0.99	1.53	0.17	0.11	0.33	12.53
2010	4.20	3.52	1.72	0.98	1.54	0.17	0.11	0.33	12.59
2011	4.20	3.51	1.74	0.98	1.55	0.17	0.11	0.33	12.59
2012	4.20	3.51	1.75	0.97	1.56	0.16	0.11	0.33	12.59
2013	4.20	3.50	1.76	0.96	1.56	0.16	0.11	0.33	12.58
2014	4.20	3.49	1.77	0.95	1.57	0.16	0.11	0.33	12.58
2015	4.20	3.48	1.79	0.95	1.58	0.15	0.11	0.33	12.58
2016	4.20	3.46	1.80	0.94	1.59	0.15	0.10	0.32	12.57
2017	4.21	3.46	1.82	0.93	1.60	0.15	0.10	0.32	12.60
2018	4.21	3.45	1.84	0.92	1.61	0.14	0.10	0.32	12.61
2019	4.22	3.44	1.86	0.92	1.63	0.14	0.10	0.32	12.63
2020	4.22	3.43	1.88	0.91	1.64	0.14	0.10	0.32	12.63

Sources: BTRE estimates.

TABLE 3.12 BASE CASE PROJECTIONS OF METROPOLITAN ACETALDEHYDE EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	1.29	1.07	0.47	0.31	0.42	0.07	0.04	0.08	3.77
1991	1.23	1.02	0.45	0.30	0.40	0.07	0.04	0.08	3.59
1992	1.20	1.00	0.45	0.29	0.40	0.07	0.04	0.08	3.53
1993	1.20	0.99	0.45	0.29	0.40	0.07	0.04	0.08	3.51
1994	1.21	1.00	0.45	0.29	0.41	0.07	0.04	0.08	3.54
1995	1.23	1.02	0.47	0.29	0.42	0.07	0.04	0.08	3.62
1996	1.22	1.01	0.47	0.29	0.42	0.07	0.04	0.08	3.60
1997	1.20	0.99	0.46	0.28	0.41	0.07	0.04	0.08	3.53
1998	1.17	0.96	0.45	0.28	0.40	0.06	0.04	0.08	3.45
1999	1.15	0.95	0.45	0.27	0.40	0.06	0.04	0.08	3.40
2000	1.11	0.91	0.43	0.26	0.38	0.06	0.04	0.07	3.26
2001	1.06	0.87	0.41	0.24	0.37	0.06	0.04	0.07	3.12
2002	1.05	0.86	0.41	0.24	0.36	0.06	0.04	0.07	3.07
2003	1.01	0.83	0.40	0.23	0.35	0.05	0.04	0.07	2.97
2004	0.98	0.80	0.39	0.22	0.35	0.05	0.03	0.06	2.89
2005	0.96	0.78	0.38	0.21	0.34	0.05	0.03	0.06	2.81
2006	0.93	0.76	0.37	0.21	0.33	0.05	0.03	0.06	2.74
2007	0.91	0.74	0.37	0.20	0.33	0.04	0.03	0.06	2.69
2008	0.90	0.73	0.36	0.20	0.32	0.04	0.03	0.06	2.63
2009	0.88	0.71	0.36	0.19	0.32	0.04	0.03	0.06	2.58
2010	0.86	0.70	0.35	0.19	0.31	0.04	0.03	0.05	2.54
2011	0.85	0.68	0.35	0.18	0.31	0.04	0.03	0.05	2.49
2012	0.83	0.67	0.34	0.18	0.31	0.04	0.03	0.05	2.45
2013	0.82	0.66	0.34	0.17	0.31	0.04	0.03	0.05	2.42
2014	0.81	0.65	0.34	0.17	0.30	0.03	0.03	0.05	2.39
2015	0.81	0.64	0.34	0.17	0.30	0.03	0.03	0.05	2.37
2016	0.80	0.64	0.34	0.17	0.30	0.03	0.03	0.05	2.35
2017	0.79	0.63	0.34	0.16	0.30	0.03	0.03	0.05	2.33
2018	0.79	0.63	0.34	0.16	0.30	0.03	0.02	0.05	2.33
2019	0.79	0.63	0.34	0.16	0.31	0.03	0.02	0.05	2.33
2020	0.79	0.63	0.35	0.16	0.31	0.03	0.02	0.05	2.34

Sources: BTRE estimates.

TABLE 3.13 BASE CASE PROJECTIONS OF METROPOLITAN FORMALDEHYDE EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	1.95	1.68	0.72	0.49	0.65	0.10	0.05	0.15	5.80
1991	1.86	1.61	0.69	0.48	0.62	0.10	0.05	0.14	5.54
1992	1.81	1.57	0.68	0.46	0.61	0.10	0.05	0.14	5.43
1993	1.80	1.55	0.68	0.46	0.61	0.09	0.05	0.14	5.39
1994	1.79	1.54	0.68	0.45	0.61	0.09	0.05	0.14	5.36
1995	1.81	1.56	0.69	0.46	0.62	0.10	0.05	0.14	5.42
1996	1.79	1.53	0.69	0.45	0.62	0.09	0.05	0.14	5.36
1997	1.74	1.49	0.67	0.43	0.60	0.09	0.05	0.13	5.21
1998	1.68	1.45	0.65	0.43	0.58	0.09	0.05	0.13	5.06
1999	1.64	1.42	0.65	0.41	0.57	0.08	0.05	0.13	4.94
2000	1.57	1.35	0.61	0.39	0.55	0.08	0.05	0.12	4.73
2001	1.50	1.28	0.58	0.37	0.52	0.08	0.04	0.11	4.49
2002	1.46	1.25	0.57	0.36	0.51	0.07	0.04	0.11	4.38
2003	1.42	1.21	0.56	0.34	0.50	0.07	0.04	0.11	4.26
2004	1.39	1.18	0.55	0.33	0.49	0.07	0.04	0.10	4.15
2005	1.35	1.15	0.54	0.32	0.48	0.06	0.04	0.10	4.05
2006	1.31	1.11	0.53	0.31	0.47	0.06	0.04	0.10	3.94
2007	1.28	1.08	0.52	0.30	0.46	0.06	0.04	0.10	3.84
2008	1.25	1.06	0.51	0.29	0.45	0.06	0.04	0.09	3.75
2009	1.22	1.03	0.50	0.28	0.44	0.05	0.04	0.09	3.66
2010	1.20	1.01	0.49	0.28	0.44	0.05	0.03	0.09	3.59
2011	1.17	0.98	0.49	0.27	0.43	0.05	0.03	0.08	3.51
2012	1.15	0.96	0.48	0.26	0.43	0.05	0.03	0.08	3.44
2013	1.13	0.94	0.47	0.25	0.42	0.05	0.03	0.08	3.38
2014	1.11	0.92	0.47	0.25	0.42	0.04	0.03	0.08	3.32
2015	1.10	0.90	0.47	0.24	0.41	0.04	0.03	0.08	3.27
2016	1.08	0.89	0.46	0.24	0.41	0.04	0.03	0.07	3.22
2017	1.07	0.88	0.46	0.23	0.41	0.04	0.03	0.07	3.18
2018	1.06	0.87	0.46	0.23	0.41	0.04	0.03	0.07	3.17
2019	1.06	0.86	0.47	0.23	0.41	0.04	0.03	0.07	3.17
2020	1.06	0.86	0.47	0.22	0.41	0.04	0.03	0.07	3.16

Sources: BTRE estimates.

TABLE 3.14 BASE CASE PROJECTIONS OF METROPOLITAN CARBONYL (TOTAL) EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	5.77	4.95	2.13	1.44	1.92	0.31	0.17	0.42	17.11
1991	5.50	4.71	2.03	1.39	1.83	0.29	0.16	0.40	16.32
1992	5.37	4.61	2.02	1.36	1.81	0.29	0.16	0.40	16.02
1993	5.33	4.56	2.01	1.34	1.81	0.29	0.16	0.40	15.89
1994	5.31	4.54	2.02	1.33	1.81	0.28	0.16	0.40	15.85
1995	5.39	4.59	2.06	1.34	1.84	0.29	0.16	0.40	16.07
1996	5.33	4.52	2.05	1.32	1.83	0.28	0.16	0.40	15.90
1997	5.20	4.40	2.00	1.28	1.79	0.28	0.16	0.39	15.48
1998	5.03	4.29	1.95	1.26	1.74	0.26	0.15	0.37	15.06
1999	4.92	4.20	1.93	1.21	1.71	0.26	0.15	0.37	14.74
2000	4.72	4.00	1.84	1.16	1.64	0.25	0.15	0.35	14.10
2001	4.49	3.80	1.75	1.09	1.57	0.23	0.14	0.33	13.41
2002	4.40	3.72	1.72	1.06	1.54	0.22	0.14	0.32	13.13
2003	4.27	3.60	1.68	1.02	1.50	0.21	0.13	0.31	12.73
2004	4.16	3.51	1.65	0.99	1.47	0.20	0.13	0.30	12.41
2005	4.06	3.41	1.62	0.96	1.44	0.20	0.13	0.30	12.11
2006	3.95	3.31	1.58	0.92	1.41	0.19	0.12	0.29	11.77
2007	3.86	3.23	1.56	0.90	1.38	0.18	0.12	0.28	11.50
2008	3.77	3.14	1.53	0.87	1.36	0.17	0.11	0.27	11.22
2009	3.69	3.07	1.50	0.84	1.34	0.16	0.11	0.26	10.97
2010	3.62	3.00	1.49	0.82	1.32	0.16	0.11	0.26	10.77
2011	3.54	2.93	1.47	0.80	1.30	0.15	0.11	0.25	10.54
2012	3.47	2.87	1.45	0.78	1.28	0.15	0.10	0.24	10.34
2013	3.42	2.81	1.43	0.76	1.27	0.14	0.10	0.23	10.16
2014	3.36	2.76	1.42	0.74	1.25	0.14	0.10	0.23	10.01
2015	3.32	2.72	1.41	0.72	1.25	0.13	0.10	0.22	9.87
2016	3.27	2.67	1.41	0.71	1.24	0.13	0.10	0.22	9.73
2017	3.24	2.63	1.40	0.69	1.23	0.12	0.09	0.21	9.62
2018	3.23	2.62	1.41	0.69	1.24	0.12	0.09	0.21	9.60
2019	3.22	2.61	1.42	0.68	1.24	0.12	0.09	0.21	9.58
2020	3.22	2.59	1.43	0.67	1.25	0.11	0.09	0.21	9.57

Sources: BTRE estimates.

TABLE 3.15 BASE CASE PROJECTIONS OF METROPOLITAN BENZENE EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	5.17	4.71	1.96	1.40	1.77	0.24	0.10	0.48	15.83
1991	4.88	4.44	1.85	1.34	1.66	0.22	0.10	0.45	14.94
1992	4.66	4.25	1.80	1.28	1.61	0.22	0.10	0.44	14.36
1993	4.56	4.16	1.76	1.25	1.58	0.21	0.10	0.43	14.04
1994	4.38	4.00	1.69	1.20	1.52	0.20	0.09	0.42	13.50
1995	4.31	3.94	1.67	1.18	1.51	0.20	0.09	0.41	13.32
1996	4.18	3.81	1.63	1.14	1.46	0.20	0.09	0.40	12.91
1997	3.97	3.61	1.54	1.08	1.39	0.18	0.08	0.38	12.23
1998	3.76	3.47	1.47	1.05	1.31	0.17	0.08	0.35	11.66
1999	3.50	3.24	1.40	0.96	1.23	0.16	0.08	0.33	10.89
2000	3.24	2.97	1.27	0.89	1.14	0.15	0.07	0.30	10.03
2001	2.95	2.69	1.16	0.80	1.04	0.13	0.06	0.27	9.11
2002	2.75	2.51	1.09	0.74	0.97	0.12	0.06	0.25	8.49
2003	2.59	2.35	1.03	0.69	0.92	0.11	0.06	0.24	7.99
2004	2.44	2.21	0.98	0.65	0.87	0.10	0.05	0.22	7.52
2005	2.28	2.06	0.92	0.60	0.81	0.10	0.05	0.21	7.02
2006	2.14	1.93	0.87	0.56	0.77	0.09	0.05	0.19	6.61
2007	2.04	1.83	0.84	0.53	0.74	0.08	0.04	0.18	6.29
2008	2.00	1.78	0.82	0.51	0.72	0.08	0.04	0.18	6.14
2009	1.95	1.74	0.81	0.50	0.71	0.08	0.04	0.17	5.99
2010	1.90	1.69	0.80	0.48	0.70	0.07	0.04	0.17	5.86
2011	1.86	1.65	0.79	0.47	0.68	0.07	0.04	0.16	5.71
2012	1.82	1.60	0.77	0.45	0.67	0.07	0.04	0.16	5.58
2013	1.78	1.56	0.76	0.44	0.66	0.06	0.04	0.15	5.45
2014	1.74	1.52	0.75	0.42	0.65	0.06	0.04	0.15	5.34
2015	1.70	1.49	0.75	0.41	0.64	0.06	0.04	0.15	5.23
2016	1.67	1.45	0.74	0.40	0.63	0.06	0.04	0.14	5.13
2017	1.64	1.42	0.73	0.39	0.62	0.05	0.03	0.14	5.03
2018	1.62	1.40	0.73	0.38	0.62	0.05	0.03	0.14	4.98
2019	1.61	1.39	0.74	0.37	0.62	0.05	0.03	0.13	4.94
2020	1.60	1.37	0.74	0.37	0.62	0.05	0.03	0.13	4.90

Sources: BTRE estimates.

TABLE 3.16 BASE CASE PROJECTIONS OF METROPOLITAN TOLUENE EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	7.78	7.09	2.95	2.11	2.66	0.36	0.15	0.72	23.81
1991	7.44	6.77	2.82	2.04	2.53	0.34	0.15	0.68	22.78
1992	7.21	6.58	2.79	1.98	2.50	0.34	0.15	0.69	22.24
1993	7.16	6.53	2.77	1.96	2.49	0.33	0.15	0.68	22.08
1994	6.97	6.37	2.70	1.91	2.43	0.33	0.15	0.66	21.52
1995	6.97	6.37	2.71	1.91	2.43	0.33	0.15	0.67	21.53
1996	6.86	6.25	2.67	1.87	2.40	0.32	0.14	0.65	21.17
1997	6.61	6.01	2.57	1.79	2.31	0.31	0.14	0.63	20.36
1998	6.35	5.86	2.49	1.78	2.22	0.29	0.14	0.60	19.72
1999	6.13	5.68	2.45	1.69	2.15	0.28	0.13	0.58	19.09
2000	5.90	5.42	2.31	1.63	2.07	0.27	0.13	0.55	18.27
2001	5.59	5.11	2.19	1.52	1.97	0.25	0.12	0.52	17.27
2002	5.43	4.96	2.14	1.47	1.92	0.24	0.12	0.50	16.78
2003	5.35	4.87	2.13	1.44	1.90	0.23	0.12	0.49	16.53
2004	5.29	4.81	2.12	1.41	1.89	0.23	0.11	0.49	16.34
2005	5.21	4.72	2.10	1.38	1.86	0.22	0.11	0.48	16.06
2006	5.06	4.57	2.05	1.33	1.82	0.21	0.11	0.46	15.60
2007	4.93	4.44	2.01	1.28	1.78	0.20	0.11	0.45	15.19
2008	4.83	4.34	1.98	1.25	1.75	0.19	0.10	0.44	14.88
2009	4.72	4.22	1.95	1.21	1.72	0.18	0.10	0.42	14.53
2010	4.62	4.12	1.93	1.17	1.69	0.18	0.10	0.41	14.21
2011	4.51	4.01	1.90	1.14	1.66	0.17	0.10	0.40	13.88
2012	4.41	3.92	1.87	1.10	1.63	0.16	0.09	0.39	13.58
2013	4.32	3.82	1.85	1.07	1.60	0.16	0.09	0.38	13.29
2014	4.24	3.74	1.83	1.04	1.58	0.15	0.09	0.37	13.03
2015	4.16	3.66	1.82	1.01	1.56	0.14	0.09	0.36	12.80
2016	4.09	3.59	1.80	0.99	1.55	0.14	0.08	0.35	12.59
2017	4.03	3.52	1.80	0.96	1.53	0.13	0.08	0.34	12.40
2018	4.00	3.48	1.80	0.94	1.53	0.13	0.08	0.34	12.31
2019	3.98	3.45	1.81	0.93	1.53	0.13	0.08	0.33	12.23
2020	3.95	3.41	1.82	0.91	1.53	0.12	0.08	0.33	12.16

Sources: BTRE estimates.

TABLE 3.17 BASE CASE PROJECTIONS OF METROPOLITAN XYLENE EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	6.45	5.87	2.44	1.74	2.21	0.30	0.13	0.60	19.74
1991	6.17	5.61	2.34	1.69	2.10	0.28	0.13	0.57	18.88
1992	5.98	5.46	2.31	1.64	2.07	0.28	0.13	0.57	18.44
1993	5.94	5.42	2.30	1.63	2.06	0.28	0.13	0.57	18.31
1994	5.78	5.28	2.24	1.58	2.01	0.27	0.12	0.55	17.84
1995	5.78	5.29	2.24	1.58	2.02	0.27	0.12	0.55	17.86
1996	5.69	5.19	2.21	1.55	1.99	0.27	0.12	0.54	17.57
1997	5.49	4.99	2.13	1.49	1.92	0.25	0.12	0.52	16.90
1998	5.27	4.87	2.06	1.48	1.84	0.24	0.11	0.49	16.38
1999	5.09	4.72	2.03	1.41	1.79	0.23	0.11	0.49	15.87
2000	4.91	4.51	1.92	1.35	1.72	0.22	0.10	0.46	15.19
2001	4.65	4.25	1.82	1.27	1.64	0.21	0.10	0.43	14.37
2002	4.52	4.13	1.78	1.22	1.60	0.20	0.10	0.42	13.97
2003	4.46	4.06	1.77	1.20	1.58	0.19	0.10	0.41	13.77
2004	4.41	4.01	1.76	1.18	1.57	0.19	0.10	0.41	13.63
2005	4.34	3.94	1.75	1.15	1.55	0.18	0.09	0.40	13.40
2006	4.22	3.81	1.71	1.11	1.52	0.17	0.09	0.39	13.02
2007	4.11	3.71	1.68	1.07	1.48	0.17	0.09	0.37	12.68
2008	4.03	3.62	1.66	1.04	1.46	0.16	0.09	0.36	12.43
2009	3.94	3.53	1.63	1.01	1.44	0.15	0.08	0.35	12.15
2010	3.86	3.45	1.61	0.98	1.41	0.15	0.08	0.35	11.89
2011	3.77	3.36	1.59	0.95	1.39	0.14	0.08	0.34	11.62
2012	3.69	3.28	1.57	0.92	1.37	0.14	0.08	0.33	11.37
2013	3.62	3.20	1.55	0.90	1.34	0.13	0.08	0.32	11.13
2014	3.55	3.13	1.53	0.87	1.33	0.13	0.07	0.31	10.92
2015	3.49	3.07	1.52	0.85	1.31	0.12	0.07	0.30	10.73
2016	3.43	3.01	1.51	0.83	1.30	0.12	0.07	0.29	10.56
2017	3.39	2.95	1.51	0.81	1.29	0.11	0.07	0.29	10.41
2018	3.36	2.92	1.51	0.79	1.29	0.11	0.07	0.28	10.34
2019	3.34	2.90	1.52	0.78	1.29	0.11	0.07	0.28	10.28
2020	3.32	2.87	1.53	0.77	1.29	0.10	0.07	0.28	10.22

Note: Includes emissions of o, m and p isomers.

Sources: BTRE estimates.

TABLE 3.18 BASE CASE PROJECTIONS OF METROPOLITAN PAH EMISSIONS BY MOTOR VEHICLES TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	0.302	0.258	0.111	0.076	0.101	0.016	0.009	0.023	0.894	
1991	0.288	0.246	0.106	0.073	0.096	0.015	0.008	0.022	0.854	
1992	0.281	0.240	0.106	0.071	0.095	0.015	0.008	0.022	0.838	
1993	0.279	0.238	0.105	0.070	0.095	0.015	0.008	0.021	0.832	
1994	0.278	0.237	0.106	0.070	0.095	0.015	0.008	0.021	0.830	
1995	0.283	0.240	0.108	0.071	0.097	0.015	0.008	0.021	0.843	
1996	0.281	0.238	0.108	0.070	0.097	0.015	0.008	0.021	0.838	
1997	0.273	0.231	0.105	0.067	0.095	0.014	0.008	0.021	0.815	
1998	0.265	0.226	0.103	0.067	0.092	0.014	0.008	0.020	0.794	
1999	0.259	0.221	0.102	0.064	0.090	0.013	0.008	0.020	0.778	
2000	0.250	0.212	0.097	0.062	0.087	0.013	0.008	0.019	0.746	
2001	0.239	0.202	0.093	0.058	0.084	0.012	0.007	0.018	0.714	
2002	0.235	0.199	0.092	0.057	0.083	0.012	0.007	0.018	0.702	
2003	0.229	0.193	0.090	0.055	0.081	0.011	0.007	0.017	0.683	
2004	0.224	0.189	0.089	0.053	0.079	0.011	0.007	0.017	0.669	
2005	0.219	0.185	0.087	0.052	0.078	0.010	0.007	0.016	0.655	
2006	0.213	0.179	0.086	0.050	0.076	0.010	0.006	0.016	0.637	
2007	0.209	0.175	0.084	0.049	0.075	0.010	0.006	0.016	0.624	
2008	0.205	0.171	0.083	0.048	0.074	0.009	0.006	0.015	0.612	
2009	0.201	0.168	0.082	0.046	0.073	0.009	0.006	0.015	0.600	
2010	0.198	0.165	0.081	0.045	0.072	0.008	0.006	0.014	0.591	
2011	0.195	0.162	0.081	0.044	0.071	0.008	0.006	0.014	0.580	
2012	0.191	0.159	0.080	0.043	0.071	0.008	0.006	0.014	0.571	
2013	0.189	0.156	0.079	0.042	0.070	0.008	0.005	0.013	0.562	
2014	0.186	0.153	0.079	0.041	0.070	0.007	0.005	0.013	0.555	
2015	0.184	0.151	0.078	0.041	0.069	0.007	0.005	0.013	0.549	
2016	0.182	0.149	0.078	0.040	0.069	0.007	0.005	0.013	0.543	
2017	0.181	0.147	0.078	0.039	0.069	0.007	0.005	0.012	0.538	
2018	0.180	0.147	0.079	0.039	0.069	0.006	0.005	0.012	0.537	
2019	0.180	0.146	0.079	0.038	0.069	0.006	0.005	0.012	0.536	
2020	0.180	0.145	0.080	0.038	0.070	0.006	0.005	0.012	0.536	

Sources: BTRE estimates.

TABLE 3.19 BASE CASE PROJECTIONS OF METROPOLITAN 1,3-BUTADIENE EMISSIONS BY MOTOR VEHICLES TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	0.545	0.496	0.206	0.147	0.186	0.026	0.011	0.050	1.668	
1991	0.522	0.474	0.198	0.143	0.177	0.024	0.011	0.048	1.596	
1992	0.506	0.461	0.196	0.139	0.175	0.024	0.011	0.048	1.559	
1993	0.502	0.458	0.194	0.137	0.174	0.024	0.011	0.048	1.548	
1994	0.490	0.447	0.189	0.134	0.170	0.023	0.010	0.046	1.510	
1995	0.490	0.447	0.190	0.134	0.171	0.023	0.010	0.047	1.512	
1996	0.483	0.439	0.188	0.131	0.169	0.023	0.010	0.046	1.488	
1997	0.465	0.422	0.181	0.126	0.163	0.022	0.010	0.044	1.433	
1998	0.448	0.413	0.175	0.125	0.157	0.020	0.010	0.042	1.389	
1999	0.433	0.401	0.173	0.119	0.152	0.020	0.009	0.041	1.347	
2000	0.417	0.382	0.163	0.115	0.146	0.019	0.009	0.039	1.290	
2001	0.396	0.361	0.155	0.107	0.139	0.018	0.009	0.037	1.222	
2002	0.385	0.351	0.152	0.104	0.136	0.017	0.008	0.035	1.188	
2003	0.380	0.345	0.151	0.102	0.135	0.016	0.008	0.035	1.172	
2004	0.376	0.341	0.150	0.100	0.134	0.016	0.008	0.034	1.160	
2005	0.370	0.335	0.149	0.098	0.132	0.016	0.008	0.034	1.141	
2006	0.360	0.325	0.146	0.094	0.129	0.015	0.008	0.033	1.109	
2007	0.351	0.316	0.143	0.091	0.127	0.014	0.008	0.032	1.081	
2008	0.344	0.309	0.141	0.089	0.125	0.014	0.007	0.031	1.060	
2009	0.337	0.301	0.139	0.086	0.123	0.013	0.007	0.030	1.037	
2010	0.330	0.294	0.138	0.084	0.121	0.013	0.007	0.029	1.015	
2011	0.323	0.287	0.136	0.081	0.119	0.012	0.007	0.029	0.993	
2012	0.316	0.280	0.134	0.079	0.117	0.012	0.007	0.028	0.972	
2013	0.310	0.274	0.133	0.077	0.115	0.011	0.007	0.027	0.953	
2014	0.304	0.268	0.131	0.075	0.114	0.011	0.006	0.026	0.936	
2015	0.299	0.263	0.131	0.073	0.113	0.010	0.006	0.026	0.921	
2016	0.295	0.258	0.130	0.071	0.112	0.010	0.006	0.025	0.907	
2017	0.291	0.254	0.130	0.069	0.111	0.010	0.006	0.025	0.895	
2018	0.290	0.251	0.130	0.068	0.111	0.009	0.006	0.024	0.890	
2019	0.288	0.249	0.131	0.067	0.111	0.009	0.006	0.024	0.886	
2020	0.287	0.247	0.132	0.066	0.111	0.009	0.006	0.024	0.882	

Sources: BTRE estimates.

TABLE 3.20 ESTIMATED OZONE REACTIVITY OF BASE CASE PROJECTIONS OF METROPOLITAN VOC EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	284.3	258.2	107.3	76.6	97.2	13.4	5.8	26.0	868.8
1991	268.6	243.6	101.5	73.2	91.4	12.4	5.6	24.3	820.7
1992	258.3	234.8	99.5	70.5	89.4	12.2	5.6	24.2	794.6
1993	253.4	230.1	97.6	69.0	88.0	12.0	5.5	23.7	779.3
1994	245.2	222.8	94.6	66.7	85.3	11.6	5.3	22.9	754.4
1995	242.9	220.8	93.9	66.0	84.8	11.5	5.2	22.7	747.8
1996	236.8	214.6	91.8	64.1	83.0	11.2	5.1	22.2	728.8
1997	226.5	204.7	87.7	60.9	79.3	10.6	4.9	21.2	695.8
1998	215.8	198.0	84.2	60.0	75.5	9.8	4.8	19.8	667.9
1999	206.5	190.3	82.1	56.5	72.5	9.6	4.6	19.3	641.4
2000	197.1	179.7	76.8	53.7	69.1	9.1	4.4	18.0	608.0
2001	185.1	168.2	72.3	49.9	65.2	8.4	4.1	16.8	570.0
2002	178.3	161.7	70.0	47.7	63.0	8.0	4.0	16.1	548.8
2003	174.3	157.8	68.9	46.3	61.9	7.7	3.9	15.7	536.5
2004	171.2	154.7	68.1	45.2	61.1	7.4	3.8	15.5	527.0
2005	167.9	151.2	67.2	44.0	60.2	7.1	3.8	15.1	516.5
2006	162.8	146.2	65.6	42.3	58.6	6.8	3.6	14.6	500.6
2007	158.3	141.8	64.3	40.8	57.2	6.5	3.5	14.1	486.6
2008	154.2	137.7	63.0	39.4	56.0	6.2	3.4	13.7	473.6
2009	150.3	133.9	61.9	38.1	54.9	5.9	3.3	13.2	461.6
2010	146.9	130.5	61.0	37.0	53.9	5.7	3.2	12.9	451.0
2011	143.8	127.3	60.2	35.9	53.0	5.5	3.2	12.5	441.4
2012	141.0	124.5	59.5	34.9	52.3	5.3	3.1	12.2	432.6
2013	138.4	121.8	58.9	33.9	51.6	5.1	3.0	11.9	424.5
2014	136.1	119.4	58.4	33.1	51.0	4.9	2.9	11.6	417.3
2015	134.0	117.2	58.0	32.3	50.5	4.7	2.9	11.3	410.9
2016	132.2	115.2	57.8	31.5	50.1	4.5	2.8	11.1	405.2
2017	130.6	113.3	57.7	30.8	49.9	4.4	2.8	10.9	400.2
2018	129.8	112.3	57.9	30.3	49.9	4.3	2.7	10.7	398.0
2019	129.2	111.3	58.3	29.9	50.0	4.1	2.7	10.6	396.2
2020	128.7	110.5	58.7	29.5	50.1	4.0	2.7	10.4	394.6

Note: Table estimates do not refer to actual urban ozone production – but to how much ozone would typically be produced under stable conditions (for weather and NOx concentrations) from the projected volume of VOC emissions (given in table 3.7), using values for the average reactivity of major VOC species (in terms of grams of O<sub>3</sub> produced per gram of VOC emitted).

In many urban areas, the rate of VOC conversion to form ozone depends much more strongly on the ambient NOx concentrations than those of the VOCs. Under these conditions, a reduction in total VOC reactivity (as given above) need not lead to a reduction in actual ozone formation. Substantial reductions in ozone formation will generally only follow if both NOx and VOC concentrations fall.

Sources: BTRE estimates, Hoekman 1992.

TABLE 3.21 ESTIMATED METROPOLITAN EMISSIONS OF VARIOUS OTHER NPI SPECIES BY MOTOR VEHICLES TO 2020

Year	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	<i>n</i> -Hexane	Styrene
1990	1.98	0.65	5.27	0.37	3.53	4.99	0.69
1991	1.89	0.61	5.04	0.36	3.38	4.77	0.66
1992	1.86	0.60	4.92	0.35	3.30	4.68	0.64
1993	1.85	0.59	4.85	0.35	3.26	4.67	0.63
1994	1.86	0.58	4.79	0.34	3.20	4.58	0.62
1995	1.90	0.58	4.80	0.34	3.20	4.62	0.62
1996	1.88	0.56	4.72	0.34	3.14	4.59	0.61
1997	1.85	0.54	4.54	0.33	3.02	4.46	0.59
1998	1.80	0.52	4.39	0.32	2.92	4.37	0.57
1999	1.77	0.50	4.25	0.31	2.82	4.28	0.55
2000	1.70	0.47	4.05	0.30	2.70	4.16	0.52
2001	1.62	0.45	3.82	0.29	2.55	3.99	0.49
2002	1.60	0.43	3.71	0.28	2.47	3.92	0.48
2003	1.54	0.42	3.62	0.28	2.43	3.91	0.47
2004	1.50	0.41	3.52	0.27	2.38	3.91	0.46
2005	1.46	0.40	3.45	0.27	2.34	3.89	0.45
2006	1.43	0.39	3.34	0.27	2.27	3.81	0.44
2007	1.40	0.38	3.25	0.26	2.21	3.75	0.43
2008	1.37	0.37	3.14	0.25	2.14	3.70	0.41
2009	1.34	0.36	3.06	0.25	2.09	3.65	0.40
2010	1.32	0.35	2.98	0.25	2.04	3.61	0.39
2011	1.29	0.34	2.91	0.24	1.99	3.57	0.38
2012	1.27	0.33	2.84	0.24	1.95	3.53	0.37
2013	1.25	0.32	2.77	0.23	1.90	3.49	0.36
2014	1.24	0.31	2.71	0.23	1.86	3.47	0.36
2015	1.23	0.30	2.65	0.23	1.83	3.44	0.35
2016	1.21	0.29	2.60	0.23	1.79	3.42	0.34
2017	1.20	0.29	2.55	0.23	1.76	3.41	0.34
2018	1.20	0.28	2.53	0.22	1.75	3.41	0.33
2019	1.20	0.28	2.51	0.22	1.74	3.42	0.33
2020	1.20	0.28	2.49	0.22	1.72	3.42	0.33

NPI – National Pollutant Inventory

Sources: BTRE estimates.

## Summary tables - Major Pollutant Emissions

TABLE 3.22 BASE CASE PROJECTIONS OF NATIONAL LEAD EMISSIONS BY MOTOR VEHICLES TO 2020

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	(tonnes)
							Total
1990	3139.6	666.0	58.5	0.5	6.2	21.4	3892.3
1991	2884.4	611.5	55.5	0.5	5.6	18.6	3576.1
1992	2698.3	561.2	52.4	0.4	4.9	17.0	3334.3
1993	2211.5	451.3	43.1	0.3	3.8	13.5	2723.5
1994	1742.5	346.8	34.7	0.2	2.8	10.3	2137.3
1995	1081.3	221.4	21.6	0.1	1.6	6.1	1332.0
1996	963.2	201.8	20.0	0.1	1.2	5.5	1191.9
1997	849.5	179.2	18.5	0.0	0.9	4.9	1053.1
1998	750.9	172.7	15.7	0.0	0.6	4.2	944.2
1999	491.4	119.9	10.0	0.0	0.3	2.7	624.4
2000	367.4	91.3	7.4	0.0	0.2	2.0	468.3
2001	143.3	37.2	2.8	0.0	0.1	0.8	184.2
2002	23.8	4.6	0.2	0.0	0.0	0.1	28.7
2003	23.3	4.4	0.2	0.0	0.0	0.1	28.1
2004	21.6	3.8	0.1	0.0	0.0	0.1	25.7
2005	21.5	3.8	0.1	0.0	0.0	0.1	25.5
2006	21.2	3.7	0.1	0.0	0.0	0.1	25.0
2007	20.2	3.3	0.0	0.0	0.0	0.1	23.6
2008	20.2	3.2	0.0	0.0	0.0	0.1	23.6
2009	20.2	3.2	0.0	0.0	0.0	0.1	23.5
2010	20.2	3.2	0.0	0.0	0.0	0.1	23.5
2011	20.0	3.1	0.0	0.0	0.0	0.1	23.3
2012	20.0	3.1	0.0	0.0	0.0	0.1	23.2
2013	19.9	3.0	0.0	0.0	0.0	0.1	23.0
2014	19.8	2.9	0.0	0.0	0.0	0.1	22.9
2015	19.7	2.8	0.0	0.0	0.0	0.1	22.7
2016	19.6	2.8	0.0	0.0	0.0	0.1	22.5
2017	19.5	2.7	0.0	0.0	0.0	0.1	22.4
2018	19.4	2.6	0.0	0.0	0.0	0.1	22.2
2019	19.2	2.5	0.0	0.0	0.0	0.1	21.9
2020	19.0	2.4	0.0	0.0	0.0	0.1	21.6

Sources: BTRE estimates.

TABLE 3.23 BASE CASE PROJECTIONS OF NATIONAL SO<sub>X</sub> EMISSIONS BY MOTOR VEHICLES TO 2020

Year	Cars	LCVs	Rigid	Articulated trucks	Buses	Motor cycles	Total
			and other trucks				
1990	9711	3710	6027	7645	1280	66	28438
1991	9128	3560	5152	7163	1150	59	26211
1992	8524	3396	4825	6939	1055	54	24793
1993	8008	3252	4580	7241	986	49	24115
1994	7395	3070	4560	7059	964	44	23093
1995	7091	3061	4403	7146	928	40	22670
1996	6675	2951	4247	6824	894	38	21628
1997	6296	2847	4112	6563	857	36	20711
1998	6071	2884	3970	6653	820	34	20433
1999	5820	2695	3471	5936	719	32	18673
2000	5428	2378	2945	5036	633	30	16450
2001	5204	2276	2649	4532	545	29	15235
2002	4953	2172	2427	4193	479	28	14252
2003	4712	1648	1532	2686	299	26	10902
2004	4556	1262	950	1680	180	25	8653
2005	4035	1002	638	1150	123	21	6970
2006	3908	672	167	298	35	21	5101
2007	3956	686	169	308	36	21	5175
2008	4001	695	169	318	36	21	5241
2009	4043	704	170	327	37	22	5302
2010	4082	719	172	339	37	22	5371
2011	4112	730	173	350	37	22	5424
2012	4140	740	174	360	38	22	5475
2013	4163	749	175	371	38	23	5520
2014	4185	758	176	382	38	23	5562
2015	4203	765	177	394	39	23	5601
2016	4217	772	178	405	39	23	5634
2017	4232	780	180	418	40	24	5673
2018	4241	785	180	429	40	24	5698
2019	4246	787	180	440	40	24	5717
2020	4254	782	180	450	41	24	5732

Sources: BTRE estimates.

TABLE 3.24 BASE CASE PROJECTIONS OF NATIONAL CO EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	3287.4	545.6	91.2	30.7	17.2	25.5	3997.5
1991	3215.9	532.3	85.3	30.1	16.9	24.2	3904.6
1992	3205.0	528.8	82.5	30.6	16.8	23.9	3887.5
1993	3201.2	534.0	80.3	33.5	16.7	23.6	3889.3
1994	3162.6	525.2	79.7	34.0	17.2	23.3	3841.9
1995	3193.1	543.6	78.3	35.3	17.3	23.0	3890.6
1996	3156.1	551.1	76.2	35.1	17.5	23.8	3859.8
1997	3071.9	544.3	74.5	35.2	17.7	23.8	3767.4
1998	2985.2	558.9	70.3	36.9	17.9	23.8	3693.0
1999	2882.2	560.1	65.7	36.9	17.8	23.8	3586.4
2000	2777.0	542.8	61.1	35.8	18.1	24.0	3458.8
2001	2612.0	544.2	57.7	34.6	17.1	24.2	3289.8
2002	2524.2	553.2	55.7	35.0	16.4	24.4	3208.9
2003	2486.1	550.8	52.7	34.6	15.8	24.6	3164.7
2004	2446.2	544.0	50.5	34.6	15.2	24.9	3115.5
2005	2394.5	538.8	47.9	34.3	14.7	25.1	3055.3
2006	2315.8	527.6	45.0	34.2	14.1	25.3	2962.1
2007	2241.0	517.5	43.2	34.2	13.7	25.5	2875.0
2008	2168.7	505.9	41.2	34.0	13.2	25.7	2788.7
2009	2102.2	493.6	39.7	33.8	12.8	25.9	2708.0
2010	2035.3	484.8	38.8	33.8	12.5	26.1	2631.2
2011	1964.8	472.4	37.8	33.8	12.1	26.3	2547.1
2012	1892.6	459.5	37.1	33.9	11.8	26.4	2461.2
2013	1821.2	446.8	36.4	34.0	11.5	26.6	2376.6
2014	1753.0	434.0	35.8	34.3	11.1	26.8	2295.0
2015	1687.1	422.5	35.3	34.7	10.9	27.0	2217.4
2016	1625.2	411.5	34.8	34.9	10.6	27.1	2144.0
2017	1559.7	400.9	34.5	35.1	10.5	27.3	2067.9
2018	1526.7	392.6	34.1	35.3	10.3	27.5	2026.5
2019	1502.2	384.0	33.9	35.6	10.2	27.6	1993.5
2020	1477.0	374.8	33.7	36.0	10.1	27.8	1959.4

Sources: BTRE estimates.

TABLE 3.25 BASE CASE PROJECTIONS OF NATIONAL NO<sub>x</sub> EMISSIONS BY MOTOR VEHICLES TO 2020

(thousand tonnes)

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	233.5	48.7	62.1	69.8	15.8	0.9	430.8
1991	236.7	49.9	55.5	68.1	15.0	0.8	426.0
1992	244.9	51.8	53.9	68.8	14.6	0.8	434.8
1993	249.6	53.1	53.2	74.7	14.4	0.8	445.7
1994	252.2	53.6	55.0	75.8	14.9	0.8	452.3
1995	260.9	56.7	55.4	79.7	15.1	0.8	468.5
1996	266.5	58.2	55.8	78.5	15.4	0.8	475.2
1997	266.0	59.3	56.7	77.6	15.7	0.8	476.0
1998	265.0	62.9	57.2	80.9	16.0	0.8	482.7
1999	263.3	65.0	56.6	80.9	16.1	0.8	482.7
2000	260.8	65.8	55.8	79.4	16.7	0.8	479.4
2001	252.1	67.9	54.3	76.8	15.9	0.8	467.7
2002	249.5	70.2	54.5	77.4	15.5	0.8	467.9
2003	250.3	71.5	53.4	76.9	15.2	0.8	468.1
2004	250.1	72.0	53.4	77.1	14.9	0.8	468.4
2005	248.1	71.7	52.4	76.2	14.8	0.8	464.1
2006	242.2	70.3	51.7	76.1	14.6	0.8	455.7
2007	236.1	68.5	51.1	76.0	14.5	0.8	447.0
2008	229.9	66.2	50.0	74.9	14.2	0.9	436.1
2009	223.7	63.8	48.8	73.6	13.9	0.9	424.7
2010	217.5	61.9	48.0	73.0	13.6	0.9	414.8
2011	210.9	59.8	46.9	72.3	13.3	0.9	404.1
2012	203.8	57.7	45.9	71.9	13.0	0.9	393.1
2013	196.7	55.8	44.9	71.4	12.7	0.9	382.3
2014	189.9	54.1	43.9	70.8	12.4	0.9	372.0
2015	183.6	52.7	43.0	70.5	12.1	0.9	362.7
2016	177.6	51.5	42.0	70.2	11.8	0.9	354.1
2017	171.8	50.7	41.2	70.4	11.6	0.9	346.7
2018	167.6	50.0	40.3	70.2	11.3	0.9	340.5
2019	164.1	49.5	39.5	70.2	11.2	0.9	335.3
2020	161.0	49.0	38.7	70.3	11.0	0.9	330.9

Sources: BTRE estimates.

TABLE 3.26      BASE CASE PROJECTIONS OF NATIONAL VOC (EXHAUST) EMISSIONS  
BY MOTOR VEHICLES TO 2020  
(thousand tonnes)

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	276.3	41.9	20.5	9.7	5.0	3.4	356.7
1991	265.9	40.3	18.5	9.5	4.7	3.2	342.1
1992	261.6	39.3	18.0	9.6	4.6	3.2	336.3
1993	258.5	39.0	17.7	10.4	4.5	3.1	333.3
1994	252.4	37.6	18.1	10.6	4.7	3.1	326.5
1995	251.2	38.4	18.1	10.9	4.7	3.1	326.4
1996	243.9	38.4	17.9	10.5	4.7	3.2	318.5
1997	233.8	37.4	17.8	10.2	4.6	3.2	306.9
1998	224.9	38.3	17.3	10.3	4.6	3.2	298.7
1999	215.0	38.1	16.6	10.1	4.5	3.2	287.5
2000	204.5	36.5	15.8	9.6	4.5	3.2	274.1
2001	189.4	36.2	14.9	9.2	4.2	3.2	257.1
2002	180.3	36.6	14.5	9.1	3.9	3.3	247.7
2003	175.2	36.5	13.7	9.0	3.7	3.3	241.3
2004	170.5	36.1	13.1	8.9	3.5	3.3	235.4
2005	165.4	35.8	12.4	8.8	3.3	3.3	229.1
2006	158.9	35.0	11.8	8.8	3.2	3.4	221.1
2007	152.9	34.4	11.4	8.8	3.1	3.4	213.9
2008	147.6	33.6	10.9	8.8	2.9	3.4	207.3
2009	142.9	32.8	10.5	8.8	2.8	3.5	201.2
2010	138.3	32.2	10.1	8.9	2.7	3.5	195.6
2011	133.8	31.3	9.7	9.0	2.6	3.5	190.0
2012	129.7	30.5	9.4	9.1	2.5	3.5	184.7
2013	125.7	29.7	9.2	9.2	2.4	3.5	179.8
2014	122.2	29.0	8.9	9.4	2.3	3.6	175.3
2015	119.0	28.2	8.7	9.4	2.2	3.6	171.1
2016	116.2	27.5	8.4	9.5	2.1	3.6	167.4
2017	113.4	26.9	8.2	9.7	2.1	3.6	163.9
2018	112.3	26.3	8.0	9.9	2.0	3.7	162.2
2019	111.3	25.8	7.8	10.0	2.0	3.7	160.6
2020	110.4	25.3	7.7	10.1	2.0	3.7	159.1

Sources: BTRE estimates.

TABLE 3.27 BASE CASE PROJECTIONS OF NATIONAL VOC (EVAPORATIVE) EMISSIONS BY MOTOR VEHICLES TO 2020

Year	Cars	LCVs	Rigid	Articulated trucks	Buses	Motor cycles	<i>Total</i>
			and other trucks				
1990	243	36	3	0	0	2	285
1991	233	34	3	0	0	2	273
1992	231	33	3	0	0	2	269
1993	232	33	3	0	0	2	270
1994	226	31	3	0	0	2	262
1995	228	32	2	0	0	2	265
1996	227	32	2	0	0	2	263
1997	222	31	2	0	0	2	258
1998	219	31	2	0	0	2	255
1999	216	31	2	0	0	2	251
2000	212	30	2	0	0	2	246
2001	204	30	1	0	0	2	237
2002	200	30	1	0	0	2	234
2003	201	30	1	0	0	2	235
2004	205	30	1	0	0	2	239
2005	204	30	1	0	0	2	237
2006	201	29	1	0	0	2	233
2007	197	29	1	0	0	2	230
2008	198	29	1	0	0	2	230
2009	195	28	1	0	0	2	227
2010	193	28	1	0	0	2	225
2011	191	28	1	0	0	2	223
2012	190	27	1	0	0	2	221
2013	188	27	1	0	0	2	219
2014	187	27	1	0	0	2	218
2015	187	26	1	0	0	2	217
2016	186	26	1	0	0	2	216
2017	186	26	1	0	0	2	215
2018	186	25	1	0	0	2	215
2019	187	25	1	0	0	2	215
2020	187	24	1	0	0	2	216

Sources: BTRE estimates.

TABLE 3.28      BASE CASE PROJECTIONS OF NATIONAL VOC (TOTAL) EMISSIONS  
BY MOTOR VEHICLES TO 2020  
(thousand tonnes)

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	519.4	77.7	23.6	9.8	5.3	5.6	641.3
1991	499.4	74.5	21.5	9.6	5.0	5.3	615.2
1992	492.3	72.4	20.8	9.7	4.9	5.2	605.4
1993	490.1	71.9	20.4	10.6	4.8	5.2	603.0
1994	478.4	68.8	20.7	10.7	5.0	5.1	588.7
1995	479.7	70.3	20.6	11.0	5.0	5.0	591.6
1996	470.9	69.9	20.3	10.6	5.0	5.2	581.9
1997	456.0	68.1	20.0	10.3	4.9	5.2	564.6
1998	443.7	69.6	19.3	10.5	4.9	5.2	553.2
1999	430.6	69.1	18.4	10.2	4.8	5.2	538.3
2000	416.5	66.6	17.3	9.8	4.8	5.3	520.3
2001	392.9	66.1	16.3	9.3	4.5	5.3	494.4
2002	380.6	66.6	15.8	9.3	4.2	5.4	481.9
2003	376.6	66.4	14.8	9.1	4.0	5.4	476.3
2004	375.4	66.1	14.2	9.1	3.8	5.5	474.1
2005	369.5	65.5	13.5	9.0	3.6	5.5	466.6
2006	359.5	64.2	12.8	8.9	3.5	5.6	454.4
2007	350.4	63.2	12.3	8.9	3.3	5.6	443.6
2008	345.6	62.5	11.7	8.9	3.2	5.6	437.6
2009	338.2	61.1	11.3	9.0	3.1	5.7	428.4
2010	331.5	60.3	10.9	9.1	3.0	5.7	420.6
2011	325.1	59.1	10.6	9.2	2.8	5.8	412.6
2012	319.3	57.9	10.3	9.3	2.7	5.8	405.3
2013	314.0	56.8	10.0	9.4	2.7	5.9	398.7
2014	309.4	55.7	9.8	9.5	2.6	5.9	392.9
2015	305.5	54.6	9.6	9.6	2.5	5.9	387.7
2016	302.2	53.5	9.3	9.7	2.4	6.0	383.1
2017	299.4	52.6	9.1	9.9	2.3	6.0	379.3
2018	298.4	51.7	8.9	10.1	2.3	6.0	377.4
2019	298.0	50.7	8.7	10.2	2.3	6.1	376.0
2020	297.8	49.7	8.5	10.3	2.2	6.1	374.8

Sources: BTRE estimates.

TABLE 3.29      BASE CASE PROJECTIONS OF NATIONAL PM (TOTAL) EMISSIONS BY MOTOR VEHICLES TO 2020

Year	Cars	LCVs	Rigid	Articulated	Buses	Motor	<i>Total</i>
			and other trucks	trucks	trucks	cycles	
1990	11.12	4.99	5.23	3.88	1.38	0.10	26.70
1991	11.01	4.92	4.65	3.77	1.31	0.10	25.76
1992	10.83	4.87	4.53	3.80	1.27	0.10	25.39
1993	10.77	4.88	4.49	4.10	1.24	0.09	25.57
1994	10.67	4.83	4.67	4.13	1.28	0.09	25.66
1995	10.87	5.05	4.74	4.29	1.31	0.09	26.35
1996	10.88	5.15	4.81	4.23	1.33	0.10	26.49
1997	10.69	4.65	4.89	4.21	1.35	0.10	25.89
1998	10.65	4.64	4.94	4.38	1.36	0.10	26.07
1999	10.64	4.52	4.92	4.32	1.36	0.10	25.85
2000	10.77	4.23	4.83	4.13	1.40	0.10	25.46
2001	10.60	4.29	4.67	3.91	1.29	0.10	24.85
2002	10.73	4.38	4.65	3.86	1.22	0.10	24.94
2003	10.97	4.38	4.38	3.65	1.13	0.10	24.62
2004	11.22	4.41	4.22	3.48	1.06	0.10	24.48
2005	11.43	4.45	3.98	3.25	1.00	0.10	24.22
2006	11.49	4.36	3.73	3.02	0.92	0.10	23.62
2007	11.64	4.33	3.61	2.85	0.87	0.10	23.40
2008	11.80	4.32	3.51	2.70	0.82	0.10	23.24
2009	11.94	4.30	3.40	2.57	0.77	0.10	23.08
2010	12.04	4.33	3.32	2.47	0.72	0.10	22.98
2011	12.11	4.34	3.23	2.37	0.67	0.11	22.82
2012	12.15	4.34	3.14	2.30	0.62	0.11	22.65
2013	12.16	4.35	3.05	2.24	0.58	0.11	22.50
2014	12.17	4.36	2.98	2.20	0.53	0.11	22.35
2015	12.15	4.37	2.91	2.17	0.49	0.11	22.19
2016	12.10	4.37	2.85	2.16	0.46	0.11	22.05
2017	12.08	4.38	2.79	2.18	0.43	0.11	21.97
2018	12.05	4.37	2.73	2.21	0.40	0.11	21.88
2019	12.01	4.36	2.67	2.27	0.38	0.11	21.80
2020	11.96	4.34	2.61	2.34	0.36	0.11	21.71

Sources: BTRE estimates.

TABLE 3.30      BASE CASE PROJECTIONS OF OTHER POLLUTANT EMISSIONS BY NATIONAL MOTOR VEHICLES TO 2020  
*(thousand tonnes)*

Year	PM10	PM2.5	PM1.0	Acet-aldehyde	Form-aldehyde	Total carbonyls	Benzene	Toluene
1990	25.72	24.01	23.42	6.77	9.59	28.86	23.31	35.04
1991	24.85	23.24	22.63	6.40	9.13	27.43	22.10	33.67
1992	24.54	22.98	22.36	6.33	8.98	26.99	21.25	32.87
1993	24.76	23.23	22.57	6.42	9.01	27.12	20.67	32.44
1994	24.91	23.40	22.72	6.52	9.01	27.22	19.84	31.55
1995	25.62	24.11	23.37	6.63	9.08	27.48	19.52	31.49
1996	25.80	24.32	23.54	6.53	8.90	26.98	18.77	30.71
1997	25.25	23.83	23.04	6.43	8.67	26.34	17.73	29.44
1998	25.46	24.05	23.24	6.43	8.57	26.09	16.95	28.58
1999	25.27	23.90	23.06	6.30	8.33	25.41	15.77	27.56
2000	24.91	23.57	22.71	6.10	8.02	24.49	14.54	26.37
2001	24.34	23.05	22.18	5.78	7.56	23.14	13.15	24.81
2002	24.45	23.16	22.27	5.66	7.36	22.56	12.21	24.00
2003	24.14	22.88	21.95	5.46	7.13	21.83	11.45	23.54
2004	24.02	22.76	21.82	5.33	6.96	21.31	10.73	23.16
2005	23.76	22.53	21.56	5.18	6.76	20.70	9.98	22.65
2006	23.18	21.98	21.00	5.04	6.55	20.08	9.37	21.91
2007	22.98	21.78	20.79	4.92	6.38	19.57	8.89	21.25
2008	22.82	21.63	20.64	4.80	6.21	19.06	8.65	20.73
2009	22.66	21.48	20.47	4.70	6.05	18.59	8.41	20.16
2010	22.57	21.40	20.38	4.62	5.92	18.23	8.18	19.65
2011	22.41	21.25	20.22	4.54	5.79	17.84	7.96	19.13
2012	22.25	21.10	20.06	4.47	5.67	17.50	7.75	18.64
2013	22.10	20.96	19.92	4.41	5.57	17.20	7.55	18.19
2014	21.96	20.82	19.78	4.35	5.47	16.92	7.37	17.77
2015	21.81	20.68	19.64	4.30	5.38	16.66	7.19	17.39
2016	21.66	20.54	19.51	4.25	5.29	16.42	7.03	17.04
2017	21.59	20.48	19.44	4.22	5.22	16.21	6.87	16.72
2018	21.50	20.39	19.36	4.20	5.19	16.12	6.79	16.54
2019	21.42	20.32	19.29	4.19	5.16	16.03	6.71	16.37
2020	21.33	20.24	19.21	4.17	5.12	15.93	6.63	16.21

Sources: BTRE estimates.

TABLE 3.30 (cont.) BASE CASE PROJECTIONS OF OTHER POLLUTANT EMISSIONS BY NATIONAL MOTOR VEHICLES TO 2020

Year	(thousand tonnes)				
	Xylene	1,3-butadiene	PAH (semi-volatile)	PAH (as component of PM)	Total PAH
1990	29.03	2.46	1.291	0.208	1.499
1991	27.90	2.37	1.229	0.201	1.429
1992	27.24	2.31	1.207	0.198	1.405
1993	26.89	2.28	1.211	0.200	1.411
1994	26.16	2.22	1.213	0.202	1.415
1995	26.11	2.22	1.223	0.208	1.431
1996	25.48	2.17	1.200	0.209	1.409
1997	24.44	2.08	1.169	0.204	1.374
1998	23.73	2.02	1.156	0.206	1.363
1999	22.90	1.95	1.125	0.204	1.329
2000	21.92	1.87	1.084	0.199	1.283
2001	20.64	1.76	1.023	0.194	1.217
2002	19.98	1.71	0.997	0.193	1.191
2003	19.60	1.68	0.966	0.188	1.154
2004	19.30	1.65	0.943	0.185	1.128
2005	18.89	1.62	0.916	0.181	1.097
2006	18.28	1.56	0.889	0.174	1.063
2007	17.74	1.52	0.865	0.171	1.036
2008	17.31	1.48	0.843	0.168	1.011
2009	16.85	1.44	0.822	0.166	0.988
2010	16.43	1.41	0.805	0.164	0.969
2011	16.00	1.37	0.788	0.161	0.949
2012	15.60	1.34	0.772	0.159	0.931
2013	15.23	1.31	0.759	0.157	0.916
2014	14.89	1.28	0.746	0.155	0.901
2015	14.57	1.26	0.734	0.154	0.888
2016	14.29	1.23	0.723	0.152	0.875
2017	14.03	1.21	0.714	0.151	0.865
2018	13.88	1.20	0.709	0.150	0.859
2019	13.75	1.19	0.705	0.149	0.854
2020	13.62	1.18	0.700	0.149	0.849

Sources: BTRE estimates.

TABLE 3.30 (cont.)

BASE CASE PROJECTIONS OF OTHER POLLUTANT EMISSIONS  
BY NATIONAL MOTOR VEHICLES TO 2020

Year	(thousand tonnes)						
	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	n-Hexane	Styrene
1990	3.54	0.94	8.26	0.57	5.35	7.56	1.04
1991	3.35	0.90	7.91	0.55	5.14	7.26	1.00
1992	3.30	0.88	7.73	0.53	5.01	7.11	0.98
1993	3.34	0.87	7.64	0.53	4.94	7.08	0.96
1994	3.39	0.84	7.50	0.52	4.80	6.89	0.93
1995	3.44	0.84	7.50	0.52	4.79	6.92	0.93
1996	3.39	0.81	7.30	0.51	4.66	6.81	0.91
1997	3.33	0.77	7.01	0.49	4.46	6.59	0.87
1998	3.32	0.75	6.83	0.48	4.32	6.46	0.84
1999	3.25	0.72	6.58	0.46	4.15	6.30	0.81
2000	3.15	0.68	6.27	0.44	3.96	6.11	0.77
2001	2.98	0.64	5.88	0.42	3.71	5.82	0.72
2002	2.92	0.61	5.68	0.41	3.58	5.69	0.69
2003	2.82	0.59	5.52	0.40	3.50	5.64	0.68
2004	2.75	0.58	5.38	0.40	3.43	5.64	0.66
2005	2.67	0.56	5.23	0.39	3.35	5.57	0.65
2006	2.60	0.54	5.04	0.38	3.23	5.43	0.62
2007	2.54	0.52	4.88	0.37	3.13	5.31	0.60
2008	2.48	0.51	4.73	0.37	3.04	5.26	0.58
2009	2.42	0.49	4.58	0.36	2.95	5.16	0.57
2010	2.38	0.47	4.46	0.35	2.87	5.07	0.55
2011	2.33	0.46	4.33	0.34	2.78	4.98	0.53
2012	2.30	0.44	4.21	0.33	2.70	4.90	0.52
2013	2.27	0.43	4.10	0.33	2.63	4.83	0.50
2014	2.24	0.42	3.99	0.32	2.56	4.77	0.49
2015	2.21	0.40	3.89	0.32	2.50	4.71	0.48
2016	2.18	0.39	3.81	0.31	2.44	4.66	0.47
2017	2.16	0.38	3.72	0.31	2.39	4.62	0.46
2018	2.15	0.38	3.68	0.31	2.36	4.60	0.45
2019	2.15	0.37	3.63	0.30	2.33	4.58	0.44
2020	2.14	0.37	3.59	0.30	2.30	4.57	0.44

Sources: BTRE estimates.

TABLE 3.31 BASE CASE PROJECTIONS OF METROPOLITAN LEAD EMISSIONS BY MOTOR VEHICLES TO 2020

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	(tonnes)
							Total
1990	1869.2	363.1	35.8	0.1	2.9	10.6	2281.7
1991	1717.0	310.2	35.4	0.1	2.7	9.2	2074.6
1992	1606.6	283.1	33.3	0.1	2.5	8.4	1933.9
1993	1318.8	239.5	27.2	0.0	1.9	6.6	1594.1
1994	1040.8	185.8	21.2	0.0	1.4	5.1	1254.3
1995	650.2	118.3	13.4	0.0	0.8	3.0	785.7
1996	580.7	115.7	12.3	0.0	0.6	2.7	712.0
1997	513.3	104.0	11.0	0.0	0.5	2.4	631.3
1998	454.9	96.5	9.0	0.0	0.3	2.1	562.8
1999	298.1	68.3	5.7	0.0	0.1	1.3	373.6
2000	223.6	50.5	4.1	0.0	0.1	1.0	279.3
2001	87.6	21.2	1.6	0.0	0.0	0.4	110.8
2002	14.6	2.7	0.1	0.0	0.0	0.1	17.4
2003	14.4	2.6	0.1	0.0	0.0	0.1	17.1
2004	13.3	2.3	0.1	0.0	0.0	0.1	15.7
2005	13.4	2.3	0.1	0.0	0.0	0.1	15.7
2006	13.2	2.2	0.0	0.0	0.0	0.1	15.5
2007	12.6	2.0	0.0	0.0	0.0	0.1	14.7
2008	12.7	2.0	0.0	0.0	0.0	0.1	14.8
2009	12.7	2.0	0.0	0.0	0.0	0.1	14.8
2010	12.8	2.0	0.0	0.0	0.0	0.1	14.9
2011	12.8	2.0	0.0	0.0	0.0	0.1	14.9
2012	12.8	2.0	0.0	0.0	0.0	0.1	14.8
2013	12.8	1.9	0.0	0.0	0.0	0.1	14.8
2014	12.8	1.9	0.0	0.0	0.0	0.1	14.8
2015	12.8	1.9	0.0	0.0	0.0	0.1	14.7
2016	12.8	1.9	0.0	0.0	0.0	0.1	14.7
2017	12.8	1.8	0.0	0.0	0.0	0.1	14.7
2018	12.8	1.8	0.0	0.0	0.0	0.1	14.7
2019	12.8	1.7	0.0	0.0	0.0	0.1	14.6
2020	12.7	1.6	0.0	0.0	0.0	0.1	14.4

Sources: BTRE estimates.

TABLE 3.32 BASE CASE PROJECTIONS OF METROPOLITAN SO<sub>X</sub> EMISSIONS BY MOTOR VEHICLES TO 2020

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
			(tonnes)				
1990	5781	2023	3689	1240	601	33	13366
1991	5434	1806	3291	1105	563	29	12227
1992	5075	1713	3068	1090	528	26	11500
1993	4776	1726	2890	1080	483	24	10979
1994	4417	1645	2784	1099	473	22	10440
1995	4264	1635	2739	1138	456	20	10253
1996	4024	1692	2598	1139	440	19	9911
1997	3804	1653	2447	1127	427	18	9476
1998	3678	1612	2268	1095	412	17	9082
1999	3530	1535	1979	1014	362	16	8437
2000	3303	1316	1629	852	319	15	7434
2001	3181	1299	1490	783	275	14	7042
2002	3038	1258	1384	735	242	14	6671
2003	2903	965	876	470	153	13	5378
2004	2818	746	540	295	93	12	4503
2005	2508	602	364	206	63	11	3753
2006	2438	408	96	54	18	10	3024
2007	2478	421	98	57	18	10	3083
2008	2517	432	99	60	19	10	3137
2009	2554	443	100	63	19	11	3189
2010	2591	457	102	66	19	11	3246
2011	2621	467	104	69	20	11	3291
2012	2651	477	105	72	20	11	3336
2013	2678	487	107	76	20	11	3378
2014	2705	497	108	79	20	11	3420
2015	2730	506	110	83	21	11	3460
2016	2752	514	111	87	21	11	3497
2017	2777	525	113	91	21	12	3540
2018	2797	532	115	96	22	12	3573
2019	2816	538	116	100	22	12	3604
2020	2837	540	118	105	22	12	3633

Sources: BTRE estimates.

TABLE 3.33      BASE CASE PROJECTIONS OF METROPOLITAN CO EMISSIONS BY  
MOTOR VEHICLES TO 2020  
(thousand tonnes)

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	2320.0	362.2	61.5	6.4	10.6	12.6	2773.3
1991	2273.2	335.9	59.6	6.0	10.8	11.9	2697.3
1992	2269.2	333.1	57.4	6.3	10.8	11.8	2688.5
1993	2272.6	350.0	55.5	6.6	10.6	11.6	2706.9
1994	2251.4	347.5	53.6	7.0	10.9	11.5	2681.8
1995	2281.3	359.5	53.4	7.4	11.1	11.3	2724.1
1996	2264.0	384.1	51.3	7.7	11.2	11.7	2730.1
1997	2211.1	383.5	49.0	8.0	11.4	11.7	2674.7
1998	2156.2	383.9	44.7	8.1	11.6	11.7	2616.2
1999	2089.0	390.8	41.7	8.4	11.5	11.7	2553.1
2000	2021.4	371.6	37.8	8.1	11.7	11.8	2462.5
2001	1907.8	380.8	36.2	8.0	11.1	11.9	2355.8
2002	1851.3	391.5	35.3	8.3	10.7	12.0	2309.1
2003	1831.5	393.2	33.4	8.2	10.4	12.1	2288.8
2004	1810.5	391.7	32.0	8.2	10.0	12.3	2264.7
2005	1780.3	392.1	30.4	8.3	9.7	12.4	2233.2
2006	1728.2	387.2	28.7	8.4	9.3	12.5	2174.3
2007	1678.6	383.1	27.8	8.5	9.0	12.6	2119.6
2008	1630.3	377.6	26.7	8.6	8.7	12.7	2064.6
2009	1585.9	371.5	25.9	8.7	8.5	12.8	2013.3
2010	1541.0	367.1	25.5	8.9	8.3	12.9	1963.7
2011	1492.7	359.6	25.1	9.0	8.1	12.9	1907.4
2012	1442.8	351.7	24.7	9.2	7.9	13.0	1849.3
2013	1393.1	344.0	24.4	9.3	7.7	13.1	1791.7
2014	1345.5	336.1	24.2	9.6	7.5	13.2	1736.1
2015	1299.5	329.1	24.0	9.8	7.3	13.3	1683.1
2016	1256.1	322.5	23.8	10.0	7.2	13.4	1633.1
2017	1210.1	316.4	23.8	10.3	7.1	13.4	1581.1
2018	1188.8	311.5	23.8	10.5	7.0	13.5	1555.2
2019	1174.0	306.6	23.8	10.8	6.9	13.6	1535.8
2020	1158.6	301.2	23.9	11.2	6.9	13.7	1515.5

Sources: BTRE estimates.

TABLE 3.34      BASE CASE PROJECTIONS OF METROPOLITAN NO<sub>x</sub> EMISSIONS BY  
MOTOR VEHICLES TO 2020  
(thousand tonnes)

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	141.9	27.2	38.4	12.0	8.8	0.4	228.7
1991	144.6	26.2	35.8	11.2	8.6	0.4	226.9
1992	151.9	27.7	34.6	11.6	8.5	0.4	234.7
1993	155.7	29.9	33.9	12.0	8.3	0.4	240.2
1994	158.3	30.7	33.9	12.8	8.6	0.4	244.7
1995	165.0	32.6	34.8	13.8	8.7	0.4	255.2
1996	169.9	35.8	34.4	14.3	8.9	0.4	263.8
1997	170.7	37.1	34.1	14.6	9.1	0.4	266.0
1998	171.2	38.2	33.0	14.7	9.4	0.4	266.8
1999	171.2	40.3	32.7	15.3	9.5	0.4	269.3
2000	170.8	39.9	31.3	14.9	9.8	0.4	267.1
2001	166.0	42.4	30.9	14.7	9.4	0.4	263.7
2002	165.4	44.5	31.4	15.1	9.1	0.4	266.0
2003	167.0	45.9	30.8	15.0	9.1	0.4	268.2
2004	168.0	46.7	30.7	15.1	8.9	0.4	269.9
2005	167.8	47.2	30.2	15.3	8.9	0.4	269.8
2006	164.6	46.7	30.0	15.5	8.7	0.4	266.0
2007	161.3	46.1	29.9	15.8	8.7	0.4	262.2
2008	157.8	45.0	29.6	15.8	8.5	0.4	257.2
2009	154.3	43.8	29.1	15.8	8.4	0.4	251.8
2010	150.7	42.8	28.9	16.0	8.3	0.4	247.1
2011	146.8	41.6	28.4	16.1	8.1	0.4	241.5
2012	142.5	40.5	28.0	16.2	7.9	0.4	235.6
2013	138.1	39.4	27.6	16.3	7.8	0.4	229.7
2014	134.0	38.5	27.3	16.5	7.6	0.4	224.3
2015	130.1	37.8	26.9	16.7	7.4	0.4	219.4
2016	126.5	37.3	26.5	16.9	7.2	0.4	214.9
2017	122.9	37.0	26.3	17.3	7.2	0.4	211.1
2018	120.5	36.8	26.0	17.6	7.1	0.5	208.3
2019	118.5	36.7	25.7	17.9	7.0	0.5	206.2
2020	116.8	36.6	25.5	18.3	6.9	0.5	204.6

Sources: BTRE estimates.

TABLE 3.35      BASE CASE PROJECTIONS OF METROPOLITAN VOC (EXHAUST)  
EMISSIONS BY MOTOR VEHICLES TO 2020  
(thousand tonnes)

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	190.9	27.1	13.5	1.9	3.0	1.7	238.1
1991	183.8	24.6	12.7	1.8	3.0	1.6	227.5
1992	181.0	23.9	12.3	1.9	2.9	1.6	223.7
1993	179.2	24.7	12.0	2.0	2.8	1.5	222.3
1994	175.3	24.1	11.9	2.1	2.9	1.5	217.9
1995	175.0	24.6	12.1	2.2	2.9	1.5	218.4
1996	170.4	25.9	11.8	2.2	2.9	1.6	214.9
1997	163.8	25.5	11.5	2.2	2.9	1.6	207.5
1998	158.0	25.4	10.8	2.2	2.9	1.6	200.9
1999	151.5	25.7	10.4	2.2	2.9	1.6	194.2
2000	144.6	24.1	9.6	2.1	2.9	1.6	184.8
2001	134.3	24.5	9.1	2.0	2.7	1.6	174.2
2002	128.3	25.0	9.0	2.1	2.5	1.6	168.5
2003	125.2	25.2	8.5	2.0	2.4	1.6	164.9
2004	122.3	25.1	8.1	2.0	2.2	1.6	161.5
2005	119.2	25.2	7.7	2.1	2.2	1.6	158.0
2006	114.9	24.9	7.4	2.1	2.1	1.7	153.0
2007	111.0	24.6	7.2	2.1	2.0	1.7	148.6
2008	107.6	24.3	6.9	2.1	1.9	1.7	144.5
2009	104.5	23.9	6.7	2.2	1.8	1.7	140.8
2010	101.5	23.6	6.5	2.2	1.8	1.7	137.4
2011	98.6	23.1	6.3	2.3	1.7	1.7	133.8
2012	95.9	22.7	6.2	2.4	1.6	1.7	130.4
2013	93.3	22.2	6.0	2.4	1.6	1.7	127.3
2014	91.0	21.8	5.9	2.5	1.5	1.8	124.5
2015	88.9	21.3	5.8	2.6	1.5	1.8	121.9
2016	87.1	20.9	5.7	2.6	1.4	1.8	119.6
2017	85.4	20.6	5.6	2.7	1.4	1.8	117.5
2018	84.9	20.3	5.5	2.8	1.4	1.8	116.7
2019	84.5	20.0	5.4	2.9	1.3	1.8	116.0
2020	84.1	19.8	5.4	3.0	1.3	1.8	115.4

Sources: BTRE estimates.

TABLE 3.36      BASE CASE PROJECTIONS OF METROPOLITAN VOC (EVAPORATIVE) EMISSIONS BY MOTOR VEHICLES TO 2020

Year	Cars	LCVs	Rigid	Articulated trucks	Buses	Motor cycles	<i>Total</i>
			and other trucks				
1990	158	21	2	0	0	1	182
1991	152	19	2	0	0	1	174
1992	151	19	2	0	0	1	172
1993	150	19	2	0	0	1	172
1994	149	19	2	0	0	1	170
1995	151	19	2	0	0	1	173
1996	151	20	2	0	0	1	174
1997	149	20	1	0	0	1	171
1998	147	20	1	0	0	1	169
1999	146	20	1	0	0	1	168
2000	145	19	1	0	0	1	166
2001	140	19	1	0	0	1	161
2002	139	20	1	0	0	1	160
2003	140	20	1	0	0	1	162
2004	142	20	1	0	0	1	164
2005	142	20	1	0	0	1	164
2006	141	20	1	0	0	1	163
2007	140	20	1	0	0	1	162
2008	139	20	1	0	0	1	161
2009	138	20	1	0	0	1	160
2010	138	20	1	0	0	1	159
2011	137	20	1	0	0	1	159
2012	137	20	1	0	0	1	158
2013	137	20	1	0	0	1	158
2014	137	20	1	0	0	1	158
2015	137	20	1	0	0	1	159
2016	138	19	1	0	0	1	159
2017	138	19	1	0	0	1	160
2018	139	19	1	0	0	1	161
2019	140	19	1	0	0	1	162
2020	142	19	1	0	0	1	163

Sources: BTRE estimates.

TABLE 3.37      BASE CASE PROJECTIONS OF METROPOLITAN VOC (TOTAL)  
EMISSIONS BY MOTOR VEHICLES TO 2020  
(thousand tonnes)

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	348.6	48.5	15.6	2.0	3.1	2.8	420.5
1991	335.8	43.9	14.7	1.8	3.1	2.6	402.0
1992	331.6	42.7	14.2	1.9	3.1	2.6	396.0
1993	329.3	44.0	13.8	2.0	3.0	2.6	394.6
1994	324.1	42.8	13.6	2.1	3.1	2.5	388.3
1995	326.3	43.7	13.8	2.2	3.1	2.5	391.5
1996	321.6	46.1	13.4	2.2	3.1	2.6	388.9
1997	312.6	45.4	12.9	2.3	3.1	2.6	378.7
1998	305.3	45.1	12.0	2.2	3.1	2.6	370.3
1999	297.6	45.6	11.4	2.2	3.0	2.6	362.5
2000	289.3	43.1	10.5	2.1	3.0	2.6	350.6
2001	274.1	43.8	10.0	2.1	2.8	2.6	335.4
2002	267.0	44.8	9.8	2.1	2.6	2.6	328.9
2003	265.7	45.1	9.2	2.1	2.5	2.7	327.2
2004	264.2	45.1	8.8	2.1	2.4	2.7	325.3
2005	261.7	45.3	8.4	2.1	2.3	2.7	322.5
2006	256.0	44.8	8.0	2.1	2.2	2.7	315.9
2007	251.0	44.6	7.7	2.1	2.1	2.8	310.3
2008	246.5	44.3	7.5	2.2	2.0	2.8	305.2
2009	242.5	43.8	7.2	2.2	2.0	2.8	300.5
2010	239.0	43.6	7.1	2.3	1.9	2.8	296.7
2011	235.6	43.0	6.9	2.3	1.8	2.8	292.5
2012	232.6	42.5	6.7	2.4	1.8	2.9	288.8
2013	229.9	41.9	6.6	2.5	1.7	2.9	285.5
2014	227.7	41.4	6.5	2.6	1.7	2.9	282.8
2015	226.0	40.9	6.4	2.6	1.6	2.9	280.4
2016	224.7	40.4	6.3	2.7	1.6	2.9	278.5
2017	223.8	40.1	6.1	2.8	1.5	3.0	277.3
2018	224.1	39.7	6.1	2.9	1.5	3.0	277.2
2019	224.9	39.2	6.0	3.0	1.5	3.0	277.6
2020	225.9	38.7	6.0	3.1	1.5	3.0	278.2

Sources: BTRE estimates.

TABLE 3.38      BASE CASE PROJECTIONS OF METROPOLITAN PM (TOTAL)  
EMISSIONS BY MOTOR VEHICLES TO 2020

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	<i>Total</i>
1990	7.06	2.93	3.45	0.77	0.82	0.05	15.08
1991	6.99	2.70	3.18	0.72	0.80	0.05	14.44
1992	6.88	2.66	3.09	0.74	0.79	0.05	14.20
1993	6.85	2.79	3.04	0.76	0.76	0.05	14.25
1994	6.79	2.78	3.07	0.80	0.78	0.05	14.28
1995	6.94	2.91	3.17	0.86	0.80	0.05	14.72
1996	6.97	3.16	3.16	0.89	0.81	0.05	15.04
1997	6.86	2.89	3.14	0.91	0.83	0.05	14.68
1998	6.85	2.78	3.06	0.92	0.85	0.05	14.50
1999	6.86	2.76	3.05	0.94	0.85	0.05	14.50
2000	6.96	2.52	2.92	0.89	0.87	0.05	14.21
2001	6.86	2.62	2.85	0.86	0.81	0.05	14.05
2002	6.97	2.71	2.88	0.87	0.77	0.05	14.24
2003	7.15	2.74	2.72	0.82	0.72	0.05	14.19
2004	7.35	2.78	2.60	0.78	0.67	0.05	14.24
2005	7.52	2.84	2.47	0.75	0.63	0.05	14.26
2006	7.58	2.82	2.33	0.71	0.58	0.05	14.06
2007	7.72	2.83	2.27	0.68	0.55	0.05	14.09
2008	7.85	2.85	2.22	0.65	0.52	0.05	14.14
2009	7.97	2.87	2.17	0.63	0.49	0.05	14.18
2010	8.07	2.91	2.14	0.62	0.46	0.05	14.25
2011	8.15	2.94	2.09	0.60	0.43	0.05	14.26
2012	8.21	2.96	2.04	0.59	0.40	0.05	14.26
2013	8.25	2.99	2.01	0.59	0.37	0.05	14.26
2014	8.29	3.02	1.97	0.58	0.35	0.05	14.26
2015	8.31	3.04	1.94	0.59	0.32	0.05	14.26
2016	8.32	3.07	1.91	0.59	0.30	0.05	14.25
2017	8.35	3.10	1.89	0.61	0.28	0.05	14.29
2018	8.36	3.12	1.87	0.63	0.26	0.05	14.30
2019	8.37	3.14	1.84	0.66	0.25	0.05	14.31
2020	8.38	3.14	1.82	0.69	0.24	0.05	14.32

Sources: BTRE estimates.

TABLE 3.39      BASE CASE PROJECTIONS OF NON-METROPOLITAN LEAD EMISSIONS BY MOTOR VEHICLES TO 2020

(tonnes)

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	1270.4	302.9	22.7	0.4	3.3	10.9	1610.6
1991	1167.4	301.3	20.0	0.4	2.8	9.5	1501.5
1992	1091.7	278.1	19.1	0.3	2.5	8.6	1400.4
1993	892.7	211.8	15.9	0.3	1.9	6.8	1129.4
1994	701.7	161.0	13.5	0.2	1.4	5.2	883.0
1995	431.1	103.1	8.2	0.1	0.8	3.1	546.3
1996	382.5	86.1	7.8	0.1	0.6	2.8	479.8
1997	336.2	75.2	7.5	0.0	0.5	2.5	421.8
1998	296.0	76.2	6.7	0.0	0.3	2.1	381.4
1999	193.4	51.6	4.3	0.0	0.1	1.4	250.8
2000	143.8	40.8	3.3	0.0	0.1	1.0	189.0
2001	55.7	16.0	1.2	0.0	0.0	0.4	73.3
2002	9.2	1.9	0.1	0.0	0.0	0.1	11.3
2003	8.9	1.8	0.1	0.0	0.0	0.1	10.9
2004	8.2	1.6	0.0	0.0	0.0	0.1	9.9
2005	8.1	1.5	0.0	0.0	0.0	0.1	9.7
2006	8.0	1.4	0.0	0.0	0.0	0.1	9.5
2007	7.5	1.3	0.0	0.0	0.0	0.1	8.9
2008	7.5	1.2	0.0	0.0	0.0	0.1	8.8
2009	7.4	1.2	0.0	0.0	0.0	0.1	8.7
2010	7.4	1.2	0.0	0.0	0.0	0.1	8.6
2011	7.3	1.1	0.0	0.0	0.0	0.1	8.5
2012	7.2	1.1	0.0	0.0	0.0	0.1	8.3
2013	7.1	1.0	0.0	0.0	0.0	0.1	8.2
2014	7.0	1.0	0.0	0.0	0.0	0.1	8.1
2015	6.9	1.0	0.0	0.0	0.0	0.1	7.9
2016	6.8	0.9	0.0	0.0	0.0	0.1	7.8
2017	6.7	0.9	0.0	0.0	0.0	0.1	7.7
2018	6.6	0.8	0.0	0.0	0.0	0.1	7.5
2019	6.5	0.8	0.0	0.0	0.0	0.1	7.4
2020	6.3	0.7	0.0	0.0	0.0	0.1	7.1

Sources: BTRE estimates.

TABLE 3.40      BASE CASE PROJECTIONS OF NON-METROPOLITAN SO<sub>X</sub> EMISSIONS  
BY MOTOR VEHICLES TO 2020  
(tonnes)

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	3929	1687	2338	6405	679	34	15073
1991	3695	1754	1861	6058	586	30	13984
1992	3449	1683	1758	5849	527	27	13293
1993	3233	1526	1690	6161	502	25	13136
1994	2978	1425	1776	5960	491	22	12653
1995	2827	1426	1664	6008	472	20	12417
1996	2650	1259	1649	5685	454	19	11716
1997	2491	1194	1665	5436	431	18	11236
1998	2393	1272	1702	5558	407	17	11350
1999	2290	1160	1492	4921	357	16	10236
2000	2124	1063	1316	4183	314	15	9015
2001	2023	977	1159	3749	270	15	8193
2002	1915	914	1042	3458	237	14	7580
2003	1809	683	657	2216	146	13	5524
2004	1738	515	410	1386	88	12	4149
2005	1527	401	274	944	60	11	3217
2006	1470	264	71	243	17	11	2076
2007	1478	264	71	251	17	11	2092
2008	1484	263	70	258	17	11	2104
2009	1489	261	70	265	18	11	2113
2010	1491	263	69	273	18	11	2125
2011	1491	263	69	281	18	11	2133
2012	1489	263	69	288	18	11	2138
2013	1485	262	68	296	18	11	2141
2014	1480	261	68	303	18	12	2142
2015	1474	260	67	311	18	12	2141
2016	1465	257	67	318	18	12	2137
2017	1455	255	66	327	18	12	2134
2018	1444	253	65	333	18	12	2125
2019	1430	249	64	339	18	12	2113
2020	1417	243	62	345	19	12	2099

Sources: BTRE estimates.

TABLE 3.41      BASE CASE PROJECTIONS OF NON-METROPOLITAN CO EMISSIONS  
BY MOTOR VEHICLES TO 2020  
(thousand tonnes)

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	967.4	183.4	29.7	24.2	6.6	12.9	1224.3
1991	942.7	196.5	25.7	24.0	6.2	12.3	1207.3
1992	935.7	195.7	25.1	24.3	6.0	12.1	1199.0
1993	928.7	184.0	24.8	26.9	6.1	11.9	1182.4
1994	911.2	177.7	26.2	27.0	6.2	11.8	1160.1
1995	911.7	184.1	24.9	27.9	6.3	11.6	1166.5
1996	892.1	167.0	24.9	27.3	6.3	12.0	1129.8
1997	860.7	160.8	25.5	27.2	6.3	12.0	1092.7
1998	829.0	175.0	25.7	28.8	6.3	12.0	1076.9
1999	793.2	169.4	24.0	28.5	6.3	12.0	1033.3
2000	755.7	171.1	23.3	27.7	6.3	12.2	996.3
2001	704.3	163.4	21.6	26.6	6.0	12.3	934.1
2002	672.9	161.7	20.4	26.7	5.7	12.4	899.8
2003	654.6	157.7	19.2	26.5	5.5	12.5	875.9
2004	635.7	152.3	18.6	26.4	5.2	12.6	850.8
2005	614.2	146.6	17.5	26.0	5.0	12.7	822.1
2006	587.6	140.5	16.3	25.8	4.8	12.8	787.8
2007	562.4	134.4	15.4	25.6	4.7	12.9	755.4
2008	538.4	128.3	14.5	25.4	4.5	13.0	724.1
2009	516.3	122.1	13.8	25.1	4.3	13.1	694.7
2010	494.2	117.7	13.3	25.0	4.1	13.2	667.6
2011	472.0	112.8	12.8	24.8	4.0	13.3	639.8
2012	449.8	107.8	12.4	24.7	3.9	13.4	611.9
2013	428.1	102.8	12.0	24.7	3.8	13.5	584.9
2014	407.4	97.9	11.6	24.8	3.7	13.6	559.0
2015	387.6	93.3	11.3	24.9	3.6	13.7	534.3
2016	369.1	88.9	10.9	24.8	3.5	13.8	511.0
2017	349.6	84.5	10.7	24.8	3.4	13.8	486.8
2018	337.9	81.0	10.4	24.8	3.3	13.9	471.3
2019	328.2	77.4	10.1	24.8	3.2	14.0	457.7
2020	318.4	73.7	9.7	24.9	3.2	14.1	444.0

Sources: BTRE estimates.

TABLE 3.42      BASE CASE PROJECTIONS OF NON-METROPOLITAN NO<sub>x</sub> EMISSIONS  
BY MOTOR VEHICLES TO 2020  
(thousand tonnes)

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	91.6	21.5	23.7	57.8	7.1	0.4	202.0
1991	92.1	23.7	19.7	56.9	6.4	0.4	199.2
1992	93.1	24.2	19.3	57.2	6.1	0.4	200.2
1993	93.9	23.2	19.3	62.7	6.1	0.4	205.6
1994	93.9	22.9	21.1	63.0	6.3	0.4	207.6
1995	95.9	24.1	20.6	65.9	6.4	0.4	213.3
1996	96.6	22.4	21.3	64.2	6.5	0.4	211.5
1997	95.2	22.2	22.6	63.0	6.6	0.4	210.1
1998	93.8	24.7	24.1	66.2	6.6	0.4	215.9
1999	92.1	24.7	23.9	65.6	6.6	0.4	213.5
2000	90.1	25.9	24.5	64.5	6.9	0.4	212.2
2001	86.1	25.5	23.4	62.1	6.6	0.4	204.0
2002	84.1	25.7	23.1	62.3	6.4	0.4	202.0
2003	83.2	25.6	22.6	61.9	6.2	0.4	199.9
2004	82.1	25.3	22.7	62.0	6.0	0.4	198.5
2005	80.3	24.5	22.1	60.9	6.0	0.4	194.3
2006	77.6	23.5	21.7	60.6	5.9	0.4	189.7
2007	74.8	22.4	21.1	60.2	5.8	0.4	184.8
2008	72.1	21.2	20.5	59.1	5.7	0.4	179.0
2009	69.4	20.0	19.7	57.8	5.5	0.4	172.9
2010	66.8	19.1	19.1	57.0	5.3	0.4	167.7
2011	64.1	18.1	18.5	56.3	5.2	0.4	162.6
2012	61.3	17.2	17.9	55.7	5.1	0.4	157.6
2013	58.5	16.4	17.2	55.0	4.9	0.4	152.5
2014	55.9	15.6	16.6	54.3	4.8	0.5	147.7
2015	53.5	14.9	16.1	53.8	4.7	0.5	143.3
2016	51.2	14.3	15.5	53.3	4.5	0.5	139.2
2017	48.9	13.7	15.0	53.1	4.4	0.5	135.5
2018	47.2	13.2	14.4	52.7	4.3	0.5	132.2
2019	45.6	12.8	13.8	52.3	4.2	0.5	129.1
2020	44.2	12.4	13.2	52.0	4.1	0.5	126.3

Sources: BTRE estimates.

TABLE 3.43      BASE CASE PROJECTIONS OF NON-METROPOLITAN VOC (TOTAL)  
EMISSIONS BY MOTOR VEHICLES TO 2020  
(*thousand tonnes*)

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	Total
1990	170.8	29.2	8.0	7.8	2.1	2.8	220.8
1991	163.6	30.5	6.8	7.7	1.9	2.7	213.2
1992	160.7	29.8	6.6	7.8	1.8	2.7	209.4
1993	160.8	27.9	6.6	8.6	1.9	2.6	208.4
1994	154.2	26.0	7.1	8.6	1.9	2.6	200.5
1995	153.4	26.6	6.8	8.8	1.9	2.6	200.1
1996	149.3	23.8	6.9	8.4	1.9	2.6	193.0
1997	143.5	22.7	7.1	8.1	1.9	2.6	185.8
1998	138.4	24.5	7.3	8.3	1.8	2.6	182.9
1999	133.0	23.5	7.0	8.0	1.8	2.6	175.9
2000	127.2	23.5	6.8	7.6	1.8	2.7	169.7
2001	118.8	22.3	6.3	7.2	1.7	2.7	159.0
2002	113.7	21.8	6.0	7.2	1.6	2.7	153.0
2003	110.9	21.3	5.6	7.1	1.5	2.7	149.1
2004	111.2	21.0	5.4	7.0	1.4	2.8	148.8
2005	107.8	20.2	5.1	6.9	1.3	2.8	144.1
2006	103.4	19.3	4.8	6.8	1.3	2.8	138.5
2007	99.4	18.5	4.5	6.8	1.2	2.8	133.3
2008	99.1	18.2	4.3	6.8	1.2	2.9	132.4
2009	95.7	17.3	4.1	6.7	1.1	2.9	127.8
2010	92.5	16.8	3.9	6.8	1.1	2.9	123.9
2011	89.5	16.1	3.7	6.8	1.0	2.9	120.1
2012	86.7	15.5	3.6	6.9	1.0	2.9	116.5
2013	84.1	14.9	3.4	6.9	0.9	3.0	113.2
2014	81.7	14.3	3.3	7.0	0.9	3.0	110.1
2015	79.5	13.7	3.2	7.0	0.9	3.0	107.2
2016	77.6	13.1	3.0	7.0	0.8	3.0	104.6
2017	75.6	12.5	2.9	7.1	0.8	3.0	102.1
2018	74.3	12.0	2.8	7.2	0.8	3.1	100.2
2019	73.1	11.5	2.7	7.2	0.8	3.1	98.4
2020	71.9	11.0	2.6	7.2	0.8	3.1	96.6

Sources: BTRE estimates.

TABLE 3.44      BASE CASE PROJECTIONS OF NON-METROPOLITAN PM (TOTAL)  
EMISSIONS BY MOTOR VEHICLES TO 2020

Year	Cars	LCVs	Rigid and other trucks	Articulated trucks	Buses	Motor cycles	<i>Total</i>
1990	4.06	2.06	1.78	3.11	0.56	0.05	11.63
1991	4.02	2.22	1.47	3.06	0.51	0.05	11.31
1992	3.95	2.21	1.44	3.06	0.48	0.05	11.19
1993	3.92	2.09	1.45	3.34	0.48	0.05	11.32
1994	3.87	2.04	1.60	3.33	0.50	0.05	11.38
1995	3.93	2.14	1.57	3.43	0.51	0.05	11.63
1996	3.92	1.99	1.64	3.34	0.51	0.05	11.45
1997	3.83	1.77	1.75	3.30	0.51	0.05	11.21
1998	3.80	1.86	1.88	3.47	0.51	0.05	11.57
1999	3.79	1.76	1.87	3.38	0.51	0.05	11.36
2000	3.81	1.71	1.92	3.23	0.53	0.05	11.25
2001	3.73	1.67	1.81	3.05	0.49	0.05	10.80
2002	3.76	1.67	1.77	3.00	0.46	0.05	10.70
2003	3.82	1.64	1.67	2.83	0.42	0.05	10.43
2004	3.87	1.63	1.62	2.69	0.39	0.05	10.24
2005	3.91	1.60	1.52	2.50	0.36	0.05	9.95
2006	3.90	1.54	1.41	2.31	0.34	0.05	9.56
2007	3.93	1.50	1.34	2.17	0.32	0.05	9.31
2008	3.95	1.47	1.29	2.05	0.30	0.05	9.10
2009	3.97	1.43	1.23	1.94	0.28	0.05	8.90
2010	3.97	1.42	1.18	1.85	0.26	0.05	8.73
2011	3.96	1.40	1.14	1.77	0.24	0.05	8.56
2012	3.94	1.38	1.09	1.70	0.22	0.05	8.39
2013	3.91	1.36	1.05	1.65	0.20	0.05	8.23
2014	3.88	1.34	1.01	1.61	0.19	0.05	8.08
2015	3.83	1.32	0.97	1.58	0.17	0.05	7.94
2016	3.78	1.30	0.94	1.56	0.16	0.06	7.80
2017	3.74	1.28	0.90	1.57	0.15	0.06	7.69
2018	3.69	1.25	0.87	1.58	0.14	0.06	7.58
2019	3.63	1.23	0.83	1.61	0.13	0.06	7.48
2020	3.58	1.20	0.79	1.65	0.12	0.06	7.39

Sources: BTRE estimates.

## Detailed tables for metropolitan emissions

TABLE 3.45 BASE CASE PROJECTIONS OF METROPOLITAN LEAD EMISSIONS BY PASSENGER CARS TO 2020

Year	(tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	599.0	575.9	227.2	168.3	204.0	28.3	9.9	56.8	1869.2	
1991	550.9	527.3	209.3	156.5	186.6	25.3	9.6	51.5	1717.0	
1992	511.5	490.9	198.4	145.7	176.8	24.1	9.4	49.8	1606.6	
1993	419.8	403.3	162.5	119.6	145.3	19.8	7.7	40.8	1318.8	
1994	331.3	318.5	128.1	94.3	114.8	15.6	6.0	32.2	1040.8	
1995	206.9	199.1	80.0	58.8	71.8	9.8	3.7	20.1	650.2	
1996	184.7	177.8	71.4	52.5	64.3	8.7	3.3	17.9	580.7	
1997	163.5	157.2	63.0	46.3	56.8	7.7	2.9	15.8	513.3	
1998	143.6	140.6	55.8	42.3	49.7	6.6	2.7	13.6	454.9	
1999	93.6	92.4	37.2	27.2	32.5	4.4	1.7	9.0	298.1	
2000	70.9	69.0	27.4	20.5	24.6	3.3	1.3	6.7	223.6	
2001	27.8	27.0	10.8	8.0	9.7	1.3	0.5	2.6	87.6	
2002	4.6	4.5	1.8	1.3	1.6	0.2	0.1	0.4	14.6	
2003	4.6	4.4	1.8	1.3	1.6	0.2	0.1	0.4	14.4	
2004	4.2	4.1	1.7	1.2	1.5	0.2	0.1	0.4	13.3	
2005	4.2	4.1	1.7	1.2	1.5	0.2	0.1	0.4	13.4	
2006	4.2	4.0	1.7	1.2	1.5	0.2	0.1	0.4	13.2	
2007	4.0	3.9	1.6	1.1	1.4	0.2	0.1	0.4	12.6	
2008	4.0	3.9	1.6	1.1	1.4	0.2	0.1	0.4	12.7	
2009	4.0	3.9	1.7	1.1	1.5	0.2	0.1	0.4	12.7	
2010	4.1	3.9	1.7	1.1	1.5	0.2	0.1	0.4	12.8	
2011	4.1	3.9	1.7	1.1	1.5	0.2	0.1	0.4	12.8	
2012	4.1	3.9	1.7	1.1	1.5	0.2	0.1	0.4	12.8	
2013	4.1	3.8	1.7	1.1	1.5	0.2	0.1	0.4	12.8	
2014	4.1	3.8	1.7	1.1	1.5	0.1	0.1	0.4	12.8	
2015	4.1	3.8	1.8	1.0	1.5	0.1	0.1	0.4	12.8	
2016	4.1	3.8	1.8	1.0	1.5	0.1	0.1	0.3	12.8	
2017	4.1	3.8	1.8	1.0	1.5	0.1	0.1	0.3	12.8	
2018	4.1	3.8	1.8	1.0	1.6	0.1	0.1	0.3	12.8	
2019	4.1	3.7	1.8	1.0	1.6	0.1	0.1	0.3	12.8	
2020	4.0	3.7	1.9	1.0	1.6	0.1	0.1	0.3	12.7	

Sources: BTRE estimates.

TABLE 3.46 BASE CASE PROJECTIONS OF METROPOLITAN SO<sub>X</sub> EMISSIONS BY PASSENGER CARS TO 2020

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	1852.5	1781.2	702.6	520.4	631.0	87.4	30.5	175.5	5781.2
1991	1743.4	1668.7	662.4	495.4	590.6	80.0	30.2	162.9	5433.7
1992	1615.7	1550.7	626.8	460.3	558.5	76.2	29.7	157.2	5074.9
1993	1520.3	1460.2	588.5	432.9	526.3	71.7	27.8	147.9	4775.6
1994	1406.0	1351.6	543.7	400.1	487.4	66.4	25.5	136.7	4417.3
1995	1356.8	1305.5	524.6	385.9	471.2	64.1	24.5	131.8	4264.3
1996	1279.9	1232.4	494.9	363.7	445.3	60.5	23.0	124.3	4024.2
1997	1212.0	1165.1	467.2	343.0	420.7	57.2	21.8	117.4	3804.4
1998	1160.7	1137.2	451.1	342.3	402.1	53.0	21.4	110.0	3677.9
1999	1108.6	1094.2	440.8	322.1	384.9	52.0	20.4	107.0	3530.0
2000	1046.9	1018.9	405.2	302.7	362.9	49.1	19.3	98.4	3303.4
2001	1008.6	981.7	391.6	289.2	351.0	46.4	18.7	94.1	3181.3
2002	963.3	938.0	375.8	274.5	336.2	43.6	17.9	89.2	3038.4
2003	920.3	894.6	361.6	260.3	322.8	41.0	17.2	84.9	2902.8
2004	893.4	866.9	353.5	251.1	314.7	39.2	16.6	82.6	2818.0
2005	795.1	770.0	316.9	221.9	281.5	34.3	14.8	73.2	2507.6
2006	773.2	747.1	310.3	214.2	274.9	32.8	14.4	70.8	2437.7
2007	786.2	757.8	317.9	216.1	280.9	32.8	14.6	71.6	2477.9
2008	798.8	768.1	325.5	217.8	286.8	32.7	14.8	72.3	2516.8
2009	810.8	777.5	333.0	219.3	292.6	32.6	15.0	72.9	2553.8
2010	822.8	786.7	340.9	220.6	298.7	32.5	15.2	73.5	2590.8
2011	832.8	793.7	348.0	221.3	304.0	32.2	15.4	73.9	2621.3
2012	842.5	800.3	355.2	221.8	309.3	32.0	15.5	74.2	2650.9
2013	851.4	805.9	362.3	222.0	314.5	31.7	15.7	74.5	2678.0
2014	860.2	811.1	369.6	222.1	319.7	31.4	15.8	74.7	2704.6
2015	868.4	815.6	377.0	222.0	324.9	31.0	15.9	74.8	2729.6
2016	875.9	819.1	384.3	221.5	330.0	30.6	16.0	74.8	2752.1
2017	884.2	822.7	392.3	221.1	335.6	30.2	16.1	74.9	2777.1
2018	890.9	825.0	399.8	220.3	340.7	29.7	16.1	74.8	2797.3
2019	897.1	826.4	407.5	219.2	345.7	29.2	16.2	74.6	2816.0
2020	904.0	828.2	415.6	218.2	351.1	28.7	16.2	74.5	2836.6

Sources: BTRE estimates.

TABLE 3.47 BASE CASE PROJECTIONS OF METROPOLITAN CO EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	743.4	714.8	281.9	208.8	253.2	35.1	12.2	70.4	2320.0
1991	729.4	698.1	277.1	207.3	247.1	33.5	12.6	68.2	2273.2
1992	722.4	693.4	280.3	205.8	249.7	34.1	13.3	70.3	2269.2
1993	723.4	694.9	280.1	206.0	250.5	34.1	13.2	70.4	2272.6
1994	716.6	688.9	277.1	203.9	248.4	33.9	13.0	69.6	2251.4
1995	725.8	698.4	280.6	206.4	252.1	34.3	13.1	70.5	2281.3
1996	720.1	693.3	278.4	204.6	250.5	34.1	12.9	70.0	2264.0
1997	704.4	677.2	271.6	199.4	244.5	33.3	12.7	68.2	2211.1
1998	680.5	666.7	264.4	200.7	235.8	31.1	12.6	64.5	2156.2
1999	656.1	647.5	260.9	190.6	227.7	30.8	12.0	63.3	2089.0
2000	640.6	623.4	248.0	185.2	222.0	30.1	11.8	60.2	2021.4
2001	604.8	588.7	234.8	173.4	210.5	27.8	11.2	56.4	1907.8
2002	586.9	571.5	228.9	167.2	204.8	26.6	10.9	54.3	1851.3
2003	580.7	564.5	228.2	164.3	203.6	25.9	10.8	53.6	1831.5
2004	574.0	557.0	227.1	161.3	202.2	25.2	10.7	53.0	1810.5
2005	564.5	546.7	225.0	157.6	199.8	24.4	10.5	51.9	1780.3
2006	548.1	529.7	220.0	151.9	194.9	23.3	10.2	50.2	1728.2
2007	532.6	513.4	215.3	146.4	190.3	22.2	9.9	48.5	1678.6
2008	517.4	497.5	210.8	141.1	185.8	21.2	9.6	46.8	1630.3
2009	503.5	482.8	206.8	136.2	181.7	20.3	9.3	45.3	1585.9
2010	489.4	467.9	202.8	131.2	177.6	19.3	9.0	43.7	1541.0
2011	474.3	452.0	198.2	126.0	173.1	18.4	8.8	42.1	1492.7
2012	458.5	435.6	193.3	120.7	168.4	17.4	8.5	40.4	1442.8
2013	442.9	419.2	188.5	115.5	163.6	16.5	8.1	38.8	1393.1
2014	427.9	403.5	183.9	110.5	159.1	15.6	7.8	37.2	1345.5
2015	413.4	388.3	179.5	105.7	154.7	14.8	7.6	35.6	1299.5
2016	399.8	373.8	175.4	101.1	150.6	14.0	7.3	34.2	1256.1
2017	385.3	358.5	171.0	96.3	146.2	13.1	7.0	32.6	1210.1
2018	378.6	350.6	169.9	93.6	144.8	12.6	6.9	31.8	1188.8
2019	374.0	344.5	169.9	91.4	144.1	12.2	6.7	31.1	1174.0
2020	369.2	338.3	169.8	89.1	143.4	11.7	6.6	30.4	1158.6

Sources: BTRE estimates.

TABLE 3.48 BASE CASE PROJECTIONS OF METROPOLITAN NO<sub>x</sub> EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	45.5	43.7	17.2	12.8	15.5	2.1	0.7	4.3	141.9
1991	46.4	44.4	17.6	13.2	15.7	2.1	0.8	4.3	144.6
1992	48.3	46.4	18.8	13.8	16.7	2.3	0.9	4.7	151.9
1993	49.6	47.6	19.2	14.1	17.2	2.3	0.9	4.8	155.7
1994	50.4	48.4	19.5	14.3	17.5	2.4	0.9	4.9	158.3
1995	52.5	50.5	20.3	14.9	18.2	2.5	0.9	5.1	165.0
1996	54.1	52.0	20.9	15.4	18.8	2.6	1.0	5.3	169.9
1997	54.4	52.3	21.0	15.4	18.9	2.6	1.0	5.3	170.7
1998	54.0	52.9	21.0	15.9	18.7	2.5	1.0	5.1	171.2
1999	53.8	53.1	21.4	15.6	18.7	2.5	1.0	5.2	171.2
2000	54.1	52.7	20.9	15.6	18.8	2.5	1.0	5.1	170.8
2001	52.6	51.2	20.4	15.1	18.3	2.4	1.0	4.9	166.0
2002	52.4	51.1	20.5	14.9	18.3	2.4	1.0	4.9	165.4
2003	53.0	51.5	20.8	15.0	18.6	2.4	1.0	4.9	167.0
2004	53.3	51.7	21.1	15.0	18.8	2.3	1.0	4.9	168.0
2005	53.2	51.5	21.2	14.8	18.8	2.3	1.0	4.9	167.8
2006	52.2	50.5	21.0	14.5	18.6	2.2	1.0	4.8	164.6
2007	51.2	49.3	20.7	14.1	18.3	2.1	1.0	4.7	161.3
2008	50.1	48.2	20.4	13.7	18.0	2.1	0.9	4.5	157.8
2009	49.0	47.0	20.1	13.3	17.7	2.0	0.9	4.4	154.3
2010	47.9	45.8	19.8	12.8	17.4	1.9	0.9	4.3	150.7
2011	46.6	44.5	19.5	12.4	17.0	1.8	0.9	4.1	146.8
2012	45.3	43.0	19.1	11.9	16.6	1.7	0.8	4.0	142.5
2013	43.9	41.6	18.7	11.5	16.2	1.6	0.8	3.8	138.1
2014	42.6	40.2	18.3	11.0	15.8	1.6	0.8	3.7	134.0
2015	41.4	38.9	18.0	10.6	15.5	1.5	0.8	3.6	130.1
2016	40.2	37.6	17.7	10.2	15.2	1.4	0.7	3.4	126.5
2017	39.1	36.4	17.4	9.8	14.9	1.3	0.7	3.3	122.9
2018	38.4	35.5	17.2	9.5	14.7	1.3	0.7	3.2	120.5
2019	37.7	34.8	17.1	9.2	14.5	1.2	0.7	3.1	118.5
2020	37.2	34.1	17.1	9.0	14.5	1.2	0.7	3.1	116.8

Sources: BTRE estimates.

TABLE 3.49 BASE CASE PROJECTIONS OF METROPOLITAN VOC (EXHAUST) EMISSIONS  
BY PASSENGER CARS TO 2020

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	61.17	58.82	23.20	17.19	20.84	2.89	1.01	5.80	190.91
1991	58.99	56.46	22.41	16.76	19.98	2.71	1.02	5.51	183.84
1992	57.64	55.31	22.36	16.42	19.92	2.72	1.06	5.61	181.03
1993	57.05	54.79	22.08	16.24	19.75	2.69	1.04	5.55	179.20
1994	55.81	53.65	21.58	15.88	19.35	2.64	1.01	5.42	175.35
1995	55.69	53.58	21.53	15.84	19.34	2.63	1.00	5.41	175.03
1996	54.21	52.19	20.96	15.40	18.86	2.56	0.97	5.27	170.43
1997	52.17	50.15	20.11	14.77	18.11	2.46	0.94	5.05	163.77
1998	49.88	48.87	19.38	14.71	17.28	2.28	0.92	4.73	158.04
1999	47.58	46.96	18.92	13.82	16.52	2.23	0.87	4.59	151.49
2000	45.82	44.59	17.74	13.25	15.88	2.15	0.85	4.31	144.57
2001	42.57	41.44	16.53	12.21	14.82	1.96	0.79	3.97	134.28
2002	40.67	39.61	15.87	11.59	14.19	1.84	0.76	3.77	128.30
2003	39.69	38.58	15.59	11.23	13.92	1.77	0.74	3.66	125.18
2004	38.79	37.64	15.34	10.90	13.66	1.70	0.72	3.58	122.34
2005	37.80	36.61	15.06	10.55	13.38	1.63	0.70	3.48	119.21
2006	36.45	35.22	14.63	10.10	12.96	1.55	0.68	3.34	114.91
2007	35.23	33.96	14.24	9.69	12.59	1.47	0.65	3.21	111.04
2008	34.14	32.83	13.91	9.31	12.26	1.40	0.63	3.09	107.56
2009	33.18	31.81	13.63	8.97	11.97	1.33	0.61	2.98	104.50
2010	32.24	30.82	13.36	8.64	11.70	1.27	0.60	2.88	101.51
2011	31.32	29.85	13.09	8.32	11.43	1.21	0.58	2.78	98.58
2012	30.47	28.94	12.85	8.02	11.19	1.16	0.56	2.68	95.87
2013	29.66	28.07	12.62	7.73	10.95	1.10	0.55	2.60	93.28
2014	28.94	27.29	12.43	7.47	10.76	1.06	0.53	2.51	90.98
2015	28.29	26.57	12.28	7.23	10.59	1.01	0.52	2.44	88.93
2016	27.73	25.93	12.17	7.02	10.45	0.97	0.51	2.37	87.14
2017	27.19	25.30	12.07	6.80	10.32	0.93	0.49	2.30	85.41
2018	27.03	25.03	12.13	6.69	10.34	0.90	0.49	2.27	84.88
2019	26.91	24.79	12.22	6.58	10.37	0.88	0.49	2.24	84.48
2020	26.81	24.56	12.33	6.47	10.41	0.85	0.48	2.21	84.13

Sources: BTRE estimates.

TABLE 3.50 BASE CASE PROJECTIONS OF METROPOLITAN VOC (EVAPORATIVE) EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	50.44	48.46	19.42	13.95	17.18	2.43	0.85	4.97	157.70
1991	48.67	46.54	18.78	13.61	16.49	2.28	0.86	4.73	151.96
1992	47.85	45.88	18.85	13.42	16.54	2.30	0.90	4.84	150.57
1993	47.70	45.77	18.75	13.37	16.51	2.29	0.89	4.83	150.11
1994	47.27	45.40	18.56	13.24	16.39	2.28	0.88	4.78	148.80
1995	48.03	46.17	18.86	13.45	16.68	2.31	0.88	4.86	151.24
1996	47.99	46.16	18.84	13.42	16.70	2.31	0.88	4.85	151.16
1997	47.31	45.44	18.52	13.18	16.43	2.28	0.87	4.77	148.80
1998	46.40	45.42	18.31	13.47	16.08	2.16	0.88	4.58	147.29
1999	45.80	45.16	18.49	13.10	15.90	2.19	0.86	4.60	146.10
2000	45.79	44.52	18.00	13.03	15.87	2.19	0.86	4.48	144.74
2001	44.24	43.03	17.44	12.49	15.40	2.08	0.84	4.29	139.81
2002	43.88	42.69	17.38	12.31	15.31	2.03	0.83	4.23	138.67
2003	44.45	43.18	17.74	12.38	15.59	2.02	0.85	4.27	140.47
2004	44.90	43.53	18.04	12.42	15.82	2.01	0.85	4.32	141.89
2005	45.09	43.63	18.25	12.39	15.96	1.98	0.86	4.32	142.48
2006	44.67	43.12	18.20	12.18	15.88	1.93	0.85	4.26	141.09
2007	44.31	42.67	18.19	11.99	15.83	1.88	0.84	4.20	139.93
2008	44.00	42.27	18.21	11.81	15.80	1.84	0.83	4.14	138.91
2009	43.74	41.90	18.24	11.64	15.79	1.79	0.83	4.09	138.02
2010	43.59	41.64	18.34	11.50	15.82	1.75	0.82	4.05	137.53
2011	43.44	41.37	18.43	11.36	15.86	1.71	0.82	4.01	137.01
2012	43.36	41.16	18.57	11.24	15.92	1.68	0.82	3.98	136.72
2013	43.34	40.99	18.73	11.13	16.01	1.64	0.81	3.95	136.61
2014	43.40	40.89	18.94	11.03	16.13	1.61	0.81	3.92	136.75
2015	43.52	40.83	19.18	10.95	16.28	1.58	0.81	3.90	137.07
2016	43.68	40.81	19.46	10.88	16.46	1.55	0.81	3.88	137.54
2017	43.96	40.87	19.81	10.82	16.69	1.53	0.82	3.88	138.37
2018	44.26	40.94	20.17	10.77	16.93	1.50	0.82	3.87	139.26
2019	44.65	41.09	20.59	10.74	17.21	1.48	0.82	3.86	140.45
2020	45.09	41.27	21.05	10.72	17.51	1.46	0.83	3.87	141.79

Sources: BTRE estimates.

TABLE 3.51 BASE CASE PROJECTIONS OF METROPOLITAN VOC (TOTAL) EMISSIONS  
BY PASSENGER CARS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	111.6	107.3	42.6	31.1	38.0	5.3	1.9	10.8	348.6	
1991	107.7	103.0	41.2	30.4	36.5	5.0	1.9	10.2	335.8	
1992	105.5	101.2	41.2	29.8	36.5	5.0	2.0	10.5	331.6	
1993	104.7	100.6	40.8	29.6	36.3	5.0	1.9	10.4	329.3	
1994	103.1	99.1	40.1	29.1	35.7	4.9	1.9	10.2	324.1	
1995	103.7	99.8	40.4	29.3	36.0	4.9	1.9	10.3	326.3	
1996	102.2	98.4	39.8	28.8	35.6	4.9	1.9	10.1	321.6	
1997	99.5	95.6	38.6	27.9	34.5	4.7	1.8	9.8	312.6	
1998	96.3	94.3	37.7	28.2	33.4	4.4	1.8	9.3	305.3	
1999	93.4	92.1	37.4	26.9	32.4	4.4	1.7	9.2	297.6	
2000	91.6	89.1	35.7	26.3	31.8	4.3	1.7	8.8	289.3	
2001	86.8	84.5	34.0	24.7	30.2	4.0	1.6	8.3	274.1	
2002	84.6	82.3	33.2	23.9	29.5	3.9	1.6	8.0	267.0	
2003	84.1	81.8	33.3	23.6	29.5	3.8	1.6	7.9	265.7	
2004	83.7	81.2	33.4	23.3	29.5	3.7	1.6	7.9	264.2	
2005	82.9	80.2	33.3	22.9	29.3	3.6	1.6	7.8	261.7	
2006	81.1	78.3	32.8	22.3	28.8	3.5	1.5	7.6	256.0	
2007	79.5	76.6	32.4	21.7	28.4	3.4	1.5	7.4	251.0	
2008	78.1	75.1	32.1	21.1	28.1	3.2	1.5	7.2	246.5	
2009	76.9	73.7	31.9	20.6	27.8	3.1	1.4	7.1	242.5	
2010	75.8	72.5	31.7	20.1	27.5	3.0	1.4	6.9	239.0	
2011	74.8	71.2	31.5	19.7	27.3	2.9	1.4	6.8	235.6	
2012	73.8	70.1	31.4	19.3	27.1	2.8	1.4	6.7	232.6	
2013	73.0	69.1	31.4	18.9	27.0	2.7	1.4	6.5	229.9	
2014	72.3	68.2	31.4	18.5	26.9	2.7	1.3	6.4	227.7	
2015	71.8	67.4	31.5	18.2	26.9	2.6	1.3	6.3	226.0	
2016	71.4	66.7	31.6	17.9	26.9	2.5	1.3	6.3	224.7	
2017	71.2	66.2	31.9	17.6	27.0	2.5	1.3	6.2	223.8	
2018	71.3	66.0	32.3	17.5	27.3	2.4	1.3	6.1	224.1	
2019	71.6	65.9	32.8	17.3	27.6	2.4	1.3	6.1	224.9	
2020	71.9	65.8	33.4	17.2	27.9	2.3	1.3	6.1	225.9	

Sources: BTRE estimates.

TABLE 3.52 BASE CASE PROJECTIONS OF METROPOLITAN PM (TOTAL) EMISSIONS BY PASSENGER CARS TO 2020

(*thousand tonnes*)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	2.264	2.176	0.858	0.636	0.771	0.107	0.037	0.214	7.064
1991	2.243	2.147	0.852	0.637	0.760	0.103	0.039	0.210	6.992
1992	2.190	2.102	0.850	0.624	0.757	0.103	0.040	0.213	6.880
1993	2.181	2.095	0.844	0.621	0.755	0.103	0.040	0.212	6.851
1994	2.162	2.079	0.836	0.615	0.750	0.102	0.039	0.210	6.794
1995	2.208	2.124	0.854	0.628	0.767	0.104	0.040	0.215	6.939
1996	2.216	2.134	0.857	0.630	0.771	0.105	0.040	0.215	6.967
1997	2.185	2.100	0.842	0.618	0.758	0.103	0.039	0.212	6.859
1998	2.160	2.117	0.840	0.637	0.748	0.099	0.040	0.205	6.846
1999	2.153	2.125	0.856	0.626	0.748	0.101	0.040	0.208	6.857
2000	2.206	2.147	0.854	0.638	0.765	0.103	0.041	0.207	6.961
2001	2.176	2.118	0.845	0.624	0.757	0.100	0.040	0.203	6.864
2002	2.211	2.153	0.862	0.630	0.771	0.100	0.041	0.205	6.973
2003	2.268	2.205	0.891	0.642	0.796	0.101	0.042	0.209	7.155
2004	2.330	2.261	0.922	0.655	0.821	0.102	0.043	0.215	7.350
2005	2.385	2.310	0.950	0.666	0.844	0.103	0.044	0.219	7.521
2006	2.405	2.324	0.965	0.666	0.855	0.102	0.045	0.220	7.583
2007	2.448	2.360	0.990	0.673	0.875	0.102	0.046	0.223	7.716
2008	2.490	2.395	1.015	0.679	0.894	0.102	0.046	0.225	7.847
2009	2.530	2.426	1.039	0.684	0.913	0.102	0.047	0.228	7.968
2010	2.564	2.452	1.062	0.687	0.931	0.101	0.047	0.229	8.074
2011	2.589	2.468	1.082	0.688	0.945	0.100	0.048	0.230	8.150
2012	2.609	2.478	1.100	0.687	0.958	0.099	0.048	0.230	8.209
2013	2.624	2.484	1.117	0.684	0.969	0.098	0.048	0.230	8.254
2014	2.637	2.487	1.133	0.681	0.980	0.096	0.048	0.229	8.291
2015	2.645	2.484	1.148	0.676	0.990	0.094	0.048	0.228	8.312
2016	2.648	2.476	1.162	0.670	0.997	0.092	0.048	0.226	8.319
2017	2.658	2.473	1.179	0.665	1.009	0.091	0.048	0.225	8.347
2018	2.664	2.467	1.196	0.659	1.019	0.089	0.048	0.224	8.365
2019	2.668	2.458	1.212	0.652	1.028	0.087	0.048	0.222	8.374
2020	2.671	2.447	1.228	0.645	1.037	0.085	0.048	0.220	8.381

Sources: BTRE estimates.

TABLE 3.53 BASE CASE PROJECTIONS OF METROPOLITAN PM10 EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	2.121	2.039	0.804	0.596	0.722	0.100	0.035	0.201	6.618
1991	2.113	2.022	0.803	0.600	0.716	0.097	0.037	0.197	6.584
1992	2.069	1.986	0.803	0.589	0.715	0.098	0.038	0.201	6.499
1993	2.066	1.985	0.800	0.588	0.715	0.098	0.038	0.201	6.491
1994	2.056	1.977	0.795	0.585	0.713	0.097	0.037	0.200	6.460
1995	2.106	2.027	0.814	0.599	0.732	0.100	0.038	0.205	6.621
1996	2.122	2.043	0.820	0.603	0.738	0.100	0.038	0.206	6.671
1997	2.098	2.017	0.809	0.594	0.728	0.099	0.038	0.203	6.586
1998	2.080	2.038	0.808	0.613	0.721	0.095	0.038	0.197	6.591
1999	2.079	2.052	0.827	0.604	0.722	0.098	0.038	0.201	6.620
2000	2.135	2.078	0.826	0.617	0.740	0.100	0.039	0.201	6.737
2001	2.110	2.054	0.819	0.605	0.734	0.097	0.039	0.197	6.656
2002	2.148	2.092	0.838	0.612	0.750	0.097	0.040	0.199	6.776
2003	2.207	2.146	0.867	0.624	0.774	0.098	0.041	0.204	6.962
2004	2.270	2.203	0.898	0.638	0.800	0.100	0.042	0.210	7.161
2005	2.326	2.253	0.927	0.649	0.823	0.100	0.043	0.214	7.336
2006	2.348	2.268	0.942	0.650	0.835	0.100	0.044	0.215	7.401
2007	2.391	2.305	0.967	0.657	0.854	0.100	0.044	0.218	7.536
2008	2.434	2.340	0.992	0.664	0.874	0.100	0.045	0.220	7.668
2009	2.473	2.372	1.016	0.669	0.893	0.099	0.046	0.222	7.790
2010	2.508	2.398	1.039	0.672	0.910	0.099	0.046	0.224	7.896
2011	2.533	2.414	1.058	0.673	0.925	0.098	0.047	0.225	7.974
2012	2.553	2.426	1.077	0.672	0.937	0.097	0.047	0.225	8.034
2013	2.569	2.432	1.093	0.670	0.949	0.096	0.047	0.225	8.080
2014	2.582	2.435	1.109	0.667	0.960	0.094	0.047	0.224	8.118
2015	2.590	2.432	1.124	0.662	0.969	0.092	0.047	0.223	8.140
2016	2.593	2.424	1.137	0.656	0.977	0.090	0.047	0.222	8.146
2017	2.602	2.421	1.155	0.651	0.988	0.089	0.047	0.220	8.173
2018	2.609	2.416	1.171	0.645	0.998	0.087	0.047	0.219	8.191
2019	2.612	2.406	1.186	0.638	1.007	0.085	0.047	0.217	8.200
2020	2.615	2.396	1.202	0.631	1.016	0.083	0.047	0.215	8.206

Sources: BTRE estimates.

TABLE 3.54 BASE CASE PROJECTIONS OF METROPOLITAN PM2.5 EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	1.921	1.847	0.728	0.540	0.654	0.091	0.032	0.182	5.994
1991	1.923	1.840	0.731	0.546	0.651	0.088	0.033	0.180	5.992
1992	1.889	1.813	0.733	0.538	0.653	0.089	0.035	0.184	5.932
1993	1.892	1.817	0.732	0.539	0.655	0.089	0.035	0.184	5.943
1994	1.888	1.815	0.730	0.537	0.655	0.089	0.034	0.184	5.932
1995	1.940	1.867	0.750	0.552	0.674	0.092	0.035	0.189	6.098
1996	1.961	1.888	0.758	0.557	0.682	0.093	0.035	0.190	6.164
1997	1.944	1.869	0.749	0.550	0.675	0.092	0.035	0.188	6.102
1998	1.932	1.893	0.751	0.570	0.669	0.088	0.036	0.183	6.122
1999	1.935	1.910	0.770	0.562	0.672	0.091	0.036	0.187	6.163
2000	1.992	1.938	0.771	0.576	0.690	0.093	0.037	0.187	6.285
2001	1.972	1.919	0.766	0.565	0.686	0.091	0.036	0.184	6.220
2002	2.010	1.958	0.784	0.573	0.701	0.091	0.037	0.186	6.341
2003	2.068	2.010	0.813	0.585	0.725	0.092	0.039	0.191	6.523
2004	2.129	2.066	0.842	0.598	0.750	0.093	0.040	0.197	6.715
2005	2.183	2.114	0.870	0.609	0.773	0.094	0.041	0.201	6.884
2006	2.204	2.130	0.885	0.611	0.784	0.094	0.041	0.202	6.950
2007	2.246	2.165	0.908	0.617	0.803	0.094	0.042	0.204	7.079
2008	2.287	2.199	0.932	0.624	0.821	0.094	0.042	0.207	7.206
2009	2.325	2.230	0.955	0.629	0.839	0.094	0.043	0.209	7.323
2010	2.358	2.254	0.977	0.632	0.856	0.093	0.044	0.211	7.425
2011	2.383	2.271	0.996	0.633	0.870	0.092	0.044	0.212	7.501
2012	2.403	2.282	1.013	0.632	0.882	0.091	0.044	0.212	7.560
2013	2.418	2.289	1.029	0.630	0.893	0.090	0.044	0.212	7.605
2014	2.430	2.292	1.044	0.627	0.903	0.089	0.045	0.211	7.641
2015	2.438	2.290	1.058	0.623	0.912	0.087	0.045	0.210	7.663
2016	2.441	2.282	1.071	0.617	0.919	0.085	0.044	0.209	7.669
2017	2.450	2.280	1.087	0.613	0.930	0.084	0.045	0.207	7.695
2018	2.456	2.274	1.102	0.607	0.939	0.082	0.045	0.206	7.712
2019	2.460	2.266	1.117	0.601	0.948	0.080	0.044	0.205	7.721
2020	2.462	2.256	1.132	0.594	0.956	0.078	0.044	0.203	7.727

Sources: BTRE estimates.

TABLE 3.55 BASE CASE PROJECTIONS OF METROPOLITAN PM1.0 EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	1.864	1.792	0.707	0.524	0.635	0.088	0.031	0.177	5.816
1991	1.860	1.780	0.707	0.528	0.630	0.085	0.032	0.174	5.796
1992	1.822	1.749	0.707	0.519	0.630	0.086	0.033	0.177	5.724
1993	1.820	1.749	0.705	0.518	0.630	0.086	0.033	0.177	5.719
1994	1.811	1.741	0.700	0.516	0.628	0.086	0.033	0.176	5.691
1995	1.856	1.786	0.718	0.528	0.645	0.088	0.033	0.180	5.834
1996	1.870	1.801	0.723	0.531	0.651	0.088	0.034	0.182	5.880
1997	1.850	1.779	0.713	0.524	0.642	0.087	0.033	0.179	5.808
1998	1.835	1.798	0.713	0.541	0.636	0.084	0.034	0.174	5.815
1999	1.833	1.810	0.729	0.533	0.636	0.086	0.034	0.177	5.838
2000	1.883	1.832	0.729	0.544	0.653	0.088	0.035	0.177	5.941
2001	1.860	1.811	0.722	0.533	0.647	0.086	0.034	0.173	5.867
2002	1.892	1.843	0.738	0.539	0.660	0.086	0.035	0.175	5.969
2003	1.943	1.889	0.763	0.550	0.681	0.087	0.036	0.179	6.128
2004	1.997	1.938	0.790	0.561	0.703	0.088	0.037	0.185	6.298
2005	2.044	1.980	0.815	0.571	0.724	0.088	0.038	0.188	6.448
2006	2.062	1.993	0.828	0.571	0.733	0.087	0.038	0.189	6.502
2007	2.100	2.024	0.849	0.577	0.750	0.088	0.039	0.191	6.618
2008	2.137	2.054	0.871	0.583	0.767	0.088	0.040	0.193	6.732
2009	2.171	2.081	0.891	0.587	0.783	0.087	0.040	0.195	6.837
2010	2.200	2.104	0.912	0.590	0.799	0.087	0.041	0.197	6.928
2011	2.222	2.118	0.929	0.590	0.811	0.086	0.041	0.197	6.995
2012	2.240	2.128	0.944	0.590	0.822	0.085	0.041	0.197	7.047
2013	2.253	2.132	0.959	0.587	0.832	0.084	0.041	0.197	7.086
2014	2.264	2.135	0.973	0.585	0.841	0.083	0.042	0.197	7.118
2015	2.270	2.132	0.986	0.580	0.849	0.081	0.042	0.196	7.136
2016	2.272	2.125	0.997	0.575	0.856	0.079	0.041	0.194	7.140
2017	2.281	2.122	1.012	0.570	0.866	0.078	0.041	0.193	7.164
2018	2.287	2.117	1.026	0.565	0.874	0.076	0.041	0.192	7.180
2019	2.290	2.110	1.040	0.560	0.882	0.075	0.041	0.190	7.188
2020	2.292	2.100	1.054	0.553	0.890	0.073	0.041	0.189	7.193

Sources: BTRE estimates.

TABLE 3.56 BASE CASE PROJECTIONS OF METROPOLITAN ACETALDEHYDE EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.352	0.338	0.133	0.099	0.120	0.017	0.006	0.033	1.098
1991	0.350	0.335	0.133	0.099	0.119	0.016	0.006	0.033	1.091
1992	0.343	0.329	0.133	0.098	0.119	0.016	0.006	0.033	1.077
1993	0.339	0.326	0.131	0.097	0.117	0.016	0.006	0.033	1.065
1994	0.332	0.319	0.128	0.095	0.115	0.016	0.006	0.032	1.043
1995	0.333	0.321	0.129	0.095	0.116	0.016	0.006	0.032	1.047
1996	0.324	0.312	0.125	0.092	0.113	0.015	0.006	0.031	1.017
1997	0.311	0.299	0.120	0.088	0.108	0.015	0.006	0.030	0.977
1998	0.300	0.294	0.117	0.089	0.104	0.014	0.006	0.028	0.951
1999	0.289	0.285	0.115	0.084	0.100	0.014	0.005	0.028	0.920
2000	0.282	0.275	0.109	0.082	0.098	0.013	0.005	0.027	0.891
2001	0.266	0.258	0.103	0.076	0.092	0.012	0.005	0.025	0.837
2002	0.255	0.248	0.099	0.073	0.089	0.012	0.005	0.024	0.804
2003	0.248	0.241	0.097	0.070	0.087	0.011	0.005	0.023	0.781
2004	0.241	0.234	0.095	0.068	0.085	0.011	0.004	0.022	0.761
2005	0.235	0.227	0.094	0.066	0.083	0.010	0.004	0.022	0.740
2006	0.226	0.219	0.091	0.063	0.081	0.010	0.004	0.021	0.714
2007	0.219	0.211	0.089	0.060	0.078	0.009	0.004	0.020	0.691
2008	0.213	0.204	0.087	0.058	0.076	0.009	0.004	0.019	0.670
2009	0.207	0.198	0.085	0.056	0.075	0.008	0.004	0.019	0.651
2010	0.201	0.192	0.083	0.054	0.073	0.008	0.004	0.018	0.633
2011	0.196	0.187	0.082	0.052	0.071	0.008	0.004	0.017	0.616
2012	0.191	0.181	0.080	0.050	0.070	0.007	0.004	0.017	0.600
2013	0.186	0.176	0.079	0.049	0.069	0.007	0.003	0.016	0.585
2014	0.182	0.172	0.078	0.047	0.068	0.007	0.003	0.016	0.572
2015	0.178	0.167	0.077	0.046	0.067	0.006	0.003	0.015	0.560
2016	0.175	0.164	0.077	0.044	0.066	0.006	0.003	0.015	0.551
2017	0.172	0.160	0.076	0.043	0.065	0.006	0.003	0.015	0.541
2018	0.172	0.159	0.077	0.042	0.066	0.006	0.003	0.014	0.539
2019	0.171	0.158	0.078	0.042	0.066	0.006	0.003	0.014	0.538
2020	0.171	0.157	0.079	0.041	0.067	0.005	0.003	0.014	0.538

Sources: BTRE estimates.

TABLE 3.57 BASE CASE PROJECTIONS OF METROPOLITAN FORMALDEHYDE EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.998	0.960	0.379	0.280	0.340	0.047	0.016	0.095	3.115
1991	0.973	0.931	0.370	0.276	0.329	0.045	0.017	0.091	3.032
1992	0.948	0.910	0.368	0.270	0.328	0.045	0.017	0.092	2.977
1993	0.936	0.899	0.362	0.267	0.324	0.044	0.017	0.091	2.941
1994	0.916	0.881	0.354	0.261	0.318	0.043	0.017	0.089	2.878
1995	0.915	0.881	0.354	0.260	0.318	0.043	0.017	0.089	2.877
1996	0.889	0.856	0.344	0.253	0.309	0.042	0.016	0.086	2.794
1997	0.852	0.819	0.328	0.241	0.296	0.040	0.015	0.083	2.674
1998	0.815	0.798	0.317	0.240	0.282	0.037	0.015	0.077	2.581
1999	0.779	0.769	0.310	0.226	0.270	0.037	0.014	0.075	2.480
2000	0.753	0.733	0.292	0.218	0.261	0.035	0.014	0.071	2.377
2001	0.702	0.684	0.273	0.201	0.244	0.032	0.013	0.065	2.215
2002	0.673	0.655	0.262	0.192	0.235	0.030	0.013	0.062	2.122
2003	0.656	0.637	0.258	0.185	0.230	0.029	0.012	0.061	2.068
2004	0.640	0.621	0.253	0.180	0.226	0.028	0.012	0.059	2.020
2005	0.624	0.604	0.249	0.174	0.221	0.027	0.012	0.057	1.968
2006	0.602	0.581	0.241	0.167	0.214	0.026	0.011	0.055	1.897
2007	0.582	0.561	0.235	0.160	0.208	0.024	0.011	0.053	1.833
2008	0.564	0.542	0.230	0.154	0.202	0.023	0.010	0.051	1.776
2009	0.548	0.525	0.225	0.148	0.198	0.022	0.010	0.049	1.725
2010	0.532	0.509	0.220	0.143	0.193	0.021	0.010	0.048	1.676
2011	0.517	0.493	0.216	0.137	0.189	0.020	0.010	0.046	1.628
2012	0.503	0.478	0.212	0.132	0.185	0.019	0.009	0.044	1.583
2013	0.490	0.464	0.208	0.128	0.181	0.018	0.009	0.043	1.541
2014	0.478	0.451	0.205	0.123	0.178	0.017	0.009	0.041	1.503
2015	0.467	0.439	0.203	0.119	0.175	0.017	0.009	0.040	1.469
2016	0.458	0.429	0.201	0.116	0.173	0.016	0.008	0.039	1.440
2017	0.449	0.418	0.199	0.112	0.171	0.015	0.008	0.038	1.411
2018	0.447	0.414	0.201	0.110	0.171	0.015	0.008	0.038	1.403
2019	0.445	0.410	0.202	0.109	0.171	0.014	0.008	0.037	1.396
2020	0.444	0.406	0.204	0.107	0.172	0.014	0.008	0.037	1.392

Sources: BTRE estimates.

TABLE 3.58 BASE CASE PROJECTIONS OF METROPOLITAN CARBONYL (TOTAL) EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	2.646	2.544	1.003	0.743	0.901	0.125	0.044	0.251	8.257
1991	2.587	2.476	0.983	0.735	0.876	0.119	0.045	0.242	8.062
1992	2.520	2.418	0.977	0.718	0.871	0.119	0.046	0.245	7.914
1993	2.489	2.390	0.963	0.709	0.862	0.117	0.045	0.242	7.818
1994	2.435	2.340	0.941	0.693	0.844	0.115	0.044	0.237	7.649
1995	2.435	2.343	0.941	0.692	0.845	0.115	0.044	0.237	7.652
1996	2.362	2.274	0.913	0.671	0.822	0.112	0.042	0.229	7.426
1997	2.262	2.175	0.872	0.640	0.785	0.107	0.041	0.219	7.101
1998	2.165	2.121	0.841	0.638	0.750	0.099	0.040	0.205	6.859
1999	2.071	2.044	0.824	0.602	0.719	0.097	0.038	0.200	6.595
2000	2.006	1.952	0.776	0.580	0.695	0.094	0.037	0.188	6.329
2001	1.872	1.822	0.727	0.537	0.652	0.086	0.035	0.175	5.905
2002	1.795	1.748	0.700	0.511	0.626	0.081	0.033	0.166	5.662
2003	1.748	1.700	0.687	0.495	0.613	0.078	0.033	0.161	5.515
2004	1.707	1.657	0.675	0.480	0.601	0.075	0.032	0.158	5.385
2005	1.663	1.610	0.663	0.464	0.589	0.072	0.031	0.153	5.244
2006	1.603	1.549	0.643	0.444	0.570	0.068	0.030	0.147	5.055
2007	1.550	1.494	0.627	0.426	0.554	0.065	0.029	0.141	4.885
2008	1.502	1.444	0.612	0.410	0.539	0.062	0.028	0.136	4.733
2009	1.460	1.400	0.600	0.395	0.527	0.059	0.027	0.131	4.598
2010	1.419	1.356	0.588	0.380	0.515	0.056	0.026	0.127	4.467
2011	1.378	1.314	0.576	0.366	0.503	0.053	0.025	0.122	4.339
2012	1.341	1.274	0.566	0.353	0.492	0.051	0.025	0.118	4.220
2013	1.306	1.236	0.556	0.340	0.482	0.049	0.024	0.114	4.107
2014	1.274	1.202	0.548	0.329	0.474	0.046	0.023	0.111	4.007
2015	1.246	1.170	0.541	0.319	0.466	0.044	0.023	0.107	3.917
2016	1.222	1.143	0.536	0.309	0.460	0.043	0.022	0.104	3.840
2017	1.198	1.115	0.532	0.300	0.455	0.041	0.022	0.101	3.764
2018	1.192	1.103	0.535	0.295	0.456	0.040	0.022	0.100	3.741
2019	1.186	1.093	0.539	0.290	0.457	0.039	0.021	0.099	3.724
2020	1.183	1.084	0.544	0.286	0.459	0.038	0.021	0.097	3.712

Sources: BTRE estimates.

TABLE 3.59 BASE CASE PROJECTIONS OF METROPOLITAN BENZENE EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	4.308	4.142	1.634	1.210	1.468	0.203	0.071	0.408	13.445
1991	4.103	3.927	1.559	1.166	1.390	0.188	0.071	0.383	12.788
1992	3.926	3.768	1.523	1.118	1.357	0.185	0.072	0.382	12.331
1993	3.830	3.678	1.483	1.091	1.326	0.181	0.070	0.372	12.030
1994	3.691	3.548	1.427	1.050	1.280	0.174	0.067	0.359	11.596
1995	3.640	3.502	1.407	1.035	1.264	0.172	0.066	0.354	11.439
1996	3.495	3.366	1.352	0.993	1.216	0.165	0.063	0.340	10.990
1997	3.302	3.174	1.273	0.935	1.146	0.156	0.059	0.320	10.365
1998	3.110	3.047	1.208	0.917	1.077	0.142	0.057	0.295	9.854
1999	2.874	2.837	1.143	0.835	0.998	0.135	0.053	0.277	9.152
2000	2.678	2.606	1.036	0.774	0.928	0.126	0.049	0.252	8.449
2001	2.403	2.339	0.933	0.689	0.836	0.111	0.044	0.224	7.579
2002	2.218	2.160	0.865	0.632	0.774	0.101	0.041	0.205	6.997
2003	2.080	2.022	0.817	0.588	0.729	0.093	0.039	0.192	6.561
2004	1.951	1.893	0.772	0.548	0.687	0.086	0.036	0.180	6.153
2005	1.813	1.756	0.723	0.506	0.642	0.078	0.034	0.167	5.719
2006	1.699	1.641	0.682	0.471	0.604	0.072	0.032	0.155	5.355
2007	1.610	1.552	0.651	0.443	0.575	0.067	0.030	0.147	5.076
2008	1.569	1.509	0.639	0.428	0.563	0.064	0.029	0.142	4.944
2009	1.530	1.467	0.628	0.414	0.552	0.062	0.028	0.138	4.818
2010	1.491	1.426	0.618	0.400	0.541	0.059	0.028	0.133	4.695
2011	1.453	1.385	0.607	0.386	0.530	0.056	0.027	0.129	4.575
2012	1.418	1.347	0.598	0.373	0.521	0.054	0.026	0.125	4.462
2013	1.384	1.310	0.589	0.361	0.511	0.052	0.025	0.121	4.354
2014	1.354	1.277	0.582	0.350	0.503	0.049	0.025	0.118	4.257
2015	1.327	1.246	0.576	0.339	0.496	0.047	0.024	0.114	4.170
2016	1.302	1.218	0.571	0.329	0.491	0.045	0.024	0.111	4.092
2017	1.279	1.190	0.568	0.320	0.485	0.044	0.023	0.108	4.017
2018	1.271	1.177	0.571	0.314	0.486	0.042	0.023	0.107	3.992
2019	1.266	1.166	0.575	0.309	0.488	0.041	0.023	0.105	3.972
2020	1.262	1.156	0.580	0.305	0.490	0.040	0.023	0.104	3.959

Sources: BTRE estimates.

TABLE 3.60 BASE CASE PROJECTIONS OF METROPOLITAN TOLUENE EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	6.49	6.24	2.46	1.82	2.21	0.31	0.11	0.61	20.24
1991	6.26	6.00	2.38	1.78	2.12	0.29	0.11	0.59	19.52
1992	6.09	5.84	2.36	1.73	2.10	0.29	0.11	0.59	19.12
1993	6.03	5.79	2.33	1.72	2.09	0.28	0.11	0.59	18.94
1994	5.89	5.67	2.28	1.68	2.04	0.28	0.11	0.57	18.52
1995	5.90	5.67	2.28	1.68	2.05	0.28	0.11	0.57	18.54
1996	5.75	5.53	2.22	1.63	2.00	0.27	0.10	0.56	18.07
1997	5.52	5.30	2.13	1.56	1.92	0.26	0.10	0.53	17.32
1998	5.28	5.17	2.05	1.56	1.83	0.24	0.10	0.50	16.73
1999	5.07	5.00	2.01	1.47	1.76	0.24	0.09	0.49	16.13
2000	4.91	4.78	1.90	1.42	1.70	0.23	0.09	0.46	15.49
2001	4.60	4.47	1.78	1.32	1.60	0.21	0.09	0.43	14.49
2002	4.43	4.32	1.73	1.26	1.55	0.20	0.08	0.41	13.98
2003	4.36	4.24	1.71	1.23	1.53	0.19	0.08	0.40	13.75
2004	4.31	4.18	1.70	1.21	1.52	0.19	0.08	0.40	13.59
2005	4.23	4.09	1.68	1.18	1.50	0.18	0.08	0.39	13.33
2006	4.10	3.96	1.64	1.13	1.46	0.17	0.08	0.37	12.91
2007	3.98	3.84	1.61	1.09	1.42	0.17	0.07	0.36	12.54
2008	3.89	3.74	1.59	1.06	1.40	0.16	0.07	0.35	12.26
2009	3.80	3.64	1.56	1.03	1.37	0.15	0.07	0.34	11.97
2010	3.71	3.55	1.54	0.99	1.35	0.15	0.07	0.33	11.69
2011	3.62	3.45	1.51	0.96	1.32	0.14	0.07	0.32	11.41
2012	3.55	3.37	1.49	0.93	1.30	0.13	0.07	0.31	11.16
2013	3.47	3.29	1.48	0.91	1.28	0.13	0.06	0.30	10.92
2014	3.41	3.21	1.46	0.88	1.27	0.12	0.06	0.30	10.71
2015	3.35	3.15	1.45	0.86	1.25	0.12	0.06	0.29	10.53
2016	3.30	3.09	1.45	0.83	1.24	0.12	0.06	0.28	10.37
2017	3.26	3.03	1.44	0.81	1.24	0.11	0.06	0.28	10.23
2018	3.24	3.00	1.46	0.80	1.24	0.11	0.06	0.27	10.18
2019	3.24	2.98	1.47	0.79	1.25	0.11	0.06	0.27	10.16
2020	3.23	2.96	1.49	0.78	1.26	0.10	0.06	0.27	10.14

Sources: BTRE estimates.

TABLE 3.61 BASE CASE PROJECTIONS OF METROPOLITAN XYLENE EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	5.379	5.172	2.040	1.511	1.832	0.254	0.089	0.510	16.786
1991	5.194	4.971	1.973	1.476	1.759	0.238	0.090	0.485	16.188
1992	5.049	4.846	1.959	1.438	1.745	0.238	0.093	0.491	15.859
1993	5.002	4.805	1.936	1.424	1.732	0.236	0.091	0.487	15.714
1994	4.890	4.701	1.891	1.392	1.695	0.231	0.089	0.475	15.364
1995	4.895	4.710	1.893	1.392	1.700	0.231	0.088	0.476	15.384
1996	4.772	4.595	1.845	1.356	1.660	0.226	0.086	0.464	15.005
1997	4.585	4.407	1.767	1.298	1.591	0.216	0.082	0.444	14.391
1998	4.391	4.302	1.706	1.295	1.521	0.200	0.081	0.416	13.912
1999	4.215	4.160	1.676	1.225	1.463	0.198	0.077	0.407	13.421
2000	4.088	3.978	1.582	1.182	1.417	0.192	0.075	0.384	12.899
2001	3.828	3.726	1.486	1.098	1.332	0.176	0.071	0.357	12.075
2002	3.695	3.598	1.441	1.053	1.290	0.167	0.069	0.342	11.656
2003	3.636	3.535	1.429	1.029	1.275	0.162	0.068	0.336	11.469
2004	3.596	3.490	1.423	1.011	1.267	0.158	0.067	0.332	11.343
2005	3.530	3.418	1.407	0.985	1.249	0.152	0.066	0.325	11.132
2006	3.423	3.308	1.374	0.948	1.217	0.145	0.064	0.313	10.793
2007	3.327	3.207	1.345	0.915	1.189	0.139	0.062	0.303	10.487
2008	3.257	3.132	1.327	0.888	1.170	0.133	0.060	0.295	10.263
2009	3.181	3.050	1.306	0.860	1.148	0.128	0.059	0.286	10.019
2010	3.109	2.973	1.288	0.833	1.129	0.123	0.057	0.278	9.790
2011	3.038	2.896	1.270	0.807	1.109	0.118	0.056	0.270	9.563
2012	2.974	2.825	1.254	0.783	1.092	0.113	0.055	0.262	9.357
2013	2.913	2.757	1.240	0.760	1.076	0.108	0.054	0.255	9.163
2014	2.860	2.697	1.229	0.739	1.063	0.104	0.052	0.248	8.994
2015	2.814	2.643	1.222	0.719	1.053	0.100	0.051	0.242	8.845
2016	2.775	2.595	1.217	0.702	1.045	0.097	0.051	0.237	8.718
2017	2.739	2.548	1.215	0.685	1.040	0.093	0.050	0.232	8.602
2018	2.729	2.527	1.225	0.675	1.044	0.091	0.049	0.229	8.569
2019	2.724	2.509	1.237	0.666	1.050	0.089	0.049	0.226	8.550
2020	2.723	2.494	1.252	0.657	1.057	0.086	0.049	0.224	8.543

Note: Includes emissions of o, m and p isomers.

Sources: BTRE estimates.

TABLE 3.62 BASE CASE PROJECTIONS OF METROPOLITAN PAH EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.141	0.135	0.053	0.040	0.048	0.007	0.002	0.013	0.440
1991	0.138	0.132	0.052	0.039	0.047	0.006	0.002	0.013	0.430
1992	0.134	0.129	0.052	0.038	0.046	0.006	0.002	0.013	0.422
1993	0.133	0.128	0.051	0.038	0.046	0.006	0.002	0.013	0.417
1994	0.130	0.125	0.050	0.037	0.045	0.006	0.002	0.013	0.409
1995	0.131	0.126	0.050	0.037	0.045	0.006	0.002	0.013	0.410
1996	0.127	0.122	0.049	0.036	0.044	0.006	0.002	0.012	0.400
1997	0.122	0.117	0.047	0.035	0.042	0.006	0.002	0.012	0.383
1998	0.117	0.115	0.046	0.035	0.041	0.005	0.002	0.011	0.371
1999	0.113	0.111	0.045	0.033	0.039	0.005	0.002	0.011	0.359
2000	0.110	0.107	0.043	0.032	0.038	0.005	0.002	0.010	0.347
2001	0.103	0.101	0.040	0.030	0.036	0.005	0.002	0.010	0.326
2002	0.100	0.097	0.039	0.028	0.035	0.005	0.002	0.009	0.315
2003	0.098	0.095	0.039	0.028	0.034	0.004	0.002	0.009	0.309
2004	0.097	0.094	0.038	0.027	0.034	0.004	0.002	0.009	0.305
2005	0.095	0.092	0.038	0.026	0.034	0.004	0.002	0.009	0.299
2006	0.092	0.089	0.037	0.026	0.033	0.004	0.002	0.008	0.290
2007	0.090	0.087	0.036	0.025	0.032	0.004	0.002	0.008	0.283
2008	0.088	0.084	0.036	0.024	0.032	0.004	0.002	0.008	0.277
2009	0.086	0.083	0.035	0.023	0.031	0.003	0.002	0.008	0.271
2010	0.084	0.081	0.035	0.023	0.031	0.003	0.002	0.008	0.266
2011	0.083	0.079	0.035	0.022	0.030	0.003	0.002	0.007	0.260
2012	0.081	0.077	0.034	0.021	0.030	0.003	0.001	0.007	0.255
2013	0.080	0.075	0.034	0.021	0.029	0.003	0.001	0.007	0.250
2014	0.078	0.074	0.034	0.020	0.029	0.003	0.001	0.007	0.246
2015	0.077	0.072	0.033	0.020	0.029	0.003	0.001	0.007	0.242
2016	0.076	0.071	0.033	0.019	0.029	0.003	0.001	0.006	0.239
2017	0.075	0.070	0.033	0.019	0.029	0.003	0.001	0.006	0.236
2018	0.075	0.069	0.034	0.019	0.029	0.002	0.001	0.006	0.235
2019	0.075	0.069	0.034	0.018	0.029	0.002	0.001	0.006	0.235
2020	0.075	0.069	0.034	0.018	0.029	0.002	0.001	0.006	0.235

Sources: BTRE estimates.

TABLE 3.63 BASE CASE PROJECTIONS OF METROPOLITAN 1,3-BUTADIENE EMISSIONS  
BY PASSENGER CARS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	0.451	0.433	0.171	0.127	0.153	0.021	0.007	0.043	1.406	
1991	0.435	0.417	0.165	0.124	0.147	0.020	0.008	0.041	1.356	
1992	0.423	0.406	0.164	0.121	0.146	0.020	0.008	0.041	1.329	
1993	0.419	0.403	0.162	0.119	0.145	0.020	0.008	0.041	1.317	
1994	0.410	0.394	0.158	0.117	0.142	0.019	0.007	0.040	1.288	
1995	0.410	0.395	0.159	0.117	0.143	0.019	0.007	0.040	1.290	
1996	0.400	0.385	0.155	0.114	0.139	0.019	0.007	0.039	1.258	
1997	0.385	0.370	0.148	0.109	0.134	0.018	0.007	0.037	1.207	
1998	0.369	0.361	0.143	0.109	0.128	0.017	0.007	0.035	1.168	
1999	0.354	0.349	0.141	0.103	0.123	0.017	0.007	0.034	1.127	
2000	0.344	0.334	0.133	0.099	0.119	0.016	0.006	0.032	1.084	
2001	0.322	0.313	0.125	0.092	0.112	0.015	0.006	0.030	1.016	
2002	0.311	0.303	0.121	0.089	0.109	0.014	0.006	0.029	0.981	
2003	0.306	0.298	0.120	0.087	0.107	0.014	0.006	0.028	0.966	
2004	0.303	0.294	0.120	0.085	0.107	0.013	0.006	0.028	0.956	
2005	0.298	0.288	0.119	0.083	0.105	0.013	0.006	0.027	0.939	
2006	0.289	0.279	0.116	0.080	0.103	0.012	0.005	0.026	0.910	
2007	0.281	0.271	0.114	0.077	0.100	0.012	0.005	0.026	0.885	
2008	0.275	0.264	0.112	0.075	0.099	0.011	0.005	0.025	0.867	
2009	0.269	0.258	0.110	0.073	0.097	0.011	0.005	0.024	0.847	
2010	0.263	0.251	0.109	0.070	0.095	0.010	0.005	0.023	0.828	
2011	0.257	0.245	0.107	0.068	0.094	0.010	0.005	0.023	0.809	
2012	0.252	0.239	0.106	0.066	0.092	0.010	0.005	0.022	0.792	
2013	0.247	0.233	0.105	0.064	0.091	0.009	0.005	0.022	0.776	
2014	0.242	0.229	0.104	0.063	0.090	0.009	0.004	0.021	0.762	
2015	0.239	0.224	0.104	0.061	0.089	0.009	0.004	0.021	0.750	
2016	0.235	0.220	0.103	0.060	0.089	0.008	0.004	0.020	0.740	
2017	0.233	0.216	0.103	0.058	0.088	0.008	0.004	0.020	0.730	
2018	0.232	0.215	0.104	0.057	0.089	0.008	0.004	0.019	0.728	
2019	0.232	0.213	0.105	0.057	0.089	0.008	0.004	0.019	0.727	
2020	0.232	0.212	0.106	0.056	0.090	0.007	0.004	0.019	0.727	

Sources: BTRE estimates.

TABLE 3.64 ESTIMATED OZONE REACTIVITY OF BASE CASE PROJECTIONS OF METROPOLITAN VOC EMISSIONS BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	230.2	221.4	87.3	64.7	78.4	10.9	3.8	21.8	718.5
1991	219.5	210.1	83.4	62.4	74.4	10.1	3.8	20.5	684.1
1992	211.3	202.8	82.0	60.2	73.0	10.0	3.9	20.6	663.7
1993	206.5	198.4	79.9	58.8	71.5	9.7	3.8	20.1	648.7
1994	199.9	192.2	77.3	56.9	69.3	9.4	3.6	19.4	628.1
1995	197.7	190.2	76.4	56.2	68.7	9.3	3.6	19.2	621.4
1996	190.8	183.7	73.8	54.2	66.4	9.0	3.4	18.5	599.9
1997	181.7	174.7	70.1	51.4	63.1	8.6	3.3	17.6	570.4
1998	172.3	168.9	67.0	50.8	59.7	7.9	3.2	16.3	546.1
1999	163.7	161.6	65.1	47.6	56.8	7.7	3.0	15.8	521.4
2000	157.2	153.0	60.9	45.4	54.5	7.4	2.9	14.8	496.1
2001	145.8	141.9	56.6	41.8	50.7	6.7	2.7	13.6	459.9
2002	139.2	135.5	54.3	39.7	48.6	6.3	2.6	12.9	438.9
2003	135.9	132.1	53.4	38.5	47.7	6.1	2.5	12.5	428.7
2004	133.5	129.5	52.8	37.5	47.0	5.9	2.5	12.3	421.1
2005	130.6	126.5	52.1	36.5	46.2	5.6	2.4	12.0	412.0
2006	126.4	122.1	50.7	35.0	44.9	5.4	2.3	11.6	398.4
2007	122.5	118.1	49.5	33.7	43.8	5.1	2.3	11.2	386.1
2008	119.0	114.4	48.5	32.5	42.7	4.9	2.2	10.8	375.0
2009	115.9	111.2	47.6	31.3	41.8	4.7	2.1	10.4	365.1
2010	113.1	108.1	46.8	30.3	41.0	4.5	2.1	10.1	356.0
2011	110.6	105.4	46.2	29.4	40.4	4.3	2.0	9.8	348.1
2012	108.4	103.0	45.7	28.5	39.8	4.1	2.0	9.6	341.1
2013	106.3	100.7	45.3	27.7	39.3	4.0	2.0	9.3	334.5
2014	104.6	98.6	44.9	27.0	38.9	3.8	1.9	9.1	328.8
2015	103.0	96.8	44.7	26.3	38.6	3.7	1.9	8.9	323.9
2016	101.7	95.1	44.6	25.7	38.3	3.6	1.9	8.7	319.7
2017	100.6	93.6	44.6	25.2	38.2	3.4	1.8	8.5	316.0
2018	100.3	92.9	45.0	24.8	38.3	3.3	1.8	8.4	314.8
2019	100.1	92.2	45.5	24.5	38.6	3.3	1.8	8.3	314.3
2020	100.1	91.7	46.0	24.2	38.9	3.2	1.8	8.2	314.0

Note: Table estimates do not refer to actual urban ozone production – but to how much ozone would typically be produced under stable conditions (for weather and NOx concentrations) from the projected volume of VOC emissions (given in table 3.7), using values for the average *reactivity* of major VOC species (in terms of grams of O<sub>3</sub> produced per gram of VOC emitted).

In many urban areas, the rate of VOC conversion to form ozone depends much more strongly on the ambient NOx concentrations than those of the VOCs. Under these conditions, a reduction in total VOC reactivity (as given above) need not lead to a reduction in actual ozone formation. Substantial reductions in ozone formation will generally only follow if both NOx and VOC concentrations fall.

Sources: BTRE estimates, Hoekman 1992.

TABLE 3.65 ESTIMATED METROPOLITAN EMISSIONS OF OTHER NPI SPECIES BY PASSENGER CARS TO 2020

Year	(thousand tonnes)						
	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	n-Hexane	Styrene
1990	0.63	0.55	3.97	0.31	3.00	4.24	0.58
1991	0.63	0.53	3.84	0.30	2.90	4.08	0.56
1992	0.62	0.52	3.76	0.30	2.84	4.02	0.55
1993	0.61	0.51	3.69	0.29	2.80	4.00	0.54
1994	0.60	0.50	3.64	0.29	2.75	3.93	0.54
1995	0.60	0.50	3.63	0.29	2.76	3.96	0.54
1996	0.58	0.49	3.53	0.28	2.68	3.91	0.52
1997	0.56	0.46	3.36	0.27	2.57	3.80	0.50
1998	0.54	0.45	3.24	0.27	2.48	3.71	0.48
1999	0.52	0.43	3.11	0.26	2.39	3.63	0.46
2000	0.50	0.41	2.97	0.25	2.29	3.54	0.44
2001	0.47	0.38	2.76	0.24	2.14	3.37	0.41
2002	0.45	0.36	2.65	0.23	2.06	3.30	0.40
2003	0.44	0.35	2.59	0.23	2.02	3.29	0.39
2004	0.43	0.35	2.52	0.23	1.98	3.29	0.38
2005	0.42	0.34	2.46	0.22	1.94	3.27	0.37
2006	0.40	0.33	2.38	0.22	1.88	3.21	0.36
2007	0.39	0.31	2.30	0.21	1.83	3.15	0.35
2008	0.38	0.30	2.21	0.21	1.76	3.11	0.34
2009	0.37	0.30	2.15	0.20	1.72	3.06	0.33
2010	0.36	0.29	2.09	0.20	1.68	3.03	0.32
2011	0.35	0.28	2.03	0.20	1.64	2.99	0.31
2012	0.34	0.27	1.98	0.19	1.60	2.96	0.31
2013	0.33	0.26	1.92	0.19	1.57	2.93	0.30
2014	0.32	0.26	1.88	0.19	1.53	2.91	0.29
2015	0.31	0.25	1.83	0.19	1.51	2.89	0.29
2016	0.31	0.24	1.80	0.19	1.48	2.88	0.28
2017	0.30	0.24	1.76	0.18	1.46	2.87	0.28
2018	0.30	0.24	1.75	0.18	1.45	2.88	0.28
2019	0.30	0.24	1.74	0.18	1.45	2.89	0.28
2020	0.30	0.23	1.73	0.19	1.44	2.91	0.27

Sources: BTRE estimates.

TABLE 3.66 ESTIMATED NATIONAL EMISSIONS OF OTHER NPI SPECIES BY PASSENGER CARS TO 2020

(thousand tonnes)

Year	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	n-Hexane	Styrene
1990	0.918	0.800	5.909	0.464	4.475	6.311	0.871
1991	0.909	0.771	5.712	0.447	4.315	6.073	0.840
1992	0.894	0.753	5.580	0.438	4.219	5.971	0.821
1993	0.881	0.742	5.498	0.435	4.165	5.947	0.810
1994	0.861	0.725	5.365	0.424	4.064	5.803	0.790
1995	0.861	0.721	5.342	0.425	4.052	5.829	0.788
1996	0.832	0.697	5.164	0.415	3.930	5.727	0.763
1997	0.794	0.663	4.909	0.399	3.747	5.541	0.727
1998	0.768	0.636	4.707	0.386	3.602	5.396	0.699
1999	0.738	0.607	4.499	0.374	3.455	5.254	0.669
2000	0.711	0.577	4.279	0.360	3.296	5.101	0.638
2001	0.665	0.534	3.964	0.338	3.065	4.830	0.593
2002	0.636	0.510	3.785	0.327	2.939	4.702	0.568
2003	0.616	0.495	3.677	0.323	2.869	4.669	0.554
2004	0.598	0.482	3.579	0.320	2.811	4.680	0.542
2005	0.579	0.468	3.473	0.315	2.739	4.619	0.527
2006	0.556	0.449	3.335	0.305	2.639	4.505	0.508
2007	0.536	0.432	3.209	0.297	2.548	4.401	0.490
2008	0.517	0.417	3.096	0.292	2.473	4.358	0.475
2009	0.501	0.404	2.995	0.285	2.400	4.273	0.461
2010	0.485	0.390	2.897	0.278	2.330	4.198	0.447
2011	0.470	0.377	2.801	0.272	2.261	4.124	0.433
2012	0.456	0.365	2.712	0.267	2.198	4.059	0.421
2013	0.442	0.354	2.627	0.262	2.138	4.001	0.409
2014	0.430	0.343	2.550	0.257	2.084	3.951	0.398
2015	0.419	0.334	2.480	0.253	2.035	3.909	0.388
2016	0.410	0.326	2.418	0.250	1.992	3.874	0.380
2017	0.401	0.318	2.357	0.247	1.951	3.846	0.372
2018	0.397	0.314	2.330	0.245	1.933	3.836	0.368
2019	0.394	0.311	2.306	0.245	1.917	3.833	0.365
2020	0.392	0.308	2.285	0.244	1.904	3.835	0.362

Sources: BTRE estimates.

TABLE 3.67 BASE CASE PROJECTIONS OF METROPOLITAN LEAD EMISSIONS BY LCVS TO 2020

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	131.97	83.28	48.32	28.91	48.67	5.43	4.80	11.73	363.11
1991	112.74	71.15	41.28	24.70	41.58	4.64	4.10	10.02	310.21
1992	102.81	64.67	38.01	22.39	38.12	4.21	3.74	9.15	283.11
1993	86.90	54.50	32.44	18.81	32.40	3.54	3.16	7.75	239.50
1994	67.34	42.11	25.42	14.48	25.26	2.73	2.45	6.02	185.81
1995	42.78	26.68	16.36	9.14	16.16	1.72	1.56	3.84	118.25
1996	41.77	25.99	16.20	8.87	15.90	1.67	1.54	3.78	115.72
1997	37.58	23.32	14.61	7.89	14.36	1.48	1.36	3.44	104.05
1998	34.80	21.66	13.61	7.28	13.35	1.35	1.25	3.21	96.52
1999	24.63	15.33	9.68	5.09	9.48	0.94	0.88	2.28	68.32
2000	18.22	11.34	7.16	3.74	7.03	0.68	0.64	1.69	50.51
2001	7.66	4.77	3.02	1.56	2.96	0.28	0.27	0.71	21.24
2002	0.96	0.60	0.38	0.19	0.37	0.03	0.03	0.09	2.66
2003	0.94	0.58	0.37	0.19	0.36	0.03	0.03	0.09	2.60
2004	0.82	0.51	0.33	0.16	0.32	0.03	0.03	0.08	2.26
2005	0.81	0.51	0.33	0.16	0.32	0.03	0.03	0.08	2.25
2006	0.80	0.50	0.32	0.16	0.31	0.03	0.03	0.07	2.22
2007	0.72	0.45	0.29	0.14	0.28	0.02	0.02	0.07	2.00
2008	0.73	0.45	0.29	0.14	0.29	0.02	0.02	0.07	2.01
2009	0.73	0.45	0.30	0.14	0.29	0.02	0.02	0.07	2.02
2010	0.74	0.46	0.30	0.14	0.29	0.02	0.02	0.07	2.04
2011	0.72	0.45	0.30	0.14	0.29	0.02	0.02	0.07	2.01
2012	0.71	0.44	0.29	0.14	0.28	0.02	0.02	0.06	1.98
2013	0.70	0.43	0.29	0.13	0.28	0.02	0.02	0.06	1.94
2014	0.69	0.42	0.29	0.13	0.28	0.02	0.02	0.06	1.91
2015	0.68	0.42	0.28	0.13	0.27	0.02	0.02	0.06	1.87
2016	0.67	0.41	0.28	0.13	0.27	0.02	0.02	0.06	1.85
2017	0.66	0.40	0.28	0.12	0.27	0.02	0.02	0.06	1.83
2018	0.65	0.39	0.27	0.12	0.26	0.02	0.02	0.06	1.79
2019	0.63	0.38	0.27	0.11	0.25	0.02	0.02	0.05	1.73
2020	0.59	0.36	0.26	0.11	0.24	0.02	0.02	0.05	1.64

Sources: BTRE estimates.

TABLE 3.68 BASE CASE PROJECTIONS OF METROPOLITAN SO<sub>x</sub> EMISSIONS BY LCVS  
TO 2020

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	735.1	463.9	269.2	161.0	271.1	30.3	26.7	65.3	2022.7
1991	656.3	414.2	240.3	143.8	242.0	27.0	23.9	58.3	1805.8
1992	622.1	391.3	230.0	135.5	230.6	25.5	22.6	55.4	1713.1
1993	626.2	392.7	233.8	135.5	233.5	25.5	22.8	55.8	1725.8
1994	596.2	372.8	225.0	128.2	223.6	24.1	21.7	53.3	1645.1
1995	591.6	369.0	226.2	126.4	223.4	23.8	21.6	53.2	1635.2
1996	610.8	379.9	236.9	129.6	232.5	24.5	22.4	55.3	1691.9
1997	596.8	370.4	232.1	125.3	228.1	23.5	21.6	54.6	1652.6
1998	581.2	361.7	227.4	121.5	223.0	22.6	20.8	53.7	1611.8
1999	553.4	344.5	217.5	114.5	213.0	21.1	19.7	51.3	1535.0
2000	474.6	295.4	186.5	97.4	183.1	17.8	16.8	44.1	1315.7
2001	468.5	291.7	184.5	95.4	181.2	17.3	16.4	43.6	1298.6
2002	453.7	282.6	179.4	91.9	175.8	16.5	15.8	42.2	1258.1
2003	347.8	216.6	138.1	70.1	135.1	12.4	12.0	32.4	964.5
2004	269.2	167.6	107.3	54.0	104.8	9.5	9.2	25.0	746.5
2005	216.9	134.9	86.8	43.3	84.6	7.5	7.3	20.1	601.5
2006	147.2	91.5	59.2	29.2	57.6	5.0	4.9	13.6	408.0
2007	151.9	94.3	61.3	30.0	59.5	5.1	5.0	14.0	421.1
2008	156.0	96.7	63.2	30.6	61.3	5.1	5.1	14.3	432.3
2009	159.9	99.1	65.1	31.2	63.0	5.1	5.2	14.6	443.1
2010	164.8	102.0	67.4	32.0	65.0	5.2	5.3	14.9	456.5
2011	168.5	104.1	69.2	32.5	66.7	5.2	5.3	15.2	466.9
2012	172.2	106.3	71.1	33.0	68.3	5.2	5.4	15.5	477.1
2013	175.8	108.3	72.9	33.5	70.0	5.2	5.4	15.8	487.0
2014	179.3	110.3	74.7	34.0	71.5	5.2	5.5	16.0	496.6
2015	182.7	112.2	76.5	34.4	73.1	5.2	5.5	16.2	505.8
2016	185.8	113.9	78.2	34.7	74.5	5.2	5.5	16.4	514.3
2017	189.7	116.0	80.3	35.2	76.4	5.2	5.6	16.7	525.1
2018	192.2	117.3	81.8	35.5	77.6	5.2	5.6	16.9	532.1
2019	194.3	118.4	83.2	35.6	78.7	5.1	5.5	17.0	537.9
2020	194.9	118.5	83.9	35.5	79.2	5.0	5.5	17.0	539.6

Sources: BTRE estimates.

TABLE 3.69 BASE CASE PROJECTIONS OF METROPOLITAN CO EMISSIONS BY LCVS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	131.6	83.1	48.2	28.8	48.6	5.4	4.8	11.7	362.2	
1991	122.1	77.0	44.7	26.7	45.0	5.0	4.4	10.8	335.9	
1992	121.0	76.1	44.7	26.3	44.8	5.0	4.4	10.8	333.1	
1993	127.0	79.7	47.4	27.5	47.4	5.2	4.6	11.3	350.0	
1994	125.9	78.8	47.5	27.1	47.2	5.1	4.6	11.3	347.5	
1995	130.1	81.1	49.7	27.8	49.1	5.2	4.7	11.7	359.5	
1996	138.7	86.3	53.8	29.4	52.8	5.6	5.1	12.5	384.1	
1997	138.5	86.0	53.9	29.1	52.9	5.5	5.0	12.7	383.5	
1998	138.4	86.1	54.2	28.9	53.1	5.4	5.0	12.8	383.9	
1999	140.9	87.7	55.4	29.1	54.2	5.4	5.0	13.1	390.8	
2000	134.1	83.4	52.7	27.5	51.7	5.0	4.7	12.5	371.6	
2001	137.4	85.5	54.1	28.0	53.1	5.1	4.8	12.8	380.8	
2002	141.2	88.0	55.8	28.6	54.7	5.1	4.9	13.1	391.5	
2003	141.8	88.3	56.3	28.6	55.1	5.1	4.9	13.2	393.2	
2004	141.3	87.9	56.3	28.3	55.0	5.0	4.8	13.1	391.7	
2005	141.4	88.0	56.6	28.2	55.2	4.9	4.8	13.1	392.1	
2006	139.7	86.8	56.1	27.7	54.6	4.7	4.7	12.9	387.2	
2007	138.2	85.8	55.8	27.3	54.2	4.6	4.6	12.7	383.1	
2008	136.2	84.5	55.2	26.7	53.5	4.5	4.5	12.5	377.6	
2009	134.1	83.0	54.6	26.2	52.8	4.3	4.3	12.2	371.5	
2010	132.5	82.0	54.2	25.7	52.3	4.2	4.2	12.0	367.1	
2011	129.8	80.2	53.3	25.0	51.4	4.0	4.1	11.7	359.6	
2012	127.0	78.4	52.4	24.3	50.4	3.9	4.0	11.4	351.7	
2013	124.2	76.5	51.5	23.7	49.4	3.7	3.8	11.1	344.0	
2014	121.4	74.7	50.6	23.0	48.4	3.6	3.7	10.8	336.1	
2015	118.9	73.0	49.8	22.4	47.6	3.4	3.6	10.6	329.1	
2016	116.5	71.4	49.0	21.8	46.8	3.3	3.5	10.3	322.5	
2017	114.3	69.9	48.4	21.2	46.0	3.1	3.3	10.1	316.4	
2018	112.5	68.7	47.9	20.8	45.5	3.0	3.3	9.9	311.5	
2019	110.8	67.5	47.4	20.3	44.9	2.9	3.2	9.7	306.6	
2020	108.8	66.1	46.9	19.8	44.2	2.8	3.1	9.5	301.2	

Sources: BTRE estimates.

TABLE 3.70 BASE CASE PROJECTIONS OF METROPOLITAN NO<sub>x</sub> EMISSIONS BY LCVS  
TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	9.90	6.25	3.63	2.17	3.65	0.41	0.36	0.88	27.25	
1991	9.54	6.02	3.49	2.09	3.52	0.39	0.35	0.85	26.24	
1992	10.05	6.32	3.72	2.19	3.73	0.41	0.37	0.89	27.67	
1993	10.87	6.81	4.06	2.35	4.05	0.44	0.40	0.97	29.94	
1994	11.12	6.96	4.20	2.39	4.17	0.45	0.40	0.99	30.69	
1995	11.78	7.35	4.50	2.52	4.45	0.47	0.43	1.06	32.56	
1996	12.94	8.05	5.02	2.75	4.92	0.52	0.48	1.17	35.84	
1997	13.39	8.31	5.21	2.81	5.12	0.53	0.49	1.23	37.09	
1998	13.77	8.57	5.39	2.88	5.28	0.53	0.49	1.27	38.19	
1999	14.54	9.05	5.71	3.01	5.59	0.55	0.52	1.35	40.32	
2000	14.41	8.97	5.66	2.96	5.56	0.54	0.51	1.34	39.94	
2001	15.29	9.52	6.02	3.11	5.91	0.56	0.54	1.42	42.39	
2002	16.06	10.00	6.35	3.25	6.22	0.58	0.56	1.49	44.52	
2003	16.55	10.31	6.57	3.33	6.43	0.59	0.57	1.54	45.89	
2004	16.85	10.49	6.72	3.38	6.56	0.59	0.58	1.56	46.73	
2005	17.03	10.59	6.82	3.40	6.64	0.59	0.58	1.57	47.22	
2006	16.86	10.48	6.78	3.35	6.59	0.57	0.56	1.55	46.75	
2007	16.63	10.32	6.71	3.28	6.52	0.55	0.55	1.53	46.09	
2008	16.23	10.07	6.58	3.19	6.38	0.53	0.53	1.48	44.99	
2009	15.80	9.79	6.43	3.08	6.22	0.51	0.51	1.44	43.77	
2010	15.45	9.56	6.32	3.00	6.10	0.49	0.49	1.40	42.81	
2011	15.03	9.29	6.17	2.90	5.95	0.47	0.47	1.36	41.64	
2012	14.62	9.02	6.03	2.80	5.80	0.44	0.46	1.32	40.50	
2013	14.23	8.77	5.90	2.71	5.66	0.42	0.44	1.28	39.41	
2014	13.92	8.56	5.80	2.64	5.55	0.41	0.42	1.24	38.53	
2015	13.67	8.39	5.72	2.57	5.47	0.39	0.41	1.22	37.84	
2016	13.47	8.26	5.67	2.52	5.41	0.38	0.40	1.19	37.29	
2017	13.37	8.18	5.66	2.48	5.38	0.37	0.39	1.18	37.02	
2018	13.30	8.12	5.66	2.45	5.37	0.36	0.38	1.17	36.81	
2019	13.26	8.07	5.67	2.43	5.37	0.35	0.38	1.16	36.69	
2020	13.24	8.05	5.70	2.41	5.38	0.34	0.37	1.15	36.65	

Sources: BTRE estimates.

TABLE 3.71 BASE CASE PROJECTIONS OF METROPOLITAN VOC (EXHAUST) EMISSIONS BY LCVS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	9.85	6.21	3.60	2.16	3.63	0.41	0.36	0.87	27.09	
1991	8.95	5.65	3.28	1.96	3.30	0.37	0.33	0.79	24.62	
1992	8.70	5.47	3.21	1.89	3.22	0.36	0.32	0.77	23.94	
1993	8.98	5.63	3.35	1.94	3.35	0.37	0.33	0.80	24.74	
1994	8.73	5.46	3.29	1.88	3.27	0.35	0.32	0.78	24.08	
1995	8.89	5.54	3.40	1.90	3.36	0.36	0.32	0.80	24.56	
1996	9.36	5.82	3.63	1.99	3.56	0.37	0.34	0.85	25.93	
1997	9.22	5.72	3.59	1.94	3.52	0.36	0.33	0.84	25.53	
1998	9.17	5.70	3.59	1.92	3.52	0.36	0.33	0.85	25.42	
1999	9.26	5.77	3.64	1.92	3.57	0.35	0.33	0.86	25.69	
2000	8.70	5.41	3.42	1.78	3.36	0.33	0.31	0.81	24.11	
2001	8.83	5.50	3.48	1.80	3.41	0.33	0.31	0.82	24.48	
2002	9.03	5.63	3.57	1.83	3.50	0.33	0.31	0.84	25.04	
2003	9.08	5.66	3.61	1.83	3.53	0.32	0.31	0.84	25.18	
2004	9.06	5.64	3.61	1.82	3.53	0.32	0.31	0.84	25.11	
2005	9.08	5.65	3.63	1.81	3.54	0.31	0.31	0.84	25.18	
2006	8.97	5.58	3.61	1.78	3.51	0.30	0.30	0.83	24.87	
2007	8.89	5.52	3.59	1.75	3.48	0.30	0.29	0.82	24.64	
2008	8.78	5.44	3.56	1.72	3.45	0.29	0.29	0.80	24.33	
2009	8.63	5.34	3.51	1.68	3.40	0.28	0.28	0.79	23.91	
2010	8.52	5.27	3.49	1.65	3.37	0.27	0.27	0.77	23.62	
2011	8.36	5.16	3.43	1.61	3.31	0.26	0.26	0.76	23.15	
2012	8.19	5.05	3.38	1.57	3.25	0.25	0.26	0.74	22.68	
2013	8.03	4.95	3.33	1.53	3.19	0.24	0.25	0.72	22.24	
2014	7.87	4.84	3.28	1.49	3.14	0.23	0.24	0.70	21.80	
2015	7.71	4.73	3.23	1.45	3.09	0.22	0.23	0.69	21.35	
2016	7.57	4.64	3.18	1.41	3.04	0.21	0.22	0.67	20.95	
2017	7.45	4.56	3.15	1.38	3.00	0.20	0.22	0.66	20.62	
2018	7.35	4.49	3.13	1.36	2.97	0.20	0.21	0.65	20.34	
2019	7.24	4.41	3.10	1.33	2.93	0.19	0.21	0.63	20.05	
2020	7.14	4.34	3.08	1.30	2.90	0.18	0.20	0.62	19.77	

Sources: BTRE estimates.

TABLE 3.72 BASE CASE PROJECTIONS OF METROPOLITAN VOC (EVAPORATIVE) EMISSIONS BY LCVS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	7.79	4.91	2.90	1.68	2.87	0.33	0.29	0.67	21.44
1991	7.02	4.43	2.61	1.51	2.59	0.29	0.26	0.61	19.32
1992	6.79	4.27	2.55	1.46	2.52	0.28	0.25	0.59	18.71
1993	6.98	4.38	2.65	1.49	2.60	0.29	0.26	0.61	19.25
1994	6.79	4.24	2.60	1.44	2.55	0.28	0.25	0.59	18.73
1995	6.92	4.31	2.68	1.45	2.61	0.28	0.25	0.61	19.12
1996	7.27	4.52	2.86	1.52	2.77	0.30	0.27	0.64	20.14
1997	7.17	4.45	2.83	1.48	2.74	0.29	0.26	0.64	19.87
1998	7.10	4.42	2.82	1.46	2.73	0.28	0.26	0.64	19.70
1999	7.18	4.47	2.87	1.46	2.77	0.28	0.26	0.65	19.93
2000	6.84	4.25	2.73	1.38	2.64	0.26	0.24	0.62	18.96
2001	6.98	4.34	2.79	1.40	2.70	0.26	0.25	0.63	19.35
2002	7.12	4.43	2.86	1.42	2.76	0.26	0.25	0.65	19.76
2003	7.18	4.47	2.90	1.42	2.79	0.26	0.25	0.65	19.92
2004	7.20	4.48	2.91	1.42	2.80	0.26	0.25	0.65	19.97
2005	7.24	4.50	2.94	1.42	2.83	0.25	0.25	0.65	20.10
2006	7.20	4.47	2.94	1.41	2.82	0.25	0.24	0.65	19.98
2007	7.21	4.47	2.95	1.40	2.82	0.24	0.24	0.65	19.98
2008	7.20	4.46	2.96	1.39	2.83	0.24	0.24	0.64	19.95
2009	7.17	4.44	2.96	1.38	2.82	0.24	0.23	0.64	19.89
2010	7.19	4.45	2.99	1.37	2.84	0.23	0.23	0.64	19.94
2011	7.17	4.42	2.99	1.36	2.84	0.23	0.23	0.63	19.86
2012	7.14	4.40	2.99	1.35	2.83	0.22	0.22	0.63	19.78
2013	7.11	4.38	2.99	1.33	2.83	0.22	0.22	0.62	19.71
2014	7.09	4.36	3.00	1.32	2.83	0.21	0.22	0.62	19.63
2015	7.06	4.33	3.00	1.31	2.82	0.21	0.21	0.61	19.55
2016	7.02	4.30	3.00	1.29	2.82	0.20	0.21	0.61	19.45
2017	7.02	4.29	3.02	1.28	2.83	0.20	0.21	0.60	19.45
2018	6.97	4.25	3.01	1.27	2.82	0.19	0.20	0.60	19.31
2019	6.92	4.21	3.01	1.25	2.80	0.19	0.20	0.59	19.15
2020	6.84	4.15	2.99	1.23	2.78	0.18	0.19	0.58	18.95

Sources: BTRE estimates.

TABLE 3.73 BASE CASE PROJECTIONS OF METROPOLITAN VOC (TOTAL) EMISSIONS  
BY LCVS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	17.63	11.12	6.50	3.84	6.50	0.73	0.64	1.55	48.52	
1991	15.97	10.07	5.89	3.47	5.89	0.66	0.58	1.40	43.94	
1992	15.49	9.74	5.76	3.35	5.74	0.64	0.57	1.36	42.65	
1993	15.96	10.01	6.00	3.43	5.95	0.66	0.58	1.41	43.99	
1994	15.51	9.70	5.89	3.31	5.82	0.63	0.57	1.37	42.81	
1995	15.80	9.85	6.08	3.35	5.97	0.64	0.58	1.40	43.68	
1996	16.63	10.34	6.49	3.50	6.33	0.67	0.61	1.49	46.07	
1997	16.39	10.17	6.42	3.42	6.26	0.65	0.60	1.48	45.39	
1998	16.27	10.12	6.41	3.38	6.24	0.64	0.59	1.49	45.13	
1999	16.45	10.23	6.51	3.38	6.33	0.63	0.59	1.51	45.63	
2000	15.53	9.66	6.15	3.16	5.99	0.59	0.55	1.43	43.07	
2001	15.81	9.84	6.27	3.20	6.11	0.59	0.56	1.46	43.82	
2002	16.16	10.06	6.43	3.25	6.26	0.59	0.56	1.49	44.80	
2003	16.26	10.12	6.50	3.25	6.32	0.59	0.56	1.50	45.10	
2004	16.26	10.11	6.52	3.24	6.33	0.58	0.56	1.49	45.08	
2005	16.32	10.15	6.58	3.23	6.37	0.57	0.55	1.49	45.27	
2006	16.17	10.05	6.55	3.19	6.32	0.55	0.54	1.47	44.85	
2007	16.10	9.99	6.54	3.15	6.31	0.54	0.53	1.46	44.62	
2008	15.98	9.90	6.52	3.11	6.28	0.53	0.52	1.44	44.28	
2009	15.80	9.78	6.48	3.06	6.22	0.51	0.51	1.42	43.79	
2010	15.72	9.72	6.47	3.03	6.21	0.50	0.50	1.41	43.56	
2011	15.52	9.59	6.42	2.97	6.14	0.49	0.49	1.39	43.01	
2012	15.32	9.45	6.37	2.92	6.08	0.47	0.48	1.36	42.46	
2013	15.14	9.33	6.32	2.86	6.02	0.46	0.47	1.34	41.94	
2014	14.96	9.20	6.28	2.81	5.97	0.44	0.46	1.32	41.44	
2015	14.77	9.06	6.23	2.76	5.91	0.43	0.44	1.30	40.90	
2016	14.59	8.94	6.19	2.71	5.85	0.41	0.43	1.28	40.40	
2017	14.47	8.85	6.17	2.67	5.82	0.40	0.43	1.26	40.06	
2018	14.32	8.74	6.14	2.62	5.78	0.39	0.42	1.24	39.66	
2019	14.16	8.62	6.11	2.58	5.74	0.38	0.41	1.22	39.20	
2020	13.98	8.49	6.07	2.53	5.68	0.36	0.39	1.20	38.72	

Sources: BTRE estimates.

TABLE 3.74 BASE CASE PROJECTIONS OF METROPOLITAN PM (TOTAL) EMISSIONS BY LCVS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	1.064	0.671	0.389	0.233	0.392	0.044	0.039	0.095	2.927	
1991	0.981	0.619	0.359	0.215	0.362	0.040	0.036	0.087	2.700	
1992	0.966	0.608	0.357	0.210	0.358	0.040	0.035	0.086	2.661	
1993	1.013	0.635	0.378	0.219	0.378	0.041	0.037	0.090	2.791	
1994	1.009	0.631	0.381	0.217	0.379	0.041	0.037	0.090	2.785	
1995	1.051	0.656	0.402	0.225	0.397	0.042	0.038	0.094	2.905	
1996	1.140	0.709	0.442	0.242	0.434	0.046	0.042	0.103	3.159	
1997	1.043	0.647	0.406	0.219	0.399	0.041	0.038	0.095	2.887	
1998	1.003	0.624	0.393	0.210	0.385	0.039	0.036	0.093	2.783	
1999	0.994	0.619	0.391	0.206	0.383	0.038	0.035	0.092	2.759	
2000	0.908	0.565	0.357	0.186	0.350	0.034	0.032	0.084	2.516	
2001	0.944	0.588	0.372	0.192	0.365	0.035	0.033	0.088	2.617	
2002	0.977	0.608	0.386	0.198	0.378	0.035	0.034	0.091	2.708	
2003	0.987	0.614	0.392	0.199	0.383	0.035	0.034	0.092	2.736	
2004	1.003	0.624	0.400	0.201	0.390	0.035	0.034	0.093	2.781	
2005	1.026	0.638	0.411	0.205	0.400	0.035	0.035	0.095	2.845	
2006	1.016	0.631	0.408	0.202	0.397	0.034	0.034	0.094	2.816	
2007	1.020	0.633	0.412	0.201	0.400	0.034	0.034	0.094	2.827	
2008	1.028	0.637	0.417	0.202	0.404	0.034	0.034	0.094	2.848	
2009	1.036	0.642	0.422	0.202	0.408	0.033	0.033	0.094	2.871	
2010	1.051	0.650	0.430	0.204	0.415	0.033	0.034	0.095	2.913	
2011	1.060	0.655	0.435	0.204	0.419	0.033	0.033	0.096	2.936	
2012	1.069	0.660	0.441	0.205	0.424	0.033	0.033	0.096	2.961	
2013	1.079	0.665	0.447	0.206	0.429	0.032	0.033	0.097	2.988	
2014	1.089	0.670	0.454	0.206	0.435	0.032	0.033	0.097	3.016	
2015	1.100	0.675	0.461	0.207	0.440	0.032	0.033	0.098	3.044	
2016	1.110	0.680	0.467	0.208	0.445	0.031	0.033	0.098	3.072	
2017	1.121	0.686	0.475	0.208	0.451	0.031	0.033	0.099	3.104	
2018	1.127	0.688	0.480	0.208	0.455	0.030	0.033	0.099	3.121	
2019	1.133	0.690	0.485	0.208	0.459	0.030	0.032	0.099	3.135	
2020	1.135	0.690	0.489	0.207	0.461	0.029	0.032	0.099	3.142	

Sources: BTRE estimates.

TABLE 3.75 BASE CASE PROJECTIONS OF METROPOLITAN PM10 EMISSIONS BY LCVS  
TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	1.030	0.650	0.377	0.226	0.380	0.042	0.037	0.092	2.834	
1991	0.952	0.601	0.349	0.209	0.351	0.039	0.035	0.085	2.620	
1992	0.939	0.591	0.347	0.205	0.348	0.038	0.034	0.084	2.586	
1993	0.986	0.618	0.368	0.213	0.368	0.040	0.036	0.088	2.717	
1994	0.984	0.615	0.371	0.212	0.369	0.040	0.036	0.088	2.716	
1995	1.026	0.640	0.392	0.219	0.388	0.041	0.037	0.092	2.837	
1996	1.115	0.694	0.432	0.237	0.424	0.045	0.041	0.101	3.088	
1997	1.020	0.633	0.397	0.214	0.390	0.040	0.037	0.093	2.823	
1998	0.981	0.611	0.384	0.205	0.377	0.038	0.035	0.091	2.722	
1999	0.973	0.606	0.382	0.201	0.375	0.037	0.035	0.090	2.699	
2000	0.888	0.553	0.349	0.182	0.343	0.033	0.031	0.083	2.462	
2001	0.925	0.576	0.364	0.188	0.358	0.034	0.032	0.086	2.564	
2002	0.957	0.596	0.378	0.194	0.371	0.035	0.033	0.089	2.654	
2003	0.967	0.602	0.384	0.195	0.376	0.035	0.033	0.090	2.683	
2004	0.984	0.612	0.392	0.197	0.383	0.035	0.034	0.091	2.728	
2005	1.007	0.626	0.403	0.201	0.393	0.035	0.034	0.093	2.792	
2006	0.997	0.620	0.401	0.198	0.390	0.034	0.033	0.092	2.765	
2007	1.001	0.622	0.404	0.198	0.392	0.033	0.033	0.092	2.776	
2008	1.009	0.626	0.409	0.198	0.396	0.033	0.033	0.092	2.796	
2009	1.017	0.630	0.414	0.199	0.401	0.033	0.033	0.093	2.819	
2010	1.032	0.639	0.422	0.200	0.407	0.033	0.033	0.094	2.860	
2011	1.041	0.643	0.428	0.201	0.412	0.032	0.033	0.094	2.884	
2012	1.051	0.648	0.434	0.201	0.417	0.032	0.033	0.095	2.910	
2013	1.061	0.654	0.440	0.202	0.422	0.032	0.033	0.095	2.937	
2014	1.071	0.659	0.446	0.203	0.427	0.031	0.033	0.096	2.966	
2015	1.081	0.664	0.453	0.204	0.433	0.031	0.032	0.096	2.994	
2016	1.092	0.669	0.460	0.204	0.438	0.031	0.032	0.097	3.022	
2017	1.103	0.675	0.467	0.205	0.444	0.030	0.032	0.097	3.053	
2018	1.109	0.677	0.472	0.205	0.448	0.030	0.032	0.097	3.070	
2019	1.114	0.679	0.477	0.204	0.451	0.029	0.032	0.097	3.084	
2020	1.117	0.678	0.481	0.203	0.454	0.029	0.031	0.097	3.090	

Sources: BTRE estimates.

TABLE 3.76 BASE CASE PROJECTIONS OF METROPOLITAN PM2.5 EMISSIONS BY LCVS  
TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	0.967	0.610	0.354	0.212	0.357	0.040	0.035	0.086	2.661	
1991	0.896	0.566	0.328	0.196	0.330	0.037	0.033	0.080	2.466	
1992	0.886	0.557	0.327	0.193	0.328	0.036	0.032	0.079	2.439	
1993	0.931	0.584	0.348	0.201	0.347	0.038	0.034	0.083	2.566	
1994	0.931	0.582	0.351	0.200	0.349	0.038	0.034	0.083	2.569	
1995	0.972	0.606	0.372	0.208	0.367	0.039	0.035	0.087	2.687	
1996	1.057	0.658	0.410	0.224	0.402	0.042	0.039	0.096	2.929	
1997	0.967	0.600	0.376	0.203	0.369	0.038	0.035	0.088	2.677	
1998	0.931	0.579	0.364	0.195	0.357	0.036	0.033	0.086	2.581	
1999	0.923	0.575	0.363	0.191	0.355	0.035	0.033	0.086	2.560	
2000	0.843	0.525	0.331	0.173	0.325	0.032	0.030	0.078	2.336	
2001	0.878	0.547	0.346	0.179	0.340	0.032	0.031	0.082	2.434	
2002	0.909	0.566	0.360	0.184	0.352	0.033	0.032	0.085	2.521	
2003	0.919	0.572	0.365	0.185	0.357	0.033	0.032	0.085	2.549	
2004	0.935	0.582	0.373	0.188	0.364	0.033	0.032	0.087	2.594	
2005	0.958	0.596	0.383	0.191	0.374	0.033	0.032	0.089	2.655	
2006	0.949	0.589	0.381	0.188	0.371	0.032	0.032	0.087	2.629	
2007	0.953	0.591	0.384	0.188	0.373	0.032	0.031	0.087	2.640	
2008	0.960	0.595	0.389	0.188	0.377	0.031	0.031	0.088	2.660	
2009	0.968	0.599	0.394	0.189	0.381	0.031	0.031	0.088	2.682	
2010	0.982	0.608	0.402	0.191	0.388	0.031	0.031	0.089	2.721	
2011	0.991	0.612	0.407	0.191	0.392	0.031	0.031	0.090	2.745	
2012	1.000	0.617	0.413	0.192	0.397	0.030	0.031	0.090	2.771	
2013	1.010	0.622	0.419	0.193	0.402	0.030	0.031	0.091	2.798	
2014	1.021	0.628	0.425	0.193	0.407	0.030	0.031	0.091	2.826	
2015	1.031	0.633	0.432	0.194	0.412	0.030	0.031	0.092	2.854	
2016	1.041	0.638	0.438	0.195	0.418	0.029	0.031	0.092	2.881	
2017	1.052	0.643	0.445	0.195	0.423	0.029	0.031	0.093	2.912	
2018	1.058	0.646	0.450	0.195	0.427	0.029	0.031	0.093	2.928	
2019	1.063	0.647	0.455	0.195	0.431	0.028	0.030	0.093	2.942	
2020	1.066	0.648	0.459	0.194	0.433	0.028	0.030	0.093	2.950	

Sources: BTRE estimates.

TABLE 3.77 BASE CASE PROJECTIONS OF METROPOLITAN PM1.0 EMISSIONS BY LCVS  
TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	0.948	0.598	0.347	0.208	0.350	0.039	0.035	0.084	2.609	
1991	0.877	0.554	0.321	0.192	0.324	0.036	0.032	0.078	2.414	
1992	0.866	0.545	0.320	0.189	0.321	0.035	0.032	0.077	2.386	
1993	0.910	0.571	0.340	0.197	0.339	0.037	0.033	0.081	2.508	
1994	0.909	0.569	0.343	0.196	0.341	0.037	0.033	0.081	2.509	
1995	0.949	0.592	0.363	0.203	0.358	0.038	0.035	0.085	2.623	
1996	1.031	0.642	0.400	0.219	0.393	0.041	0.038	0.093	2.857	
1997	0.942	0.585	0.366	0.198	0.360	0.037	0.034	0.086	2.608	
1998	0.906	0.564	0.354	0.189	0.348	0.035	0.032	0.084	2.512	
1999	0.898	0.559	0.353	0.186	0.346	0.034	0.032	0.083	2.490	
2000	0.819	0.509	0.322	0.168	0.316	0.031	0.029	0.076	2.269	
2001	0.852	0.531	0.336	0.174	0.330	0.031	0.030	0.079	2.362	
2002	0.882	0.549	0.349	0.179	0.342	0.032	0.031	0.082	2.445	
2003	0.891	0.555	0.354	0.179	0.346	0.032	0.031	0.083	2.470	
2004	0.906	0.564	0.361	0.182	0.353	0.032	0.031	0.084	2.512	
2005	0.927	0.577	0.371	0.185	0.362	0.032	0.031	0.086	2.570	
2006	0.917	0.570	0.369	0.182	0.359	0.031	0.031	0.085	2.543	
2007	0.921	0.572	0.372	0.182	0.361	0.031	0.030	0.085	2.552	
2008	0.927	0.575	0.376	0.182	0.364	0.030	0.030	0.085	2.570	
2009	0.935	0.579	0.380	0.182	0.368	0.030	0.030	0.085	2.590	
2010	0.948	0.587	0.388	0.184	0.374	0.030	0.030	0.086	2.627	
2011	0.956	0.591	0.393	0.184	0.378	0.030	0.030	0.086	2.649	
2012	0.965	0.595	0.398	0.185	0.383	0.029	0.030	0.087	2.672	
2013	0.974	0.600	0.404	0.186	0.387	0.029	0.030	0.087	2.697	
2014	0.983	0.605	0.410	0.186	0.392	0.029	0.030	0.088	2.723	
2015	0.993	0.610	0.416	0.187	0.397	0.028	0.030	0.088	2.750	
2016	1.003	0.615	0.422	0.188	0.402	0.028	0.030	0.089	2.776	
2017	1.013	0.620	0.429	0.188	0.408	0.028	0.030	0.089	2.805	
2018	1.019	0.622	0.434	0.188	0.412	0.027	0.029	0.090	2.821	
2019	1.024	0.624	0.438	0.188	0.415	0.027	0.029	0.090	2.835	
2020	1.027	0.624	0.442	0.187	0.418	0.027	0.029	0.089	2.844	

Sources: BTRE estimates.

TABLE 3.78 BASE CASE PROJECTIONS OF METROPOLITAN ACETALDEHYDE EMISSIONS BY LCVS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.088	0.055	0.032	0.019	0.032	0.004	0.003	0.008	0.241
1991	0.081	0.051	0.030	0.018	0.030	0.003	0.003	0.007	0.224
1992	0.080	0.051	0.030	0.017	0.030	0.003	0.003	0.007	0.221
1993	0.084	0.053	0.031	0.018	0.031	0.003	0.003	0.008	0.232
1994	0.083	0.052	0.031	0.018	0.031	0.003	0.003	0.007	0.230
1995	0.086	0.054	0.033	0.018	0.033	0.003	0.003	0.008	0.238
1996	0.093	0.058	0.036	0.020	0.035	0.004	0.003	0.008	0.257
1997	0.093	0.058	0.036	0.020	0.036	0.004	0.003	0.009	0.259
1998	0.095	0.059	0.037	0.020	0.036	0.004	0.003	0.009	0.263
1999	0.099	0.062	0.039	0.021	0.038	0.004	0.004	0.009	0.276
2000	0.095	0.059	0.037	0.019	0.037	0.004	0.003	0.009	0.263
2001	0.098	0.061	0.039	0.020	0.038	0.004	0.003	0.009	0.271
2002	0.102	0.063	0.040	0.021	0.039	0.004	0.004	0.009	0.282
2003	0.104	0.065	0.041	0.021	0.040	0.004	0.004	0.010	0.289
2004	0.106	0.066	0.042	0.021	0.041	0.004	0.004	0.010	0.294
2005	0.108	0.067	0.043	0.022	0.042	0.004	0.004	0.010	0.300
2006	0.109	0.068	0.044	0.022	0.043	0.004	0.004	0.010	0.302
2007	0.110	0.068	0.044	0.022	0.043	0.004	0.004	0.010	0.305
2008	0.111	0.069	0.045	0.022	0.044	0.004	0.004	0.010	0.307
2009	0.111	0.069	0.045	0.022	0.044	0.004	0.004	0.010	0.308
2010	0.112	0.069	0.046	0.022	0.044	0.004	0.004	0.010	0.311
2011	0.112	0.069	0.046	0.022	0.044	0.003	0.004	0.010	0.311
2012	0.112	0.069	0.046	0.022	0.045	0.003	0.004	0.010	0.311
2013	0.113	0.069	0.047	0.021	0.045	0.003	0.003	0.010	0.312
2014	0.113	0.070	0.047	0.021	0.045	0.003	0.003	0.010	0.313
2015	0.114	0.070	0.048	0.021	0.045	0.003	0.003	0.010	0.314
2016	0.114	0.070	0.048	0.021	0.046	0.003	0.003	0.010	0.316
2017	0.115	0.071	0.049	0.021	0.046	0.003	0.003	0.010	0.319
2018	0.117	0.071	0.050	0.022	0.047	0.003	0.003	0.010	0.323
2019	0.118	0.072	0.051	0.022	0.048	0.003	0.003	0.010	0.328
2020	0.120	0.073	0.052	0.022	0.049	0.003	0.003	0.010	0.332

Sources: BTRE estimates.

TABLE 3.79 BASE CASE PROJECTIONS OF METROPOLITAN FORMALDEHYDE EMISSIONS BY LCVS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.184	0.116	0.067	0.040	0.068	0.008	0.007	0.016	0.506
1991	0.167	0.106	0.061	0.037	0.062	0.007	0.006	0.015	0.461
1992	0.162	0.102	0.060	0.035	0.060	0.007	0.006	0.014	0.447
1993	0.167	0.105	0.062	0.036	0.062	0.007	0.006	0.015	0.461
1994	0.162	0.101	0.061	0.035	0.061	0.007	0.006	0.015	0.448
1995	0.165	0.103	0.063	0.035	0.062	0.007	0.006	0.015	0.456
1996	0.175	0.109	0.068	0.037	0.067	0.007	0.006	0.016	0.486
1997	0.174	0.108	0.068	0.037	0.067	0.007	0.006	0.016	0.483
1998	0.175	0.109	0.069	0.037	0.067	0.007	0.006	0.016	0.486
1999	0.179	0.112	0.070	0.037	0.069	0.007	0.006	0.017	0.497
2000	0.169	0.105	0.066	0.035	0.065	0.006	0.006	0.016	0.468
2001	0.173	0.107	0.068	0.035	0.067	0.006	0.006	0.016	0.478
2002	0.178	0.111	0.070	0.036	0.069	0.006	0.006	0.017	0.493
2003	0.180	0.112	0.071	0.036	0.070	0.006	0.006	0.017	0.499
2004	0.181	0.112	0.072	0.036	0.070	0.006	0.006	0.017	0.501
2005	0.182	0.113	0.073	0.036	0.071	0.006	0.006	0.017	0.506
2006	0.181	0.113	0.073	0.036	0.071	0.006	0.006	0.017	0.503
2007	0.181	0.113	0.073	0.036	0.071	0.006	0.006	0.017	0.502
2008	0.180	0.112	0.073	0.035	0.071	0.006	0.006	0.016	0.500
2009	0.179	0.111	0.073	0.035	0.070	0.006	0.006	0.016	0.495
2010	0.178	0.110	0.073	0.035	0.070	0.006	0.006	0.016	0.493
2011	0.176	0.109	0.072	0.034	0.070	0.005	0.006	0.016	0.488
2012	0.174	0.107	0.072	0.033	0.069	0.005	0.005	0.016	0.482
2013	0.172	0.106	0.071	0.033	0.069	0.005	0.005	0.015	0.478
2014	0.171	0.105	0.071	0.032	0.068	0.005	0.005	0.015	0.473
2015	0.169	0.104	0.071	0.032	0.068	0.005	0.005	0.015	0.468
2016	0.168	0.103	0.071	0.031	0.067	0.005	0.005	0.015	0.464
2017	0.167	0.102	0.071	0.031	0.067	0.005	0.005	0.015	0.462
2018	0.166	0.102	0.071	0.031	0.067	0.004	0.005	0.015	0.461
2019	0.166	0.101	0.071	0.030	0.067	0.004	0.005	0.015	0.460
2020	0.165	0.101	0.071	0.030	0.067	0.004	0.005	0.014	0.458

Sources: BTRE estimates.

TABLE 3.80 BASE CASE PROJECTIONS OF METROPOLITAN CARBONYL (TOTAL)  
EMISSIONS BY LCVS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.509	0.321	0.186	0.111	0.188	0.021	0.019	0.045	1.400
1991	0.464	0.293	0.170	0.102	0.171	0.019	0.017	0.041	1.277
1992	0.451	0.283	0.167	0.098	0.167	0.018	0.016	0.040	1.241
1993	0.465	0.291	0.173	0.101	0.173	0.019	0.017	0.041	1.280
1994	0.451	0.282	0.170	0.097	0.169	0.018	0.016	0.040	1.244
1995	0.458	0.286	0.175	0.098	0.173	0.018	0.017	0.041	1.267
1996	0.489	0.304	0.190	0.104	0.186	0.020	0.018	0.044	1.354
1997	0.487	0.303	0.190	0.102	0.186	0.019	0.018	0.045	1.350
1998	0.491	0.305	0.192	0.103	0.188	0.019	0.018	0.045	1.361
1999	0.504	0.314	0.198	0.104	0.194	0.019	0.018	0.047	1.398
2000	0.476	0.296	0.187	0.098	0.184	0.018	0.017	0.044	1.319
2001	0.487	0.303	0.192	0.099	0.188	0.018	0.017	0.045	1.349
2002	0.502	0.313	0.199	0.102	0.195	0.018	0.018	0.047	1.392
2003	0.509	0.317	0.202	0.103	0.198	0.018	0.018	0.047	1.412
2004	0.512	0.319	0.204	0.103	0.199	0.018	0.017	0.048	1.420
2005	0.518	0.322	0.207	0.103	0.202	0.018	0.018	0.048	1.437
2006	0.517	0.321	0.208	0.103	0.202	0.018	0.017	0.048	1.433
2007	0.517	0.321	0.209	0.102	0.203	0.017	0.017	0.048	1.434
2008	0.516	0.320	0.209	0.101	0.203	0.017	0.017	0.047	1.430
2009	0.512	0.317	0.209	0.100	0.202	0.016	0.017	0.047	1.420
2010	0.512	0.317	0.209	0.099	0.202	0.016	0.016	0.046	1.418
2011	0.507	0.313	0.208	0.098	0.201	0.016	0.016	0.046	1.405
2012	0.503	0.310	0.207	0.096	0.199	0.015	0.016	0.045	1.392
2013	0.499	0.307	0.207	0.095	0.198	0.015	0.015	0.045	1.381
2014	0.495	0.304	0.206	0.094	0.197	0.014	0.015	0.044	1.371
2015	0.491	0.301	0.206	0.092	0.196	0.014	0.015	0.044	1.359
2016	0.488	0.299	0.205	0.091	0.196	0.014	0.014	0.043	1.350
2017	0.487	0.298	0.206	0.090	0.196	0.013	0.014	0.043	1.347
2018	0.487	0.297	0.207	0.090	0.197	0.013	0.014	0.043	1.348
2019	0.487	0.296	0.208	0.089	0.197	0.013	0.014	0.043	1.347
2020	0.486	0.295	0.209	0.088	0.197	0.013	0.014	0.042	1.344

Sources: BTRE estimates.

TABLE 3.81 BASE CASE PROJECTIONS OF METROPOLITAN BENZENE EMISSIONS BY LCVS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	0.657	0.414	0.240	0.144	0.242	0.027	0.024	0.058	1.807	
1991	0.580	0.366	0.212	0.127	0.214	0.024	0.021	0.052	1.597	
1992	0.545	0.343	0.202	0.119	0.202	0.022	0.020	0.049	1.501	
1993	0.544	0.341	0.203	0.118	0.203	0.022	0.020	0.049	1.500	
1994	0.510	0.319	0.192	0.110	0.191	0.021	0.019	0.046	1.406	
1995	0.500	0.312	0.191	0.107	0.189	0.020	0.018	0.045	1.383	
1996	0.518	0.322	0.201	0.110	0.197	0.021	0.019	0.047	1.436	
1997	0.503	0.312	0.196	0.106	0.192	0.020	0.018	0.046	1.394	
1998	0.492	0.306	0.193	0.103	0.189	0.019	0.018	0.045	1.365	
1999	0.474	0.295	0.186	0.098	0.183	0.018	0.017	0.044	1.316	
2000	0.427	0.266	0.168	0.088	0.165	0.016	0.015	0.040	1.183	
2001	0.415	0.258	0.163	0.084	0.160	0.015	0.015	0.039	1.150	
2002	0.405	0.252	0.160	0.082	0.157	0.015	0.014	0.038	1.122	
2003	0.388	0.241	0.154	0.078	0.151	0.014	0.013	0.036	1.075	
2004	0.368	0.229	0.147	0.074	0.143	0.013	0.013	0.034	1.021	
2005	0.350	0.218	0.140	0.070	0.137	0.012	0.012	0.032	0.971	
2006	0.335	0.208	0.134	0.066	0.131	0.011	0.011	0.031	0.927	
2007	0.324	0.201	0.131	0.064	0.127	0.011	0.011	0.030	0.897	
2008	0.319	0.198	0.129	0.063	0.125	0.010	0.010	0.029	0.884	
2009	0.312	0.194	0.127	0.061	0.123	0.010	0.010	0.028	0.866	
2010	0.307	0.190	0.126	0.060	0.121	0.010	0.010	0.028	0.852	
2011	0.301	0.186	0.124	0.058	0.119	0.009	0.009	0.027	0.834	
2012	0.294	0.182	0.121	0.056	0.117	0.009	0.009	0.026	0.815	
2013	0.287	0.177	0.119	0.055	0.114	0.009	0.009	0.026	0.796	
2014	0.280	0.172	0.117	0.053	0.112	0.008	0.009	0.025	0.776	
2015	0.273	0.167	0.114	0.051	0.109	0.008	0.008	0.024	0.755	
2016	0.264	0.162	0.111	0.049	0.106	0.007	0.008	0.023	0.732	
2017	0.257	0.157	0.109	0.048	0.103	0.007	0.008	0.023	0.711	
2018	0.250	0.152	0.106	0.046	0.101	0.007	0.007	0.022	0.691	
2019	0.241	0.147	0.103	0.044	0.098	0.006	0.007	0.021	0.668	
2020	0.231	0.140	0.100	0.042	0.094	0.006	0.007	0.020	0.640	

Sources: BTRE estimates.

TABLE 3.82 BASE CASE PROJECTIONS OF METROPOLITAN TOLUENE EMISSIONS BY LCVS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	1.01	0.64	0.37	0.22	0.37	0.04	0.04	0.09	2.77	
1991	0.90	0.57	0.33	0.20	0.33	0.04	0.03	0.08	2.48	
1992	0.86	0.54	0.32	0.19	0.32	0.04	0.03	0.08	2.37	
1993	0.87	0.55	0.33	0.19	0.33	0.04	0.03	0.08	2.41	
1994	0.83	0.52	0.31	0.18	0.31	0.03	0.03	0.07	2.29	
1995	0.83	0.52	0.32	0.18	0.31	0.03	0.03	0.07	2.29	
1996	0.87	0.54	0.34	0.18	0.33	0.03	0.03	0.08	2.41	
1997	0.86	0.53	0.33	0.18	0.33	0.03	0.03	0.08	2.37	
1998	0.85	0.53	0.33	0.18	0.33	0.03	0.03	0.08	2.36	
1999	0.85	0.53	0.34	0.18	0.33	0.03	0.03	0.08	2.37	
2000	0.80	0.50	0.31	0.16	0.31	0.03	0.03	0.07	2.21	
2001	0.81	0.50	0.32	0.16	0.31	0.03	0.03	0.08	2.23	
2002	0.82	0.51	0.32	0.17	0.32	0.03	0.03	0.08	2.27	
2003	0.82	0.51	0.33	0.17	0.32	0.03	0.03	0.08	2.27	
2004	0.82	0.51	0.33	0.16	0.32	0.03	0.03	0.08	2.26	
2005	0.81	0.51	0.33	0.16	0.32	0.03	0.03	0.08	2.26	
2006	0.80	0.50	0.32	0.16	0.31	0.03	0.03	0.07	2.22	
2007	0.79	0.49	0.32	0.16	0.31	0.03	0.03	0.07	2.19	
2008	0.78	0.48	0.32	0.15	0.31	0.03	0.03	0.07	2.16	
2009	0.76	0.47	0.31	0.15	0.30	0.02	0.02	0.07	2.12	
2010	0.75	0.46	0.31	0.15	0.30	0.02	0.02	0.07	2.08	
2011	0.73	0.45	0.30	0.14	0.29	0.02	0.02	0.07	2.03	
2012	0.71	0.44	0.29	0.14	0.28	0.02	0.02	0.06	1.98	
2013	0.70	0.43	0.29	0.13	0.28	0.02	0.02	0.06	1.93	
2014	0.68	0.42	0.28	0.13	0.27	0.02	0.02	0.06	1.88	
2015	0.66	0.41	0.28	0.12	0.26	0.02	0.02	0.06	1.83	
2016	0.64	0.39	0.27	0.12	0.26	0.02	0.02	0.06	1.78	
2017	0.62	0.38	0.26	0.12	0.25	0.02	0.02	0.06	1.73	
2018	0.61	0.37	0.26	0.11	0.25	0.02	0.02	0.05	1.68	
2019	0.59	0.36	0.25	0.11	0.24	0.02	0.02	0.05	1.63	
2020	0.57	0.34	0.24	0.10	0.23	0.01	0.02	0.05	1.57	

Sources: BTRE estimates.

TABLE 3.83 BASE CASE PROJECTIONS OF METROPOLITAN XYLENE EMISSIONS BY LCVS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	0.835	0.527	0.306	0.183	0.308	0.034	0.030	0.074	2.297	
1991	0.749	0.473	0.274	0.164	0.276	0.031	0.027	0.067	2.061	
1992	0.715	0.450	0.264	0.156	0.265	0.029	0.026	0.064	1.969	
1993	0.726	0.455	0.271	0.157	0.271	0.030	0.026	0.065	2.001	
1994	0.690	0.432	0.261	0.148	0.259	0.028	0.025	0.062	1.905	
1995	0.690	0.430	0.264	0.147	0.261	0.028	0.025	0.062	1.907	
1996	0.724	0.451	0.281	0.154	0.276	0.029	0.027	0.066	2.007	
1997	0.713	0.442	0.277	0.150	0.272	0.028	0.026	0.065	1.974	
1998	0.708	0.440	0.277	0.148	0.272	0.027	0.025	0.065	1.963	
1999	0.709	0.441	0.279	0.147	0.273	0.027	0.025	0.066	1.967	
2000	0.663	0.412	0.260	0.136	0.256	0.025	0.023	0.062	1.837	
2001	0.670	0.417	0.264	0.136	0.259	0.025	0.024	0.062	1.857	
2002	0.681	0.424	0.269	0.138	0.264	0.025	0.024	0.063	1.889	
2003	0.682	0.425	0.271	0.137	0.265	0.024	0.024	0.063	1.891	
2004	0.679	0.423	0.271	0.136	0.264	0.024	0.023	0.063	1.884	
2005	0.678	0.422	0.271	0.135	0.264	0.023	0.023	0.063	1.879	
2006	0.667	0.414	0.268	0.132	0.261	0.023	0.022	0.061	1.848	
2007	0.658	0.409	0.266	0.130	0.258	0.022	0.022	0.060	1.824	
2008	0.650	0.403	0.263	0.128	0.255	0.021	0.021	0.059	1.801	
2009	0.636	0.394	0.259	0.124	0.251	0.020	0.021	0.058	1.763	
2010	0.626	0.387	0.256	0.121	0.247	0.020	0.020	0.057	1.735	
2011	0.611	0.378	0.251	0.118	0.242	0.019	0.019	0.055	1.694	
2012	0.596	0.368	0.246	0.114	0.237	0.018	0.019	0.054	1.652	
2013	0.582	0.358	0.241	0.111	0.231	0.017	0.018	0.052	1.611	
2014	0.567	0.349	0.236	0.107	0.226	0.017	0.017	0.051	1.570	
2015	0.552	0.339	0.231	0.104	0.221	0.016	0.017	0.049	1.527	
2016	0.537	0.329	0.226	0.100	0.215	0.015	0.016	0.048	1.486	
2017	0.523	0.320	0.222	0.097	0.211	0.014	0.015	0.046	1.449	
2018	0.509	0.311	0.217	0.094	0.206	0.014	0.015	0.045	1.410	
2019	0.494	0.301	0.212	0.091	0.200	0.013	0.014	0.043	1.368	
2020	0.475	0.289	0.205	0.086	0.193	0.012	0.013	0.041	1.315	

Note: Includes emissions of o, m and p isomers.

Sources: BTRE estimates.

TABLE 3.84 BASE CASE PROJECTIONS OF METROPOLITAN PAH EMISSIONS BY LCVS  
TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	0.034	0.021	0.012	0.007	0.012	0.001	0.001	0.003	0.093	
1991	0.031	0.020	0.011	0.007	0.011	0.001	0.001	0.003	0.085	
1992	0.030	0.019	0.011	0.007	0.011	0.001	0.001	0.003	0.083	
1993	0.031	0.019	0.012	0.007	0.012	0.001	0.001	0.003	0.086	
1994	0.030	0.019	0.011	0.007	0.011	0.001	0.001	0.003	0.084	
1995	0.031	0.019	0.012	0.007	0.012	0.001	0.001	0.003	0.086	
1996	0.033	0.021	0.013	0.007	0.013	0.001	0.001	0.003	0.092	
1997	0.032	0.020	0.012	0.007	0.012	0.001	0.001	0.003	0.089	
1998	0.032	0.020	0.012	0.007	0.012	0.001	0.001	0.003	0.088	
1999	0.032	0.020	0.013	0.007	0.012	0.001	0.001	0.003	0.089	
2000	0.030	0.019	0.012	0.006	0.012	0.001	0.001	0.003	0.083	
2001	0.031	0.019	0.012	0.006	0.012	0.001	0.001	0.003	0.085	
2002	0.032	0.020	0.013	0.006	0.012	0.001	0.001	0.003	0.088	
2003	0.032	0.020	0.013	0.006	0.012	0.001	0.001	0.003	0.089	
2004	0.032	0.020	0.013	0.006	0.013	0.001	0.001	0.003	0.089	
2005	0.033	0.020	0.013	0.007	0.013	0.001	0.001	0.003	0.090	
2006	0.032	0.020	0.013	0.006	0.013	0.001	0.001	0.003	0.090	
2007	0.032	0.020	0.013	0.006	0.013	0.001	0.001	0.003	0.089	
2008	0.032	0.020	0.013	0.006	0.013	0.001	0.001	0.003	0.089	
2009	0.032	0.020	0.013	0.006	0.013	0.001	0.001	0.003	0.089	
2010	0.032	0.020	0.013	0.006	0.013	0.001	0.001	0.003	0.089	
2011	0.032	0.020	0.013	0.006	0.013	0.001	0.001	0.003	0.088	
2012	0.032	0.019	0.013	0.006	0.013	0.001	0.001	0.003	0.087	
2013	0.031	0.019	0.013	0.006	0.012	0.001	0.001	0.003	0.087	
2014	0.031	0.019	0.013	0.006	0.012	0.001	0.001	0.003	0.086	
2015	0.031	0.019	0.013	0.006	0.012	0.001	0.001	0.003	0.086	
2016	0.031	0.019	0.013	0.006	0.012	0.001	0.001	0.003	0.086	
2017	0.031	0.019	0.013	0.006	0.012	0.001	0.001	0.003	0.085	
2018	0.031	0.019	0.013	0.006	0.012	0.001	0.001	0.003	0.085	
2019	0.031	0.019	0.013	0.006	0.012	0.001	0.001	0.003	0.085	
2020	0.031	0.019	0.013	0.006	0.012	0.001	0.001	0.003	0.085	

Sources: BTRE estimates.

TABLE 3.85 BASE CASE PROJECTIONS OF METROPOLITAN 1,3-BUTADIENE EMISSIONS  
BY LCVS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	0.070	0.044	0.026	0.015	0.026	0.003	0.003	0.006	0.193	
1991	0.063	0.040	0.023	0.014	0.023	0.003	0.002	0.006	0.173	
1992	0.060	0.038	0.022	0.013	0.022	0.002	0.002	0.005	0.165	
1993	0.061	0.038	0.023	0.013	0.023	0.002	0.002	0.005	0.168	
1994	0.058	0.036	0.022	0.012	0.022	0.002	0.002	0.005	0.160	
1995	0.058	0.036	0.022	0.012	0.022	0.002	0.002	0.005	0.160	
1996	0.061	0.038	0.024	0.013	0.023	0.002	0.002	0.006	0.169	
1997	0.060	0.037	0.023	0.013	0.023	0.002	0.002	0.005	0.166	
1998	0.060	0.037	0.023	0.012	0.023	0.002	0.002	0.006	0.165	
1999	0.060	0.037	0.023	0.012	0.023	0.002	0.002	0.006	0.166	
2000	0.056	0.035	0.022	0.011	0.022	0.002	0.002	0.005	0.155	
2001	0.056	0.035	0.022	0.012	0.022	0.002	0.002	0.005	0.157	
2002	0.057	0.036	0.023	0.012	0.022	0.002	0.002	0.005	0.159	
2003	0.058	0.036	0.023	0.012	0.022	0.002	0.002	0.005	0.160	
2004	0.057	0.036	0.023	0.012	0.022	0.002	0.002	0.005	0.159	
2005	0.057	0.036	0.023	0.011	0.022	0.002	0.002	0.005	0.159	
2006	0.056	0.035	0.023	0.011	0.022	0.002	0.002	0.005	0.156	
2007	0.056	0.035	0.022	0.011	0.022	0.002	0.002	0.005	0.154	
2008	0.055	0.034	0.022	0.011	0.022	0.002	0.002	0.005	0.152	
2009	0.054	0.033	0.022	0.011	0.021	0.002	0.002	0.005	0.149	
2010	0.053	0.033	0.022	0.010	0.021	0.002	0.002	0.005	0.147	
2011	0.052	0.032	0.021	0.010	0.021	0.002	0.002	0.005	0.144	
2012	0.051	0.031	0.021	0.010	0.020	0.002	0.002	0.005	0.141	
2013	0.050	0.031	0.021	0.009	0.020	0.001	0.002	0.004	0.137	
2014	0.048	0.030	0.020	0.009	0.019	0.001	0.001	0.004	0.134	
2015	0.047	0.029	0.020	0.009	0.019	0.001	0.001	0.004	0.131	
2016	0.046	0.028	0.019	0.009	0.019	0.001	0.001	0.004	0.128	
2017	0.045	0.028	0.019	0.008	0.018	0.001	0.001	0.004	0.125	
2018	0.044	0.027	0.019	0.008	0.018	0.001	0.001	0.004	0.122	
2019	0.043	0.026	0.018	0.008	0.017	0.001	0.001	0.004	0.119	
2020	0.042	0.025	0.018	0.008	0.017	0.001	0.001	0.004	0.116	

Sources: BTRE estimates.

TABLE 3.86 ESTIMATED OZONE REACTIVITY OF BASE CASE PROJECTIONS OF METROPOLITAN VOC EMISSIONS BY LCVS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	36.2	22.9	13.3	7.9	13.4	1.5	1.3	3.2	99.7
1991	32.2	20.3	11.8	7.1	11.9	1.3	1.2	2.9	88.7
1992	30.6	19.3	11.3	6.7	11.4	1.3	1.1	2.7	84.4
1993	30.9	19.4	11.5	6.7	11.5	1.3	1.1	2.8	85.2
1994	29.4	18.4	11.1	6.3	11.0	1.2	1.1	2.6	81.1
1995	29.3	18.3	11.2	6.3	11.1	1.2	1.1	2.6	81.0
1996	30.5	18.9	11.8	6.5	11.6	1.2	1.1	2.8	84.4
1997	29.6	18.4	11.5	6.2	11.3	1.2	1.1	2.7	82.1
1998	29.1	18.1	11.4	6.1	11.1	1.1	1.0	2.7	80.6
1999	28.9	18.0	11.4	6.0	11.1	1.1	1.0	2.7	80.2
2000	26.8	16.7	10.5	5.5	10.3	1.0	0.9	2.5	74.3
2001	26.8	16.7	10.6	5.5	10.4	1.0	0.9	2.5	74.4
2002	27.0	16.8	10.7	5.5	10.5	1.0	0.9	2.5	75.0
2003	26.9	16.7	10.7	5.4	10.4	1.0	0.9	2.5	74.5
2004	26.6	16.6	10.6	5.3	10.4	0.9	0.9	2.5	73.9
2005	26.5	16.5	10.6	5.3	10.4	0.9	0.9	2.5	73.6
2006	26.1	16.2	10.5	5.2	10.2	0.9	0.9	2.4	72.3
2007	25.7	16.0	10.4	5.1	10.1	0.9	0.8	2.4	71.2
2008	25.3	15.7	10.2	5.0	9.9	0.8	0.8	2.3	70.0
2009	24.7	15.3	10.1	4.8	9.7	0.8	0.8	2.3	68.5
2010	24.3	15.1	10.0	4.7	9.6	0.8	0.8	2.2	67.5
2011	23.9	14.7	9.8	4.6	9.4	0.7	0.8	2.2	66.1
2012	23.4	14.4	9.6	4.5	9.3	0.7	0.7	2.1	64.7
2013	22.9	14.1	9.5	4.4	9.1	0.7	0.7	2.1	63.5
2014	22.5	13.8	9.4	4.3	9.0	0.7	0.7	2.0	62.2
2015	22.0	13.5	9.2	4.1	8.8	0.6	0.7	2.0	60.8
2016	21.5	13.2	9.1	4.0	8.6	0.6	0.6	1.9	59.6
2017	21.1	12.9	8.9	3.9	8.5	0.6	0.6	1.9	58.5
2018	20.7	12.7	8.8	3.8	8.4	0.6	0.6	1.8	57.4
2019	20.3	12.4	8.7	3.7	8.2	0.5	0.6	1.8	56.2
2020	19.8	12.0	8.5	3.6	8.0	0.5	0.6	1.7	54.8

Sources: BTRE estimates.

TABLE 3.87 ESTIMATED METROPOLITAN EMISSIONS OF OTHER NPI SPECIES BY LCVS TO 2020

Year	(thousand tonnes)						
	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	n-Hexane	Styrene
1990	0.132	0.075	0.561	0.043	0.409	0.580	0.080
1991	0.122	0.068	0.503	0.038	0.366	0.522	0.071
1992	0.119	0.064	0.481	0.037	0.349	0.502	0.068
1993	0.124	0.065	0.487	0.037	0.353	0.513	0.069
1994	0.122	0.062	0.468	0.036	0.338	0.493	0.066
1995	0.126	0.062	0.468	0.036	0.338	0.498	0.066
1996	0.136	0.065	0.497	0.038	0.357	0.525	0.069
1997	0.136	0.064	0.491	0.038	0.352	0.517	0.068
1998	0.139	0.064	0.490	0.037	0.350	0.514	0.068
1999	0.145	0.064	0.494	0.038	0.351	0.517	0.068
2000	0.138	0.059	0.460	0.035	0.327	0.487	0.064
2001	0.142	0.060	0.467	0.036	0.332	0.495	0.064
2002	0.147	0.061	0.478	0.037	0.338	0.504	0.066
2003	0.150	0.061	0.480	0.037	0.339	0.507	0.066
2004	0.153	0.061	0.475	0.037	0.335	0.507	0.065
2005	0.156	0.060	0.476	0.037	0.335	0.507	0.065
2006	0.156	0.059	0.470	0.036	0.329	0.502	0.064
2007	0.158	0.058	0.465	0.036	0.325	0.498	0.063
2008	0.158	0.057	0.455	0.035	0.318	0.495	0.062
2009	0.159	0.056	0.447	0.035	0.311	0.489	0.060
2010	0.160	0.055	0.440	0.034	0.306	0.486	0.059
2011	0.160	0.053	0.430	0.034	0.299	0.479	0.058
2012	0.160	0.052	0.420	0.033	0.291	0.473	0.056
2013	0.160	0.050	0.410	0.033	0.283	0.466	0.055
2014	0.160	0.048	0.400	0.032	0.276	0.460	0.053
2015	0.160	0.047	0.389	0.031	0.268	0.453	0.052
2016	0.161	0.045	0.379	0.031	0.260	0.446	0.050
2017	0.162	0.044	0.370	0.030	0.253	0.441	0.049
2018	0.164	0.043	0.362	0.030	0.245	0.434	0.047
2019	0.165	0.041	0.352	0.029	0.237	0.426	0.046
2020	0.167	0.039	0.340	0.028	0.227	0.417	0.044

Sources: BTRE estimates.

TABLE 3.88 ESTIMATED NATIONAL EMISSIONS OF OTHER NPI SPECIES BY LCVS TO 2020

Year	(thousand tonnes)						
	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	n-Hexane	Styrene
1990	0.204	0.117	0.898	0.068	0.655	0.928	0.127
1991	0.199	0.110	0.852	0.065	0.620	0.884	0.121
1992	0.196	0.106	0.817	0.063	0.593	0.852	0.115
1993	0.196	0.103	0.796	0.061	0.577	0.838	0.112
1994	0.191	0.097	0.753	0.058	0.544	0.793	0.106
1995	0.197	0.097	0.753	0.058	0.544	0.802	0.106
1996	0.201	0.097	0.754	0.058	0.542	0.796	0.105
1997	0.200	0.094	0.736	0.056	0.528	0.775	0.103
1998	0.209	0.096	0.756	0.058	0.540	0.792	0.105
1999	0.214	0.095	0.748	0.057	0.532	0.783	0.103
2000	0.208	0.090	0.712	0.055	0.506	0.753	0.098
2001	0.210	0.089	0.705	0.054	0.500	0.746	0.097
2002	0.215	0.089	0.711	0.054	0.503	0.750	0.098
2003	0.218	0.089	0.707	0.054	0.498	0.746	0.097
2004	0.219	0.087	0.697	0.054	0.491	0.743	0.095
2005	0.221	0.086	0.689	0.053	0.484	0.734	0.094
2006	0.220	0.083	0.673	0.052	0.471	0.718	0.091
2007	0.220	0.081	0.659	0.051	0.460	0.706	0.089
2008	0.219	0.079	0.643	0.050	0.449	0.699	0.087
2009	0.217	0.076	0.623	0.049	0.435	0.683	0.084
2010	0.217	0.074	0.609	0.048	0.424	0.673	0.082
2011	0.216	0.072	0.591	0.047	0.411	0.659	0.079
2012	0.215	0.069	0.573	0.045	0.397	0.645	0.077
2013	0.214	0.067	0.555	0.044	0.384	0.632	0.074
2014	0.213	0.064	0.538	0.043	0.371	0.618	0.071
2015	0.211	0.062	0.520	0.042	0.357	0.604	0.069
2016	0.211	0.059	0.502	0.041	0.344	0.590	0.066
2017	0.211	0.057	0.486	0.040	0.332	0.579	0.064
2018	0.212	0.055	0.472	0.039	0.320	0.566	0.061
2019	0.213	0.053	0.456	0.038	0.307	0.552	0.059
2020	0.214	0.050	0.437	0.036	0.292	0.535	0.056

Sources: BTRE estimates.

TABLE 3.89 BASE CASE PROJECTIONS OF METROPOLITAN LEAD EMISSIONS BY RIGID TRUCKS TO 2020

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	13.097	10.430	4.273	2.547	3.754	0.788	0.416	0.523	35.827
1991	12.949	10.312	4.225	2.518	3.712	0.779	0.411	0.517	35.421
1992	12.170	9.660	4.009	2.352	3.507	0.729	0.386	0.486	33.299
1993	9.945	7.870	3.309	1.910	2.882	0.592	0.315	0.398	27.222
1994	7.727	6.098	2.599	1.475	2.253	0.458	0.245	0.310	21.165
1995	4.895	3.853	1.668	0.928	1.437	0.288	0.156	0.198	13.422
1996	4.460	3.501	1.542	0.840	1.320	0.264	0.144	0.183	12.254
1997	4.008	3.139	1.389	0.747	1.190	0.236	0.129	0.168	11.006
1998	3.265	2.564	1.138	0.606	0.974	0.191	0.105	0.140	8.982
1999	2.077	1.632	0.728	0.381	0.621	0.121	0.067	0.090	5.718
2000	1.486	1.167	0.520	0.271	0.446	0.086	0.048	0.065	4.089
2001	0.570	0.448	0.200	0.103	0.171	0.033	0.019	0.025	1.569
2002	0.043	0.034	0.015	0.008	0.013	0.002	0.001	0.002	0.119
2003	0.035	0.028	0.013	0.006	0.011	0.002	0.001	0.002	0.097
2004	0.024	0.019	0.008	0.004	0.007	0.001	0.001	0.001	0.066
2005	0.020	0.016	0.007	0.004	0.006	0.001	0.001	0.001	0.055
2006	0.013	0.010	0.005	0.002	0.004	0.001	0.000	0.001	0.037
2007	0.009	0.007	0.003	0.002	0.003	0.000	0.000	0.000	0.024
2008	0.006	0.005	0.002	0.001	0.002	0.000	0.000	0.000	0.018
2009	0.005	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.014
2010	0.005	0.004	0.002	0.001	0.001	0.000	0.000	0.000	0.013
2011	0.004	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.012
2012	0.005	0.004	0.002	0.001	0.001	0.000	0.000	0.000	0.013
2013	0.005	0.004	0.002	0.001	0.001	0.000	0.000	0.000	0.013
2014	0.005	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.013
2015	0.005	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.014
2016	0.005	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.014
2017	0.005	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.015
2018	0.006	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.015
2019	0.006	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.016
2020	0.006	0.005	0.002	0.001	0.002	0.000	0.000	0.000	0.016

Sources: BTRE estimates.

TABLE 3.90 BASE CASE PROJECTIONS OF METROPOLITAN SO<sub>X</sub> EMISSIONS BY RIGID TRUCKS TO 2020

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	1348.5	1073.8	440.0	262.2	386.5	81.2	42.8	53.8	3688.7
1991	1202.9	957.9	392.5	233.9	344.8	72.4	38.2	48.0	3290.6
1992	1121.2	890.0	369.3	216.7	323.1	67.1	35.6	44.8	3067.8
1993	1055.9	835.6	351.3	202.8	306.0	62.9	33.5	42.3	2890.2
1994	1016.3	802.0	341.8	193.9	296.3	60.2	32.3	40.8	2783.6
1995	999.0	786.3	340.3	189.4	293.3	58.8	31.8	40.3	2739.2
1996	945.5	742.2	326.9	178.1	279.7	55.9	30.6	38.8	2597.8
1997	891.1	697.9	308.8	166.0	264.7	52.4	28.7	37.4	2447.1
1998	824.5	647.5	287.4	153.0	245.9	48.2	26.6	35.3	2268.3
1999	719.0	564.9	251.8	132.0	215.1	41.8	23.2	31.2	1979.0
2000	592.2	465.1	207.3	107.8	177.6	34.2	19.2	26.0	1629.4
2001	541.5	425.4	190.1	97.9	162.8	31.1	17.6	24.1	1490.4
2002	502.6	395.0	177.1	90.3	151.4	28.7	16.4	22.6	1384.1
2003	317.8	249.7	112.4	56.8	95.9	18.0	10.4	14.4	875.6
2004	195.8	153.8	69.5	34.8	59.2	11.0	6.4	9.0	539.5
2005	132.1	103.6	47.1	23.4	40.0	7.4	4.3	6.1	364.1
2006	34.8	27.3	12.5	6.1	10.6	1.9	1.1	1.6	96.0
2007	35.5	27.8	12.8	6.2	10.8	1.9	1.1	1.6	97.7
2008	35.9	28.1	13.0	6.3	11.0	1.9	1.1	1.6	98.8
2009	36.4	28.4	13.2	6.3	11.1	1.9	1.1	1.7	100.2
2010	37.2	29.0	13.5	6.4	11.4	1.9	1.1	1.7	102.2
2011	37.7	29.4	13.8	6.5	11.6	1.9	1.2	1.7	103.7
2012	38.3	29.8	14.1	6.5	11.8	1.9	1.2	1.7	105.2
2013	38.8	30.2	14.3	6.6	12.0	1.9	1.2	1.7	106.7
2014	39.4	30.6	14.6	6.6	12.2	1.9	1.2	1.8	108.2
2015	40.0	31.0	14.9	6.7	12.4	1.9	1.2	1.8	109.7
2016	40.5	31.3	15.2	6.7	12.6	1.8	1.2	1.8	111.2
2017	41.3	31.9	15.6	6.8	12.9	1.8	1.2	1.8	113.3
2018	41.8	32.2	15.9	6.9	13.1	1.8	1.2	1.8	114.8
2019	42.4	32.6	16.2	6.9	13.3	1.8	1.2	1.9	116.2
2020	42.9	32.9	16.5	6.9	13.6	1.8	1.2	1.9	117.7

Sources: BTRE estimates.

TABLE 3.91 BASE CASE PROJECTIONS OF METROPOLITAN CO EMISSIONS BY RIGID TRUCKS TO 2020

Year	(thousand tonnes)								
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	22.47	17.89	7.33	4.37	6.44	1.35	0.71	0.90	61.46
1991	21.77	17.34	7.10	4.23	6.24	1.31	0.69	0.87	59.56
1992	20.98	16.65	6.91	4.06	6.05	1.26	0.67	0.84	57.41
1993	20.28	16.05	6.75	3.89	5.88	1.21	0.64	0.81	55.50
1994	19.56	15.44	6.58	3.73	5.70	1.16	0.62	0.79	53.58
1995	19.49	15.34	6.64	3.70	5.72	1.15	0.62	0.79	53.43
1996	18.67	14.66	6.45	3.52	5.52	1.10	0.60	0.77	51.30
1997	17.84	13.97	6.18	3.32	5.30	1.05	0.58	0.75	48.98
1998	16.23	12.75	5.66	3.01	4.84	0.95	0.52	0.69	44.66
1999	15.15	11.90	5.31	2.78	4.53	0.88	0.49	0.66	41.70
2000	13.74	10.79	4.81	2.50	4.12	0.79	0.45	0.60	37.80
2001	13.14	10.32	4.61	2.37	3.95	0.75	0.43	0.58	36.16
2002	12.81	10.07	4.51	2.30	3.86	0.73	0.42	0.58	35.29
2003	12.14	9.54	4.30	2.17	3.66	0.69	0.40	0.55	33.45
2004	11.59	9.11	4.12	2.06	3.51	0.65	0.38	0.53	31.95
2005	11.03	8.65	3.93	1.95	3.34	0.62	0.36	0.51	30.40
2006	10.42	8.17	3.73	1.84	3.17	0.57	0.34	0.48	28.72
2007	10.09	7.90	3.63	1.77	3.07	0.55	0.32	0.46	27.79
2008	9.69	7.58	3.50	1.69	2.96	0.52	0.31	0.44	26.68
2009	9.42	7.36	3.42	1.63	2.88	0.49	0.29	0.43	25.92
2010	9.28	7.24	3.38	1.60	2.85	0.48	0.29	0.42	25.53
2011	9.11	7.10	3.33	1.56	2.80	0.46	0.28	0.41	25.05
2012	8.99	7.00	3.31	1.53	2.77	0.44	0.27	0.40	24.71
2013	8.89	6.91	3.28	1.50	2.75	0.43	0.27	0.40	24.42
2014	8.81	6.84	3.27	1.48	2.73	0.42	0.26	0.39	24.20
2015	8.75	6.78	3.27	1.46	2.72	0.41	0.25	0.39	24.03
2016	8.69	6.72	3.26	1.44	2.71	0.40	0.25	0.38	23.85
2017	8.69	6.70	3.28	1.43	2.72	0.39	0.25	0.38	23.84
2018	8.67	6.68	3.29	1.42	2.72	0.38	0.24	0.38	23.79
2019	8.70	6.68	3.32	1.41	2.74	0.37	0.24	0.38	23.84
2020	8.74	6.70	3.35	1.41	2.76	0.37	0.24	0.38	23.94

Sources: BTRE estimates.

TABLE 3.92 BASE CASE PROJECTIONS OF METROPOLITAN NO<sub>x</sub> EMISSIONS BY RIGID TRUCKS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	14.04	11.18	4.58	2.73	4.03	0.85	0.45	0.56	38.42	
1991	13.08	10.42	4.27	2.54	3.75	0.79	0.42	0.52	35.79	
1992	12.65	10.04	4.17	2.45	3.64	0.76	0.40	0.51	34.61	
1993	12.38	9.80	4.12	2.38	3.59	0.74	0.39	0.50	33.88	
1994	12.39	9.78	4.17	2.36	3.61	0.73	0.39	0.50	33.93	
1995	12.68	9.98	4.32	2.40	3.72	0.75	0.40	0.51	34.78	
1996	12.54	9.84	4.33	2.36	3.71	0.74	0.41	0.51	34.44	
1997	12.41	9.72	4.30	2.31	3.69	0.73	0.40	0.52	34.07	
1998	12.00	9.42	4.18	2.23	3.58	0.70	0.39	0.51	33.02	
1999	11.87	9.33	4.16	2.18	3.55	0.69	0.38	0.52	32.68	
2000	11.37	8.93	3.98	2.07	3.41	0.66	0.37	0.50	31.29	
2001	11.21	8.81	3.94	2.03	3.37	0.64	0.37	0.50	30.86	
2002	11.41	8.97	4.02	2.05	3.44	0.65	0.37	0.51	31.42	
2003	11.19	8.79	3.96	2.00	3.38	0.64	0.37	0.51	30.83	
2004	11.13	8.74	3.95	1.98	3.37	0.63	0.36	0.51	30.67	
2005	10.96	8.60	3.91	1.94	3.32	0.61	0.36	0.51	30.21	
2006	10.89	8.54	3.90	1.92	3.31	0.60	0.35	0.50	30.01	
2007	10.86	8.51	3.91	1.90	3.31	0.59	0.35	0.50	29.92	
2008	10.74	8.40	3.88	1.87	3.28	0.57	0.34	0.49	29.57	
2009	10.58	8.27	3.84	1.83	3.24	0.55	0.33	0.48	29.13	
2010	10.49	8.19	3.82	1.81	3.22	0.54	0.32	0.47	28.88	
2011	10.34	8.06	3.78	1.77	3.18	0.52	0.32	0.47	28.44	
2012	10.19	7.94	3.75	1.73	3.14	0.50	0.31	0.46	28.03	
2013	10.06	7.82	3.72	1.70	3.11	0.49	0.30	0.45	27.65	
2014	9.93	7.71	3.69	1.67	3.08	0.47	0.29	0.44	27.27	
2015	9.80	7.60	3.66	1.64	3.05	0.46	0.29	0.44	26.93	
2016	9.66	7.47	3.62	1.60	3.01	0.44	0.28	0.43	26.52	
2017	9.58	7.39	3.61	1.58	3.00	0.43	0.27	0.42	26.28	
2018	9.47	7.29	3.59	1.55	2.97	0.41	0.27	0.42	25.96	
2019	9.38	7.21	3.58	1.53	2.95	0.40	0.26	0.41	25.72	
2020	9.31	7.14	3.57	1.50	2.94	0.39	0.25	0.40	25.51	

Sources: BTRE estimates.

TABLE 3.93 BASE CASE PROJECTIONS OF METROPOLITAN VOC (EXHAUST) EMISSIONS BY RIGID TRUCKS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	4.949	3.941	1.615	0.962	1.419	0.298	0.157	0.197	13.538	
1991	4.654	3.706	1.519	0.905	1.334	0.280	0.148	0.186	12.732	
1992	4.501	3.572	1.482	0.870	1.297	0.269	0.143	0.180	12.314	
1993	4.391	3.475	1.461	0.843	1.272	0.261	0.139	0.176	12.019	
1994	4.363	3.443	1.467	0.833	1.272	0.258	0.138	0.175	11.949	
1995	4.427	3.484	1.508	0.839	1.299	0.261	0.141	0.179	12.138	
1996	4.313	3.385	1.491	0.812	1.276	0.255	0.140	0.177	11.848	
1997	4.172	3.268	1.446	0.777	1.239	0.246	0.135	0.175	11.458	
1998	3.917	3.076	1.365	0.727	1.168	0.229	0.126	0.168	10.776	
1999	3.761	2.954	1.317	0.690	1.125	0.219	0.122	0.163	10.351	
2000	3.480	2.733	1.218	0.634	1.043	0.201	0.113	0.153	9.575	
2001	3.323	2.610	1.166	0.600	0.999	0.191	0.108	0.148	9.145	
2002	3.265	2.567	1.151	0.587	0.984	0.186	0.107	0.147	8.993	
2003	3.083	2.423	1.091	0.551	0.931	0.175	0.101	0.140	8.495	
2004	2.946	2.314	1.047	0.524	0.891	0.166	0.096	0.135	8.120	
2005	2.802	2.199	1.000	0.496	0.850	0.157	0.092	0.129	7.725	
2006	2.685	2.105	0.962	0.473	0.816	0.148	0.087	0.123	7.400	
2007	2.601	2.037	0.935	0.456	0.792	0.141	0.083	0.119	7.164	
2008	2.512	1.966	0.907	0.438	0.767	0.134	0.080	0.115	6.917	
2009	2.432	1.901	0.882	0.421	0.744	0.127	0.076	0.111	6.695	
2010	2.373	1.852	0.865	0.409	0.728	0.122	0.073	0.107	6.528	
2011	2.303	1.796	0.843	0.394	0.708	0.116	0.070	0.104	6.334	
2012	2.244	1.748	0.825	0.382	0.692	0.111	0.068	0.101	6.171	
2013	2.195	1.706	0.811	0.371	0.679	0.106	0.065	0.098	6.032	
2014	2.154	1.672	0.800	0.362	0.668	0.102	0.063	0.096	5.917	
2015	2.120	1.643	0.791	0.354	0.659	0.099	0.062	0.094	5.822	
2016	2.074	1.604	0.778	0.344	0.647	0.095	0.060	0.092	5.692	
2017	2.024	1.562	0.763	0.334	0.633	0.090	0.057	0.089	5.553	
2018	1.996	1.537	0.757	0.327	0.626	0.087	0.056	0.088	5.474	
2019	1.973	1.516	0.753	0.321	0.621	0.085	0.055	0.086	5.409	
2020	1.953	1.498	0.750	0.316	0.617	0.082	0.053	0.085	5.354	

Sources: BTRE estimates.

TABLE 3.94 BASE CASE PROJECTIONS OF METROPOLITAN VOC (EVAPORATIVE) EMISSIONS BY RIGID TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.752	0.576	0.241	0.137	0.214	0.046	0.024	0.029	2.019
1991	0.747	0.571	0.239	0.136	0.212	0.046	0.024	0.029	2.004
1992	0.710	0.541	0.229	0.128	0.203	0.043	0.023	0.027	1.905
1993	0.672	0.511	0.219	0.121	0.193	0.041	0.022	0.026	1.805
1994	0.623	0.472	0.206	0.111	0.180	0.038	0.020	0.024	1.673
1995	0.604	0.457	0.202	0.107	0.176	0.036	0.019	0.023	1.625
1996	0.563	0.425	0.191	0.099	0.165	0.034	0.018	0.022	1.518
1997	0.520	0.392	0.177	0.090	0.153	0.031	0.017	0.021	1.402
1998	0.447	0.338	0.153	0.077	0.132	0.027	0.015	0.018	1.207
1999	0.393	0.297	0.135	0.067	0.116	0.023	0.013	0.016	1.061
2000	0.334	0.252	0.115	0.057	0.099	0.020	0.011	0.014	0.902
2001	0.314	0.237	0.108	0.053	0.094	0.018	0.010	0.013	0.849
2002	0.292	0.220	0.101	0.049	0.087	0.017	0.010	0.013	0.788
2003	0.271	0.205	0.094	0.045	0.081	0.016	0.009	0.012	0.734
2004	0.256	0.193	0.089	0.043	0.077	0.015	0.008	0.011	0.693
2005	0.241	0.182	0.084	0.040	0.072	0.014	0.008	0.011	0.652
2006	0.217	0.164	0.076	0.036	0.065	0.012	0.007	0.010	0.588
2007	0.209	0.157	0.074	0.034	0.063	0.012	0.007	0.009	0.564
2008	0.200	0.150	0.071	0.032	0.060	0.011	0.006	0.009	0.540
2009	0.196	0.147	0.070	0.032	0.059	0.010	0.006	0.009	0.529
2010	0.197	0.148	0.070	0.032	0.060	0.010	0.006	0.009	0.532
2011	0.198	0.148	0.071	0.032	0.060	0.010	0.006	0.009	0.533
2012	0.201	0.150	0.073	0.032	0.061	0.010	0.006	0.009	0.542
2013	0.204	0.153	0.074	0.032	0.063	0.010	0.006	0.009	0.551
2014	0.208	0.155	0.076	0.033	0.064	0.010	0.006	0.009	0.561
2015	0.212	0.158	0.078	0.033	0.065	0.010	0.006	0.009	0.570
2016	0.215	0.160	0.079	0.033	0.067	0.010	0.006	0.009	0.580
2017	0.219	0.163	0.081	0.034	0.068	0.010	0.006	0.009	0.590
2018	0.223	0.165	0.083	0.034	0.069	0.010	0.006	0.009	0.601
2019	0.228	0.168	0.085	0.035	0.071	0.010	0.006	0.010	0.613
2020	0.232	0.171	0.088	0.035	0.073	0.010	0.006	0.010	0.625

Sources: BTRE estimates.

TABLE 3.95 BASE CASE PROJECTIONS OF METROPOLITAN VOC (TOTAL) EMISSIONS  
BY RIGID TRUCKS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	5.70	4.52	1.86	1.10	1.63	0.34	0.18	0.23	15.56	
1991	5.40	4.28	1.76	1.04	1.55	0.33	0.17	0.21	14.74	
1992	5.21	4.11	1.71	1.00	1.50	0.31	0.17	0.21	14.22	
1993	5.06	3.99	1.68	0.96	1.47	0.30	0.16	0.20	13.82	
1994	4.99	3.91	1.67	0.94	1.45	0.30	0.16	0.20	13.62	
1995	5.03	3.94	1.71	0.95	1.48	0.30	0.16	0.20	13.76	
1996	4.88	3.81	1.68	0.91	1.44	0.29	0.16	0.20	13.37	
1997	4.69	3.66	1.62	0.87	1.39	0.28	0.15	0.20	12.86	
1998	4.36	3.41	1.52	0.80	1.30	0.26	0.14	0.19	11.98	
1999	4.15	3.25	1.45	0.76	1.24	0.24	0.13	0.18	11.41	
2000	3.81	2.99	1.33	0.69	1.14	0.22	0.12	0.17	10.48	
2001	3.64	2.85	1.27	0.65	1.09	0.21	0.12	0.16	9.99	
2002	3.56	2.79	1.25	0.64	1.07	0.20	0.12	0.16	9.78	
2003	3.35	2.63	1.19	0.60	1.01	0.19	0.11	0.15	9.23	
2004	3.20	2.51	1.14	0.57	0.97	0.18	0.10	0.15	8.81	
2005	3.04	2.38	1.08	0.54	0.92	0.17	0.10	0.14	8.38	
2006	2.90	2.27	1.04	0.51	0.88	0.16	0.09	0.13	7.99	
2007	2.81	2.19	1.01	0.49	0.86	0.15	0.09	0.13	7.73	
2008	2.71	2.12	0.98	0.47	0.83	0.14	0.09	0.12	7.46	
2009	2.63	2.05	0.95	0.45	0.80	0.14	0.08	0.12	7.22	
2010	2.57	2.00	0.94	0.44	0.79	0.13	0.08	0.12	7.06	
2011	2.50	1.94	0.91	0.43	0.77	0.13	0.08	0.11	6.87	
2012	2.45	1.90	0.90	0.41	0.75	0.12	0.07	0.11	6.71	
2013	2.40	1.86	0.89	0.40	0.74	0.12	0.07	0.11	6.58	
2014	2.36	1.83	0.88	0.39	0.73	0.11	0.07	0.10	6.48	
2015	2.33	1.80	0.87	0.39	0.72	0.11	0.07	0.10	6.39	
2016	2.29	1.76	0.86	0.38	0.71	0.10	0.07	0.10	6.27	
2017	2.24	1.72	0.84	0.37	0.70	0.10	0.06	0.10	6.14	
2018	2.22	1.70	0.84	0.36	0.70	0.10	0.06	0.10	6.07	
2019	2.20	1.68	0.84	0.36	0.69	0.09	0.06	0.10	6.02	
2020	2.19	1.67	0.84	0.35	0.69	0.09	0.06	0.09	5.98	

Sources: BTRE estimates.

TABLE 3.96 BASE CASE PROJECTIONS OF METROPOLITAN PM (TOTAL) EMISSIONS BY RIGID TRUCKS TO 2020

(*thousand tonnes*)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	1.260	1.004	0.411	0.245	0.361	0.076	0.040	0.050	3.448
1991	1.164	0.927	0.380	0.226	0.334	0.070	0.037	0.046	3.184
1992	1.129	0.896	0.372	0.218	0.325	0.068	0.036	0.045	3.090
1993	1.110	0.879	0.369	0.213	0.322	0.066	0.035	0.044	3.039
1994	1.121	0.884	0.377	0.214	0.327	0.066	0.036	0.045	3.070
1995	1.156	0.910	0.394	0.219	0.339	0.068	0.037	0.047	3.171
1996	1.152	0.904	0.398	0.217	0.341	0.068	0.037	0.047	3.164
1997	1.144	0.896	0.396	0.213	0.340	0.067	0.037	0.048	3.141
1998	1.113	0.874	0.388	0.207	0.332	0.065	0.036	0.048	3.063
1999	1.107	0.869	0.388	0.203	0.331	0.064	0.036	0.048	3.046
2000	1.060	0.833	0.371	0.193	0.318	0.061	0.034	0.047	2.917
2001	1.037	0.815	0.364	0.187	0.312	0.059	0.034	0.046	2.854
2002	1.044	0.821	0.368	0.188	0.315	0.060	0.034	0.047	2.876
2003	0.986	0.775	0.349	0.176	0.298	0.056	0.032	0.045	2.717
2004	0.945	0.742	0.336	0.168	0.286	0.053	0.031	0.043	2.604
2005	0.895	0.702	0.319	0.158	0.271	0.050	0.029	0.041	2.467
2006	0.844	0.662	0.302	0.149	0.256	0.046	0.027	0.039	2.325
2007	0.822	0.644	0.296	0.144	0.251	0.045	0.026	0.038	2.266
2008	0.806	0.631	0.291	0.140	0.246	0.043	0.026	0.037	2.220
2009	0.789	0.617	0.286	0.137	0.241	0.041	0.025	0.036	2.172
2010	0.776	0.606	0.283	0.134	0.238	0.040	0.024	0.035	2.136
2011	0.759	0.592	0.278	0.130	0.234	0.038	0.023	0.034	2.088
2012	0.743	0.579	0.273	0.126	0.229	0.037	0.022	0.033	2.044
2013	0.730	0.567	0.270	0.123	0.226	0.035	0.022	0.033	2.006
2014	0.718	0.557	0.266	0.121	0.223	0.034	0.021	0.032	1.972
2015	0.707	0.548	0.264	0.118	0.220	0.033	0.021	0.031	1.940
2016	0.697	0.539	0.261	0.116	0.217	0.032	0.020	0.031	1.912
2017	0.689	0.532	0.260	0.114	0.216	0.031	0.020	0.030	1.891
2018	0.680	0.524	0.258	0.111	0.213	0.030	0.019	0.030	1.866
2019	0.673	0.517	0.257	0.109	0.212	0.029	0.019	0.029	1.845
2020	0.663	0.508	0.254	0.107	0.209	0.028	0.018	0.029	1.817

Sources: BTRE estimates.

TABLE 3.97 BASE CASE PROJECTIONS OF METROPOLITAN PM10 EMISSIONS BY RIGID TRUCKS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	1.245	0.991	0.406	0.242	0.357	0.075	0.039	0.050	3.405	
1991	1.149	0.915	0.375	0.223	0.329	0.069	0.036	0.046	3.144	
1992	1.115	0.885	0.367	0.216	0.321	0.067	0.035	0.045	3.051	
1993	1.096	0.868	0.365	0.211	0.318	0.065	0.035	0.044	3.001	
1994	1.107	0.874	0.372	0.211	0.323	0.066	0.035	0.044	3.032	
1995	1.143	0.899	0.389	0.217	0.335	0.067	0.036	0.046	3.133	
1996	1.138	0.893	0.393	0.214	0.337	0.067	0.037	0.047	3.127	
1997	1.130	0.885	0.392	0.211	0.336	0.067	0.036	0.047	3.105	
1998	1.101	0.864	0.384	0.204	0.328	0.064	0.035	0.047	3.028	
1999	1.094	0.860	0.383	0.201	0.327	0.064	0.035	0.047	3.012	
2000	1.048	0.823	0.367	0.191	0.314	0.061	0.034	0.046	2.885	
2001	1.025	0.806	0.360	0.185	0.308	0.059	0.033	0.046	2.823	
2002	1.033	0.812	0.364	0.186	0.311	0.059	0.034	0.046	2.845	
2003	0.976	0.767	0.345	0.174	0.294	0.055	0.032	0.044	2.688	
2004	0.935	0.734	0.332	0.166	0.283	0.053	0.031	0.043	2.577	
2005	0.886	0.695	0.316	0.157	0.269	0.050	0.029	0.041	2.442	
2006	0.835	0.655	0.299	0.147	0.254	0.046	0.027	0.038	2.301	
2007	0.814	0.638	0.293	0.143	0.248	0.044	0.026	0.037	2.243	
2008	0.798	0.624	0.288	0.139	0.244	0.042	0.025	0.036	2.197	
2009	0.781	0.610	0.283	0.135	0.239	0.041	0.024	0.035	2.150	
2010	0.769	0.600	0.280	0.132	0.236	0.039	0.024	0.035	2.115	
2011	0.751	0.586	0.275	0.129	0.231	0.038	0.023	0.034	2.067	
2012	0.736	0.573	0.271	0.125	0.227	0.036	0.022	0.033	2.023	
2013	0.722	0.562	0.267	0.122	0.223	0.035	0.022	0.032	1.985	
2014	0.710	0.551	0.264	0.119	0.220	0.034	0.021	0.032	1.952	
2015	0.699	0.542	0.261	0.117	0.217	0.033	0.020	0.031	1.921	
2016	0.690	0.533	0.259	0.114	0.215	0.031	0.020	0.030	1.893	
2017	0.682	0.527	0.257	0.112	0.213	0.030	0.019	0.030	1.872	
2018	0.673	0.519	0.255	0.110	0.211	0.029	0.019	0.030	1.847	
2019	0.666	0.512	0.254	0.108	0.210	0.029	0.018	0.029	1.826	
2020	0.656	0.503	0.252	0.106	0.207	0.028	0.018	0.029	1.798	

Sources: BTRE estimates.

TABLE 3.98 BASE CASE PROJECTIONS OF METROPOLITAN PM2.5 EMISSIONS BY RIGID TRUCKS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	1.192	0.949	0.389	0.232	0.342	0.072	0.038	0.048	3.259	
1991	1.100	0.876	0.359	0.214	0.315	0.066	0.035	0.044	3.009	
1992	1.067	0.847	0.352	0.206	0.308	0.064	0.034	0.043	2.921	
1993	1.050	0.831	0.349	0.202	0.304	0.062	0.033	0.042	2.873	
1994	1.060	0.837	0.357	0.202	0.309	0.063	0.034	0.043	2.904	
1995	1.094	0.861	0.373	0.207	0.321	0.064	0.035	0.044	3.000	
1996	1.090	0.856	0.377	0.205	0.323	0.064	0.035	0.045	2.995	
1997	1.083	0.848	0.375	0.202	0.322	0.064	0.035	0.045	2.975	
1998	1.055	0.828	0.368	0.196	0.315	0.062	0.034	0.045	2.902	
1999	1.049	0.824	0.367	0.193	0.314	0.061	0.034	0.046	2.887	
2000	1.005	0.789	0.352	0.183	0.301	0.058	0.033	0.044	2.766	
2001	0.983	0.772	0.345	0.178	0.296	0.056	0.032	0.044	2.706	
2002	0.991	0.779	0.349	0.178	0.298	0.057	0.032	0.045	2.729	
2003	0.936	0.735	0.331	0.167	0.282	0.053	0.031	0.042	2.578	
2004	0.897	0.704	0.319	0.160	0.271	0.051	0.029	0.041	2.472	
2005	0.850	0.667	0.303	0.150	0.258	0.048	0.028	0.039	2.342	
2006	0.801	0.628	0.287	0.141	0.243	0.044	0.026	0.037	2.208	
2007	0.781	0.612	0.281	0.137	0.238	0.042	0.025	0.036	2.152	
2008	0.766	0.599	0.276	0.133	0.234	0.041	0.024	0.035	2.108	
2009	0.749	0.586	0.272	0.130	0.229	0.039	0.023	0.034	2.063	
2010	0.737	0.576	0.269	0.127	0.226	0.038	0.023	0.033	2.029	
2011	0.721	0.562	0.264	0.123	0.222	0.036	0.022	0.033	1.983	
2012	0.706	0.550	0.260	0.120	0.218	0.035	0.021	0.032	1.941	
2013	0.693	0.539	0.256	0.117	0.214	0.034	0.021	0.031	1.905	
2014	0.682	0.529	0.253	0.115	0.211	0.032	0.020	0.030	1.873	
2015	0.671	0.520	0.250	0.112	0.209	0.031	0.020	0.030	1.843	
2016	0.662	0.512	0.248	0.110	0.206	0.030	0.019	0.029	1.817	
2017	0.655	0.505	0.247	0.108	0.205	0.029	0.019	0.029	1.796	
2018	0.646	0.498	0.245	0.106	0.203	0.028	0.018	0.028	1.772	
2019	0.639	0.491	0.244	0.104	0.201	0.027	0.018	0.028	1.752	
2020	0.630	0.483	0.242	0.102	0.199	0.026	0.017	0.027	1.726	

Sources: BTRE estimates.

TABLE 3.99 BASE CASE PROJECTIONS OF METROPOLITAN PM1.0 EMISSIONS BY RIGID TRUCKS TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	1.167	0.929	0.381	0.227	0.334	0.070	0.037	0.047	3.191	
1991	1.077	0.858	0.351	0.209	0.309	0.065	0.034	0.043	2.946	
1992	1.045	0.830	0.344	0.202	0.301	0.063	0.033	0.042	2.860	
1993	1.028	0.813	0.342	0.197	0.298	0.061	0.033	0.041	2.813	
1994	1.038	0.819	0.349	0.198	0.303	0.061	0.033	0.042	2.843	
1995	1.071	0.843	0.365	0.203	0.314	0.063	0.034	0.043	2.938	
1996	1.067	0.838	0.369	0.201	0.316	0.063	0.035	0.044	2.932	
1997	1.060	0.831	0.368	0.198	0.315	0.062	0.034	0.044	2.912	
1998	1.033	0.811	0.360	0.192	0.308	0.060	0.033	0.044	2.841	
1999	1.027	0.807	0.360	0.189	0.307	0.060	0.033	0.045	2.826	
2000	0.984	0.773	0.345	0.179	0.295	0.057	0.032	0.043	2.707	
2001	0.963	0.756	0.338	0.174	0.289	0.055	0.031	0.043	2.649	
2002	0.970	0.762	0.342	0.174	0.292	0.055	0.032	0.044	2.671	
2003	0.916	0.720	0.324	0.164	0.276	0.052	0.030	0.042	2.524	
2004	0.878	0.689	0.312	0.156	0.266	0.050	0.029	0.040	2.419	
2005	0.832	0.653	0.297	0.147	0.252	0.047	0.027	0.038	2.293	
2006	0.784	0.615	0.281	0.138	0.238	0.043	0.025	0.036	2.161	
2007	0.765	0.599	0.275	0.134	0.233	0.041	0.024	0.035	2.106	
2008	0.749	0.586	0.271	0.131	0.229	0.040	0.024	0.034	2.063	
2009	0.733	0.573	0.266	0.127	0.224	0.038	0.023	0.033	2.019	
2010	0.722	0.564	0.263	0.124	0.221	0.037	0.022	0.033	1.986	
2011	0.706	0.550	0.258	0.121	0.217	0.036	0.022	0.032	1.941	
2012	0.691	0.538	0.254	0.118	0.213	0.034	0.021	0.031	1.900	
2013	0.678	0.527	0.251	0.115	0.210	0.033	0.020	0.030	1.865	
2014	0.667	0.518	0.248	0.112	0.207	0.032	0.020	0.030	1.833	
2015	0.657	0.509	0.245	0.110	0.204	0.031	0.019	0.029	1.804	
2016	0.648	0.501	0.243	0.108	0.202	0.030	0.019	0.029	1.778	
2017	0.641	0.495	0.242	0.106	0.200	0.029	0.018	0.028	1.758	
2018	0.632	0.487	0.240	0.104	0.198	0.028	0.018	0.028	1.734	
2019	0.625	0.481	0.239	0.102	0.197	0.027	0.017	0.027	1.715	
2020	0.616	0.473	0.236	0.100	0.195	0.026	0.017	0.027	1.689	

Sources: BTRE estimates.

TABLE 3.100 BASE CASE PROJECTIONS OF METROPOLITAN ACETALDEHYDE EMISSIONS BY RIGID TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.616	0.490	0.201	0.120	0.177	0.037	0.020	0.025	1.685
1991	0.570	0.454	0.186	0.111	0.163	0.034	0.018	0.023	1.560
1992	0.555	0.441	0.183	0.107	0.160	0.033	0.018	0.022	1.519
1993	0.547	0.433	0.182	0.105	0.159	0.033	0.017	0.022	1.499
1994	0.556	0.439	0.187	0.106	0.162	0.033	0.018	0.022	1.522
1995	0.572	0.450	0.195	0.109	0.168	0.034	0.018	0.023	1.569
1996	0.566	0.444	0.196	0.107	0.167	0.033	0.018	0.023	1.556
1997	0.557	0.436	0.193	0.104	0.165	0.033	0.018	0.023	1.529
1998	0.536	0.421	0.187	0.099	0.160	0.031	0.017	0.023	1.474
1999	0.526	0.413	0.184	0.096	0.157	0.031	0.017	0.023	1.447
2000	0.496	0.389	0.174	0.090	0.149	0.029	0.016	0.022	1.363
2001	0.477	0.375	0.168	0.086	0.144	0.027	0.016	0.021	1.314
2002	0.476	0.374	0.168	0.086	0.143	0.027	0.016	0.021	1.310
2003	0.453	0.356	0.160	0.081	0.137	0.026	0.015	0.021	1.248
2004	0.436	0.343	0.155	0.078	0.132	0.025	0.014	0.020	1.203
2005	0.418	0.328	0.149	0.074	0.127	0.023	0.014	0.019	1.151
2006	0.405	0.317	0.145	0.071	0.123	0.022	0.013	0.019	1.115
2007	0.394	0.308	0.142	0.069	0.120	0.021	0.013	0.018	1.085
2008	0.382	0.299	0.138	0.067	0.117	0.020	0.012	0.017	1.052
2009	0.371	0.290	0.135	0.064	0.113	0.019	0.012	0.017	1.021
2010	0.362	0.283	0.132	0.062	0.111	0.019	0.011	0.016	0.996
2011	0.352	0.274	0.129	0.060	0.108	0.018	0.011	0.016	0.967
2012	0.343	0.267	0.126	0.058	0.106	0.017	0.010	0.015	0.942
2013	0.335	0.260	0.124	0.057	0.104	0.016	0.010	0.015	0.920
2014	0.328	0.255	0.122	0.055	0.102	0.016	0.010	0.015	0.902
2015	0.323	0.250	0.121	0.054	0.100	0.015	0.009	0.014	0.887
2016	0.316	0.244	0.118	0.052	0.098	0.014	0.009	0.014	0.866
2017	0.308	0.238	0.116	0.051	0.096	0.014	0.009	0.014	0.845
2018	0.303	0.234	0.115	0.050	0.095	0.013	0.008	0.013	0.832
2019	0.299	0.230	0.114	0.049	0.094	0.013	0.008	0.013	0.821
2020	0.296	0.227	0.114	0.048	0.094	0.012	0.008	0.013	0.811

Sources: BTRE estimates.

TABLE 3.101 BASE CASE PROJECTIONS OF METROPOLITAN FORMALDEHYDE EMISSIONS BY RIGID TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.551	0.439	0.180	0.107	0.158	0.033	0.017	0.022	1.507
1991	0.511	0.407	0.167	0.099	0.146	0.031	0.016	0.020	1.397
1992	0.497	0.394	0.164	0.096	0.143	0.030	0.016	0.020	1.360
1993	0.489	0.387	0.163	0.094	0.142	0.029	0.016	0.020	1.340
1994	0.496	0.391	0.167	0.095	0.145	0.029	0.016	0.020	1.358
1995	0.510	0.401	0.174	0.097	0.150	0.030	0.016	0.021	1.398
1996	0.504	0.395	0.174	0.095	0.149	0.030	0.016	0.021	1.384
1997	0.494	0.387	0.171	0.092	0.147	0.029	0.016	0.021	1.358
1998	0.475	0.373	0.165	0.088	0.142	0.028	0.015	0.020	1.306
1999	0.465	0.365	0.163	0.085	0.139	0.027	0.015	0.020	1.279
2000	0.438	0.344	0.153	0.080	0.131	0.025	0.014	0.019	1.204
2001	0.421	0.331	0.148	0.076	0.127	0.024	0.014	0.019	1.159
2002	0.419	0.329	0.148	0.075	0.126	0.024	0.014	0.019	1.154
2003	0.399	0.313	0.141	0.071	0.120	0.023	0.013	0.018	1.099
2004	0.384	0.301	0.136	0.068	0.116	0.022	0.013	0.018	1.058
2005	0.367	0.288	0.131	0.065	0.111	0.021	0.012	0.017	1.012
2006	0.355	0.279	0.127	0.063	0.108	0.020	0.011	0.016	0.979
2007	0.346	0.271	0.124	0.061	0.105	0.019	0.011	0.016	0.952
2008	0.335	0.262	0.121	0.058	0.102	0.018	0.011	0.015	0.923
2009	0.325	0.254	0.118	0.056	0.100	0.017	0.010	0.015	0.895
2010	0.318	0.248	0.116	0.055	0.097	0.016	0.010	0.014	0.874
2011	0.308	0.240	0.113	0.053	0.095	0.016	0.009	0.014	0.848
2012	0.300	0.234	0.110	0.051	0.093	0.015	0.009	0.013	0.826
2013	0.294	0.228	0.108	0.050	0.091	0.014	0.009	0.013	0.807
2014	0.288	0.224	0.107	0.048	0.089	0.014	0.008	0.013	0.791
2015	0.283	0.220	0.106	0.047	0.088	0.013	0.008	0.013	0.778
2016	0.277	0.214	0.104	0.046	0.086	0.013	0.008	0.012	0.760
2017	0.270	0.208	0.102	0.045	0.085	0.012	0.008	0.012	0.741
2018	0.266	0.205	0.101	0.044	0.084	0.012	0.007	0.012	0.730
2019	0.263	0.202	0.100	0.043	0.083	0.011	0.007	0.011	0.720
2020	0.260	0.199	0.100	0.042	0.082	0.011	0.007	0.011	0.712

Sources: BTRE estimates.

TABLE 3.102 BASE CASE PROJECTIONS OF METROPOLITAN CARBONYL (TOTAL) EMISSIONS BY RIGID TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	1.875	1.493	0.612	0.364	0.537	0.113	0.059	0.075	5.128
1991	1.738	1.384	0.567	0.338	0.498	0.105	0.055	0.069	4.753
1992	1.691	1.342	0.557	0.327	0.487	0.101	0.054	0.068	4.626
1993	1.666	1.318	0.554	0.320	0.483	0.099	0.053	0.067	4.560
1994	1.688	1.332	0.568	0.322	0.492	0.100	0.054	0.068	4.624
1995	1.737	1.367	0.592	0.329	0.510	0.102	0.055	0.070	4.763
1996	1.717	1.348	0.593	0.323	0.508	0.102	0.056	0.070	4.717
1997	1.686	1.321	0.584	0.314	0.501	0.099	0.054	0.071	4.631
1998	1.620	1.272	0.565	0.301	0.483	0.095	0.052	0.069	4.457
1999	1.588	1.247	0.556	0.291	0.475	0.092	0.051	0.069	4.370
2000	1.495	1.174	0.524	0.272	0.448	0.086	0.048	0.066	4.115
2001	1.440	1.131	0.505	0.260	0.433	0.083	0.047	0.064	3.963
2002	1.433	1.126	0.505	0.258	0.432	0.082	0.047	0.064	3.947
2003	1.364	1.072	0.483	0.244	0.412	0.077	0.045	0.062	3.758
2004	1.313	1.031	0.466	0.234	0.397	0.074	0.043	0.060	3.619
2005	1.256	0.986	0.448	0.222	0.381	0.070	0.041	0.058	3.463
2006	1.216	0.953	0.435	0.214	0.370	0.067	0.039	0.056	3.351
2007	1.183	0.927	0.426	0.207	0.360	0.064	0.038	0.054	3.260
2008	1.148	0.898	0.415	0.200	0.350	0.061	0.036	0.052	3.161
2009	1.114	0.871	0.404	0.193	0.341	0.058	0.035	0.051	3.067
2010	1.088	0.849	0.396	0.187	0.334	0.056	0.034	0.049	2.993
2011	1.056	0.824	0.387	0.181	0.325	0.053	0.032	0.048	2.905
2012	1.029	0.801	0.378	0.175	0.317	0.051	0.031	0.046	2.829
2013	1.006	0.782	0.372	0.170	0.311	0.049	0.030	0.045	2.764
2014	0.986	0.765	0.366	0.166	0.306	0.047	0.029	0.044	2.709
2015	0.970	0.752	0.362	0.162	0.302	0.045	0.028	0.043	2.664
2016	0.948	0.733	0.356	0.157	0.296	0.043	0.027	0.042	2.603
2017	0.925	0.714	0.349	0.152	0.289	0.041	0.026	0.041	2.538
2018	0.911	0.702	0.346	0.149	0.286	0.040	0.026	0.040	2.499
2019	0.899	0.691	0.343	0.146	0.283	0.039	0.025	0.039	2.466
2020	0.889	0.682	0.341	0.144	0.281	0.037	0.024	0.039	2.437

Sources: BTRE estimates.

TABLE 3.103 BASE CASE PROJECTIONS OF METROPOLITAN BENZENE EMISSIONS BY RIGID TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.126	0.101	0.041	0.025	0.036	0.008	0.004	0.005	0.346
1991	0.120	0.095	0.039	0.023	0.034	0.007	0.004	0.005	0.328
1992	0.113	0.090	0.037	0.022	0.033	0.007	0.004	0.005	0.310
1993	0.107	0.085	0.036	0.021	0.031	0.006	0.003	0.004	0.294
1994	0.102	0.081	0.034	0.020	0.030	0.006	0.003	0.004	0.280
1995	0.100	0.079	0.034	0.019	0.029	0.006	0.003	0.004	0.275
1996	0.094	0.074	0.033	0.018	0.028	0.006	0.003	0.004	0.259
1997	0.088	0.069	0.031	0.016	0.026	0.005	0.003	0.004	0.243
1998	0.079	0.062	0.028	0.015	0.024	0.005	0.003	0.003	0.217
1999	0.072	0.057	0.025	0.013	0.022	0.004	0.002	0.003	0.199
2000	0.064	0.051	0.023	0.012	0.019	0.004	0.002	0.003	0.177
2001	0.059	0.047	0.021	0.011	0.018	0.003	0.002	0.003	0.164
2002	0.056	0.044	0.020	0.010	0.017	0.003	0.002	0.003	0.155
2003	0.052	0.041	0.018	0.009	0.016	0.003	0.002	0.002	0.142
2004	0.048	0.038	0.017	0.009	0.015	0.003	0.002	0.002	0.132
2005	0.045	0.035	0.016	0.008	0.014	0.003	0.001	0.002	0.124
2006	0.042	0.033	0.015	0.007	0.013	0.002	0.001	0.002	0.116
2007	0.040	0.032	0.015	0.007	0.012	0.002	0.001	0.002	0.111
2008	0.039	0.030	0.014	0.007	0.012	0.002	0.001	0.002	0.107
2009	0.038	0.029	0.014	0.006	0.011	0.002	0.001	0.002	0.103
2010	0.037	0.029	0.013	0.006	0.011	0.002	0.001	0.002	0.101
2011	0.036	0.028	0.013	0.006	0.011	0.002	0.001	0.002	0.098
2012	0.035	0.027	0.013	0.006	0.011	0.002	0.001	0.002	0.095
2013	0.034	0.026	0.013	0.006	0.010	0.002	0.001	0.002	0.093
2014	0.033	0.026	0.012	0.006	0.010	0.002	0.001	0.001	0.092
2015	0.033	0.025	0.012	0.005	0.010	0.002	0.001	0.001	0.090
2016	0.032	0.025	0.012	0.005	0.010	0.001	0.001	0.001	0.088
2017	0.031	0.024	0.012	0.005	0.010	0.001	0.001	0.001	0.086
2018	0.031	0.024	0.012	0.005	0.010	0.001	0.001	0.001	0.085
2019	0.031	0.024	0.012	0.005	0.010	0.001	0.001	0.001	0.084
2020	0.030	0.023	0.012	0.005	0.010	0.001	0.001	0.001	0.083

Sources: BTRE estimates.

TABLE 3.104 BASE CASE PROJECTIONS OF METROPOLITAN TOLUENE EMISSIONS BY RIGID TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.164	0.130	0.053	0.032	0.047	0.010	0.005	0.007	0.448
1991	0.158	0.126	0.052	0.031	0.045	0.010	0.005	0.006	0.432
1992	0.150	0.119	0.049	0.029	0.043	0.009	0.005	0.006	0.411
1993	0.143	0.113	0.048	0.028	0.042	0.009	0.005	0.006	0.392
1994	0.136	0.107	0.046	0.026	0.040	0.008	0.004	0.005	0.372
1995	0.133	0.105	0.045	0.025	0.039	0.008	0.004	0.005	0.366
1996	0.125	0.099	0.043	0.024	0.037	0.007	0.004	0.005	0.345
1997	0.117	0.092	0.041	0.022	0.035	0.007	0.004	0.005	0.321
1998	0.103	0.081	0.036	0.019	0.031	0.006	0.003	0.004	0.283
1999	0.094	0.074	0.033	0.017	0.028	0.005	0.003	0.004	0.258
2000	0.083	0.065	0.029	0.015	0.025	0.005	0.003	0.004	0.228
2001	0.076	0.060	0.027	0.014	0.023	0.004	0.002	0.003	0.210
2002	0.071	0.056	0.025	0.013	0.021	0.004	0.002	0.003	0.196
2003	0.065	0.051	0.023	0.012	0.019	0.004	0.002	0.003	0.178
2004	0.060	0.047	0.021	0.011	0.018	0.003	0.002	0.003	0.164
2005	0.055	0.043	0.020	0.010	0.017	0.003	0.002	0.003	0.152
2006	0.051	0.040	0.018	0.009	0.015	0.003	0.002	0.002	0.139
2007	0.048	0.038	0.017	0.008	0.015	0.003	0.002	0.002	0.132
2008	0.045	0.035	0.016	0.008	0.014	0.002	0.001	0.002	0.125
2009	0.043	0.034	0.016	0.008	0.013	0.002	0.001	0.002	0.120
2010	0.042	0.033	0.015	0.007	0.013	0.002	0.001	0.002	0.117
2011	0.041	0.032	0.015	0.007	0.013	0.002	0.001	0.002	0.113
2012	0.040	0.031	0.015	0.007	0.012	0.002	0.001	0.002	0.111
2013	0.040	0.031	0.015	0.007	0.012	0.002	0.001	0.002	0.109
2014	0.039	0.030	0.015	0.007	0.012	0.002	0.001	0.002	0.108
2015	0.039	0.030	0.014	0.006	0.012	0.002	0.001	0.002	0.106
2016	0.038	0.030	0.014	0.006	0.012	0.002	0.001	0.002	0.105
2017	0.037	0.029	0.014	0.006	0.012	0.002	0.001	0.002	0.103
2018	0.037	0.029	0.014	0.006	0.012	0.002	0.001	0.002	0.102
2019	0.037	0.028	0.014	0.006	0.012	0.002	0.001	0.002	0.101
2020	0.037	0.028	0.014	0.006	0.012	0.002	0.001	0.002	0.101

Sources: BTRE estimates.

TABLE 3.105 BASE CASE PROJECTIONS OF METROPOLITAN XYLENE EMISSIONS BY RIGID TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.134	0.107	0.044	0.026	0.038	0.008	0.004	0.005	0.366
1991	0.129	0.103	0.042	0.025	0.037	0.008	0.004	0.005	0.353
1992	0.123	0.098	0.040	0.024	0.035	0.007	0.004	0.005	0.336
1993	0.117	0.093	0.039	0.023	0.034	0.007	0.004	0.005	0.321
1994	0.111	0.088	0.037	0.021	0.032	0.007	0.004	0.004	0.305
1995	0.109	0.086	0.037	0.021	0.032	0.006	0.003	0.004	0.299
1996	0.103	0.080	0.035	0.019	0.030	0.006	0.003	0.004	0.282
1997	0.095	0.075	0.033	0.018	0.028	0.006	0.003	0.004	0.262
1998	0.084	0.066	0.029	0.016	0.025	0.005	0.003	0.004	0.231
1999	0.076	0.060	0.027	0.014	0.023	0.004	0.002	0.003	0.210
2000	0.067	0.053	0.024	0.012	0.020	0.004	0.002	0.003	0.186
2001	0.062	0.049	0.022	0.011	0.019	0.004	0.002	0.003	0.171
2002	0.058	0.045	0.020	0.010	0.017	0.003	0.002	0.003	0.159
2003	0.053	0.041	0.019	0.009	0.016	0.003	0.002	0.002	0.145
2004	0.048	0.038	0.017	0.009	0.015	0.003	0.002	0.002	0.134
2005	0.045	0.035	0.016	0.008	0.014	0.003	0.001	0.002	0.124
2006	0.041	0.032	0.015	0.007	0.012	0.002	0.001	0.002	0.113
2007	0.039	0.031	0.014	0.007	0.012	0.002	0.001	0.002	0.107
2008	0.037	0.029	0.013	0.006	0.011	0.002	0.001	0.002	0.102
2009	0.035	0.028	0.013	0.006	0.011	0.002	0.001	0.002	0.097
2010	0.034	0.027	0.013	0.006	0.011	0.002	0.001	0.002	0.095
2011	0.034	0.026	0.012	0.006	0.010	0.002	0.001	0.002	0.092
2012	0.033	0.026	0.012	0.006	0.010	0.002	0.001	0.001	0.090
2013	0.032	0.025	0.012	0.005	0.010	0.002	0.001	0.001	0.089
2014	0.032	0.025	0.012	0.005	0.010	0.002	0.001	0.001	0.088
2015	0.032	0.024	0.012	0.005	0.010	0.001	0.001	0.001	0.087
2016	0.031	0.024	0.012	0.005	0.010	0.001	0.001	0.001	0.085
2017	0.031	0.024	0.012	0.005	0.010	0.001	0.001	0.001	0.084
2018	0.030	0.023	0.012	0.005	0.010	0.001	0.001	0.001	0.083
2019	0.030	0.023	0.012	0.005	0.009	0.001	0.001	0.001	0.083
2020	0.030	0.023	0.012	0.005	0.009	0.001	0.001	0.001	0.082

Note: Includes emissions of o, m and p isomers.

Sources: BTRE estimates.

TABLE 3.106 BASE CASE PROJECTIONS OF METROPOLITAN PAH EMISSIONS BY RIGID TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.091	0.072	0.030	0.018	0.026	0.005	0.003	0.004	0.248
1991	0.084	0.067	0.027	0.016	0.024	0.005	0.003	0.003	0.230
1992	0.082	0.065	0.027	0.016	0.024	0.005	0.003	0.003	0.224
1993	0.081	0.064	0.027	0.015	0.023	0.005	0.003	0.003	0.220
1994	0.082	0.064	0.027	0.016	0.024	0.005	0.003	0.003	0.223
1995	0.084	0.066	0.029	0.016	0.025	0.005	0.003	0.003	0.230
1996	0.083	0.065	0.029	0.016	0.025	0.005	0.003	0.003	0.228
1997	0.082	0.064	0.028	0.015	0.024	0.005	0.003	0.003	0.224
1998	0.079	0.062	0.027	0.015	0.023	0.005	0.003	0.003	0.216
1999	0.077	0.061	0.027	0.014	0.023	0.004	0.002	0.003	0.213
2000	0.073	0.057	0.026	0.013	0.022	0.004	0.002	0.003	0.201
2001	0.070	0.055	0.025	0.013	0.021	0.004	0.002	0.003	0.194
2002	0.070	0.055	0.025	0.013	0.021	0.004	0.002	0.003	0.193
2003	0.067	0.052	0.024	0.012	0.020	0.004	0.002	0.003	0.184
2004	0.064	0.050	0.023	0.011	0.019	0.004	0.002	0.003	0.177
2005	0.061	0.048	0.022	0.011	0.019	0.003	0.002	0.003	0.169
2006	0.059	0.046	0.021	0.010	0.018	0.003	0.002	0.003	0.163
2007	0.058	0.045	0.021	0.010	0.018	0.003	0.002	0.003	0.158
2008	0.056	0.044	0.020	0.010	0.017	0.003	0.002	0.003	0.154
2009	0.054	0.042	0.020	0.009	0.017	0.003	0.002	0.002	0.149
2010	0.053	0.041	0.019	0.009	0.016	0.003	0.002	0.002	0.146
2011	0.052	0.040	0.019	0.009	0.016	0.003	0.002	0.002	0.142
2012	0.050	0.039	0.018	0.009	0.016	0.002	0.002	0.002	0.138
2013	0.049	0.038	0.018	0.008	0.015	0.002	0.001	0.002	0.135
2014	0.048	0.037	0.018	0.008	0.015	0.002	0.001	0.002	0.133
2015	0.047	0.037	0.018	0.008	0.015	0.002	0.001	0.002	0.130
2016	0.046	0.036	0.017	0.008	0.014	0.002	0.001	0.002	0.128
2017	0.045	0.035	0.017	0.007	0.014	0.002	0.001	0.002	0.125
2018	0.045	0.034	0.017	0.007	0.014	0.002	0.001	0.002	0.123
2019	0.044	0.034	0.017	0.007	0.014	0.002	0.001	0.002	0.121
2020	0.044	0.033	0.017	0.007	0.014	0.002	0.001	0.002	0.120

Sources: BTRE estimates.

TABLE 3.107 BASE CASE PROJECTIONS OF METROPOLITAN 1,3-BUTADIENE EMISSIONS BY RIGID TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.015	0.012	0.005	0.003	0.004	0.001	0.000	0.001	0.041
1991	0.014	0.011	0.005	0.003	0.004	0.001	0.000	0.001	0.039
1992	0.014	0.011	0.005	0.003	0.004	0.001	0.000	0.001	0.037
1993	0.013	0.010	0.004	0.003	0.004	0.001	0.000	0.001	0.036
1994	0.013	0.010	0.004	0.002	0.004	0.001	0.000	0.001	0.035
1995	0.013	0.010	0.004	0.002	0.004	0.001	0.000	0.001	0.035
1996	0.012	0.009	0.004	0.002	0.004	0.001	0.000	0.000	0.033
1997	0.011	0.009	0.004	0.002	0.003	0.001	0.000	0.000	0.031
1998	0.010	0.008	0.004	0.002	0.003	0.001	0.000	0.000	0.028
1999	0.010	0.008	0.003	0.002	0.003	0.001	0.000	0.000	0.027
2000	0.009	0.007	0.003	0.002	0.003	0.001	0.000	0.000	0.024
2001	0.008	0.006	0.003	0.001	0.002	0.000	0.000	0.000	0.022
2002	0.008	0.006	0.003	0.001	0.002	0.000	0.000	0.000	0.021
2003	0.007	0.006	0.003	0.001	0.002	0.000	0.000	0.000	0.020
2004	0.007	0.005	0.002	0.001	0.002	0.000	0.000	0.000	0.019
2005	0.006	0.005	0.002	0.001	0.002	0.000	0.000	0.000	0.018
2006	0.006	0.005	0.002	0.001	0.002	0.000	0.000	0.000	0.016
2007	0.006	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.016
2008	0.005	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.015
2009	0.005	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.015
2010	0.005	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.014
2011	0.005	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.014
2012	0.005	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.013
2013	0.005	0.004	0.002	0.001	0.001	0.000	0.000	0.000	0.013
2014	0.005	0.004	0.002	0.001	0.001	0.000	0.000	0.000	0.013
2015	0.005	0.004	0.002	0.001	0.001	0.000	0.000	0.000	0.013
2016	0.005	0.004	0.002	0.001	0.001	0.000	0.000	0.000	0.013
2017	0.005	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.012
2018	0.004	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.012
2019	0.004	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.012
2020	0.004	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.012

Sources: BTRE estimates.

TABLE 3.108 ESTIMATED OZONE REACTIVITY OF BASE CASE PROJECTIONS OF METROPOLITAN VOC EMISSIONS BY RIGID TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	12.29	9.79	4.01	2.39	3.52	0.74	0.39	0.49	33.62
1991	11.57	9.22	3.78	2.25	3.32	0.70	0.37	0.46	31.66
1992	11.11	8.82	3.66	2.15	3.20	0.67	0.35	0.44	30.39
1993	10.75	8.50	3.58	2.06	3.11	0.64	0.34	0.43	29.41
1994	10.55	8.33	3.55	2.01	3.08	0.62	0.33	0.42	28.90
1995	10.61	8.35	3.61	2.01	3.11	0.62	0.34	0.43	29.09
1996	10.25	8.05	3.54	1.93	3.03	0.61	0.33	0.42	28.17
1997	9.84	7.71	3.41	1.83	2.92	0.58	0.32	0.41	27.03
1998	9.14	7.18	3.19	1.70	2.73	0.53	0.29	0.39	25.16
1999	8.71	6.85	3.05	1.60	2.61	0.51	0.28	0.38	23.98
2000	8.01	6.29	2.81	1.46	2.40	0.46	0.26	0.35	22.05
2001	7.62	5.98	2.67	1.38	2.29	0.44	0.25	0.34	20.96
2002	7.44	5.85	2.62	1.34	2.24	0.42	0.24	0.33	20.49
2003	7.00	5.50	2.48	1.25	2.11	0.40	0.23	0.32	19.29
2004	6.68	5.24	2.37	1.19	2.02	0.38	0.22	0.31	18.40
2005	6.34	4.98	2.26	1.12	1.92	0.36	0.21	0.29	17.48
2006	6.06	4.75	2.17	1.07	1.84	0.33	0.20	0.28	16.69
2007	5.86	4.59	2.11	1.03	1.79	0.32	0.19	0.27	16.15
2008	5.66	4.43	2.04	0.99	1.73	0.30	0.18	0.26	15.58
2009	5.48	4.28	1.99	0.95	1.68	0.29	0.17	0.25	15.08
2010	5.35	4.18	1.95	0.92	1.64	0.27	0.17	0.24	14.72
2011	5.20	4.05	1.90	0.89	1.60	0.26	0.16	0.23	14.30
2012	5.07	3.95	1.87	0.86	1.56	0.25	0.15	0.23	13.95
2013	4.97	3.86	1.84	0.84	1.54	0.24	0.15	0.22	13.65
2014	4.88	3.79	1.81	0.82	1.51	0.23	0.14	0.22	13.41
2015	4.81	3.73	1.80	0.80	1.50	0.22	0.14	0.21	13.21
2016	4.71	3.64	1.77	0.78	1.47	0.22	0.14	0.21	12.93
2017	4.60	3.55	1.74	0.76	1.44	0.21	0.13	0.20	12.64
2018	4.55	3.50	1.72	0.74	1.43	0.20	0.13	0.20	12.47
2019	4.50	3.46	1.72	0.73	1.42	0.19	0.12	0.20	12.33
2020	4.46	3.42	1.71	0.72	1.41	0.19	0.12	0.19	12.21

Sources: BTRE estimates.

TABLE 3.109 ESTIMATED METROPOLITAN EMISSIONS OF OTHER NPI SPECIES BY RIGID TRUCKS TO 2020

(thousand tonnes)

Year	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	n-Hexane	Styrene
1990	0.843	0.008	0.508	0.013	0.076	0.110	0.015
1991	0.781	0.008	0.473	0.012	0.073	0.105	0.014
1992	0.760	0.008	0.459	0.012	0.070	0.101	0.014
1993	0.750	0.007	0.450	0.011	0.067	0.097	0.013
1994	0.762	0.007	0.452	0.011	0.064	0.094	0.013
1995	0.785	0.006	0.463	0.011	0.063	0.094	0.012
1996	0.778	0.006	0.455	0.011	0.059	0.090	0.012
1997	0.765	0.005	0.443	0.010	0.056	0.085	0.011
1998	0.737	0.004	0.422	0.010	0.050	0.077	0.010
1999	0.724	0.003	0.411	0.009	0.046	0.072	0.009
2000	0.682	0.003	0.384	0.008	0.041	0.065	0.008
2001	0.657	0.002	0.368	0.008	0.038	0.061	0.007
2002	0.655	0.002	0.364	0.008	0.035	0.059	0.007
2003	0.624	0.002	0.345	0.007	0.032	0.055	0.006
2004	0.601	0.001	0.331	0.007	0.030	0.052	0.006
2005	0.576	0.001	0.316	0.007	0.028	0.049	0.005
2006	0.557	0.001	0.304	0.006	0.026	0.046	0.005
2007	0.542	0.001	0.295	0.006	0.024	0.044	0.005
2008	0.526	0.001	0.286	0.006	0.023	0.043	0.005
2009	0.510	0.000	0.277	0.006	0.022	0.041	0.004
2010	0.498	0.000	0.270	0.005	0.022	0.040	0.004
2011	0.483	0.000	0.262	0.005	0.021	0.039	0.004
2012	0.471	0.000	0.255	0.005	0.020	0.039	0.004
2013	0.460	0.000	0.249	0.005	0.020	0.038	0.004
2014	0.451	0.000	0.245	0.005	0.020	0.038	0.004
2015	0.443	0.000	0.241	0.005	0.020	0.037	0.004
2016	0.433	0.000	0.235	0.005	0.019	0.037	0.004
2017	0.422	0.000	0.229	0.005	0.019	0.036	0.004
2018	0.416	0.000	0.226	0.005	0.019	0.036	0.004
2019	0.410	0.000	0.223	0.005	0.018	0.036	0.004
2020	0.406	0.000	0.220	0.005	0.018	0.036	0.004

Sources: BTRE estimates.

TABLE 3.110 ESTIMATED NATIONAL EMISSIONS OF OTHER NPI SPECIES BY RIGID TRUCKS TO 2020

Year	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	<i>n</i> -Hexane	Styrene
1990	1.274	0.013	0.769	0.019	0.115	0.167	0.023
1991	1.137	0.012	0.691	0.018	0.107	0.154	0.021
1992	1.112	0.011	0.673	0.017	0.102	0.148	0.020
1993	1.104	0.011	0.664	0.017	0.098	0.144	0.019
1994	1.154	0.010	0.687	0.017	0.097	0.143	0.019
1995	1.171	0.009	0.691	0.017	0.094	0.140	0.019
1996	1.178	0.008	0.690	0.016	0.090	0.136	0.018
1997	1.186	0.008	0.689	0.016	0.086	0.132	0.017
1998	1.185	0.006	0.680	0.015	0.080	0.124	0.016
1999	1.163	0.005	0.661	0.015	0.073	0.116	0.015
2000	1.126	0.005	0.635	0.014	0.067	0.107	0.013
2001	1.071	0.004	0.601	0.013	0.061	0.100	0.012
2002	1.054	0.003	0.587	0.013	0.057	0.095	0.011
2003	1.003	0.002	0.555	0.012	0.052	0.088	0.010
2004	0.971	0.002	0.535	0.011	0.048	0.084	0.010
2005	0.925	0.002	0.508	0.011	0.045	0.079	0.009
2006	0.891	0.001	0.487	0.010	0.041	0.074	0.008
2007	0.860	0.001	0.469	0.010	0.039	0.070	0.008
2008	0.828	0.001	0.450	0.009	0.036	0.067	0.007
2009	0.797	0.001	0.432	0.009	0.035	0.064	0.007
2010	0.771	0.001	0.418	0.008	0.033	0.063	0.007
2011	0.744	0.001	0.404	0.008	0.032	0.061	0.006
2012	0.720	0.001	0.390	0.008	0.031	0.059	0.006
2013	0.698	0.001	0.379	0.008	0.030	0.058	0.006
2014	0.679	0.001	0.369	0.008	0.030	0.057	0.006
2015	0.662	0.001	0.360	0.007	0.029	0.056	0.006
2016	0.643	0.001	0.349	0.007	0.028	0.055	0.006
2017	0.622	0.001	0.338	0.007	0.028	0.054	0.005
2018	0.607	0.001	0.330	0.007	0.027	0.053	0.005
2019	0.593	0.001	0.322	0.007	0.027	0.052	0.005
2020	0.580	0.001	0.315	0.007	0.026	0.051	0.005

Sources: BTRE estimates.

TABLE 3.111 BASE CASE PROJECTIONS OF METROPOLITAN SO<sub>X</sub> EMISSIONS BY ARTICULATED TRUCKS TO 2020

Year	(tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	390.7	355.5	158.2	108.8	180.6	19.7	19.1	6.9	1239.5	
1991	348.3	317.0	141.0	97.0	161.0	17.6	17.0	6.2	1105.1	
1992	343.4	311.4	140.3	95.0	159.5	17.2	16.8	6.1	1089.8	
1993	340.1	307.5	140.4	93.5	158.9	17.0	16.6	6.0	1080.0	
1994	345.8	311.8	144.3	94.5	162.5	17.2	16.9	6.2	1099.2	
1995	357.6	321.6	151.1	97.1	169.3	17.7	17.5	6.4	1138.3	
1996	357.1	320.3	153.2	96.3	170.3	17.5	17.6	6.4	1138.9	
1997	353.8	316.6	152.1	94.4	169.4	17.1	17.2	6.5	1127.2	
1998	343.3	308.0	148.4	91.2	165.0	16.3	16.5	6.3	1095.1	
1999	317.9	285.4	138.2	83.6	153.4	14.9	15.2	5.9	1014.4	
2000	267.3	239.9	116.1	69.7	129.2	12.3	12.7	5.0	852.1	
2001	245.6	220.4	106.9	63.5	119.0	11.1	11.6	4.6	782.7	
2002	230.6	207.1	100.8	59.3	112.0	10.3	10.8	4.3	735.2	
2003	147.4	132.3	64.7	37.7	71.7	6.5	6.8	2.7	469.9	
2004	92.4	82.9	40.7	23.5	45.1	4.0	4.2	1.7	294.6	
2005	64.7	58.0	28.6	16.4	31.6	2.7	2.9	1.2	206.4	
2006	17.0	15.2	7.5	4.3	8.3	0.7	0.8	0.3	54.1	
2007	17.9	16.0	8.0	4.5	8.8	0.7	0.8	0.3	57.0	
2008	18.7	16.8	8.4	4.7	9.2	0.8	0.8	0.3	59.7	
2009	19.6	17.5	8.8	4.9	9.7	0.8	0.9	0.4	62.5	
2010	20.7	18.4	9.3	5.1	10.2	0.8	0.9	0.4	65.9	
2011	21.6	19.3	9.8	5.3	10.7	0.8	0.9	0.4	68.9	
2012	22.7	20.2	10.3	5.5	11.3	0.8	0.9	0.4	72.2	
2013	23.7	21.1	10.9	5.7	11.8	0.9	1.0	0.4	75.6	
2014	24.9	22.1	11.5	6.0	12.4	0.9	1.0	0.4	79.1	
2015	26.0	23.1	12.1	6.2	13.1	0.9	1.1	0.5	82.9	
2016	27.3	24.1	12.7	6.5	13.7	0.9	1.1	0.5	86.7	
2017	28.7	25.3	13.4	6.8	14.5	1.0	1.1	0.5	91.3	
2018	30.1	26.5	14.1	7.0	15.2	1.0	1.2	0.5	95.6	
2019	31.5	27.6	14.9	7.3	16.0	1.0	1.2	0.5	100.1	
2020	32.9	28.8	15.7	7.6	16.8	1.0	1.2	0.6	104.7	

Sources: BTRE estimates.

TABLE 3.112 BASE CASE PROJECTIONS OF METROPOLITAN CO EMISSIONS BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	2.02	1.84	0.82	0.56	0.94	0.10	0.10	0.04	6.42
1991	1.90	1.73	0.77	0.53	0.88	0.10	0.09	0.03	6.03
1992	1.98	1.79	0.81	0.55	0.92	0.10	0.10	0.04	6.28
1993	2.07	1.87	0.85	0.57	0.96	0.10	0.10	0.04	6.56
1994	2.19	1.98	0.91	0.60	1.03	0.11	0.11	0.04	6.96
1995	2.33	2.10	0.99	0.63	1.10	0.12	0.11	0.04	7.43
1996	2.43	2.18	1.04	0.65	1.16	0.12	0.12	0.04	7.74
1997	2.52	2.25	1.08	0.67	1.21	0.12	0.12	0.05	8.02
1998	2.54	2.28	1.10	0.68	1.22	0.12	0.12	0.05	8.11
1999	2.64	2.37	1.15	0.69	1.27	0.12	0.13	0.05	8.43
2000	2.56	2.29	1.11	0.67	1.24	0.12	0.12	0.05	8.15
2001	2.52	2.26	1.10	0.65	1.22	0.11	0.12	0.05	8.03
2002	2.59	2.32	1.13	0.67	1.26	0.12	0.12	0.05	8.25
2003	2.56	2.30	1.12	0.66	1.25	0.11	0.12	0.05	8.16
2004	2.57	2.31	1.13	0.65	1.25	0.11	0.12	0.05	8.19
2005	2.61	2.34	1.16	0.66	1.28	0.11	0.12	0.05	8.32
2006	2.64	2.37	1.17	0.67	1.29	0.11	0.12	0.05	8.42
2007	2.68	2.40	1.20	0.67	1.32	0.11	0.12	0.05	8.54
2008	2.71	2.42	1.21	0.68	1.33	0.11	0.12	0.05	8.63
2009	2.74	2.45	1.23	0.68	1.35	0.11	0.12	0.05	8.73
2010	2.79	2.49	1.26	0.69	1.38	0.11	0.12	0.05	8.89
2011	2.83	2.52	1.28	0.69	1.40	0.11	0.12	0.05	9.00
2012	2.87	2.56	1.31	0.70	1.43	0.11	0.12	0.05	9.15
2013	2.94	2.61	1.35	0.71	1.46	0.11	0.12	0.05	9.34
2014	3.00	2.67	1.38	0.72	1.50	0.11	0.12	0.05	9.56
2015	3.08	2.73	1.43	0.74	1.55	0.11	0.12	0.05	9.82
2016	3.15	2.79	1.47	0.75	1.58	0.11	0.13	0.06	10.03
2017	3.23	2.85	1.51	0.76	1.63	0.11	0.13	0.06	10.27
2018	3.31	2.91	1.56	0.78	1.68	0.11	0.13	0.06	10.53
2019	3.40	2.99	1.61	0.79	1.73	0.11	0.13	0.06	10.82
2020	3.51	3.08	1.67	0.81	1.79	0.11	0.13	0.06	11.16

Sources: BTRE estimates.

TABLE 3.113 BASE CASE PROJECTIONS OF METROPOLITAN NO<sub>x</sub> EMISSIONS BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	3.79	3.45	1.53	1.06	1.75	0.19	0.19	0.07	12.03
1991	3.54	3.22	1.43	0.98	1.64	0.18	0.17	0.06	11.22
1992	3.65	3.31	1.49	1.01	1.70	0.18	0.18	0.06	11.58
1993	3.78	3.42	1.56	1.04	1.77	0.19	0.18	0.07	12.02
1994	4.02	3.62	1.68	1.10	1.89	0.20	0.20	0.07	12.77
1995	4.33	3.90	1.83	1.18	2.05	0.21	0.21	0.08	13.79
1996	4.48	4.02	1.92	1.21	2.14	0.22	0.22	0.08	14.30
1997	4.58	4.10	1.97	1.22	2.19	0.22	0.22	0.08	14.60
1998	4.59	4.12	1.99	1.22	2.21	0.22	0.22	0.08	14.65
1999	4.78	4.29	2.08	1.26	2.31	0.22	0.23	0.09	15.26
2000	4.67	4.19	2.03	1.22	2.26	0.21	0.22	0.09	14.90
2001	4.62	4.15	2.01	1.20	2.24	0.21	0.22	0.09	14.74
2002	4.74	4.26	2.07	1.22	2.30	0.21	0.22	0.09	15.11
2003	4.70	4.22	2.07	1.20	2.29	0.21	0.22	0.09	15.00
2004	4.74	4.25	2.09	1.21	2.31	0.20	0.22	0.09	15.11
2005	4.80	4.31	2.12	1.22	2.35	0.20	0.22	0.09	15.31
2006	4.87	4.36	2.16	1.23	2.38	0.20	0.22	0.09	15.51
2007	4.95	4.43	2.21	1.24	2.43	0.20	0.22	0.09	15.76
2008	4.96	4.44	2.22	1.24	2.44	0.20	0.22	0.09	15.81
2009	4.97	4.44	2.23	1.23	2.45	0.20	0.22	0.09	15.82
2010	5.01	4.47	2.27	1.24	2.48	0.19	0.21	0.09	15.97
2011	5.04	4.49	2.29	1.24	2.50	0.19	0.21	0.09	16.06
2012	5.09	4.53	2.32	1.24	2.53	0.19	0.21	0.09	16.20
2013	5.14	4.56	2.35	1.24	2.56	0.19	0.21	0.09	16.35
2014	5.18	4.60	2.39	1.25	2.59	0.19	0.21	0.09	16.49
2015	5.24	4.64	2.43	1.25	2.63	0.18	0.21	0.09	16.69
2016	5.32	4.70	2.47	1.26	2.67	0.18	0.21	0.09	16.92
2017	5.43	4.79	2.54	1.28	2.74	0.18	0.21	0.10	17.27
2018	5.52	4.86	2.60	1.29	2.79	0.18	0.21	0.10	17.56
2019	5.64	4.95	2.67	1.31	2.86	0.18	0.22	0.10	17.92
2020	5.76	5.05	2.74	1.33	2.94	0.18	0.22	0.10	18.32

Sources: BTRE estimates.

TABLE 3.114 BASE CASE PROJECTIONS OF METROPOLITAN VOC (TOTAL) EMISSIONS  
BY ARTICULATED TRUCKS TO 2020  
(*thousand tonnes*)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.620	0.564	0.251	0.172	0.286	0.031	0.030	0.011	1.966
1991	0.580	0.527	0.235	0.161	0.268	0.029	0.028	0.010	1.838
1992	0.599	0.544	0.245	0.166	0.278	0.030	0.029	0.011	1.902
1993	0.624	0.564	0.257	0.171	0.291	0.031	0.030	0.011	1.980
1994	0.662	0.597	0.276	0.181	0.311	0.033	0.032	0.012	2.103
1995	0.698	0.628	0.295	0.189	0.330	0.034	0.034	0.013	2.221
1996	0.703	0.631	0.302	0.189	0.335	0.035	0.035	0.013	2.242
1997	0.707	0.632	0.304	0.188	0.338	0.034	0.034	0.013	2.250
1998	0.692	0.621	0.299	0.184	0.332	0.033	0.033	0.013	2.207
1999	0.702	0.630	0.305	0.184	0.338	0.033	0.034	0.013	2.237
2000	0.668	0.599	0.290	0.174	0.322	0.031	0.032	0.012	2.128
2001	0.650	0.583	0.283	0.168	0.314	0.029	0.031	0.012	2.071
2002	0.659	0.592	0.288	0.169	0.320	0.029	0.031	0.012	2.101
2003	0.648	0.582	0.284	0.166	0.315	0.028	0.030	0.012	2.065
2004	0.648	0.582	0.286	0.165	0.316	0.028	0.030	0.012	2.066
2005	0.656	0.588	0.290	0.166	0.320	0.028	0.030	0.012	2.090
2006	0.662	0.593	0.294	0.167	0.324	0.028	0.030	0.012	2.109
2007	0.672	0.602	0.300	0.168	0.330	0.027	0.030	0.012	2.142
2008	0.684	0.611	0.306	0.170	0.336	0.027	0.030	0.012	2.177
2009	0.698	0.623	0.314	0.173	0.344	0.028	0.030	0.013	2.222
2010	0.718	0.641	0.325	0.177	0.355	0.028	0.031	0.013	2.286
2011	0.736	0.656	0.334	0.180	0.365	0.028	0.031	0.013	2.344
2012	0.757	0.674	0.346	0.184	0.376	0.028	0.032	0.014	2.411
2013	0.781	0.694	0.358	0.189	0.389	0.029	0.032	0.014	2.486
2014	0.803	0.712	0.370	0.193	0.401	0.029	0.033	0.014	2.555
2015	0.823	0.729	0.381	0.197	0.412	0.029	0.033	0.015	2.618
2016	0.847	0.748	0.394	0.201	0.425	0.029	0.034	0.015	2.692
2017	0.878	0.774	0.411	0.207	0.442	0.030	0.034	0.015	2.791
2018	0.910	0.801	0.428	0.213	0.460	0.030	0.035	0.016	2.893
2019	0.941	0.826	0.445	0.219	0.477	0.030	0.036	0.016	2.990
2020	0.968	0.848	0.461	0.224	0.492	0.031	0.037	0.017	3.077

Sources: BTRE estimates.

TABLE 3.115 BASE CASE PROJECTIONS OF METROPOLITAN PM (TOTAL) EMISSIONS BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.244	0.222	0.099	0.068	0.113	0.012	0.012	0.004	0.772
1991	0.227	0.206	0.092	0.063	0.105	0.011	0.011	0.004	0.719
1992	0.233	0.211	0.095	0.064	0.108	0.012	0.011	0.004	0.739
1993	0.240	0.217	0.099	0.066	0.112	0.012	0.012	0.004	0.763
1994	0.253	0.228	0.106	0.069	0.119	0.013	0.012	0.005	0.804
1995	0.269	0.242	0.114	0.073	0.128	0.013	0.013	0.005	0.858
1996	0.278	0.250	0.119	0.075	0.133	0.014	0.014	0.005	0.887
1997	0.286	0.256	0.123	0.076	0.137	0.014	0.014	0.005	0.912
1998	0.287	0.257	0.124	0.076	0.138	0.014	0.014	0.005	0.915
1999	0.294	0.264	0.128	0.077	0.142	0.014	0.014	0.005	0.938
2000	0.280	0.251	0.122	0.073	0.135	0.013	0.013	0.005	0.892
2001	0.271	0.243	0.118	0.070	0.131	0.012	0.013	0.005	0.863
2002	0.272	0.244	0.119	0.070	0.132	0.012	0.013	0.005	0.867
2003	0.257	0.231	0.113	0.066	0.125	0.011	0.012	0.005	0.819
2004	0.246	0.221	0.108	0.063	0.120	0.011	0.011	0.005	0.783
2005	0.235	0.211	0.104	0.060	0.115	0.010	0.011	0.004	0.750
2006	0.222	0.199	0.098	0.056	0.109	0.009	0.010	0.004	0.706
2007	0.213	0.190	0.095	0.053	0.105	0.009	0.009	0.004	0.678
2008	0.205	0.183	0.092	0.051	0.101	0.008	0.009	0.004	0.654
2009	0.198	0.177	0.089	0.049	0.098	0.008	0.009	0.004	0.632
2010	0.194	0.173	0.088	0.048	0.096	0.008	0.008	0.004	0.617
2011	0.189	0.169	0.086	0.046	0.094	0.007	0.008	0.003	0.602
2012	0.186	0.165	0.085	0.045	0.092	0.007	0.008	0.003	0.592
2013	0.184	0.164	0.084	0.045	0.092	0.007	0.008	0.003	0.587
2014	0.184	0.163	0.085	0.044	0.092	0.007	0.008	0.003	0.585
2015	0.184	0.163	0.085	0.044	0.092	0.006	0.007	0.003	0.586
2016	0.186	0.164	0.087	0.044	0.094	0.006	0.007	0.003	0.592
2017	0.192	0.169	0.090	0.045	0.097	0.006	0.008	0.003	0.609
2018	0.198	0.174	0.093	0.046	0.100	0.007	0.008	0.003	0.630
2019	0.207	0.182	0.098	0.048	0.105	0.007	0.008	0.004	0.658
2020	0.218	0.191	0.104	0.050	0.111	0.007	0.008	0.004	0.693

Sources: BTRE estimates.

TABLE 3.116 BASE CASE PROJECTIONS OF METROPOLITAN PM10 EMISSIONS BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.241	0.219	0.098	0.067	0.111	0.012	0.012	0.004	0.765
1991	0.224	0.204	0.091	0.062	0.104	0.011	0.011	0.004	0.712
1992	0.230	0.209	0.094	0.064	0.107	0.012	0.011	0.004	0.731
1993	0.238	0.215	0.098	0.065	0.111	0.012	0.012	0.004	0.756
1994	0.251	0.226	0.105	0.068	0.118	0.012	0.012	0.004	0.796
1995	0.267	0.240	0.113	0.072	0.126	0.013	0.013	0.005	0.849
1996	0.275	0.247	0.118	0.074	0.131	0.014	0.014	0.005	0.878
1997	0.284	0.254	0.122	0.076	0.136	0.014	0.014	0.005	0.903
1998	0.284	0.255	0.123	0.075	0.137	0.014	0.014	0.005	0.906
1999	0.291	0.261	0.126	0.076	0.140	0.014	0.014	0.005	0.929
2000	0.277	0.249	0.120	0.072	0.134	0.013	0.013	0.005	0.883
2001	0.268	0.241	0.117	0.069	0.130	0.012	0.013	0.005	0.854
2002	0.269	0.242	0.118	0.069	0.131	0.012	0.013	0.005	0.858
2003	0.254	0.228	0.112	0.065	0.124	0.011	0.012	0.005	0.811
2004	0.243	0.218	0.107	0.062	0.119	0.010	0.011	0.005	0.776
2005	0.233	0.209	0.103	0.059	0.114	0.010	0.011	0.004	0.743
2006	0.219	0.197	0.097	0.055	0.108	0.009	0.010	0.004	0.699
2007	0.211	0.189	0.094	0.053	0.103	0.009	0.009	0.004	0.671
2008	0.203	0.182	0.091	0.051	0.100	0.008	0.009	0.004	0.647
2009	0.196	0.175	0.088	0.049	0.097	0.008	0.009	0.004	0.626
2010	0.192	0.171	0.087	0.047	0.095	0.007	0.008	0.003	0.611
2011	0.187	0.167	0.085	0.046	0.093	0.007	0.008	0.003	0.596
2012	0.184	0.164	0.084	0.045	0.091	0.007	0.008	0.003	0.586
2013	0.182	0.162	0.084	0.044	0.091	0.007	0.008	0.003	0.581
2014	0.182	0.161	0.084	0.044	0.091	0.007	0.007	0.003	0.579
2015	0.182	0.162	0.084	0.044	0.091	0.006	0.007	0.003	0.581
2016	0.184	0.163	0.086	0.044	0.093	0.006	0.007	0.003	0.586
2017	0.190	0.167	0.089	0.045	0.096	0.006	0.007	0.003	0.603
2018	0.196	0.173	0.092	0.046	0.099	0.006	0.008	0.003	0.624
2019	0.205	0.180	0.097	0.048	0.104	0.007	0.008	0.004	0.652
2020	0.216	0.189	0.103	0.050	0.110	0.007	0.008	0.004	0.686

Sources: BTRE estimates.

TABLE 3.117 BASE CASE PROJECTIONS OF METROPOLITAN PM2.5 EMISSIONS BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.231	0.210	0.094	0.064	0.107	0.012	0.011	0.004	0.734
1991	0.215	0.196	0.087	0.060	0.100	0.011	0.011	0.004	0.683
1992	0.221	0.201	0.090	0.061	0.103	0.011	0.011	0.004	0.702
1993	0.228	0.206	0.094	0.063	0.107	0.011	0.011	0.004	0.725
1994	0.240	0.217	0.100	0.066	0.113	0.012	0.012	0.004	0.764
1995	0.256	0.230	0.108	0.069	0.121	0.013	0.013	0.005	0.815
1996	0.264	0.237	0.113	0.071	0.126	0.013	0.013	0.005	0.843
1997	0.272	0.243	0.117	0.073	0.130	0.013	0.013	0.005	0.867
1998	0.273	0.245	0.118	0.072	0.131	0.013	0.013	0.005	0.870
1999	0.279	0.251	0.121	0.073	0.135	0.013	0.013	0.005	0.891
2000	0.266	0.239	0.115	0.069	0.128	0.012	0.013	0.005	0.847
2001	0.257	0.231	0.112	0.067	0.125	0.012	0.012	0.005	0.820
2002	0.258	0.232	0.113	0.066	0.125	0.012	0.012	0.005	0.824
2003	0.244	0.219	0.107	0.062	0.119	0.011	0.011	0.005	0.778
2004	0.233	0.209	0.103	0.059	0.114	0.010	0.011	0.004	0.744
2005	0.224	0.201	0.099	0.057	0.109	0.009	0.010	0.004	0.713
2006	0.211	0.189	0.094	0.053	0.103	0.009	0.009	0.004	0.671
2007	0.202	0.181	0.090	0.051	0.099	0.008	0.009	0.004	0.644
2008	0.195	0.174	0.087	0.049	0.096	0.008	0.009	0.004	0.621
2009	0.188	0.168	0.085	0.047	0.093	0.007	0.008	0.003	0.600
2010	0.184	0.164	0.083	0.045	0.091	0.007	0.008	0.003	0.587
2011	0.180	0.160	0.082	0.044	0.089	0.007	0.008	0.003	0.572
2012	0.177	0.157	0.081	0.043	0.088	0.007	0.007	0.003	0.562
2013	0.175	0.156	0.080	0.042	0.087	0.006	0.007	0.003	0.557
2014	0.175	0.155	0.080	0.042	0.087	0.006	0.007	0.003	0.555
2015	0.175	0.155	0.081	0.042	0.088	0.006	0.007	0.003	0.557
2016	0.177	0.156	0.082	0.042	0.089	0.006	0.007	0.003	0.562
2017	0.182	0.160	0.085	0.043	0.092	0.006	0.007	0.003	0.579
2018	0.188	0.166	0.089	0.044	0.095	0.006	0.007	0.003	0.599
2019	0.197	0.173	0.093	0.046	0.100	0.006	0.008	0.003	0.625
2020	0.207	0.181	0.099	0.048	0.105	0.007	0.008	0.004	0.658

Sources: BTRE estimates.

TABLE 3.118 BASE CASE PROJECTIONS OF METROPOLITAN PM1.0 EMISSIONS BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.226	0.206	0.092	0.063	0.105	0.011	0.011	0.004	0.718
1991	0.211	0.192	0.085	0.059	0.097	0.011	0.010	0.004	0.669
1992	0.216	0.196	0.088	0.060	0.101	0.011	0.011	0.004	0.687
1993	0.224	0.202	0.092	0.061	0.104	0.011	0.011	0.004	0.710
1994	0.235	0.212	0.098	0.064	0.111	0.012	0.012	0.004	0.748
1995	0.251	0.225	0.106	0.068	0.119	0.012	0.012	0.004	0.798
1996	0.259	0.232	0.111	0.070	0.123	0.013	0.013	0.005	0.825
1997	0.266	0.238	0.115	0.071	0.128	0.013	0.013	0.005	0.849
1998	0.267	0.239	0.115	0.071	0.128	0.013	0.013	0.005	0.851
1999	0.273	0.245	0.119	0.072	0.132	0.013	0.013	0.005	0.872
2000	0.260	0.234	0.113	0.068	0.126	0.012	0.012	0.005	0.829
2001	0.252	0.226	0.110	0.065	0.122	0.011	0.012	0.005	0.802
2002	0.253	0.227	0.111	0.065	0.123	0.011	0.012	0.005	0.806
2003	0.239	0.215	0.105	0.061	0.116	0.010	0.011	0.004	0.762
2004	0.229	0.205	0.101	0.058	0.111	0.010	0.010	0.004	0.729
2005	0.219	0.196	0.097	0.056	0.107	0.009	0.010	0.004	0.698
2006	0.206	0.185	0.092	0.052	0.101	0.009	0.009	0.004	0.657
2007	0.198	0.177	0.088	0.050	0.097	0.008	0.009	0.004	0.631
2008	0.191	0.171	0.085	0.048	0.094	0.008	0.008	0.003	0.608
2009	0.184	0.165	0.083	0.046	0.091	0.007	0.008	0.003	0.588
2010	0.180	0.161	0.082	0.044	0.089	0.007	0.008	0.003	0.574
2011	0.176	0.157	0.080	0.043	0.087	0.007	0.007	0.003	0.560
2012	0.173	0.154	0.079	0.042	0.086	0.006	0.007	0.003	0.550
2013	0.171	0.152	0.079	0.041	0.085	0.006	0.007	0.003	0.546
2014	0.171	0.152	0.079	0.041	0.085	0.006	0.007	0.003	0.544
2015	0.171	0.152	0.079	0.041	0.086	0.006	0.007	0.003	0.545
2016	0.173	0.153	0.081	0.041	0.087	0.006	0.007	0.003	0.550
2017	0.178	0.157	0.083	0.042	0.090	0.006	0.007	0.003	0.567
2018	0.184	0.162	0.087	0.043	0.093	0.006	0.007	0.003	0.586
2019	0.192	0.169	0.091	0.045	0.098	0.006	0.007	0.003	0.612
2020	0.203	0.178	0.097	0.047	0.103	0.006	0.008	0.004	0.645

Sources: BTRE estimates.

TABLE 3.119 BASE CASE PROJECTIONS OF METROPOLITAN ACETALDEHYDE EMISSIONS BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.098	0.089	0.040	0.027	0.045	0.005	0.005	0.002	0.310
1991	0.091	0.083	0.037	0.025	0.042	0.005	0.004	0.002	0.290
1992	0.095	0.086	0.039	0.026	0.044	0.005	0.005	0.002	0.300
1993	0.098	0.089	0.041	0.027	0.046	0.005	0.005	0.002	0.313
1994	0.104	0.094	0.044	0.029	0.049	0.005	0.005	0.002	0.332
1995	0.110	0.099	0.047	0.030	0.052	0.005	0.005	0.002	0.351
1996	0.111	0.100	0.048	0.030	0.053	0.005	0.005	0.002	0.354
1997	0.111	0.100	0.048	0.030	0.053	0.005	0.005	0.002	0.355
1998	0.109	0.098	0.047	0.029	0.052	0.005	0.005	0.002	0.348
1999	0.111	0.099	0.048	0.029	0.053	0.005	0.005	0.002	0.353
2000	0.105	0.094	0.046	0.027	0.051	0.005	0.005	0.002	0.335
2001	0.102	0.092	0.045	0.026	0.050	0.005	0.005	0.002	0.326
2002	0.104	0.093	0.045	0.027	0.050	0.005	0.005	0.002	0.331
2003	0.102	0.091	0.045	0.026	0.050	0.004	0.005	0.002	0.325
2004	0.102	0.091	0.045	0.026	0.050	0.004	0.005	0.002	0.325
2005	0.103	0.092	0.046	0.026	0.050	0.004	0.005	0.002	0.329
2006	0.104	0.093	0.046	0.026	0.051	0.004	0.005	0.002	0.331
2007	0.106	0.094	0.047	0.026	0.052	0.004	0.005	0.002	0.336
2008	0.107	0.096	0.048	0.027	0.053	0.004	0.005	0.002	0.342
2009	0.110	0.098	0.049	0.027	0.054	0.004	0.005	0.002	0.349
2010	0.113	0.101	0.051	0.028	0.056	0.004	0.005	0.002	0.359
2011	0.116	0.103	0.052	0.028	0.057	0.004	0.005	0.002	0.368
2012	0.119	0.106	0.054	0.029	0.059	0.004	0.005	0.002	0.378
2013	0.123	0.109	0.056	0.030	0.061	0.004	0.005	0.002	0.390
2014	0.126	0.112	0.058	0.030	0.063	0.005	0.005	0.002	0.401
2015	0.129	0.114	0.060	0.031	0.065	0.005	0.005	0.002	0.411
2016	0.133	0.117	0.062	0.032	0.067	0.005	0.005	0.002	0.422
2017	0.138	0.121	0.064	0.032	0.069	0.005	0.005	0.002	0.438
2018	0.143	0.126	0.067	0.033	0.072	0.005	0.006	0.002	0.454
2019	0.147	0.129	0.070	0.034	0.075	0.005	0.006	0.003	0.469
2020	0.152	0.133	0.072	0.035	0.077	0.005	0.006	0.003	0.482

Sources: BTRE estimates.

TABLE 3.120 BASE CASE PROJECTIONS OF METROPOLITAN FORMALDEHYDE EMISSIONS BY ARTICULATED TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.086	0.078	0.035	0.024	0.040	0.004	0.004	0.002	0.271
1991	0.080	0.073	0.032	0.022	0.037	0.004	0.004	0.001	0.254
1992	0.083	0.075	0.034	0.023	0.038	0.004	0.004	0.001	0.263
1993	0.086	0.078	0.036	0.024	0.040	0.004	0.004	0.002	0.273
1994	0.091	0.082	0.038	0.025	0.043	0.005	0.004	0.002	0.291
1995	0.096	0.087	0.041	0.026	0.046	0.005	0.005	0.002	0.307
1996	0.097	0.087	0.042	0.026	0.046	0.005	0.005	0.002	0.310
1997	0.098	0.087	0.042	0.026	0.047	0.005	0.005	0.002	0.311
1998	0.096	0.086	0.041	0.025	0.046	0.005	0.005	0.002	0.305
1999	0.097	0.087	0.042	0.025	0.047	0.005	0.005	0.002	0.309
2000	0.092	0.083	0.040	0.024	0.044	0.004	0.004	0.002	0.293
2001	0.090	0.080	0.039	0.023	0.043	0.004	0.004	0.002	0.285
2002	0.091	0.082	0.040	0.023	0.044	0.004	0.004	0.002	0.289
2003	0.089	0.080	0.039	0.023	0.043	0.004	0.004	0.002	0.284
2004	0.089	0.080	0.039	0.023	0.043	0.004	0.004	0.002	0.284
2005	0.090	0.081	0.040	0.023	0.044	0.004	0.004	0.002	0.288
2006	0.091	0.082	0.040	0.023	0.045	0.004	0.004	0.002	0.290
2007	0.092	0.083	0.041	0.023	0.045	0.004	0.004	0.002	0.294
2008	0.094	0.084	0.042	0.023	0.046	0.004	0.004	0.002	0.299
2009	0.096	0.086	0.043	0.024	0.047	0.004	0.004	0.002	0.305
2010	0.099	0.088	0.045	0.024	0.049	0.004	0.004	0.002	0.314
2011	0.101	0.090	0.046	0.025	0.050	0.004	0.004	0.002	0.322
2012	0.104	0.093	0.047	0.025	0.052	0.004	0.004	0.002	0.331
2013	0.107	0.095	0.049	0.026	0.053	0.004	0.004	0.002	0.341
2014	0.110	0.098	0.051	0.027	0.055	0.004	0.005	0.002	0.351
2015	0.113	0.100	0.052	0.027	0.057	0.004	0.005	0.002	0.359
2016	0.116	0.103	0.054	0.028	0.058	0.004	0.005	0.002	0.369
2017	0.120	0.106	0.056	0.028	0.061	0.004	0.005	0.002	0.383
2018	0.125	0.110	0.059	0.029	0.063	0.004	0.005	0.002	0.397
2019	0.129	0.113	0.061	0.030	0.065	0.004	0.005	0.002	0.410
2020	0.133	0.116	0.063	0.031	0.068	0.004	0.005	0.002	0.422

Sources: BTRE estimates.

TABLE 3.121 BASE CASE PROJECTIONS OF METROPOLITAN CARBONYL (TOTAL) EMISSIONS BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.293	0.267	0.119	0.082	0.136	0.015	0.014	0.005	0.930
1991	0.274	0.250	0.111	0.076	0.127	0.014	0.013	0.005	0.870
1992	0.284	0.257	0.116	0.079	0.132	0.014	0.014	0.005	0.900
1993	0.295	0.267	0.122	0.081	0.138	0.015	0.014	0.005	0.938
1994	0.313	0.283	0.131	0.086	0.147	0.016	0.015	0.006	0.996
1995	0.331	0.297	0.140	0.090	0.156	0.016	0.016	0.006	1.052
1996	0.333	0.299	0.143	0.090	0.159	0.016	0.016	0.006	1.062
1997	0.334	0.299	0.144	0.089	0.160	0.016	0.016	0.006	1.066
1998	0.327	0.294	0.142	0.087	0.157	0.016	0.016	0.006	1.045
1999	0.332	0.298	0.144	0.087	0.160	0.016	0.016	0.006	1.058
2000	0.316	0.283	0.137	0.082	0.153	0.015	0.015	0.006	1.006
2001	0.307	0.275	0.134	0.079	0.149	0.014	0.014	0.006	0.978
2002	0.311	0.279	0.136	0.080	0.151	0.014	0.015	0.006	0.992
2003	0.306	0.274	0.134	0.078	0.149	0.013	0.014	0.006	0.974
2004	0.306	0.274	0.135	0.078	0.149	0.013	0.014	0.006	0.974
2005	0.309	0.277	0.137	0.078	0.151	0.013	0.014	0.006	0.986
2006	0.312	0.279	0.139	0.079	0.153	0.013	0.014	0.006	0.994
2007	0.317	0.283	0.141	0.079	0.156	0.013	0.014	0.006	1.009
2008	0.322	0.288	0.144	0.080	0.158	0.013	0.014	0.006	1.026
2009	0.329	0.293	0.148	0.081	0.162	0.013	0.014	0.006	1.047
2010	0.338	0.302	0.153	0.083	0.167	0.013	0.014	0.006	1.077
2011	0.347	0.309	0.157	0.085	0.172	0.013	0.015	0.006	1.104
2012	0.357	0.317	0.163	0.087	0.177	0.013	0.015	0.006	1.135
2013	0.368	0.327	0.169	0.089	0.183	0.013	0.015	0.007	1.170
2014	0.378	0.335	0.174	0.091	0.189	0.014	0.015	0.007	1.203
2015	0.387	0.343	0.179	0.093	0.194	0.014	0.016	0.007	1.232
2016	0.398	0.352	0.185	0.095	0.200	0.014	0.016	0.007	1.267
2017	0.413	0.364	0.193	0.097	0.208	0.014	0.016	0.007	1.313
2018	0.428	0.377	0.201	0.100	0.217	0.014	0.017	0.008	1.361
2019	0.442	0.388	0.209	0.103	0.224	0.014	0.017	0.008	1.406
2020	0.455	0.399	0.217	0.105	0.232	0.014	0.017	0.008	1.447

Sources: BTRE estimates.

TABLE 3.122 BASE CASE PROJECTIONS OF METROPOLITAN BENZENE EMISSIONS BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.0094	0.0085	0.0038	0.0026	0.0043	0.0005	0.0005	0.0002	0.0297
1991	0.0088	0.0080	0.0035	0.0024	0.0040	0.0004	0.0004	0.0002	0.0278
1992	0.0090	0.0082	0.0037	0.0025	0.0042	0.0005	0.0004	0.0002	0.0287
1993	0.0094	0.0085	0.0039	0.0026	0.0044	0.0005	0.0005	0.0002	0.0298
1994	0.0099	0.0090	0.0042	0.0027	0.0047	0.0005	0.0005	0.0002	0.0316
1995	0.0105	0.0094	0.0044	0.0028	0.0050	0.0005	0.0005	0.0002	0.0334
1996	0.0105	0.0095	0.0045	0.0028	0.0050	0.0005	0.0005	0.0002	0.0336
1997	0.0106	0.0095	0.0046	0.0028	0.0051	0.0005	0.0005	0.0002	0.0337
1998	0.0104	0.0093	0.0045	0.0028	0.0050	0.0005	0.0005	0.0002	0.0330
1999	0.0105	0.0094	0.0046	0.0028	0.0051	0.0005	0.0005	0.0002	0.0334
2000	0.0100	0.0089	0.0043	0.0026	0.0048	0.0005	0.0005	0.0002	0.0318
2001	0.0097	0.0087	0.0042	0.0025	0.0047	0.0004	0.0005	0.0002	0.0309
2002	0.0098	0.0088	0.0043	0.0025	0.0048	0.0004	0.0005	0.0002	0.0313
2003	0.0096	0.0086	0.0042	0.0025	0.0047	0.0004	0.0004	0.0002	0.0307
2004	0.0096	0.0086	0.0042	0.0025	0.0047	0.0004	0.0004	0.0002	0.0307
2005	0.0097	0.0087	0.0043	0.0025	0.0048	0.0004	0.0004	0.0002	0.0310
2006	0.0098	0.0088	0.0044	0.0025	0.0048	0.0004	0.0004	0.0002	0.0312
2007	0.0099	0.0089	0.0044	0.0025	0.0049	0.0004	0.0004	0.0002	0.0317
2008	0.0101	0.0090	0.0045	0.0025	0.0050	0.0004	0.0004	0.0002	0.0322
2009	0.0103	0.0092	0.0046	0.0026	0.0051	0.0004	0.0004	0.0002	0.0329
2010	0.0106	0.0095	0.0048	0.0026	0.0053	0.0004	0.0005	0.0002	0.0338
2011	0.0109	0.0097	0.0049	0.0027	0.0054	0.0004	0.0005	0.0002	0.0347
2012	0.0112	0.0100	0.0051	0.0027	0.0056	0.0004	0.0005	0.0002	0.0357
2013	0.0115	0.0103	0.0053	0.0028	0.0058	0.0004	0.0005	0.0002	0.0368
2014	0.0119	0.0105	0.0055	0.0029	0.0059	0.0004	0.0005	0.0002	0.0378
2015	0.0122	0.0108	0.0056	0.0029	0.0061	0.0004	0.0005	0.0002	0.0387
2016	0.0125	0.0111	0.0058	0.0030	0.0063	0.0004	0.0005	0.0002	0.0398
2017	0.0130	0.0114	0.0061	0.0031	0.0065	0.0004	0.0005	0.0002	0.0413
2018	0.0134	0.0118	0.0063	0.0032	0.0068	0.0004	0.0005	0.0002	0.0427
2019	0.0139	0.0122	0.0066	0.0032	0.0071	0.0004	0.0005	0.0002	0.0442
2020	0.0143	0.0125	0.0068	0.0033	0.0073	0.0005	0.0005	0.0002	0.0454

Sources: BTRE estimates.

TABLE 3.123 BASE CASE PROJECTIONS OF METROPOLITAN TOLUENE EMISSIONS BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.0095	0.0086	0.0038	0.0026	0.0044	0.0005	0.0005	0.0002	0.0301
1991	0.0089	0.0081	0.0036	0.0025	0.0041	0.0004	0.0004	0.0002	0.0281
1992	0.0092	0.0083	0.0037	0.0025	0.0043	0.0005	0.0004	0.0002	0.0290
1993	0.0095	0.0086	0.0039	0.0026	0.0044	0.0005	0.0005	0.0002	0.0302
1994	0.0101	0.0091	0.0042	0.0027	0.0047	0.0005	0.0005	0.0002	0.0320
1995	0.0106	0.0095	0.0045	0.0029	0.0050	0.0005	0.0005	0.0002	0.0337
1996	0.0107	0.0096	0.0046	0.0029	0.0051	0.0005	0.0005	0.0002	0.0340
1997	0.0107	0.0096	0.0046	0.0029	0.0051	0.0005	0.0005	0.0002	0.0341
1998	0.0105	0.0094	0.0045	0.0028	0.0050	0.0005	0.0005	0.0002	0.0334
1999	0.0106	0.0095	0.0046	0.0028	0.0051	0.0005	0.0005	0.0002	0.0339
2000	0.0101	0.0091	0.0044	0.0026	0.0049	0.0005	0.0005	0.0002	0.0322
2001	0.0098	0.0088	0.0043	0.0025	0.0048	0.0004	0.0005	0.0002	0.0314
2002	0.0100	0.0090	0.0044	0.0026	0.0048	0.0004	0.0005	0.0002	0.0318
2003	0.0098	0.0088	0.0043	0.0025	0.0048	0.0004	0.0005	0.0002	0.0313
2004	0.0098	0.0088	0.0043	0.0025	0.0048	0.0004	0.0005	0.0002	0.0313
2005	0.0099	0.0089	0.0044	0.0025	0.0049	0.0004	0.0005	0.0002	0.0317
2006	0.0100	0.0090	0.0045	0.0025	0.0049	0.0004	0.0005	0.0002	0.0320
2007	0.0102	0.0091	0.0045	0.0026	0.0050	0.0004	0.0005	0.0002	0.0324
2008	0.0104	0.0093	0.0046	0.0026	0.0051	0.0004	0.0005	0.0002	0.0330
2009	0.0106	0.0094	0.0048	0.0026	0.0052	0.0004	0.0005	0.0002	0.0337
2010	0.0109	0.0097	0.0049	0.0027	0.0054	0.0004	0.0005	0.0002	0.0346
2011	0.0112	0.0099	0.0051	0.0027	0.0055	0.0004	0.0005	0.0002	0.0355
2012	0.0115	0.0102	0.0052	0.0028	0.0057	0.0004	0.0005	0.0002	0.0365
2013	0.0118	0.0105	0.0054	0.0029	0.0059	0.0004	0.0005	0.0002	0.0377
2014	0.0122	0.0108	0.0056	0.0029	0.0061	0.0004	0.0005	0.0002	0.0387
2015	0.0125	0.0110	0.0058	0.0030	0.0062	0.0004	0.0005	0.0002	0.0397
2016	0.0128	0.0113	0.0060	0.0030	0.0064	0.0004	0.0005	0.0002	0.0408
2017	0.0133	0.0117	0.0062	0.0031	0.0067	0.0004	0.0005	0.0002	0.0423
2018	0.0138	0.0121	0.0065	0.0032	0.0070	0.0005	0.0005	0.0002	0.0438
2019	0.0142	0.0125	0.0067	0.0033	0.0072	0.0005	0.0005	0.0002	0.0453
2020	0.0147	0.0128	0.0070	0.0034	0.0075	0.0005	0.0006	0.0003	0.0466

Sources: BTRE estimates.

TABLE 3.124 BASE CASE PROJECTIONS OF METROPOLITAN XYLENE EMISSIONS BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.0076	0.0069	0.0031	0.0021	0.0035	0.0004	0.0004	0.0001	0.0242
1991	0.0071	0.0065	0.0029	0.0020	0.0033	0.0004	0.0003	0.0001	0.0226
1992	0.0073	0.0067	0.0030	0.0020	0.0034	0.0004	0.0004	0.0001	0.0233
1993	0.0076	0.0069	0.0031	0.0021	0.0036	0.0004	0.0004	0.0001	0.0242
1994	0.0081	0.0073	0.0034	0.0022	0.0038	0.0004	0.0004	0.0001	0.0257
1995	0.0085	0.0076	0.0036	0.0023	0.0040	0.0004	0.0004	0.0002	0.0271
1996	0.0086	0.0077	0.0037	0.0023	0.0041	0.0004	0.0004	0.0002	0.0273
1997	0.0086	0.0077	0.0037	0.0023	0.0041	0.0004	0.0004	0.0002	0.0274
1998	0.0084	0.0075	0.0036	0.0022	0.0040	0.0004	0.0004	0.0002	0.0268
1999	0.0085	0.0077	0.0037	0.0022	0.0041	0.0004	0.0004	0.0002	0.0272
2000	0.0081	0.0073	0.0035	0.0021	0.0039	0.0004	0.0004	0.0002	0.0259
2001	0.0079	0.0071	0.0034	0.0020	0.0038	0.0004	0.0004	0.0001	0.0252
2002	0.0080	0.0072	0.0035	0.0021	0.0039	0.0004	0.0004	0.0001	0.0256
2003	0.0079	0.0071	0.0035	0.0020	0.0038	0.0003	0.0004	0.0001	0.0251
2004	0.0079	0.0071	0.0035	0.0020	0.0038	0.0003	0.0004	0.0001	0.0251
2005	0.0080	0.0072	0.0035	0.0020	0.0039	0.0003	0.0004	0.0001	0.0254
2006	0.0080	0.0072	0.0036	0.0020	0.0039	0.0003	0.0004	0.0001	0.0257
2007	0.0082	0.0073	0.0036	0.0021	0.0040	0.0003	0.0004	0.0001	0.0261
2008	0.0083	0.0074	0.0037	0.0021	0.0041	0.0003	0.0004	0.0002	0.0265
2009	0.0085	0.0076	0.0038	0.0021	0.0042	0.0003	0.0004	0.0002	0.0270
2010	0.0087	0.0078	0.0039	0.0022	0.0043	0.0003	0.0004	0.0002	0.0278
2011	0.0090	0.0080	0.0041	0.0022	0.0044	0.0003	0.0004	0.0002	0.0285
2012	0.0092	0.0082	0.0042	0.0022	0.0046	0.0003	0.0004	0.0002	0.0293
2013	0.0095	0.0084	0.0044	0.0023	0.0047	0.0003	0.0004	0.0002	0.0302
2014	0.0098	0.0087	0.0045	0.0023	0.0049	0.0004	0.0004	0.0002	0.0311
2015	0.0100	0.0089	0.0046	0.0024	0.0050	0.0004	0.0004	0.0002	0.0319
2016	0.0103	0.0091	0.0048	0.0024	0.0052	0.0004	0.0004	0.0002	0.0328
2017	0.0107	0.0094	0.0050	0.0025	0.0054	0.0004	0.0004	0.0002	0.0340
2018	0.0111	0.0097	0.0052	0.0026	0.0056	0.0004	0.0004	0.0002	0.0352
2019	0.0114	0.0100	0.0054	0.0027	0.0058	0.0004	0.0004	0.0002	0.0364
2020	0.0118	0.0103	0.0056	0.0027	0.0060	0.0004	0.0004	0.0002	0.0374

Note: Includes emissions of o, m and p isomers.

Sources: BTRE estimates.

TABLE 3.125 BASE CASE PROJECTIONS OF METROPOLITAN PAH EMISSIONS BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.0147	0.0134	0.0059	0.0041	0.0068	0.0007	0.0007	0.0003	0.0465
1991	0.0137	0.0125	0.0055	0.0038	0.0063	0.0007	0.0007	0.0002	0.0435
1992	0.0142	0.0128	0.0058	0.0039	0.0066	0.0007	0.0007	0.0003	0.0450
1993	0.0147	0.0133	0.0061	0.0040	0.0069	0.0007	0.0007	0.0003	0.0468
1994	0.0156	0.0141	0.0065	0.0043	0.0073	0.0008	0.0008	0.0003	0.0496
1995	0.0165	0.0148	0.0070	0.0045	0.0078	0.0008	0.0008	0.0003	0.0525
1996	0.0167	0.0150	0.0072	0.0045	0.0080	0.0008	0.0008	0.0003	0.0532
1997	0.0168	0.0151	0.0072	0.0045	0.0081	0.0008	0.0008	0.0003	0.0536
1998	0.0165	0.0148	0.0072	0.0044	0.0080	0.0008	0.0008	0.0003	0.0528
1999	0.0168	0.0151	0.0073	0.0044	0.0081	0.0008	0.0008	0.0003	0.0536
2000	0.0160	0.0143	0.0069	0.0042	0.0077	0.0007	0.0008	0.0003	0.0509
2001	0.0155	0.0139	0.0068	0.0040	0.0075	0.0007	0.0007	0.0003	0.0495
2002	0.0157	0.0141	0.0069	0.0040	0.0076	0.0007	0.0007	0.0003	0.0501
2003	0.0153	0.0138	0.0067	0.0039	0.0075	0.0007	0.0007	0.0003	0.0489
2004	0.0152	0.0137	0.0067	0.0039	0.0074	0.0007	0.0007	0.0003	0.0485
2005	0.0153	0.0137	0.0068	0.0039	0.0075	0.0006	0.0007	0.0003	0.0486
2006	0.0152	0.0136	0.0068	0.0038	0.0075	0.0006	0.0007	0.0003	0.0485
2007	0.0153	0.0137	0.0068	0.0038	0.0075	0.0006	0.0007	0.0003	0.0489
2008	0.0155	0.0138	0.0069	0.0039	0.0076	0.0006	0.0007	0.0003	0.0493
2009	0.0157	0.0140	0.0071	0.0039	0.0077	0.0006	0.0007	0.0003	0.0500
2010	0.0160	0.0143	0.0073	0.0040	0.0079	0.0006	0.0007	0.0003	0.0511
2011	0.0164	0.0146	0.0074	0.0040	0.0081	0.0006	0.0007	0.0003	0.0521
2012	0.0167	0.0149	0.0076	0.0041	0.0083	0.0006	0.0007	0.0003	0.0533
2013	0.0172	0.0153	0.0079	0.0042	0.0086	0.0006	0.0007	0.0003	0.0547
2014	0.0176	0.0156	0.0081	0.0042	0.0088	0.0006	0.0007	0.0003	0.0560
2015	0.0180	0.0159	0.0083	0.0043	0.0090	0.0006	0.0007	0.0003	0.0573
2016	0.0185	0.0163	0.0086	0.0044	0.0093	0.0006	0.0007	0.0003	0.0588
2017	0.0191	0.0169	0.0090	0.0045	0.0097	0.0006	0.0008	0.0003	0.0609
2018	0.0198	0.0174	0.0093	0.0046	0.0100	0.0007	0.0008	0.0003	0.0630
2019	0.0205	0.0180	0.0097	0.0048	0.0104	0.0007	0.0008	0.0004	0.0652
2020	0.0212	0.0185	0.0101	0.0049	0.0108	0.0007	0.0008	0.0004	0.0673

Sources: BTRE estimates.

TABLE 3.126 BASE CASE PROJECTIONS OF METROPOLITAN 1,3-BUTADIENE EMISSIONS BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
1991	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.004
1992	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.004
1993	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
1994	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
1995	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
1996	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
1997	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
1998	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
1999	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2000	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2001	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2002	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2003	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2004	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2005	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2006	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2007	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2008	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2009	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2010	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
2011	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
2012	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
2013	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
2014	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
2015	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
2016	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
2017	0.002	0.002	0.001	0.000	0.001	0.000	0.000	0.000	0.006
2018	0.002	0.002	0.001	0.000	0.001	0.000	0.000	0.000	0.006
2019	0.002	0.002	0.001	0.000	0.001	0.000	0.000	0.000	0.006
2020	0.002	0.002	0.001	0.000	0.001	0.000	0.000	0.000	0.006

Sources: BTRE estimates.

TABLE 3.127 ESTIMATED OZONE REACTIVITY OF BASE CASE PROJECTIONS OF  
METROPOLITAN VOC EMISSIONS BY ARTICULATED TRUCKS TO 2020  
(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	1.36	1.23	0.55	0.38	0.63	0.07	0.07	0.02	4.30
1991	1.27	1.15	0.51	0.35	0.59	0.06	0.06	0.02	4.02
1992	1.31	1.19	0.54	0.36	0.61	0.07	0.06	0.02	4.16
1993	1.36	1.23	0.56	0.37	0.64	0.07	0.07	0.02	4.33
1994	1.45	1.30	0.60	0.40	0.68	0.07	0.07	0.03	4.60
1995	1.53	1.37	0.64	0.41	0.72	0.08	0.07	0.03	4.86
1996	1.54	1.38	0.66	0.41	0.73	0.08	0.08	0.03	4.90
1997	1.54	1.38	0.66	0.41	0.74	0.07	0.08	0.03	4.92
1998	1.51	1.36	0.65	0.40	0.73	0.07	0.07	0.03	4.82
1999	1.53	1.37	0.67	0.40	0.74	0.07	0.07	0.03	4.88
2000	1.46	1.31	0.63	0.38	0.70	0.07	0.07	0.03	4.64
2001	1.42	1.27	0.62	0.37	0.69	0.06	0.07	0.03	4.52
2002	1.44	1.29	0.63	0.37	0.70	0.06	0.07	0.03	4.58
2003	1.41	1.27	0.62	0.36	0.69	0.06	0.07	0.03	4.50
2004	1.41	1.27	0.62	0.36	0.69	0.06	0.06	0.03	4.50
2005	1.43	1.28	0.63	0.36	0.70	0.06	0.06	0.03	4.55
2006	1.44	1.29	0.64	0.36	0.71	0.06	0.06	0.03	4.59
2007	1.46	1.31	0.65	0.37	0.72	0.06	0.06	0.03	4.66
2008	1.49	1.33	0.67	0.37	0.73	0.06	0.07	0.03	4.74
2009	1.52	1.36	0.68	0.38	0.75	0.06	0.07	0.03	4.84
2010	1.56	1.39	0.71	0.39	0.77	0.06	0.07	0.03	4.98
2011	1.60	1.43	0.73	0.39	0.79	0.06	0.07	0.03	5.10
2012	1.65	1.47	0.75	0.40	0.82	0.06	0.07	0.03	5.25
2013	1.70	1.51	0.78	0.41	0.85	0.06	0.07	0.03	5.41
2014	1.75	1.55	0.80	0.42	0.87	0.06	0.07	0.03	5.56
2015	1.79	1.59	0.83	0.43	0.90	0.06	0.07	0.03	5.70
2016	1.84	1.63	0.86	0.44	0.93	0.06	0.07	0.03	5.86
2017	1.91	1.68	0.89	0.45	0.96	0.06	0.08	0.03	6.07
2018	1.98	1.74	0.93	0.46	1.00	0.07	0.08	0.03	6.29
2019	2.05	1.80	0.97	0.48	1.04	0.07	0.08	0.04	6.51
2020	2.10	1.84	1.00	0.49	1.07	0.07	0.08	0.04	6.69

Sources: BTRE estimates.

TABLE 3.128 ESTIMATED METROPOLITAN EMISSIONS OF OTHER NPI SPECIES BY ARTICULATED TRUCKS TO 2020

(thousand tonnes)

Year	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	n-Hexane	Styrene
1990	0.155	0.000	0.083	0.002	0.006	0.010	0.001
1991	0.145	0.000	0.078	0.001	0.006	0.009	0.001
1992	0.150	0.000	0.081	0.002	0.006	0.010	0.001
1993	0.156	0.000	0.084	0.002	0.006	0.010	0.001
1994	0.166	0.000	0.089	0.002	0.006	0.011	0.001
1995	0.175	0.000	0.094	0.002	0.007	0.011	0.001
1996	0.177	0.000	0.095	0.002	0.007	0.012	0.001
1997	0.178	0.000	0.095	0.002	0.007	0.012	0.001
1998	0.174	0.000	0.094	0.002	0.007	0.011	0.001
1999	0.176	0.000	0.095	0.002	0.007	0.012	0.001
2000	0.168	0.000	0.090	0.002	0.006	0.011	0.001
2001	0.163	0.000	0.088	0.002	0.006	0.011	0.001
2002	0.165	0.000	0.089	0.002	0.006	0.011	0.001
2003	0.162	0.000	0.087	0.002	0.006	0.011	0.001
2004	0.162	0.000	0.087	0.002	0.006	0.011	0.001
2005	0.164	0.000	0.088	0.002	0.006	0.011	0.001
2006	0.166	0.000	0.089	0.002	0.006	0.011	0.001
2007	0.168	0.000	0.090	0.002	0.006	0.011	0.001
2008	0.171	0.000	0.092	0.002	0.006	0.011	0.001
2009	0.174	0.000	0.094	0.002	0.007	0.012	0.001
2010	0.179	0.000	0.096	0.002	0.007	0.012	0.001
2011	0.184	0.000	0.099	0.002	0.007	0.012	0.001
2012	0.189	0.000	0.102	0.002	0.007	0.013	0.001
2013	0.195	0.000	0.105	0.002	0.007	0.013	0.001
2014	0.200	0.000	0.108	0.002	0.008	0.013	0.002
2015	0.205	0.000	0.110	0.002	0.008	0.014	0.002
2016	0.211	0.000	0.113	0.002	0.008	0.014	0.002
2017	0.219	0.000	0.118	0.002	0.008	0.015	0.002
2018	0.227	0.000	0.122	0.002	0.009	0.015	0.002
2019	0.234	0.000	0.126	0.002	0.009	0.016	0.002
2020	0.241	0.000	0.130	0.002	0.009	0.016	0.002

Sources: BTRE estimates.

TABLE 3.129 ESTIMATED NATIONAL EMISSIONS OF OTHER NPI SPECIES BY ARTICULATED TRUCKS TO 2020

(*thousand tonnes*)

Year	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	<i>n</i> -Hexane	Styrene
1990	0.773	0.000	0.416	0.008	0.030	0.050	0.006
1991	0.755	0.000	0.406	0.008	0.029	0.049	0.006
1992	0.764	0.000	0.411	0.008	0.029	0.050	0.006
1993	0.833	0.000	0.448	0.008	0.032	0.054	0.006
1994	0.845	0.000	0.455	0.009	0.032	0.055	0.006
1995	0.870	0.000	0.468	0.009	0.033	0.057	0.007
1996	0.837	0.000	0.450	0.008	0.032	0.054	0.006
1997	0.814	0.000	0.438	0.008	0.031	0.053	0.006
1998	0.827	0.000	0.445	0.008	0.031	0.054	0.006
1999	0.805	0.000	0.433	0.008	0.031	0.053	0.006
2000	0.769	0.000	0.414	0.008	0.029	0.050	0.006
2001	0.732	0.000	0.394	0.007	0.028	0.048	0.006
2002	0.731	0.000	0.393	0.007	0.028	0.048	0.006
2003	0.718	0.000	0.386	0.007	0.027	0.047	0.005
2004	0.715	0.000	0.384	0.007	0.027	0.047	0.005
2005	0.707	0.000	0.380	0.007	0.027	0.047	0.005
2006	0.702	0.000	0.378	0.007	0.027	0.046	0.005
2007	0.701	0.000	0.377	0.007	0.027	0.046	0.005
2008	0.701	0.000	0.377	0.007	0.027	0.046	0.005
2009	0.703	0.000	0.378	0.007	0.027	0.046	0.005
2010	0.711	0.000	0.382	0.007	0.027	0.047	0.005
2011	0.719	0.000	0.386	0.007	0.027	0.048	0.005
2012	0.728	0.000	0.391	0.007	0.028	0.048	0.006
2013	0.739	0.000	0.397	0.008	0.028	0.049	0.006
2014	0.748	0.000	0.402	0.008	0.028	0.050	0.006
2015	0.754	0.000	0.406	0.008	0.029	0.050	0.006
2016	0.763	0.000	0.410	0.008	0.029	0.051	0.006
2017	0.777	0.000	0.418	0.008	0.030	0.052	0.006
2018	0.791	0.000	0.425	0.008	0.030	0.052	0.006
2019	0.801	0.000	0.431	0.008	0.030	0.053	0.006
2020	0.808	0.000	0.434	0.008	0.031	0.054	0.006

Sources: BTRE estimates.

TABLE 3.130 BASE CASE PROJECTIONS OF METROPOLITAN LEAD EMISSIONS BY BUSES TO 2020

Year	(tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	0.923	0.664	0.414	0.304	0.344	0.083	0.063	0.098	2.894	
1991	0.866	0.622	0.393	0.285	0.323	0.078	0.059	0.094	2.720	
1992	0.786	0.563	0.361	0.257	0.294	0.071	0.054	0.086	2.470	
1993	0.589	0.421	0.275	0.192	0.222	0.053	0.040	0.064	1.858	
1994	0.434	0.309	0.205	0.141	0.165	0.039	0.030	0.047	1.370	
1995	0.243	0.172	0.116	0.078	0.093	0.021	0.017	0.027	0.766	
1996	0.194	0.137	0.094	0.062	0.075	0.017	0.014	0.021	0.614	
1997	0.148	0.105	0.072	0.047	0.058	0.013	0.010	0.016	0.468	
1998	0.101	0.072	0.049	0.032	0.039	0.009	0.007	0.011	0.320	
1999	0.040	0.029	0.020	0.012	0.016	0.003	0.003	0.004	0.127	
2000	0.035	0.025	0.017	0.011	0.014	0.003	0.003	0.004	0.112	
2001	0.016	0.011	0.008	0.005	0.006	0.001	0.001	0.002	0.049	
2002	0.004	0.003	0.002	0.001	0.002	0.000	0.000	0.000	0.014	
2003	0.004	0.003	0.002	0.001	0.002	0.000	0.000	0.000	0.013	
2004	0.004	0.003	0.002	0.001	0.002	0.000	0.000	0.000	0.012	
2005	0.004	0.003	0.002	0.001	0.002	0.000	0.000	0.000	0.012	
2006	0.004	0.003	0.002	0.001	0.002	0.000	0.000	0.000	0.012	
2007	0.004	0.002	0.002	0.001	0.001	0.000	0.000	0.000	0.011	
2008	0.004	0.002	0.002	0.001	0.001	0.000	0.000	0.000	0.011	
2009	0.004	0.002	0.002	0.001	0.001	0.000	0.000	0.000	0.011	
2010	0.004	0.002	0.002	0.001	0.001	0.000	0.000	0.000	0.011	
2011	0.004	0.002	0.002	0.001	0.001	0.000	0.000	0.000	0.011	
2012	0.004	0.002	0.002	0.001	0.001	0.000	0.000	0.000	0.011	
2013	0.004	0.002	0.002	0.001	0.001	0.000	0.000	0.000	0.011	
2014	0.004	0.002	0.002	0.001	0.002	0.000	0.000	0.000	0.011	
2015	0.004	0.002	0.002	0.001	0.002	0.000	0.000	0.000	0.011	
2016	0.004	0.002	0.002	0.001	0.002	0.000	0.000	0.000	0.011	
2017	0.004	0.002	0.002	0.001	0.002	0.000	0.000	0.000	0.012	
2018	0.004	0.002	0.002	0.001	0.002	0.000	0.000	0.000	0.012	
2019	0.004	0.002	0.002	0.001	0.002	0.000	0.000	0.000	0.012	
2020	0.004	0.002	0.002	0.001	0.002	0.000	0.000	0.000	0.012	

Sources: BTRE estimates.

TABLE 3.131 BASE CASE PROJECTIONS OF METROPOLITAN SO<sub>X</sub> EMISSIONS BY BUSES TO 2020

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	191.7	138.0	86.0	63.2	71.3	17.3	13.1	20.4	601.0
1991	179.4	128.7	81.3	59.0	66.9	16.2	12.3	19.4	563.2
1992	167.8	120.1	77.0	55.0	62.9	15.1	11.4	18.3	527.5
1993	153.4	109.5	71.6	50.0	57.8	13.8	10.5	16.8	483.3
1994	150.1	106.6	70.9	48.6	57.0	13.4	10.2	16.4	473.2
1995	144.5	102.3	69.0	46.3	55.4	12.8	10.0	15.8	456.0
1996	139.3	98.5	67.0	44.2	53.8	12.2	9.7	15.2	439.9
1997	135.2	95.4	65.3	42.5	52.4	11.6	9.6	14.5	426.5
1998	130.6	92.4	63.5	40.9	50.8	11.0	9.3	13.8	412.3
1999	114.8	81.3	56.0	35.6	44.8	9.6	8.2	12.1	362.3
2000	101.2	71.7	49.4	31.1	39.6	8.3	7.3	10.6	319.1
2001	87.3	61.8	42.7	26.6	34.2	7.0	6.3	9.1	275.0
2002	76.8	54.3	37.8	23.2	30.2	6.1	5.6	8.0	242.0
2003	48.5	34.3	24.0	14.6	19.2	3.8	3.6	5.0	152.9
2004	29.4	20.7	14.6	8.7	11.6	2.3	2.2	3.0	92.5
2005	20.0	14.1	10.1	5.9	8.0	1.5	1.5	2.1	63.2
2006	5.8	4.1	2.9	1.7	2.3	0.4	0.4	0.6	18.2
2007	5.9	4.1	3.0	1.7	2.4	0.4	0.4	0.6	18.5
2008	5.9	4.1	3.0	1.7	2.4	0.4	0.4	0.6	18.7
2009	6.0	4.2	3.1	1.7	2.4	0.4	0.5	0.6	18.9
2010	6.1	4.3	3.2	1.7	2.5	0.4	0.5	0.6	19.4
2011	6.2	4.3	3.3	1.7	2.5	0.4	0.5	0.6	19.6
2012	6.3	4.3	3.3	1.8	2.6	0.4	0.5	0.6	19.8
2013	6.4	4.4	3.4	1.8	2.6	0.4	0.5	0.6	20.1
2014	6.4	4.4	3.5	1.8	2.7	0.4	0.5	0.6	20.3
2015	6.5	4.4	3.5	1.8	2.7	0.4	0.5	0.6	20.6
2016	6.6	4.5	3.6	1.8	2.8	0.4	0.5	0.6	20.8
2017	6.7	4.6	3.7	1.8	2.9	0.4	0.5	0.7	21.3
2018	6.8	4.6	3.8	1.8	2.9	0.4	0.5	0.7	21.5
2019	6.9	4.6	3.9	1.8	2.9	0.4	0.6	0.7	21.8
2020	7.0	4.7	3.9	1.8	3.0	0.4	0.6	0.7	22.1

Sources: BTRE estimates.

TABLE 3.132 BASE CASE PROJECTIONS OF METROPOLITAN CO EMISSIONS BY BUSES  
TO 2020

Year	(thousand tonnes)								
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	3.38	2.43	1.51	1.11	1.26	0.31	0.23	0.36	10.59
1991	3.42	2.46	1.55	1.13	1.28	0.31	0.23	0.37	10.75
1992	3.45	2.47	1.58	1.13	1.29	0.31	0.24	0.38	10.84
1993	3.37	2.41	1.57	1.10	1.27	0.30	0.23	0.37	10.62
1994	3.47	2.47	1.64	1.12	1.32	0.31	0.24	0.38	10.94
1995	3.50	2.48	1.67	1.12	1.34	0.31	0.24	0.38	11.05
1996	3.54	2.50	1.70	1.12	1.37	0.31	0.25	0.39	11.18
1997	3.62	2.55	1.75	1.14	1.40	0.31	0.26	0.39	11.41
1998	3.67	2.60	1.78	1.15	1.43	0.31	0.26	0.39	11.59
1999	3.65	2.59	1.78	1.13	1.42	0.30	0.26	0.39	11.53
2000	3.72	2.63	1.81	1.14	1.45	0.30	0.27	0.39	11.71
2001	3.52	2.49	1.72	1.07	1.38	0.28	0.25	0.37	11.08
2002	3.38	2.39	1.67	1.02	1.33	0.27	0.25	0.35	10.66
2003	3.30	2.33	1.63	0.99	1.30	0.26	0.24	0.34	10.39
2004	3.17	2.23	1.58	0.94	1.26	0.24	0.23	0.33	10.00
2005	3.07	2.16	1.54	0.91	1.22	0.23	0.23	0.32	9.68
2006	2.95	2.07	1.49	0.87	1.18	0.22	0.22	0.30	9.31
2007	2.86	2.00	1.46	0.83	1.15	0.21	0.21	0.29	9.02
2008	2.77	1.93	1.42	0.80	1.12	0.20	0.21	0.28	8.74
2009	2.69	1.87	1.39	0.77	1.09	0.19	0.20	0.27	8.48
2010	2.64	1.83	1.37	0.75	1.08	0.19	0.20	0.26	8.31
2011	2.56	1.77	1.34	0.72	1.05	0.18	0.20	0.26	8.07
2012	2.50	1.72	1.32	0.69	1.03	0.17	0.19	0.25	7.87
2013	2.44	1.67	1.30	0.67	1.01	0.16	0.19	0.24	7.68
2014	2.37	1.62	1.27	0.65	0.99	0.16	0.19	0.23	7.47
2015	2.32	1.58	1.25	0.63	0.97	0.15	0.18	0.23	7.30
2016	2.27	1.54	1.24	0.61	0.95	0.15	0.18	0.22	7.16
2017	2.25	1.53	1.24	0.60	0.95	0.14	0.18	0.22	7.11
2018	2.22	1.50	1.23	0.58	0.94	0.14	0.18	0.21	7.00
2019	2.20	1.48	1.23	0.57	0.94	0.14	0.18	0.21	6.94
2020	2.19	1.46	1.23	0.56	0.94	0.13	0.18	0.21	6.90

Sources: BTRE estimates.

TABLE 3.133 BASE CASE PROJECTIONS OF METROPOLITAN NO<sub>x</sub> EMISSIONS BY BUSES  
TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	2.80	2.01	1.25	0.92	1.04	0.25	0.19	0.30	8.77	
1991	2.75	1.97	1.25	0.90	1.03	0.25	0.19	0.30	8.63	
1992	2.71	1.94	1.24	0.89	1.02	0.24	0.18	0.30	8.53	
1993	2.62	1.87	1.22	0.86	0.99	0.24	0.18	0.29	8.26	
1994	2.71	1.93	1.28	0.88	1.03	0.24	0.19	0.30	8.56	
1995	2.75	1.95	1.31	0.88	1.05	0.24	0.19	0.30	8.69	
1996	2.81	1.98	1.35	0.89	1.08	0.25	0.20	0.31	8.86	
1997	2.89	2.04	1.40	0.91	1.12	0.25	0.20	0.31	9.12	
1998	2.97	2.10	1.44	0.93	1.15	0.25	0.21	0.31	9.37	
1999	3.00	2.12	1.46	0.93	1.17	0.25	0.22	0.32	9.46	
2000	3.12	2.21	1.52	0.96	1.22	0.26	0.22	0.33	9.84	
2001	2.97	2.10	1.45	0.90	1.16	0.24	0.22	0.31	9.35	
2002	2.90	2.05	1.43	0.88	1.14	0.23	0.21	0.30	9.14	
2003	2.87	2.03	1.42	0.86	1.13	0.22	0.21	0.30	9.05	
2004	2.83	1.99	1.41	0.84	1.12	0.22	0.21	0.29	8.91	
2005	2.81	1.97	1.41	0.83	1.12	0.21	0.21	0.29	8.86	
2006	2.77	1.94	1.40	0.81	1.11	0.21	0.21	0.28	8.74	
2007	2.76	1.93	1.41	0.80	1.11	0.20	0.21	0.28	8.70	
2008	2.71	1.89	1.39	0.78	1.10	0.20	0.20	0.27	8.55	
2009	2.65	1.84	1.37	0.76	1.08	0.19	0.20	0.27	8.36	
2010	2.62	1.82	1.37	0.74	1.07	0.19	0.20	0.26	8.26	
2011	2.56	1.77	1.34	0.72	1.05	0.18	0.20	0.26	8.08	
2012	2.51	1.73	1.33	0.70	1.03	0.17	0.19	0.25	7.92	
2013	2.46	1.69	1.31	0.68	1.02	0.17	0.19	0.24	7.76	
2014	2.40	1.64	1.29	0.66	1.00	0.16	0.19	0.24	7.57	
2015	2.35	1.60	1.27	0.64	0.98	0.15	0.18	0.23	7.41	
2016	2.30	1.56	1.25	0.62	0.97	0.15	0.18	0.22	7.25	
2017	2.28	1.54	1.25	0.61	0.96	0.14	0.18	0.22	7.18	
2018	2.24	1.51	1.24	0.59	0.95	0.14	0.18	0.21	7.05	
2019	2.20	1.48	1.23	0.58	0.94	0.14	0.18	0.21	6.95	
2020	2.19	1.46	1.23	0.56	0.94	0.13	0.18	0.21	6.90	

Sources: BTRE estimates.

TABLE 3.134 BASE CASE PROJECTIONS OF METROPOLITAN VOC (TOTAL) EMISSIONS  
BY BUSES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.998	0.718	0.448	0.329	0.371	0.090	0.068	0.106	3.129
1991	0.987	0.708	0.447	0.325	0.368	0.089	0.068	0.107	3.098
1992	0.975	0.698	0.447	0.319	0.365	0.088	0.067	0.106	3.066
1993	0.944	0.674	0.440	0.308	0.356	0.085	0.065	0.103	2.974
1994	0.973	0.691	0.459	0.315	0.370	0.087	0.066	0.106	3.068
1995	0.977	0.692	0.467	0.313	0.374	0.086	0.067	0.107	3.083
1996	0.972	0.687	0.468	0.309	0.375	0.085	0.068	0.106	3.070
1997	0.973	0.687	0.470	0.306	0.377	0.084	0.069	0.104	3.070
1998	0.975	0.690	0.474	0.305	0.380	0.083	0.070	0.103	3.079
1999	0.959	0.679	0.468	0.297	0.374	0.080	0.069	0.101	3.027
2000	0.966	0.684	0.471	0.297	0.378	0.079	0.070	0.101	3.045
2001	0.891	0.631	0.436	0.271	0.349	0.072	0.065	0.093	2.808
2002	0.838	0.592	0.412	0.253	0.330	0.066	0.061	0.087	2.639
2003	0.799	0.564	0.395	0.240	0.315	0.062	0.059	0.082	2.516
2004	0.760	0.535	0.379	0.226	0.302	0.059	0.056	0.078	2.396
2005	0.731	0.514	0.367	0.216	0.292	0.056	0.054	0.075	2.304
2006	0.697	0.488	0.353	0.204	0.279	0.052	0.052	0.071	2.196
2007	0.673	0.470	0.343	0.196	0.271	0.050	0.051	0.068	2.122
2008	0.647	0.450	0.332	0.186	0.261	0.047	0.049	0.065	2.038
2009	0.621	0.432	0.321	0.178	0.252	0.045	0.047	0.063	1.959
2010	0.604	0.419	0.315	0.171	0.247	0.043	0.046	0.061	1.905
2011	0.580	0.401	0.304	0.163	0.238	0.040	0.045	0.058	1.829
2012	0.561	0.386	0.296	0.156	0.231	0.038	0.043	0.056	1.767
2013	0.543	0.373	0.289	0.150	0.225	0.037	0.042	0.054	1.713
2014	0.525	0.359	0.282	0.144	0.218	0.035	0.041	0.052	1.656
2015	0.510	0.348	0.276	0.138	0.213	0.033	0.040	0.050	1.609
2016	0.495	0.336	0.270	0.133	0.208	0.032	0.039	0.048	1.560
2017	0.486	0.329	0.267	0.129	0.205	0.031	0.038	0.047	1.532
2018	0.476	0.321	0.263	0.125	0.202	0.030	0.038	0.046	1.501
2019	0.468	0.314	0.261	0.122	0.200	0.029	0.037	0.045	1.476
2020	0.463	0.309	0.260	0.120	0.198	0.028	0.037	0.044	1.459

Sources: BTRE estimates.

TABLE 3.135 BASE CASE PROJECTIONS OF METROPOLITAN PM (TOTAL) EMISSIONS BY BUSES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.260	0.187	0.117	0.086	0.097	0.024	0.018	0.028	0.816
1991	0.255	0.183	0.116	0.084	0.095	0.023	0.017	0.028	0.800
1992	0.250	0.179	0.115	0.082	0.094	0.022	0.017	0.027	0.786
1993	0.241	0.172	0.112	0.078	0.091	0.022	0.016	0.026	0.758
1994	0.249	0.177	0.117	0.081	0.095	0.022	0.017	0.027	0.784
1995	0.254	0.180	0.121	0.081	0.097	0.022	0.017	0.028	0.801
1996	0.258	0.182	0.124	0.082	0.100	0.023	0.018	0.028	0.814
1997	0.264	0.186	0.128	0.083	0.102	0.023	0.019	0.028	0.833
1998	0.269	0.190	0.131	0.084	0.105	0.023	0.019	0.028	0.849
1999	0.269	0.191	0.131	0.083	0.105	0.022	0.019	0.028	0.850
2000	0.277	0.196	0.135	0.085	0.108	0.023	0.020	0.029	0.874
2001	0.257	0.182	0.126	0.078	0.101	0.021	0.019	0.027	0.809
2002	0.243	0.172	0.119	0.073	0.096	0.019	0.018	0.025	0.765
2003	0.227	0.161	0.113	0.068	0.090	0.018	0.017	0.023	0.716
2004	0.212	0.149	0.106	0.063	0.084	0.016	0.016	0.022	0.669
2005	0.200	0.141	0.101	0.059	0.080	0.015	0.015	0.021	0.631
2006	0.185	0.130	0.094	0.054	0.074	0.014	0.014	0.019	0.583
2007	0.175	0.123	0.089	0.051	0.071	0.013	0.013	0.018	0.553
2008	0.165	0.115	0.085	0.048	0.067	0.012	0.012	0.017	0.521
2009	0.155	0.108	0.080	0.044	0.063	0.011	0.012	0.016	0.489
2010	0.147	0.102	0.076	0.042	0.060	0.010	0.011	0.015	0.462
2011	0.136	0.094	0.071	0.038	0.056	0.009	0.010	0.014	0.429
2012	0.127	0.088	0.067	0.035	0.052	0.009	0.010	0.013	0.401
2013	0.119	0.081	0.063	0.033	0.049	0.008	0.009	0.012	0.374
2014	0.110	0.075	0.059	0.030	0.046	0.007	0.009	0.011	0.345
2015	0.101	0.069	0.055	0.027	0.042	0.007	0.008	0.010	0.320
2016	0.094	0.064	0.051	0.025	0.040	0.006	0.007	0.009	0.297
2017	0.089	0.060	0.049	0.024	0.037	0.006	0.007	0.009	0.280
2018	0.083	0.056	0.046	0.022	0.035	0.005	0.007	0.008	0.262
2019	0.078	0.053	0.044	0.020	0.033	0.005	0.006	0.007	0.247
2020	0.075	0.050	0.042	0.019	0.032	0.005	0.006	0.007	0.235

Sources: BTRE estimates.

TABLE 3.136 BASE CASE PROJECTIONS OF METROPOLITAN PM10 EMISSIONS BY BUSES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.257	0.185	0.115	0.085	0.096	0.023	0.018	0.027	0.807
1991	0.252	0.181	0.114	0.083	0.094	0.023	0.017	0.027	0.791
1992	0.247	0.177	0.113	0.081	0.093	0.022	0.017	0.027	0.778
1993	0.238	0.170	0.111	0.078	0.090	0.021	0.016	0.026	0.750
1994	0.246	0.175	0.116	0.080	0.093	0.022	0.017	0.027	0.776
1995	0.251	0.178	0.120	0.080	0.096	0.022	0.017	0.027	0.792
1996	0.255	0.180	0.123	0.081	0.098	0.022	0.018	0.028	0.806
1997	0.261	0.184	0.126	0.082	0.101	0.022	0.018	0.028	0.824
1998	0.266	0.188	0.129	0.083	0.104	0.023	0.019	0.028	0.840
1999	0.266	0.189	0.130	0.083	0.104	0.022	0.019	0.028	0.841
2000	0.275	0.194	0.134	0.084	0.107	0.022	0.020	0.029	0.865
2001	0.254	0.180	0.124	0.077	0.100	0.020	0.018	0.026	0.801
2002	0.240	0.170	0.118	0.073	0.095	0.019	0.018	0.025	0.757
2003	0.225	0.159	0.111	0.067	0.089	0.018	0.017	0.023	0.709
2004	0.210	0.148	0.105	0.063	0.083	0.016	0.015	0.022	0.662
2005	0.198	0.139	0.100	0.059	0.079	0.015	0.015	0.020	0.624
2006	0.183	0.128	0.093	0.054	0.073	0.014	0.014	0.019	0.577
2007	0.174	0.121	0.088	0.050	0.070	0.013	0.013	0.018	0.547
2008	0.164	0.114	0.084	0.047	0.066	0.012	0.012	0.017	0.515
2009	0.153	0.107	0.079	0.044	0.062	0.011	0.012	0.015	0.483
2010	0.145	0.100	0.075	0.041	0.059	0.010	0.011	0.015	0.457
2011	0.135	0.093	0.071	0.038	0.055	0.009	0.010	0.013	0.424
2012	0.126	0.087	0.066	0.035	0.052	0.009	0.010	0.012	0.396
2013	0.117	0.080	0.062	0.032	0.049	0.008	0.009	0.012	0.370
2014	0.108	0.074	0.058	0.030	0.045	0.007	0.008	0.011	0.341
2015	0.100	0.068	0.054	0.027	0.042	0.007	0.008	0.010	0.316
2016	0.093	0.063	0.051	0.025	0.039	0.006	0.007	0.009	0.294
2017	0.088	0.059	0.048	0.023	0.037	0.006	0.007	0.008	0.277
2018	0.082	0.055	0.045	0.022	0.035	0.005	0.007	0.008	0.259
2019	0.078	0.052	0.043	0.020	0.033	0.005	0.006	0.007	0.245
2020	0.074	0.049	0.041	0.019	0.032	0.004	0.006	0.007	0.232

Sources: BTRE estimates.

TABLE 3.137 BASE CASE PROJECTIONS OF METROPOLITAN PM2.5 EMISSIONS BY BUSES TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	0.247	0.177	0.111	0.081	0.092	0.022	0.017	0.026	0.773	
1991	0.242	0.173	0.109	0.079	0.090	0.022	0.017	0.026	0.758	
1992	0.237	0.170	0.109	0.078	0.089	0.021	0.016	0.026	0.745	
1993	0.228	0.163	0.106	0.074	0.086	0.020	0.016	0.025	0.719	
1994	0.236	0.168	0.111	0.076	0.090	0.021	0.016	0.026	0.744	
1995	0.241	0.170	0.115	0.077	0.092	0.021	0.017	0.026	0.759	
1996	0.245	0.173	0.118	0.078	0.094	0.021	0.017	0.027	0.772	
1997	0.250	0.177	0.121	0.079	0.097	0.022	0.018	0.027	0.790	
1998	0.255	0.181	0.124	0.080	0.099	0.022	0.018	0.027	0.806	
1999	0.256	0.181	0.125	0.079	0.100	0.021	0.018	0.027	0.806	
2000	0.263	0.186	0.128	0.081	0.103	0.022	0.019	0.028	0.830	
2001	0.244	0.172	0.119	0.074	0.096	0.020	0.018	0.025	0.768	
2002	0.231	0.163	0.113	0.070	0.091	0.018	0.017	0.024	0.726	
2003	0.216	0.152	0.107	0.065	0.085	0.017	0.016	0.022	0.680	
2004	0.201	0.142	0.100	0.060	0.080	0.016	0.015	0.021	0.635	
2005	0.190	0.133	0.095	0.056	0.076	0.014	0.014	0.019	0.599	
2006	0.176	0.123	0.089	0.051	0.070	0.013	0.013	0.018	0.553	
2007	0.166	0.116	0.085	0.048	0.067	0.012	0.013	0.017	0.525	
2008	0.157	0.109	0.080	0.045	0.063	0.011	0.012	0.016	0.494	
2009	0.147	0.102	0.076	0.042	0.060	0.011	0.011	0.015	0.464	
2010	0.139	0.096	0.072	0.039	0.057	0.010	0.011	0.014	0.438	
2011	0.129	0.089	0.068	0.036	0.053	0.009	0.010	0.013	0.407	
2012	0.121	0.083	0.064	0.034	0.050	0.008	0.009	0.012	0.380	
2013	0.112	0.077	0.060	0.031	0.047	0.008	0.009	0.011	0.354	
2014	0.104	0.071	0.056	0.028	0.043	0.007	0.008	0.010	0.327	
2015	0.096	0.066	0.052	0.026	0.040	0.006	0.008	0.009	0.303	
2016	0.089	0.061	0.049	0.024	0.038	0.006	0.007	0.009	0.282	
2017	0.084	0.057	0.046	0.022	0.036	0.005	0.007	0.008	0.265	
2018	0.079	0.053	0.044	0.021	0.033	0.005	0.006	0.008	0.248	
2019	0.074	0.050	0.041	0.019	0.032	0.005	0.006	0.007	0.234	
2020	0.071	0.047	0.040	0.018	0.030	0.004	0.006	0.007	0.223	

Sources: BTRE estimates.

TABLE 3.138 BASE CASE PROJECTIONS OF METROPOLITAN PM1.0 EMISSIONS BY BUSES TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	0.241	0.174	0.108	0.080	0.090	0.022	0.016	0.026	0.757	
1991	0.236	0.170	0.107	0.078	0.088	0.021	0.016	0.026	0.742	
1992	0.232	0.166	0.106	0.076	0.087	0.021	0.016	0.025	0.730	
1993	0.223	0.159	0.104	0.073	0.084	0.020	0.015	0.024	0.703	
1994	0.231	0.164	0.109	0.075	0.088	0.021	0.016	0.025	0.728	
1995	0.235	0.167	0.112	0.076	0.090	0.021	0.016	0.026	0.743	
1996	0.239	0.169	0.115	0.076	0.092	0.021	0.017	0.026	0.756	
1997	0.245	0.173	0.118	0.077	0.095	0.021	0.017	0.026	0.773	
1998	0.250	0.177	0.121	0.078	0.097	0.021	0.018	0.026	0.788	
1999	0.250	0.177	0.122	0.077	0.097	0.021	0.018	0.026	0.789	
2000	0.258	0.182	0.126	0.079	0.101	0.021	0.019	0.027	0.812	
2001	0.238	0.169	0.117	0.073	0.093	0.019	0.017	0.025	0.751	
2002	0.225	0.159	0.111	0.068	0.089	0.018	0.016	0.023	0.710	
2003	0.211	0.149	0.104	0.063	0.083	0.016	0.015	0.022	0.665	
2004	0.197	0.139	0.098	0.059	0.078	0.015	0.015	0.020	0.620	
2005	0.186	0.130	0.093	0.055	0.074	0.014	0.014	0.019	0.585	
2006	0.172	0.120	0.087	0.050	0.069	0.013	0.013	0.018	0.541	
2007	0.163	0.114	0.083	0.047	0.065	0.012	0.012	0.017	0.513	
2008	0.153	0.107	0.079	0.044	0.062	0.011	0.012	0.016	0.483	
2009	0.144	0.100	0.074	0.041	0.058	0.010	0.011	0.014	0.453	
2010	0.136	0.094	0.071	0.038	0.055	0.010	0.010	0.014	0.428	
2011	0.126	0.087	0.066	0.035	0.052	0.009	0.010	0.013	0.398	
2012	0.118	0.081	0.062	0.033	0.049	0.008	0.009	0.012	0.371	
2013	0.110	0.075	0.058	0.030	0.045	0.007	0.009	0.011	0.346	
2014	0.101	0.069	0.054	0.028	0.042	0.007	0.008	0.010	0.320	
2015	0.094	0.064	0.051	0.025	0.039	0.006	0.007	0.009	0.296	
2016	0.087	0.059	0.048	0.023	0.037	0.006	0.007	0.008	0.275	
2017	0.082	0.056	0.045	0.022	0.035	0.005	0.007	0.008	0.259	
2018	0.077	0.052	0.043	0.020	0.033	0.005	0.006	0.007	0.242	
2019	0.073	0.049	0.041	0.019	0.031	0.004	0.006	0.007	0.229	
2020	0.069	0.046	0.039	0.018	0.030	0.004	0.006	0.007	0.218	

Sources: BTRE estimates.

TABLE 3.139 BASE CASE PROJECTIONS OF METROPOLITAN ACETALDEHYDE EMISSIONS BY BUSES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.135	0.097	0.061	0.045	0.050	0.012	0.009	0.014	0.423
1991	0.132	0.095	0.060	0.043	0.049	0.012	0.009	0.014	0.414
1992	0.129	0.092	0.059	0.042	0.048	0.012	0.009	0.014	0.406
1993	0.124	0.089	0.058	0.041	0.047	0.011	0.009	0.014	0.392
1994	0.129	0.091	0.061	0.042	0.049	0.011	0.009	0.014	0.406
1995	0.129	0.092	0.062	0.041	0.050	0.011	0.009	0.014	0.408
1996	0.129	0.091	0.062	0.041	0.050	0.011	0.009	0.014	0.406
1997	0.129	0.091	0.062	0.040	0.050	0.011	0.009	0.014	0.406
1998	0.129	0.091	0.063	0.040	0.050	0.011	0.009	0.014	0.407
1999	0.127	0.090	0.062	0.039	0.049	0.011	0.009	0.013	0.400
2000	0.128	0.091	0.063	0.039	0.050	0.011	0.009	0.013	0.404
2001	0.116	0.082	0.057	0.035	0.045	0.009	0.008	0.012	0.365
2002	0.107	0.076	0.053	0.032	0.042	0.009	0.008	0.011	0.338
2003	0.101	0.071	0.050	0.030	0.040	0.008	0.007	0.010	0.318
2004	0.095	0.067	0.047	0.028	0.038	0.007	0.007	0.010	0.298
2005	0.091	0.064	0.046	0.027	0.036	0.007	0.007	0.009	0.286
2006	0.086	0.060	0.044	0.025	0.034	0.006	0.006	0.009	0.271
2007	0.083	0.058	0.042	0.024	0.033	0.006	0.006	0.008	0.262
2008	0.079	0.055	0.041	0.023	0.032	0.006	0.006	0.008	0.250
2009	0.076	0.053	0.039	0.022	0.031	0.005	0.006	0.008	0.239
2010	0.073	0.051	0.038	0.021	0.030	0.005	0.006	0.007	0.232
2011	0.070	0.048	0.037	0.020	0.029	0.005	0.005	0.007	0.221
2012	0.067	0.046	0.036	0.019	0.028	0.005	0.005	0.007	0.212
2013	0.065	0.044	0.035	0.018	0.027	0.004	0.005	0.006	0.204
2014	0.062	0.043	0.033	0.017	0.026	0.004	0.005	0.006	0.196
2015	0.060	0.041	0.032	0.016	0.025	0.004	0.005	0.006	0.189
2016	0.058	0.039	0.031	0.016	0.024	0.004	0.005	0.006	0.182
2017	0.056	0.038	0.031	0.015	0.024	0.004	0.004	0.005	0.178
2018	0.055	0.037	0.030	0.014	0.023	0.003	0.004	0.005	0.173
2019	0.054	0.036	0.030	0.014	0.023	0.003	0.004	0.005	0.169
2020	0.053	0.035	0.030	0.014	0.023	0.003	0.004	0.005	0.166

Sources: BTRE estimates.

TABLE 3.140 BASE CASE PROJECTIONS OF METROPOLITAN FORMALDEHYDE EMISSIONS BY BUSES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.119	0.086	0.054	0.039	0.044	0.011	0.008	0.013	0.375
1991	0.117	0.084	0.053	0.038	0.044	0.011	0.008	0.013	0.367
1992	0.114	0.082	0.053	0.037	0.043	0.010	0.008	0.012	0.360
1993	0.110	0.079	0.051	0.036	0.042	0.010	0.008	0.012	0.347
1994	0.114	0.081	0.054	0.037	0.043	0.010	0.008	0.012	0.360
1995	0.115	0.081	0.055	0.037	0.044	0.010	0.008	0.013	0.362
1996	0.114	0.081	0.055	0.036	0.044	0.010	0.008	0.012	0.360
1997	0.114	0.080	0.055	0.036	0.044	0.010	0.008	0.012	0.360
1998	0.114	0.081	0.056	0.036	0.044	0.010	0.008	0.012	0.361
1999	0.112	0.079	0.055	0.035	0.044	0.009	0.008	0.012	0.354
2000	0.114	0.080	0.055	0.035	0.044	0.009	0.008	0.012	0.358
2001	0.103	0.073	0.050	0.031	0.040	0.008	0.007	0.011	0.324
2002	0.095	0.067	0.047	0.029	0.037	0.008	0.007	0.010	0.300
2003	0.090	0.063	0.044	0.027	0.035	0.007	0.007	0.009	0.282
2004	0.084	0.059	0.042	0.025	0.033	0.006	0.006	0.009	0.265
2005	0.081	0.057	0.041	0.024	0.032	0.006	0.006	0.008	0.254
2006	0.077	0.054	0.039	0.022	0.031	0.006	0.006	0.008	0.241
2007	0.074	0.052	0.038	0.021	0.030	0.005	0.006	0.008	0.233
2008	0.071	0.049	0.036	0.020	0.029	0.005	0.005	0.007	0.223
2009	0.068	0.047	0.035	0.019	0.027	0.005	0.005	0.007	0.213
2010	0.065	0.045	0.034	0.019	0.027	0.005	0.005	0.007	0.206
2011	0.062	0.043	0.033	0.018	0.026	0.004	0.005	0.006	0.196
2012	0.060	0.041	0.032	0.017	0.025	0.004	0.005	0.006	0.189
2013	0.058	0.040	0.031	0.016	0.024	0.004	0.004	0.006	0.182
2014	0.055	0.038	0.030	0.015	0.023	0.004	0.004	0.005	0.175
2015	0.053	0.036	0.029	0.014	0.022	0.004	0.004	0.005	0.169
2016	0.051	0.035	0.028	0.014	0.022	0.003	0.004	0.005	0.162
2017	0.050	0.034	0.028	0.013	0.021	0.003	0.004	0.005	0.158
2018	0.049	0.033	0.027	0.013	0.021	0.003	0.004	0.005	0.154
2019	0.048	0.032	0.027	0.012	0.020	0.003	0.004	0.005	0.150
2020	0.047	0.031	0.026	0.012	0.020	0.003	0.004	0.004	0.148

Sources: BTRE estimates.

TABLE 3.141 BASE CASE PROJECTIONS OF METROPOLITAN CARBONYL (TOTAL) EMISSIONS BY BUSES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.408	0.294	0.183	0.135	0.152	0.037	0.028	0.044	1.280
1991	0.399	0.286	0.181	0.131	0.149	0.036	0.027	0.043	1.252
1992	0.391	0.280	0.179	0.128	0.146	0.035	0.027	0.043	1.228
1993	0.376	0.268	0.176	0.123	0.142	0.034	0.026	0.041	1.185
1994	0.389	0.277	0.184	0.126	0.148	0.035	0.027	0.043	1.227
1995	0.391	0.277	0.187	0.125	0.150	0.035	0.027	0.043	1.235
1996	0.389	0.275	0.187	0.124	0.150	0.034	0.027	0.042	1.229
1997	0.389	0.275	0.188	0.122	0.151	0.034	0.028	0.042	1.228
1998	0.390	0.276	0.190	0.122	0.152	0.033	0.028	0.041	1.232
1999	0.383	0.271	0.187	0.119	0.149	0.032	0.028	0.040	1.210
2000	0.388	0.274	0.189	0.119	0.151	0.032	0.028	0.041	1.221
2001	0.351	0.248	0.172	0.107	0.137	0.028	0.025	0.036	1.105
2002	0.325	0.230	0.160	0.098	0.128	0.026	0.024	0.034	1.023
2003	0.305	0.215	0.151	0.092	0.121	0.024	0.022	0.032	0.962
2004	0.286	0.202	0.143	0.085	0.114	0.022	0.021	0.029	0.902
2005	0.275	0.193	0.138	0.081	0.109	0.021	0.020	0.028	0.865
2006	0.260	0.182	0.132	0.076	0.104	0.020	0.019	0.027	0.821
2007	0.252	0.176	0.128	0.073	0.101	0.019	0.019	0.026	0.793
2008	0.240	0.167	0.123	0.069	0.097	0.018	0.018	0.024	0.758
2009	0.230	0.160	0.119	0.066	0.093	0.016	0.017	0.023	0.724
2010	0.222	0.154	0.116	0.063	0.091	0.016	0.017	0.022	0.700
2011	0.212	0.146	0.111	0.060	0.087	0.015	0.016	0.021	0.668
2012	0.204	0.140	0.108	0.057	0.084	0.014	0.016	0.020	0.642
2013	0.196	0.135	0.104	0.054	0.081	0.013	0.015	0.019	0.618
2014	0.188	0.129	0.101	0.051	0.078	0.013	0.015	0.018	0.594
2015	0.182	0.124	0.098	0.049	0.076	0.012	0.014	0.018	0.573
2016	0.175	0.119	0.095	0.047	0.074	0.011	0.014	0.017	0.552
2017	0.171	0.115	0.094	0.045	0.072	0.011	0.014	0.016	0.538
2018	0.166	0.112	0.092	0.044	0.070	0.010	0.013	0.016	0.523
2019	0.162	0.109	0.090	0.042	0.069	0.010	0.013	0.015	0.511
2020	0.159	0.107	0.090	0.041	0.068	0.010	0.013	0.015	0.503

Sources: BTRE estimates.

TABLE 3.142 BASE CASE PROJECTIONS OF METROPOLITAN BENZENE EMISSIONS BY BUSES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.020	0.014	0.009	0.007	0.007	0.002	0.001	0.002	0.063
1991	0.020	0.014	0.009	0.007	0.007	0.002	0.001	0.002	0.063
1992	0.020	0.014	0.009	0.006	0.007	0.002	0.001	0.002	0.062
1993	0.019	0.014	0.009	0.006	0.007	0.002	0.001	0.002	0.060
1994	0.019	0.014	0.009	0.006	0.007	0.002	0.001	0.002	0.061
1995	0.019	0.014	0.009	0.006	0.007	0.002	0.001	0.002	0.061
1996	0.019	0.014	0.009	0.006	0.007	0.002	0.001	0.002	0.060
1997	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.060
1998	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.059
1999	0.018	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.057
2000	0.018	0.013	0.009	0.005	0.007	0.001	0.001	0.002	0.056
2001	0.016	0.011	0.008	0.005	0.006	0.001	0.001	0.002	0.051
2002	0.015	0.010	0.007	0.004	0.006	0.001	0.001	0.002	0.047
2003	0.014	0.010	0.007	0.004	0.005	0.001	0.001	0.001	0.043
2004	0.013	0.009	0.006	0.004	0.005	0.001	0.001	0.001	0.040
2005	0.012	0.008	0.006	0.004	0.005	0.001	0.001	0.001	0.038
2006	0.011	0.008	0.006	0.003	0.005	0.001	0.001	0.001	0.035
2007	0.011	0.007	0.005	0.003	0.004	0.001	0.001	0.001	0.034
2008	0.010	0.007	0.005	0.003	0.004	0.001	0.001	0.001	0.032
2009	0.010	0.007	0.005	0.003	0.004	0.001	0.001	0.001	0.031
2010	0.009	0.007	0.005	0.003	0.004	0.001	0.001	0.001	0.030
2011	0.009	0.006	0.005	0.003	0.004	0.001	0.001	0.001	0.028
2012	0.009	0.006	0.005	0.002	0.004	0.001	0.001	0.001	0.027
2013	0.008	0.006	0.004	0.002	0.003	0.001	0.001	0.001	0.026
2014	0.008	0.005	0.004	0.002	0.003	0.001	0.001	0.001	0.025
2015	0.008	0.005	0.004	0.002	0.003	0.001	0.001	0.001	0.024
2016	0.007	0.005	0.004	0.002	0.003	0.000	0.001	0.001	0.023
2017	0.007	0.005	0.004	0.002	0.003	0.000	0.001	0.001	0.023
2018	0.007	0.005	0.004	0.002	0.003	0.000	0.001	0.001	0.022
2019	0.007	0.005	0.004	0.002	0.003	0.000	0.001	0.001	0.022
2020	0.007	0.004	0.004	0.002	0.003	0.000	0.001	0.001	0.021

Sources: BTRE estimates.

TABLE 3.143 BASE CASE PROJECTIONS OF METROPOLITAN TOLUENE EMISSIONS BY BUSES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.024	0.017	0.011	0.008	0.009	0.002	0.002	0.003	0.075
1991	0.024	0.017	0.011	0.008	0.009	0.002	0.002	0.003	0.076
1992	0.024	0.017	0.011	0.008	0.009	0.002	0.002	0.003	0.076
1993	0.023	0.017	0.011	0.008	0.009	0.002	0.002	0.003	0.074
1994	0.024	0.017	0.011	0.008	0.009	0.002	0.002	0.003	0.075
1995	0.024	0.017	0.011	0.008	0.009	0.002	0.002	0.003	0.075
1996	0.023	0.017	0.011	0.007	0.009	0.002	0.002	0.003	0.074
1997	0.023	0.016	0.011	0.007	0.009	0.002	0.002	0.002	0.073
1998	0.023	0.016	0.011	0.007	0.009	0.002	0.002	0.002	0.073
1999	0.022	0.016	0.011	0.007	0.009	0.002	0.002	0.002	0.071
2000	0.022	0.016	0.011	0.007	0.009	0.002	0.002	0.002	0.070
2001	0.021	0.015	0.010	0.006	0.008	0.002	0.001	0.002	0.065
2002	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.060
2003	0.018	0.013	0.009	0.005	0.007	0.001	0.001	0.002	0.057
2004	0.017	0.012	0.008	0.005	0.007	0.001	0.001	0.002	0.053
2005	0.016	0.011	0.008	0.005	0.006	0.001	0.001	0.002	0.051
2006	0.015	0.011	0.008	0.004	0.006	0.001	0.001	0.002	0.048
2007	0.015	0.010	0.007	0.004	0.006	0.001	0.001	0.001	0.046
2008	0.014	0.010	0.007	0.004	0.006	0.001	0.001	0.001	0.044
2009	0.013	0.009	0.007	0.004	0.005	0.001	0.001	0.001	0.042
2010	0.013	0.009	0.007	0.004	0.005	0.001	0.001	0.001	0.041
2011	0.012	0.009	0.006	0.003	0.005	0.001	0.001	0.001	0.039
2012	0.012	0.008	0.006	0.003	0.005	0.001	0.001	0.001	0.037
2013	0.011	0.008	0.006	0.003	0.005	0.001	0.001	0.001	0.036
2014	0.011	0.008	0.006	0.003	0.005	0.001	0.001	0.001	0.035
2015	0.011	0.007	0.006	0.003	0.004	0.001	0.001	0.001	0.033
2016	0.010	0.007	0.006	0.003	0.004	0.001	0.001	0.001	0.032
2017	0.010	0.007	0.005	0.003	0.004	0.001	0.001	0.001	0.032
2018	0.010	0.007	0.005	0.003	0.004	0.001	0.001	0.001	0.031
2019	0.010	0.006	0.005	0.002	0.004	0.001	0.001	0.001	0.030
2020	0.009	0.006	0.005	0.002	0.004	0.001	0.001	0.001	0.030

Sources: BTRE estimates.

TABLE 3.144 BASE CASE PROJECTIONS OF METROPOLITAN XYLENE EMISSIONS BY BUSES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.020	0.014	0.009	0.006	0.007	0.002	0.001	0.002	0.061
1991	0.020	0.014	0.009	0.006	0.007	0.002	0.001	0.002	0.062
1992	0.020	0.014	0.009	0.006	0.007	0.002	0.001	0.002	0.062
1993	0.019	0.014	0.009	0.006	0.007	0.002	0.001	0.002	0.060
1994	0.019	0.014	0.009	0.006	0.007	0.002	0.001	0.002	0.061
1995	0.019	0.014	0.009	0.006	0.007	0.002	0.001	0.002	0.061
1996	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.060
1997	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.059
1998	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.059
1999	0.018	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.058
2000	0.018	0.013	0.009	0.006	0.007	0.001	0.001	0.002	0.057
2001	0.017	0.012	0.008	0.005	0.007	0.001	0.001	0.002	0.052
2002	0.015	0.011	0.008	0.005	0.006	0.001	0.001	0.002	0.049
2003	0.015	0.010	0.007	0.004	0.006	0.001	0.001	0.002	0.046
2004	0.014	0.010	0.007	0.004	0.005	0.001	0.001	0.001	0.043
2005	0.013	0.009	0.007	0.004	0.005	0.001	0.001	0.001	0.041
2006	0.012	0.009	0.006	0.004	0.005	0.001	0.001	0.001	0.039
2007	0.012	0.008	0.006	0.003	0.005	0.001	0.001	0.001	0.037
2008	0.011	0.008	0.006	0.003	0.005	0.001	0.001	0.001	0.036
2009	0.011	0.008	0.006	0.003	0.004	0.001	0.001	0.001	0.034
2010	0.011	0.007	0.005	0.003	0.004	0.001	0.001	0.001	0.033
2011	0.010	0.007	0.005	0.003	0.004	0.001	0.001	0.001	0.032
2012	0.010	0.007	0.005	0.003	0.004	0.001	0.001	0.001	0.030
2013	0.009	0.006	0.005	0.003	0.004	0.001	0.001	0.001	0.029
2014	0.009	0.006	0.005	0.002	0.004	0.001	0.001	0.001	0.028
2015	0.009	0.006	0.005	0.002	0.004	0.001	0.001	0.001	0.027
2016	0.008	0.006	0.005	0.002	0.004	0.001	0.001	0.001	0.026
2017	0.008	0.006	0.004	0.002	0.003	0.001	0.001	0.001	0.026
2018	0.008	0.005	0.004	0.002	0.003	0.000	0.001	0.001	0.025
2019	0.008	0.005	0.004	0.002	0.003	0.000	0.001	0.001	0.025
2020	0.008	0.005	0.004	0.002	0.003	0.000	0.001	0.001	0.024

Note: Includes emissions of o, m and p isomers.

Sources: BTRE estimates.

TABLE 3.145 BASE CASE PROJECTIONS OF METROPOLITAN PAH EMISSIONS BY BUSES TO 2020

Year	(thousand tonnes)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	0.020	0.014	0.009	0.006	0.007	0.002	0.001	0.002	0.062	
1991	0.019	0.014	0.009	0.006	0.007	0.002	0.001	0.002	0.060	
1992	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.059	
1993	0.018	0.013	0.008	0.006	0.007	0.002	0.001	0.002	0.057	
1994	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.059	
1995	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.060	
1996	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.060	
1997	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.060	
1998	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.060	
1999	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.059	
2000	0.019	0.013	0.009	0.006	0.007	0.002	0.001	0.002	0.060	
2001	0.017	0.012	0.008	0.005	0.007	0.001	0.001	0.002	0.054	
2002	0.016	0.011	0.008	0.005	0.006	0.001	0.001	0.002	0.050	
2003	0.015	0.011	0.007	0.005	0.006	0.001	0.001	0.002	0.047	
2004	0.014	0.010	0.007	0.004	0.006	0.001	0.001	0.001	0.044	
2005	0.013	0.009	0.007	0.004	0.005	0.001	0.001	0.001	0.042	
2006	0.013	0.009	0.006	0.004	0.005	0.001	0.001	0.001	0.040	
2007	0.012	0.009	0.006	0.004	0.005	0.001	0.001	0.001	0.039	
2008	0.012	0.008	0.006	0.003	0.005	0.001	0.001	0.001	0.037	
2009	0.011	0.008	0.006	0.003	0.005	0.001	0.001	0.001	0.035	
2010	0.011	0.007	0.006	0.003	0.004	0.001	0.001	0.001	0.034	
2011	0.010	0.007	0.005	0.003	0.004	0.001	0.001	0.001	0.032	
2012	0.010	0.007	0.005	0.003	0.004	0.001	0.001	0.001	0.031	
2013	0.009	0.006	0.005	0.003	0.004	0.001	0.001	0.001	0.029	
2014	0.009	0.006	0.005	0.002	0.004	0.001	0.001	0.001	0.028	
2015	0.009	0.006	0.005	0.002	0.004	0.001	0.001	0.001	0.027	
2016	0.008	0.006	0.004	0.002	0.003	0.001	0.001	0.001	0.026	
2017	0.008	0.005	0.004	0.002	0.003	0.001	0.001	0.001	0.025	
2018	0.008	0.005	0.004	0.002	0.003	0.000	0.001	0.001	0.024	
2019	0.008	0.005	0.004	0.002	0.003	0.000	0.001	0.001	0.024	
2020	0.007	0.005	0.004	0.002	0.003	0.000	0.001	0.001	0.023	

Sources: BTRE estimates.

TABLE 3.146 BASE CASE PROJECTIONS OF METROPOLITAN 1,3-BUTADIENE EMISSIONS BY BUSES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.008
1991	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.008
1992	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.008
1993	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.008
1994	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.008
1995	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.008
1996	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.008
1997	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.008
1998	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.008
1999	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.008
2000	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.008
2001	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.007
2002	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.007
2003	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.006
2004	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.006
2005	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.006
2006	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.006
2007	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
2008	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
2009	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
2010	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
2011	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
2012	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.005
2013	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2014	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2015	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2016	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2017	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2018	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2019	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004
2020	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.004

Sources: BTRE estimates.

TABLE 3.147 ESTIMATED OZONE REACTIVITY OF BASE CASE PROJECTIONS OF METROPOLITAN VOC EMISSIONS BY BUSES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	2.23	1.61	1.00	0.74	0.83	0.20	0.15	0.24	7.00
1991	2.20	1.58	1.00	0.72	0.82	0.20	0.15	0.24	6.90
1992	2.16	1.55	0.99	0.71	0.81	0.19	0.15	0.24	6.80
1993	2.08	1.49	0.97	0.68	0.78	0.19	0.14	0.23	6.56
1994	2.14	1.52	1.01	0.69	0.81	0.19	0.15	0.23	6.74
1995	2.14	1.51	1.02	0.69	0.82	0.19	0.15	0.23	6.74
1996	2.11	1.49	1.02	0.67	0.82	0.18	0.15	0.23	6.68
1997	2.10	1.48	1.02	0.66	0.82	0.18	0.15	0.23	6.64
1998	2.10	1.48	1.02	0.66	0.82	0.18	0.15	0.22	6.62
1999	2.05	1.45	1.00	0.64	0.80	0.17	0.15	0.22	6.48
2000	2.06	1.46	1.00	0.63	0.80	0.17	0.15	0.21	6.48
2001	1.87	1.32	0.91	0.57	0.73	0.15	0.14	0.19	5.89
2002	1.73	1.22	0.85	0.52	0.68	0.14	0.13	0.18	5.45
2003	1.63	1.15	0.81	0.49	0.64	0.13	0.12	0.17	5.12
2004	1.53	1.08	0.76	0.45	0.61	0.12	0.11	0.16	4.81
2005	1.46	1.03	0.73	0.43	0.58	0.11	0.11	0.15	4.61
2006	1.39	0.97	0.70	0.41	0.55	0.10	0.10	0.14	4.37
2007	1.33	0.93	0.68	0.39	0.54	0.10	0.10	0.14	4.20
2008	1.27	0.89	0.65	0.37	0.51	0.09	0.10	0.13	4.01
2009	1.22	0.85	0.63	0.35	0.49	0.09	0.09	0.12	3.84
2010	1.18	0.82	0.61	0.33	0.48	0.08	0.09	0.12	3.71
2011	1.12	0.78	0.59	0.32	0.46	0.08	0.09	0.11	3.54
2012	1.08	0.74	0.57	0.30	0.44	0.07	0.08	0.11	3.41
2013	1.04	0.71	0.55	0.29	0.43	0.07	0.08	0.10	3.28
2014	1.00	0.68	0.54	0.27	0.42	0.07	0.08	0.10	3.16
2015	0.97	0.66	0.52	0.26	0.40	0.06	0.08	0.09	3.05
2016	0.93	0.63	0.51	0.25	0.39	0.06	0.07	0.09	2.94
2017	0.91	0.62	0.50	0.24	0.38	0.06	0.07	0.09	2.87
2018	0.89	0.60	0.49	0.23	0.38	0.06	0.07	0.09	2.79
2019	0.87	0.58	0.48	0.23	0.37	0.05	0.07	0.08	2.73
2020	0.85	0.57	0.48	0.22	0.37	0.05	0.07	0.08	2.69

Sources: BTRE estimates.

TABLE 3.148 ESTIMATED METROPOLITAN EMISSIONS OF OTHER NPI SPECIES BY BUSES TO 2020

(thousand tonnes)

Year	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	n-Hexane	Styrene
1990	0.212	0.001	0.120	0.003	0.013	0.019	0.003
1991	0.207	0.001	0.117	0.003	0.013	0.019	0.003
1992	0.203	0.001	0.115	0.003	0.013	0.019	0.003
1993	0.196	0.001	0.111	0.002	0.013	0.018	0.003
1994	0.203	0.001	0.115	0.003	0.013	0.019	0.003
1995	0.204	0.001	0.116	0.003	0.013	0.019	0.003
1996	0.203	0.001	0.115	0.003	0.013	0.019	0.003
1997	0.203	0.001	0.115	0.003	0.013	0.019	0.003
1998	0.204	0.001	0.115	0.003	0.013	0.019	0.003
1999	0.200	0.001	0.113	0.002	0.013	0.018	0.002
2000	0.202	0.001	0.114	0.002	0.012	0.018	0.002
2001	0.183	0.001	0.103	0.002	0.011	0.017	0.002
2002	0.169	0.001	0.095	0.002	0.011	0.016	0.002
2003	0.159	0.001	0.089	0.002	0.010	0.015	0.002
2004	0.149	0.001	0.084	0.002	0.009	0.014	0.002
2005	0.143	0.001	0.080	0.002	0.009	0.014	0.002
2006	0.136	0.001	0.076	0.002	0.008	0.013	0.002
2007	0.131	0.001	0.073	0.002	0.008	0.013	0.002
2008	0.125	0.001	0.070	0.002	0.008	0.012	0.002
2009	0.120	0.001	0.067	0.001	0.007	0.012	0.001
2010	0.116	0.001	0.065	0.001	0.007	0.011	0.001
2011	0.111	0.001	0.061	0.001	0.007	0.011	0.001
2012	0.106	0.001	0.059	0.001	0.006	0.011	0.001
2013	0.102	0.001	0.057	0.001	0.006	0.010	0.001
2014	0.098	0.001	0.054	0.001	0.006	0.010	0.001
2015	0.095	0.001	0.052	0.001	0.006	0.010	0.001
2016	0.091	0.001	0.050	0.001	0.006	0.009	0.001
2017	0.089	0.001	0.049	0.001	0.005	0.009	0.001
2018	0.086	0.000	0.048	0.001	0.005	0.009	0.001
2019	0.084	0.000	0.047	0.001	0.005	0.009	0.001
2020	0.083	0.000	0.046	0.001	0.005	0.009	0.001

Sources: BTRE estimates.

TABLE 3.149 ESTIMATED NATIONAL EMISSIONS OF OTHER NPI SPECIES BY BUSES TO 2020

Year	(thousand tonnes)						
	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	n-Hexane	Styrene
1990	0.351	0.002	0.201	0.004	0.023	0.032	0.004
1991	0.332	0.002	0.191	0.004	0.022	0.031	0.004
1992	0.321	0.002	0.185	0.004	0.021	0.030	0.004
1993	0.314	0.002	0.181	0.004	0.021	0.030	0.004
1994	0.325	0.002	0.187	0.004	0.022	0.031	0.004
1995	0.327	0.002	0.188	0.004	0.022	0.031	0.004
1996	0.325	0.002	0.186	0.004	0.021	0.030	0.004
1997	0.322	0.002	0.185	0.004	0.021	0.030	0.004
1998	0.321	0.002	0.183	0.004	0.021	0.030	0.004
1999	0.315	0.002	0.180	0.004	0.020	0.029	0.004
2000	0.318	0.002	0.181	0.004	0.020	0.029	0.004
2001	0.287	0.001	0.164	0.004	0.018	0.027	0.004
2002	0.266	0.001	0.151	0.003	0.017	0.025	0.003
2003	0.247	0.001	0.141	0.003	0.016	0.024	0.003
2004	0.231	0.001	0.132	0.003	0.015	0.022	0.003
2005	0.222	0.001	0.126	0.003	0.014	0.021	0.003
2006	0.210	0.001	0.119	0.003	0.013	0.020	0.003
2007	0.203	0.001	0.115	0.003	0.013	0.020	0.002
2008	0.193	0.001	0.110	0.002	0.012	0.019	0.002
2009	0.184	0.001	0.105	0.002	0.011	0.018	0.002
2010	0.177	0.001	0.100	0.002	0.011	0.018	0.002
2011	0.168	0.001	0.095	0.002	0.010	0.017	0.002
2012	0.161	0.001	0.091	0.002	0.010	0.016	0.002
2013	0.155	0.001	0.088	0.002	0.010	0.016	0.002
2014	0.149	0.001	0.084	0.002	0.009	0.015	0.002
2015	0.143	0.001	0.081	0.002	0.009	0.015	0.002
2016	0.138	0.001	0.078	0.002	0.009	0.014	0.002
2017	0.133	0.001	0.075	0.002	0.008	0.014	0.002
2018	0.129	0.001	0.073	0.002	0.008	0.014	0.002
2019	0.126	0.001	0.071	0.002	0.008	0.014	0.002
2020	0.124	0.001	0.070	0.002	0.008	0.013	0.001

Sources: BTRE estimates.

TABLE 3.150 BASE CASE PROJECTIONS OF METROPOLITAN LEAD EMISSIONS BY MOTORCYCLES TO 2020

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	3.705	2.416	2.057	0.844	0.860	0.133	0.111	0.431	10.556
1991	3.216	2.092	1.804	0.731	0.748	0.115	0.096	0.379	9.180
1992	2.930	1.899	1.666	0.663	0.683	0.104	0.088	0.348	8.382
1993	2.317	1.496	1.343	0.522	0.543	0.082	0.070	0.276	6.650
1994	1.774	1.139	1.043	0.397	0.418	0.062	0.054	0.212	5.099
1995	1.046	0.669	0.623	0.232	0.248	0.036	0.032	0.125	3.013
1996	0.944	0.602	0.567	0.208	0.225	0.032	0.030	0.112	2.721
1997	0.829	0.529	0.502	0.181	0.199	0.028	0.026	0.097	2.393
1998	0.724	0.462	0.440	0.157	0.175	0.024	0.023	0.084	2.090
1999	0.465	0.297	0.284	0.100	0.113	0.015	0.015	0.054	1.343
2000	0.346	0.221	0.212	0.074	0.084	0.011	0.011	0.040	1.000
2001	0.137	0.088	0.084	0.029	0.034	0.004	0.004	0.016	0.397
2002	0.023	0.014	0.014	0.005	0.006	0.001	0.001	0.003	0.065
2003	0.022	0.014	0.013	0.005	0.005	0.001	0.001	0.002	0.063
2004	0.020	0.013	0.012	0.004	0.005	0.001	0.001	0.002	0.057
2005	0.019	0.012	0.012	0.004	0.005	0.001	0.001	0.002	0.056
2006	0.019	0.012	0.012	0.004	0.005	0.001	0.001	0.002	0.055
2007	0.018	0.012	0.012	0.004	0.005	0.001	0.001	0.002	0.053
2008	0.018	0.012	0.012	0.004	0.005	0.001	0.001	0.002	0.053
2009	0.018	0.012	0.012	0.004	0.005	0.001	0.001	0.002	0.053
2010	0.018	0.012	0.012	0.004	0.005	0.001	0.001	0.002	0.053
2011	0.018	0.012	0.012	0.004	0.005	0.001	0.001	0.002	0.053
2012	0.018	0.012	0.012	0.004	0.005	0.001	0.001	0.002	0.053
2013	0.018	0.012	0.012	0.004	0.005	0.001	0.001	0.002	0.053
2014	0.018	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.053
2015	0.018	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.053
2016	0.018	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.053
2017	0.018	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.054
2018	0.018	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.054
2019	0.018	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.054
2020	0.018	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.054

Sources: BTRE estimates.

TABLE 3.151 BASE CASE PROJECTIONS OF METROPOLITAN SO<sub>X</sub> EMISSIONS BY MOTORCYCLES TO 2020

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	11.46	7.47	6.36	2.61	2.66	0.41	0.34	1.33	32.65
1991	10.18	6.62	5.71	2.31	2.37	0.36	0.31	1.20	29.05
1992	9.25	6.00	5.26	2.09	2.16	0.33	0.28	1.10	26.48
1993	8.39	5.42	4.86	1.89	1.97	0.30	0.25	1.00	24.08
1994	7.53	4.83	4.43	1.69	1.78	0.26	0.23	0.90	21.64
1995	6.86	4.39	4.09	1.52	1.63	0.24	0.21	0.82	19.76
1996	6.54	4.17	3.93	1.44	1.56	0.23	0.21	0.78	18.85
1997	6.15	3.92	3.72	1.34	1.48	0.21	0.20	0.72	17.73
1998	5.85	3.73	3.56	1.27	1.42	0.20	0.19	0.68	16.90
1999	5.51	3.51	3.36	1.19	1.34	0.18	0.18	0.64	15.91
2000	5.11	3.27	3.13	1.10	1.25	0.17	0.16	0.59	14.78
2001	4.98	3.19	3.07	1.06	1.22	0.16	0.16	0.57	14.42
2002	4.71	3.02	2.91	1.00	1.16	0.15	0.15	0.54	13.63
2003	4.39	2.81	2.73	0.93	1.08	0.14	0.14	0.50	12.72
2004	4.17	2.67	2.60	0.88	1.03	0.13	0.13	0.47	12.09
2005	3.64	2.33	2.29	0.76	0.90	0.11	0.12	0.41	10.57
2006	3.52	2.26	2.22	0.74	0.88	0.11	0.11	0.39	10.23
2007	3.56	2.29	2.26	0.74	0.89	0.11	0.12	0.39	10.35
2008	3.60	2.31	2.30	0.75	0.90	0.11	0.12	0.40	10.48
2009	3.64	2.34	2.33	0.75	0.92	0.11	0.12	0.40	10.61
2010	3.69	2.37	2.37	0.76	0.93	0.11	0.12	0.40	10.74
2011	3.73	2.39	2.41	0.76	0.94	0.11	0.12	0.40	10.86
2012	3.77	2.42	2.45	0.77	0.96	0.11	0.12	0.40	10.99
2013	3.81	2.45	2.48	0.77	0.97	0.11	0.12	0.40	11.11
2014	3.85	2.47	2.52	0.78	0.98	0.10	0.12	0.40	11.24
2015	3.89	2.50	2.56	0.78	1.00	0.10	0.13	0.41	11.37
2016	3.93	2.53	2.60	0.79	1.01	0.10	0.13	0.41	11.50
2017	3.98	2.56	2.64	0.80	1.03	0.10	0.13	0.41	11.64
2018	4.02	2.59	2.68	0.80	1.04	0.10	0.13	0.41	11.77
2019	4.06	2.62	2.72	0.81	1.06	0.10	0.13	0.41	11.91
2020	4.11	2.65	2.77	0.81	1.07	0.10	0.13	0.41	12.06

Sources: BTRE estimates.

TABLE 3.152 BASE CASE PROJECTIONS OF METROPOLITAN CO EMISSIONS BY MOTORCYCLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	4.41	2.87	2.45	1.00	1.02	0.16	0.13	0.51	12.55
1991	4.17	2.71	2.34	0.95	0.97	0.15	0.12	0.49	11.89
1992	4.11	2.66	2.34	0.93	0.96	0.15	0.12	0.49	11.75
1993	4.04	2.61	2.34	0.91	0.95	0.14	0.12	0.48	11.61
1994	3.99	2.56	2.34	0.89	0.94	0.14	0.12	0.48	11.46
1995	3.93	2.51	2.34	0.87	0.93	0.14	0.12	0.47	11.32
1996	4.07	2.59	2.44	0.89	0.97	0.14	0.13	0.48	11.72
1997	4.06	2.59	2.46	0.89	0.98	0.14	0.13	0.48	11.72
1998	4.06	2.59	2.47	0.88	0.98	0.14	0.13	0.47	11.72
1999	4.05	2.59	2.48	0.88	0.99	0.13	0.13	0.47	11.72
2000	4.09	2.62	2.51	0.88	1.00	0.13	0.13	0.47	11.83
2001	4.13	2.64	2.54	0.88	1.01	0.13	0.13	0.47	11.94
2002	4.16	2.66	2.57	0.88	1.02	0.13	0.13	0.48	12.05
2003	4.19	2.69	2.61	0.89	1.03	0.13	0.14	0.48	12.15
2004	4.22	2.71	2.64	0.89	1.05	0.13	0.14	0.48	12.25
2005	4.26	2.73	2.67	0.89	1.06	0.13	0.14	0.48	12.36
2006	4.29	2.75	2.71	0.90	1.07	0.13	0.14	0.48	12.46
2007	4.32	2.77	2.74	0.90	1.08	0.13	0.14	0.48	12.56
2008	4.35	2.79	2.77	0.90	1.09	0.13	0.14	0.48	12.66
2009	4.38	2.81	2.81	0.90	1.10	0.13	0.14	0.48	12.75
2010	4.41	2.83	2.84	0.91	1.11	0.13	0.14	0.48	12.85
2011	4.44	2.85	2.87	0.91	1.13	0.13	0.14	0.48	12.94
2012	4.46	2.87	2.90	0.91	1.14	0.13	0.14	0.48	13.03
2013	4.49	2.89	2.93	0.91	1.15	0.12	0.14	0.48	13.11
2014	4.52	2.91	2.96	0.91	1.16	0.12	0.15	0.47	13.20
2015	4.54	2.92	2.99	0.92	1.17	0.12	0.15	0.47	13.28
2016	4.57	2.94	3.02	0.92	1.18	0.12	0.15	0.47	13.37
2017	4.59	2.96	3.05	0.92	1.19	0.12	0.15	0.47	13.45
2018	4.62	2.97	3.08	0.92	1.20	0.12	0.15	0.47	13.53
2019	4.64	2.99	3.11	0.92	1.21	0.12	0.15	0.47	13.61
2020	4.67	3.01	3.14	0.92	1.22	0.12	0.15	0.47	13.69

Sources: BTRE estimates.

TABLE 3.153 BASE CASE PROJECTIONS OF METROPOLITAN NO<sub>x</sub> EMISSIONS BY MOTORCYCLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.147	0.096	0.082	0.033	0.034	0.005	0.004	0.017	0.418
1991	0.139	0.090	0.078	0.032	0.032	0.005	0.004	0.016	0.396
1992	0.137	0.089	0.078	0.031	0.032	0.005	0.004	0.016	0.392
1993	0.135	0.087	0.078	0.030	0.032	0.005	0.004	0.016	0.387
1994	0.133	0.085	0.078	0.030	0.031	0.005	0.004	0.016	0.382
1995	0.131	0.084	0.078	0.029	0.031	0.005	0.004	0.016	0.377
1996	0.136	0.086	0.081	0.030	0.032	0.005	0.004	0.016	0.391
1997	0.135	0.086	0.082	0.030	0.033	0.005	0.004	0.016	0.391
1998	0.135	0.086	0.082	0.029	0.033	0.005	0.004	0.016	0.391
1999	0.135	0.086	0.083	0.029	0.033	0.004	0.004	0.016	0.391
2000	0.136	0.087	0.084	0.029	0.033	0.004	0.004	0.016	0.394
2001	0.138	0.088	0.085	0.029	0.034	0.004	0.004	0.016	0.398
2002	0.139	0.089	0.086	0.029	0.034	0.004	0.004	0.016	0.402
2003	0.140	0.090	0.087	0.030	0.034	0.004	0.005	0.016	0.405
2004	0.141	0.090	0.088	0.030	0.035	0.004	0.005	0.016	0.408
2005	0.142	0.091	0.089	0.030	0.035	0.004	0.005	0.016	0.412
2006	0.143	0.092	0.090	0.030	0.036	0.004	0.005	0.016	0.415
2007	0.144	0.092	0.091	0.030	0.036	0.004	0.005	0.016	0.419
2008	0.145	0.093	0.092	0.030	0.036	0.004	0.005	0.016	0.422
2009	0.146	0.094	0.094	0.030	0.037	0.004	0.005	0.016	0.425
2010	0.147	0.094	0.095	0.030	0.037	0.004	0.005	0.016	0.428
2011	0.148	0.095	0.096	0.030	0.038	0.004	0.005	0.016	0.431
2012	0.149	0.096	0.097	0.030	0.038	0.004	0.005	0.016	0.434
2013	0.150	0.096	0.098	0.030	0.038	0.004	0.005	0.016	0.437
2014	0.151	0.097	0.099	0.030	0.039	0.004	0.005	0.016	0.440
2015	0.151	0.097	0.100	0.031	0.039	0.004	0.005	0.016	0.443
2016	0.152	0.098	0.101	0.031	0.039	0.004	0.005	0.016	0.446
2017	0.153	0.099	0.102	0.031	0.040	0.004	0.005	0.016	0.448
2018	0.154	0.099	0.103	0.031	0.040	0.004	0.005	0.016	0.451
2019	0.155	0.100	0.104	0.031	0.040	0.004	0.005	0.016	0.454
2020	0.156	0.100	0.105	0.031	0.041	0.004	0.005	0.016	0.456

Sources: BTRE estimates.

TABLE 3.154 BASE CASE PROJECTIONS OF METROPOLITAN VOC (EXHAUST)  
EMISSIONS BY MOTORCYCLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.588	0.383	0.326	0.134	0.136	0.021	0.018	0.068	1.674
1991	0.556	0.361	0.312	0.126	0.129	0.020	0.017	0.065	1.586
1992	0.548	0.355	0.311	0.124	0.128	0.019	0.016	0.065	1.567
1993	0.539	0.348	0.313	0.122	0.126	0.019	0.016	0.064	1.548
1994	0.532	0.341	0.313	0.119	0.125	0.019	0.016	0.063	1.529
1995	0.524	0.335	0.312	0.116	0.124	0.018	0.016	0.063	1.509
1996	0.542	0.346	0.326	0.119	0.129	0.019	0.017	0.064	1.562
1997	0.542	0.345	0.328	0.118	0.130	0.018	0.017	0.064	1.562
1998	0.541	0.345	0.329	0.118	0.131	0.018	0.017	0.063	1.562
1999	0.541	0.345	0.330	0.117	0.131	0.018	0.017	0.063	1.562
2000	0.546	0.349	0.335	0.117	0.133	0.018	0.018	0.063	1.578
2001	0.550	0.352	0.339	0.117	0.135	0.018	0.018	0.063	1.592
2002	0.554	0.355	0.343	0.118	0.136	0.018	0.018	0.064	1.606
2003	0.559	0.358	0.348	0.118	0.138	0.018	0.018	0.064	1.620
2004	0.563	0.361	0.352	0.119	0.139	0.018	0.018	0.064	1.634
2005	0.567	0.364	0.357	0.119	0.141	0.017	0.018	0.064	1.648
2006	0.572	0.367	0.361	0.119	0.143	0.017	0.018	0.064	1.661
2007	0.576	0.370	0.365	0.120	0.144	0.017	0.019	0.064	1.674
2008	0.580	0.372	0.370	0.120	0.146	0.017	0.019	0.064	1.687
2009	0.584	0.375	0.374	0.121	0.147	0.017	0.019	0.064	1.701
2010	0.588	0.378	0.379	0.121	0.149	0.017	0.019	0.064	1.714
2011	0.592	0.380	0.383	0.121	0.150	0.017	0.019	0.064	1.725
2012	0.595	0.383	0.387	0.121	0.151	0.017	0.019	0.063	1.737
2013	0.599	0.385	0.391	0.122	0.153	0.017	0.019	0.063	1.748
2014	0.602	0.387	0.395	0.122	0.154	0.016	0.019	0.063	1.760
2015	0.606	0.390	0.399	0.122	0.156	0.016	0.020	0.063	1.771
2016	0.609	0.392	0.403	0.122	0.157	0.016	0.020	0.063	1.782
2017	0.612	0.394	0.407	0.123	0.158	0.016	0.020	0.063	1.793
2018	0.616	0.396	0.411	0.123	0.160	0.016	0.020	0.063	1.804
2019	0.619	0.399	0.415	0.123	0.161	0.016	0.020	0.062	1.815
2020	0.622	0.401	0.419	0.123	0.162	0.016	0.020	0.062	1.825

Sources: BTRE estimates.

TABLE 3.155 BASE CASE PROJECTIONS OF METROPOLITAN VOC (EVAPORATIVE) EMISSIONS BY MOTORCYCLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.38	0.25	0.21	0.09	0.09	0.01	0.01	0.04	1.09
1991	0.36	0.23	0.20	0.08	0.08	0.01	0.01	0.04	1.03
1992	0.36	0.23	0.20	0.08	0.08	0.01	0.01	0.04	1.02
1993	0.35	0.23	0.20	0.08	0.08	0.01	0.01	0.04	1.01
1994	0.35	0.22	0.20	0.08	0.08	0.01	0.01	0.04	0.99
1995	0.34	0.22	0.20	0.08	0.08	0.01	0.01	0.04	0.98
1996	0.35	0.22	0.21	0.08	0.08	0.01	0.01	0.04	1.02
1997	0.35	0.22	0.21	0.08	0.08	0.01	0.01	0.04	1.02
1998	0.35	0.22	0.21	0.08	0.09	0.01	0.01	0.04	1.02
1999	0.35	0.22	0.21	0.08	0.09	0.01	0.01	0.04	1.02
2000	0.35	0.23	0.22	0.08	0.09	0.01	0.01	0.04	1.03
2001	0.36	0.23	0.22	0.08	0.09	0.01	0.01	0.04	1.03
2002	0.36	0.23	0.22	0.08	0.09	0.01	0.01	0.04	1.04
2003	0.36	0.23	0.23	0.08	0.09	0.01	0.01	0.04	1.05
2004	0.37	0.23	0.23	0.08	0.09	0.01	0.01	0.04	1.06
2005	0.37	0.24	0.23	0.08	0.09	0.01	0.01	0.04	1.07
2006	0.37	0.24	0.23	0.08	0.09	0.01	0.01	0.04	1.08
2007	0.37	0.24	0.24	0.08	0.09	0.01	0.01	0.04	1.09
2008	0.38	0.24	0.24	0.08	0.09	0.01	0.01	0.04	1.10
2009	0.38	0.24	0.24	0.08	0.10	0.01	0.01	0.04	1.11
2010	0.38	0.25	0.25	0.08	0.10	0.01	0.01	0.04	1.11
2011	0.38	0.25	0.25	0.08	0.10	0.01	0.01	0.04	1.12
2012	0.39	0.25	0.25	0.08	0.10	0.01	0.01	0.04	1.13
2013	0.39	0.25	0.25	0.08	0.10	0.01	0.01	0.04	1.14
2014	0.39	0.25	0.26	0.08	0.10	0.01	0.01	0.04	1.14
2015	0.39	0.25	0.26	0.08	0.10	0.01	0.01	0.04	1.15
2016	0.40	0.25	0.26	0.08	0.10	0.01	0.01	0.04	1.16
2017	0.40	0.26	0.26	0.08	0.10	0.01	0.01	0.04	1.17
2018	0.40	0.26	0.27	0.08	0.10	0.01	0.01	0.04	1.17
2019	0.40	0.26	0.27	0.08	0.10	0.01	0.01	0.04	1.18
2020	0.40	0.26	0.27	0.08	0.11	0.01	0.01	0.04	1.19

Sources: BTRE estimates.

TABLE 3.156 BASE CASE PROJECTIONS OF METROPOLITAN VOC (TOTAL) EMISSIONS  
BY MOTORCYCLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.97	0.63	0.54	0.22	0.22	0.03	0.03	0.11	2.76
1991	0.92	0.60	0.51	0.21	0.21	0.03	0.03	0.11	2.62
1992	0.90	0.59	0.51	0.20	0.21	0.03	0.03	0.11	2.59
1993	0.89	0.57	0.52	0.20	0.21	0.03	0.03	0.11	2.55
1994	0.88	0.56	0.52	0.20	0.21	0.03	0.03	0.10	2.52
1995	0.86	0.55	0.51	0.19	0.21	0.03	0.03	0.10	2.49
1996	0.89	0.57	0.54	0.20	0.21	0.03	0.03	0.11	2.58
1997	0.89	0.57	0.54	0.20	0.21	0.03	0.03	0.10	2.58
1998	0.89	0.57	0.54	0.19	0.22	0.03	0.03	0.10	2.58
1999	0.89	0.57	0.54	0.19	0.22	0.03	0.03	0.10	2.58
2000	0.90	0.58	0.55	0.19	0.22	0.03	0.03	0.10	2.60
2001	0.91	0.58	0.56	0.19	0.22	0.03	0.03	0.10	2.63
2002	0.91	0.59	0.57	0.19	0.23	0.03	0.03	0.10	2.65
2003	0.92	0.59	0.57	0.19	0.23	0.03	0.03	0.11	2.67
2004	0.93	0.60	0.58	0.20	0.23	0.03	0.03	0.11	2.70
2005	0.94	0.60	0.59	0.20	0.23	0.03	0.03	0.11	2.72
2006	0.94	0.61	0.60	0.20	0.24	0.03	0.03	0.11	2.74
2007	0.95	0.61	0.60	0.20	0.24	0.03	0.03	0.11	2.76
2008	0.96	0.61	0.61	0.20	0.24	0.03	0.03	0.11	2.78
2009	0.96	0.62	0.62	0.20	0.24	0.03	0.03	0.11	2.81
2010	0.97	0.62	0.62	0.20	0.25	0.03	0.03	0.11	2.83
2011	0.98	0.63	0.63	0.20	0.25	0.03	0.03	0.10	2.85
2012	0.98	0.63	0.64	0.20	0.25	0.03	0.03	0.10	2.87
2013	0.99	0.64	0.64	0.20	0.25	0.03	0.03	0.10	2.88
2014	0.99	0.64	0.65	0.20	0.25	0.03	0.03	0.10	2.90
2015	1.00	0.64	0.66	0.20	0.26	0.03	0.03	0.10	2.92
2016	1.01	0.65	0.66	0.20	0.26	0.03	0.03	0.10	2.94
2017	1.01	0.65	0.67	0.20	0.26	0.03	0.03	0.10	2.96
2018	1.02	0.65	0.68	0.20	0.26	0.03	0.03	0.10	2.98
2019	1.02	0.66	0.68	0.20	0.27	0.03	0.03	0.10	2.99
2020	1.03	0.66	0.69	0.20	0.27	0.03	0.03	0.10	3.01

Sources: BTRE estimates.

TABLE 3.157 BASE CASE PROJECTIONS OF METROPOLITAN PM (TOTAL) EMISSIONS BY MOTORCYCLES TO 2020

(thousand tonnes)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	0.018	0.011	0.010	0.004	0.004	0.001	0.001	0.002	0.050
1991	0.017	0.011	0.009	0.004	0.004	0.001	0.000	0.002	0.048
1992	0.016	0.011	0.009	0.004	0.004	0.001	0.000	0.002	0.047
1993	0.016	0.010	0.009	0.004	0.004	0.001	0.000	0.002	0.046
1994	0.016	0.010	0.009	0.004	0.004	0.001	0.000	0.002	0.046
1995	0.016	0.010	0.009	0.003	0.004	0.001	0.000	0.002	0.045
1996	0.016	0.010	0.010	0.004	0.004	0.001	0.001	0.002	0.047
1997	0.016	0.010	0.010	0.004	0.004	0.001	0.001	0.002	0.047
1998	0.016	0.010	0.010	0.004	0.004	0.001	0.001	0.002	0.047
1999	0.016	0.010	0.010	0.004	0.004	0.001	0.001	0.002	0.047
2000	0.016	0.010	0.010	0.004	0.004	0.001	0.001	0.002	0.047
2001	0.017	0.011	0.010	0.004	0.004	0.001	0.001	0.002	0.048
2002	0.017	0.011	0.010	0.004	0.004	0.001	0.001	0.002	0.048
2003	0.017	0.011	0.010	0.004	0.004	0.001	0.001	0.002	0.049
2004	0.017	0.011	0.011	0.004	0.004	0.001	0.001	0.002	0.049
2005	0.017	0.011	0.011	0.004	0.004	0.001	0.001	0.002	0.049
2006	0.017	0.011	0.011	0.004	0.004	0.001	0.001	0.002	0.050
2007	0.017	0.011	0.011	0.004	0.004	0.001	0.001	0.002	0.050
2008	0.017	0.011	0.011	0.004	0.004	0.001	0.001	0.002	0.051
2009	0.018	0.011	0.011	0.004	0.004	0.001	0.001	0.002	0.051
2010	0.018	0.011	0.011	0.004	0.004	0.001	0.001	0.002	0.051
2011	0.018	0.011	0.011	0.004	0.005	0.001	0.001	0.002	0.052
2012	0.018	0.011	0.012	0.004	0.005	0.001	0.001	0.002	0.052
2013	0.018	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.052
2014	0.018	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.053
2015	0.018	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.053
2016	0.018	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.053
2017	0.018	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.054
2018	0.018	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.054
2019	0.019	0.012	0.012	0.004	0.005	0.000	0.001	0.002	0.054
2020	0.019	0.012	0.013	0.004	0.005	0.000	0.001	0.002	0.055

Sources: BTRE estimates.

TABLE 3.158 BASE CASE PROJECTIONS OF MAJOR METROPOLITAN POLLUTANT EMISSIONS BY MOTORCYCLES TO 2020

(thousand tonnes)

Year	PM10	PM2.5	PM1.0	Acet-aldehyde	Form-aldehyde	Total carbonyls	Benzene	Toluene
1990	0.049	0.046	0.043	0.008	0.027	0.116	0.14	0.25
1991	0.047	0.044	0.040	0.008	0.025	0.110	0.13	0.24
1992	0.046	0.043	0.040	0.008	0.025	0.109	0.13	0.23
1993	0.046	0.043	0.039	0.008	0.025	0.107	0.13	0.23
1994	0.045	0.042	0.039	0.008	0.024	0.106	0.13	0.23
1995	0.044	0.042	0.038	0.008	0.024	0.105	0.13	0.22
1996	0.046	0.043	0.040	0.008	0.025	0.108	0.13	0.23
1997	0.046	0.043	0.040	0.008	0.025	0.108	0.13	0.23
1998	0.046	0.043	0.040	0.008	0.025	0.108	0.13	0.23
1999	0.046	0.043	0.040	0.008	0.025	0.108	0.13	0.23
2000	0.046	0.044	0.040	0.008	0.025	0.109	0.13	0.23
2001	0.047	0.044	0.041	0.008	0.025	0.110	0.13	0.24
2002	0.047	0.044	0.041	0.008	0.026	0.111	0.14	0.24
2003	0.048	0.045	0.041	0.008	0.026	0.112	0.14	0.24
2004	0.048	0.045	0.042	0.008	0.026	0.113	0.14	0.24
2005	0.048	0.045	0.042	0.008	0.026	0.114	0.14	0.24
2006	0.049	0.046	0.042	0.008	0.027	0.115	0.14	0.25
2007	0.049	0.046	0.043	0.008	0.027	0.116	0.14	0.25
2008	0.050	0.047	0.043	0.008	0.027	0.117	0.14	0.25
2009	0.050	0.047	0.043	0.009	0.027	0.118	0.14	0.25
2010	0.050	0.047	0.044	0.009	0.027	0.119	0.14	0.25
2011	0.051	0.048	0.044	0.009	0.028	0.120	0.15	0.26
2012	0.051	0.048	0.044	0.009	0.028	0.120	0.15	0.26
2013	0.051	0.048	0.045	0.009	0.028	0.121	0.15	0.26
2014	0.052	0.049	0.045	0.009	0.028	0.122	0.15	0.26
2015	0.052	0.049	0.045	0.009	0.028	0.123	0.15	0.26
2016	0.052	0.049	0.045	0.009	0.029	0.123	0.15	0.26
2017	0.053	0.049	0.046	0.009	0.029	0.124	0.15	0.27
2018	0.053	0.050	0.046	0.009	0.029	0.125	0.15	0.27
2019	0.053	0.050	0.046	0.009	0.029	0.126	0.15	0.27
2020	0.054	0.050	0.047	0.009	0.029	0.126	0.15	0.27

Sources: BTRE estimates.

TABLE 3.158 (cont)      BASE CASE PROJECTIONS OF MAJOR METROPOLITAN  
POLLUTANT EMISSIONS BY MOTORCYCLES TO 2020  
*(thousand tonnes)*

Year	Xylene	1,3-butadiene	Total PAH	Ozone reactivity of VOCs
1990	0.202	0.017	0.006	5.7
1991	0.191	0.016	0.005	5.3
1992	0.189	0.016	0.005	5.2
1993	0.186	0.015	0.005	5.0
1994	0.184	0.015	0.005	4.9
1995	0.182	0.015	0.005	4.7
1996	0.188	0.015	0.005	4.8
1997	0.188	0.015	0.005	4.7
1998	0.188	0.015	0.005	4.6
1999	0.188	0.015	0.005	4.5
2000	0.190	0.016	0.005	4.5
2001	0.192	0.016	0.005	4.4
2002	0.193	0.016	0.005	4.4
2003	0.195	0.016	0.005	4.3
2004	0.197	0.016	0.005	4.3
2005	0.198	0.016	0.005	4.3
2006	0.200	0.016	0.005	4.3
2007	0.202	0.017	0.006	4.2
2008	0.203	0.017	0.006	4.2
2009	0.205	0.017	0.006	4.2
2010	0.206	0.017	0.006	4.2
2011	0.208	0.017	0.006	4.2
2012	0.209	0.017	0.006	4.2
2013	0.211	0.017	0.006	4.2
2014	0.212	0.017	0.006	4.2
2015	0.213	0.018	0.006	4.2
2016	0.215	0.018	0.006	4.2
2017	0.216	0.018	0.006	4.2
2018	0.217	0.018	0.006	4.2
2019	0.219	0.018	0.006	4.2
2020	0.220	0.018	0.006	4.2

Sources: BTRE estimates.

TABLE 3.159 ESTIMATED METROPOLITAN EMISSIONS OF OTHER NPI SPECIES BY MOTORCYCLES TO 2020

(thousand tonnes)

Year	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	n-Hexane	Styrene
1990	0.008	0.008	0.031	0.002	0.024	0.034	0.005
1991	0.008	0.004	0.030	0.002	0.023	0.032	0.004
1992	0.008	0.004	0.029	0.002	0.022	0.031	0.004
1993	0.008	0.004	0.029	0.002	0.022	0.031	0.004
1994	0.008	0.004	0.028	0.002	0.021	0.031	0.004
1995	0.007	0.004	0.028	0.002	0.021	0.030	0.004
1996	0.008	0.004	0.028	0.002	0.022	0.031	0.004
1997	0.008	0.004	0.028	0.002	0.021	0.031	0.004
1998	0.008	0.004	0.027	0.002	0.021	0.031	0.004
1999	0.008	0.004	0.027	0.002	0.021	0.031	0.004
2000	0.008	0.004	0.027	0.002	0.021	0.032	0.004
2001	0.008	0.004	0.026	0.002	0.020	0.032	0.004
2002	0.008	0.004	0.026	0.002	0.020	0.033	0.004
2003	0.008	0.004	0.026	0.002	0.020	0.033	0.004
2004	0.008	0.003	0.026	0.002	0.020	0.034	0.004
2005	0.008	0.003	0.026	0.002	0.020	0.034	0.004
2006	0.008	0.003	0.025	0.002	0.020	0.034	0.004
2007	0.008	0.003	0.025	0.002	0.020	0.035	0.004
2008	0.008	0.003	0.025	0.002	0.020	0.035	0.004
2009	0.008	0.003	0.025	0.002	0.020	0.035	0.004
2010	0.008	0.003	0.025	0.002	0.020	0.036	0.004
2011	0.009	0.003	0.025	0.002	0.020	0.036	0.004
2012	0.009	0.003	0.024	0.002	0.020	0.036	0.004
2013	0.009	0.003	0.024	0.002	0.020	0.037	0.004
2014	0.009	0.003	0.024	0.002	0.020	0.037	0.004
2015	0.009	0.003	0.024	0.002	0.019	0.037	0.004
2016	0.009	0.003	0.024	0.002	0.019	0.038	0.004
2017	0.009	0.003	0.023	0.002	0.019	0.038	0.004
2018	0.009	0.003	0.023	0.002	0.019	0.038	0.004
2019	0.009	0.003	0.023	0.002	0.019	0.039	0.004
2020	0.009	0.003	0.023	0.002	0.019	0.039	0.004

Sources: BTRE estimates.

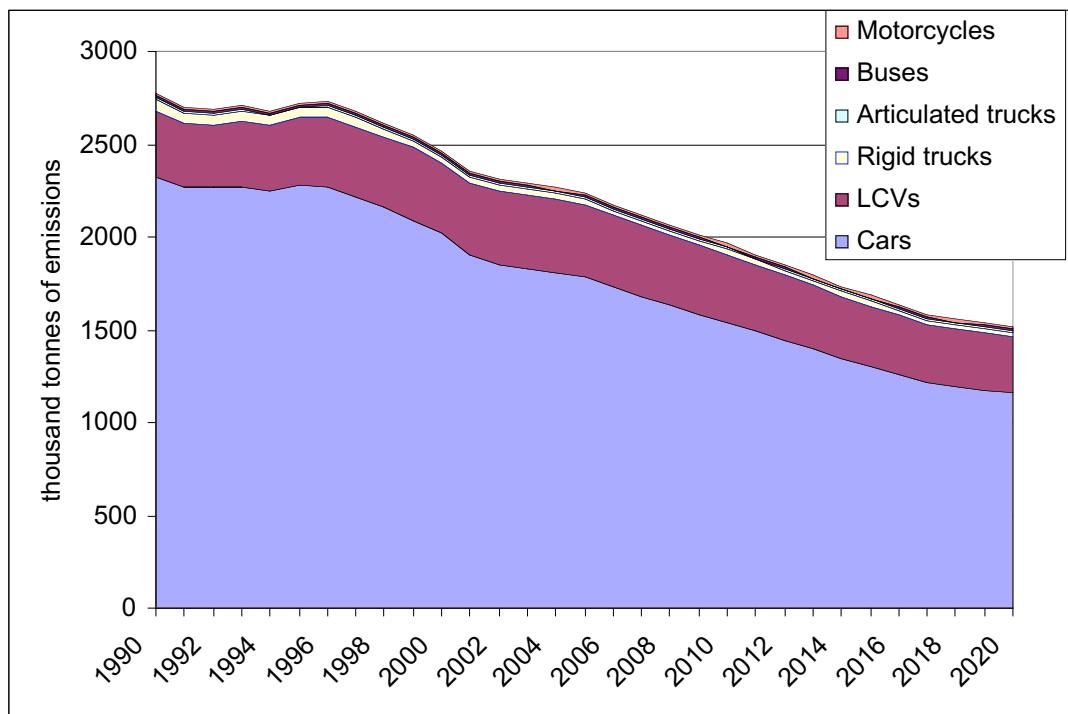
TABLE 3.160 ESTIMATED NATIONAL EMISSIONS OF OTHER NPI SPECIES BY MOTORCYCLES TO 2020

Year	(thousand tonnes)						
	Acetone	Acrolein	Acetylene	Cyclo hexane	Ethyl benzene	n-Hexane	Styrene
1990	0.017	0.009	0.064	0.005	0.048	0.068	0.009
1991	0.016	0.008	0.061	0.005	0.046	0.065	0.009
1992	0.016	0.008	0.059	0.005	0.045	0.064	0.009
1993	0.016	0.008	0.058	0.005	0.044	0.063	0.009
1994	0.015	0.008	0.057	0.005	0.043	0.062	0.008
1995	0.015	0.008	0.056	0.004	0.043	0.061	0.008
1996	0.016	0.008	0.057	0.005	0.044	0.064	0.008
1997	0.016	0.008	0.056	0.005	0.043	0.064	0.008
1998	0.016	0.007	0.055	0.005	0.042	0.064	0.008
1999	0.016	0.007	0.055	0.005	0.042	0.064	0.008
2000	0.016	0.007	0.054	0.005	0.042	0.065	0.008
2001	0.016	0.007	0.054	0.005	0.042	0.066	0.008
2002	0.016	0.007	0.053	0.005	0.042	0.066	0.008
2003	0.016	0.007	0.053	0.005	0.041	0.067	0.008
2004	0.016	0.007	0.052	0.005	0.041	0.068	0.008
2005	0.017	0.007	0.052	0.005	0.041	0.069	0.008
2006	0.017	0.007	0.052	0.005	0.041	0.070	0.008
2007	0.017	0.007	0.051	0.005	0.041	0.070	0.008
2008	0.017	0.007	0.051	0.005	0.040	0.071	0.008
2009	0.017	0.007	0.050	0.005	0.040	0.072	0.008
2010	0.017	0.007	0.050	0.005	0.040	0.073	0.008
2011	0.017	0.007	0.050	0.005	0.040	0.073	0.008
2012	0.017	0.007	0.049	0.005	0.040	0.074	0.008
2013	0.018	0.007	0.049	0.005	0.040	0.075	0.008
2014	0.018	0.007	0.049	0.005	0.040	0.075	0.008
2015	0.018	0.006	0.048	0.005	0.040	0.076	0.008
2016	0.018	0.006	0.048	0.005	0.039	0.077	0.008
2017	0.018	0.006	0.047	0.005	0.039	0.077	0.007
2018	0.018	0.006	0.047	0.005	0.039	0.078	0.007
2019	0.018	0.006	0.047	0.005	0.039	0.078	0.007
2020	0.018	0.006	0.047	0.005	0.039	0.079	0.007

Sources: BTRE estimates.

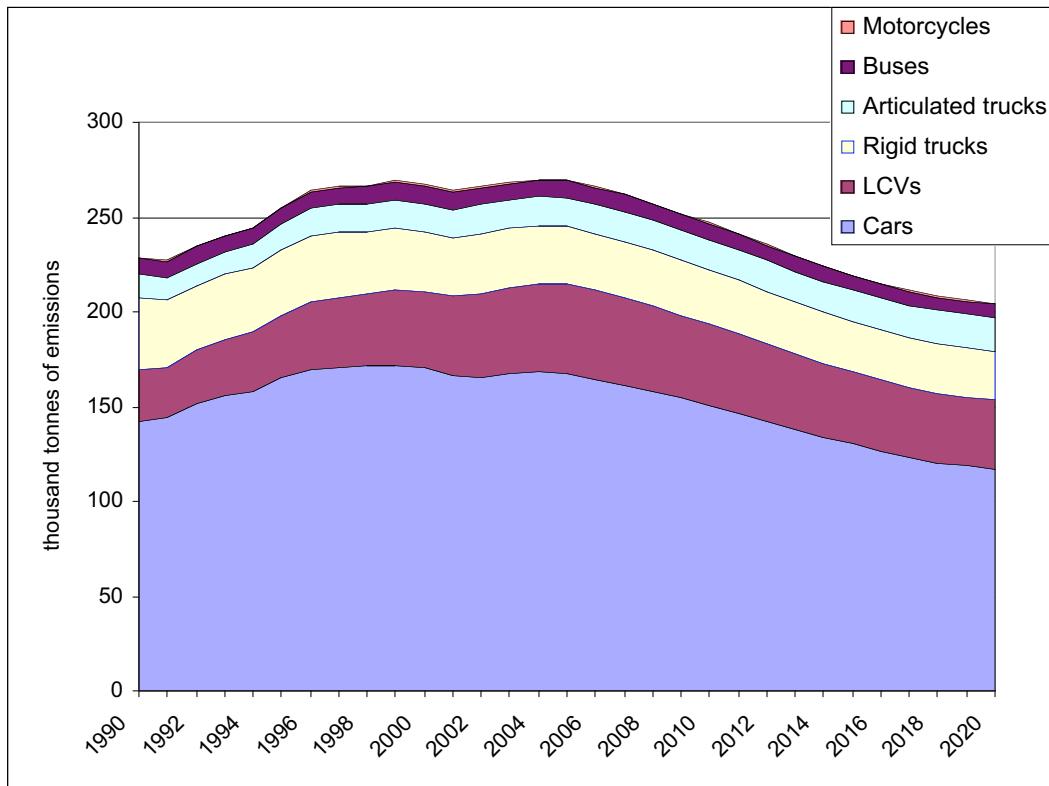
## SUMMARY CHARTS FOR BTRE POLLUTANT PROJECTIONS

**Figure 3.1 Base case trend in metropolitan CO emissions**



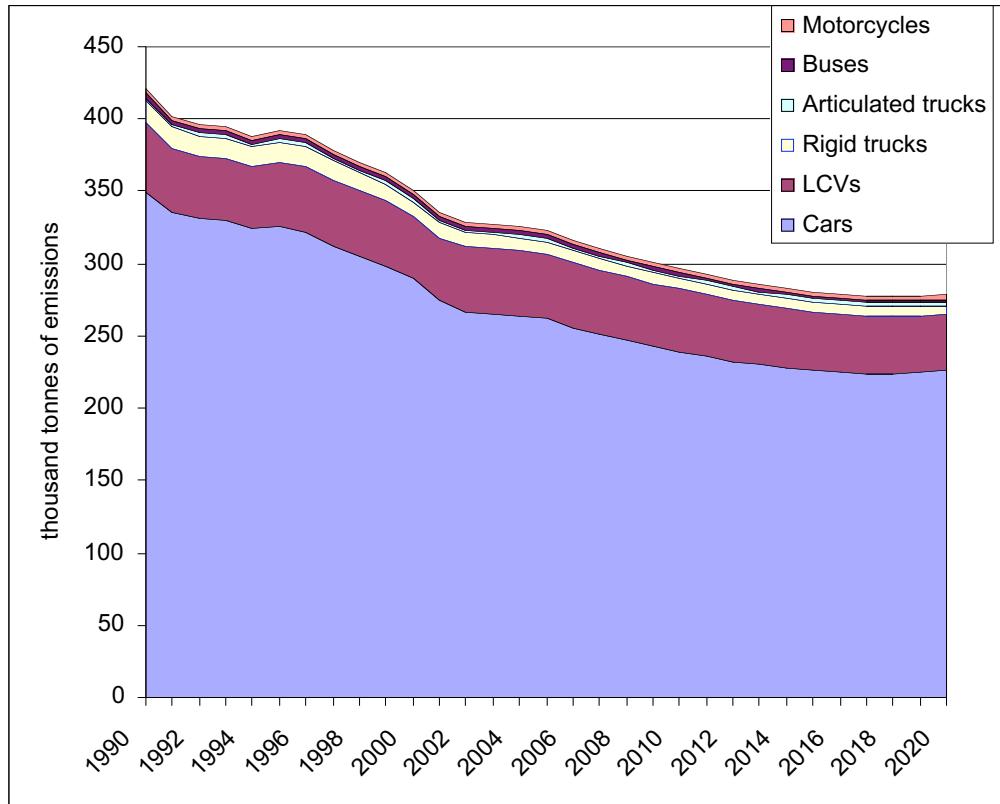
*Source:* BTRE estimates.

**Figure 3.2 Base case trend in metropolitan NOx emissions**



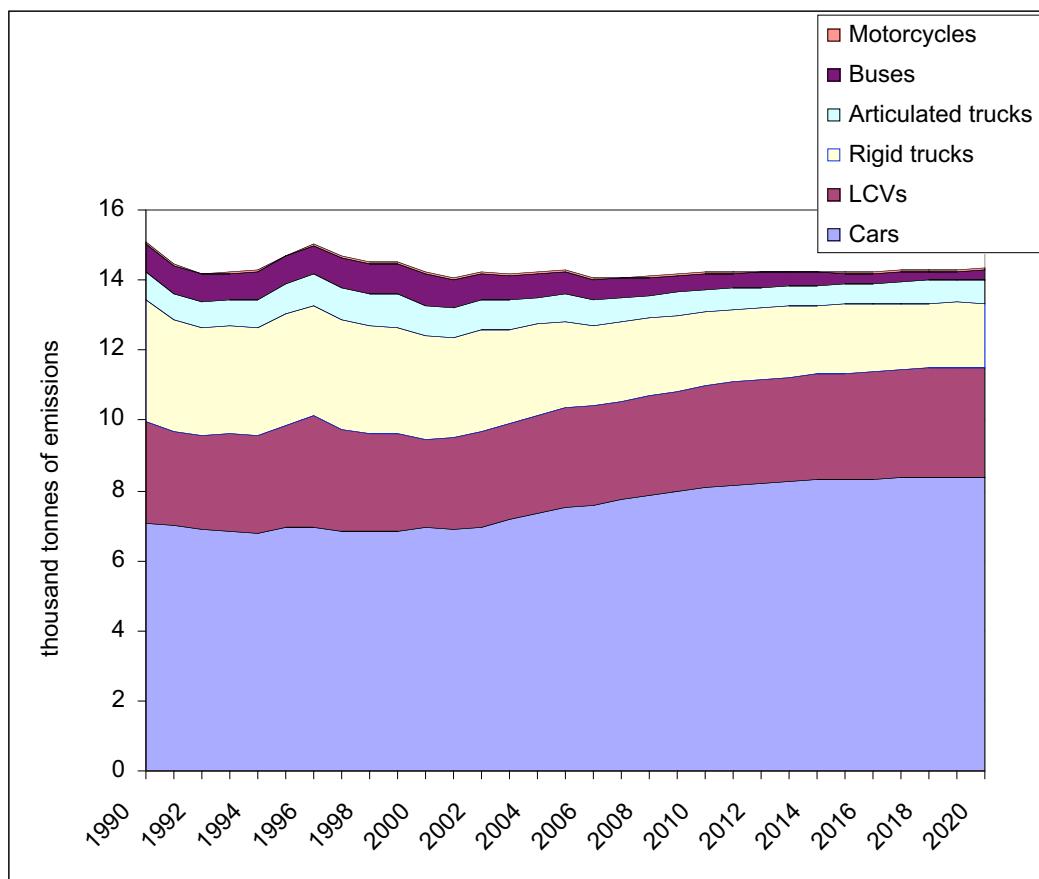
*Source:* BTRE estimates.

**Figure 3.3 Base case trend in metropolitan VOC (total) emissions**



*Source:* BTRE estimates.

**Figure 3.4 Base case trend in metropolitan PM (total) emissions**



*Source:* BTRE estimates.

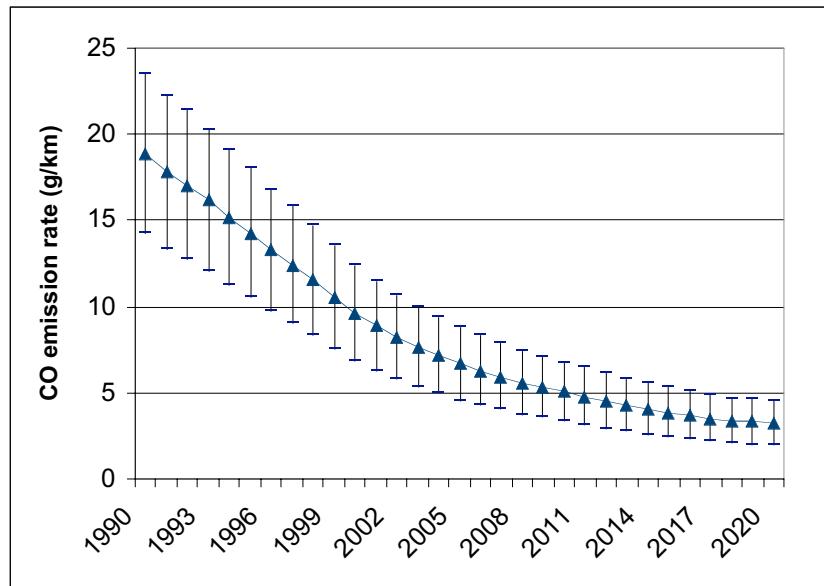
Referring to figures 3.5 to 3.7, year 2000 average emission rates (for car traffic under stabilised driving conditions) are estimated as:

- 9.65 g/km for CO (with a likely range of 6.9 to 12.4 g/km, depending on the level of variability in the driving conditions), which is a 52 per cent reduction on the similarly estimated rate for 1990;
- 1.56 g/km for NOx (with a likely range of 1.37 to 1.75 g/km), down 23 per cent from the 1990 estimate; and
- 1.03 g/km for VOCs released during vehicle movement – ie exhaust VOC and evaporative VOC running losses - (with a likely range of 1.05 to 1.34 g/km), down 48 per cent from the 1990 estimate.

Since cold start conditions also tend to more than double average PM emission rates from cars (see appendix figure I.11), a similar relationship between overall emission trends and stabilised trends will hold for PM emissions as well (though the resulting stabilised trend curve will tend to be somewhat flatter than those derived for figures 3.5 to 3.7).

The trends derived in figures 3.5 to 3.7 could possibly form a reasonable proxy for trends expected in concentration measurements, by urban air monitoring, taken next to roads with generally stabilised average driving conditions and with relatively stable traffic flow volumes over the measurement years.

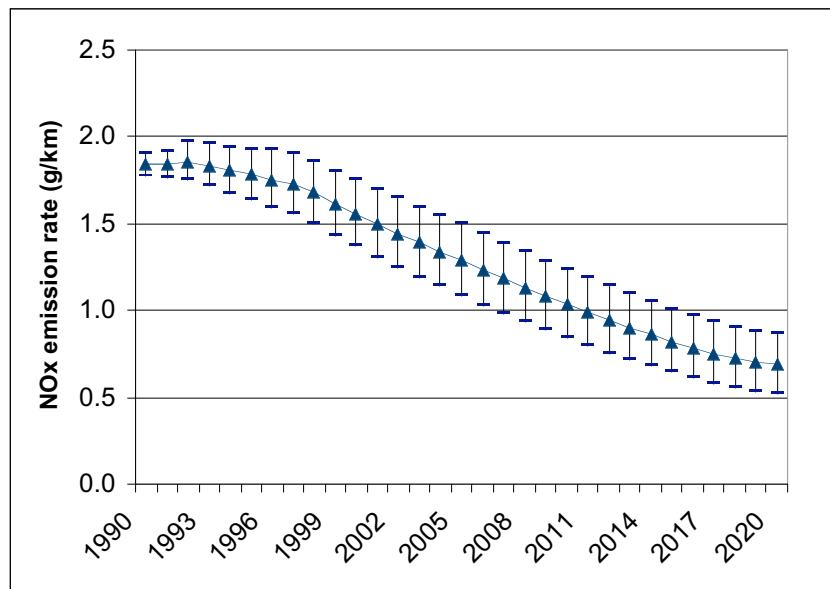
**Figure 3.5 Base case trend in average car fleet CO emission rate for stabilised driving conditions**



**Note:** 'Stabilised driving conditions' assume that catalyst emission controls are operating properly (as opposed to cold start conditions) and that stop-start movement is only at intermediate levels - with provided uncertainty ranges covering the differences between non-metropolitan travel (largely free-flow conditions) and travel under average metropolitan congestion levels.

**Source:** BTRE estimates.

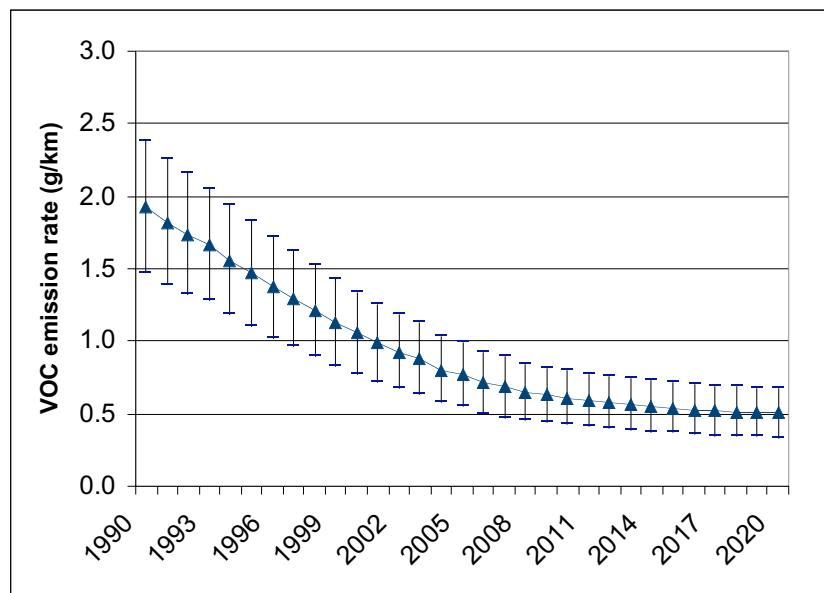
**Figure 3.6 Base case trend in average car fleet NOx emission rate for stabilised driving conditions**



**Note:** 'Stabilised driving conditions' assume that catalyst emission controls are operating properly (as opposed to cold start conditions) and that stop-start movement is only at intermediate levels - with provided uncertainty ranges covering the differences between non-metropolitan travel (largely free-flow conditions) and travel under average metropolitan congestion levels.

**Source:** BTRE estimates.

**Figure 3.7 Base case trend in average car fleet VOC emission rate for stabilised driving conditions**



**Notes:** 'Stabilised driving conditions' assume that catalyst emission controls are operating properly (as opposed to cold start conditions) and that stop-start movement is only at intermediate levels - with provided uncertainty ranges covering the differences between non-metropolitan travel (largely free-flow conditions) and travel under average metropolitan congestion levels.

Relates to VOCs released during vehicle movement – ie exhaust VOC and evaporative VOC running losses.

**Source:** BTRE estimates.

## **CHAPTER 4 IMPACT OF ALTERNATIVE TRANSPORT SCENARIOS ON POLLUTANT VEHICLE EMISSIONS**

Given that metropolitan pollutant emissions from motor vehicles are forecast to remain at generally significant levels by 2020 (even though improving steadily over the projection period due to tightened vehicle design standards), a variety of policy options offer considerable scope for emission abatement. This chapter presents the results of modelling the likely changes to base case emission projections under two policy scenarios:

- improving metropolitan travel demand management (TDM), primarily through the introduction of optimal road pricing (ORP) - ie targeted road user charges; and
- further tightening of the emission standards, for new vehicles, within the Australian Design Rules (ADRs) – above the currently legislated levels (mandated by 2006).

#### **4.1 TDM THROUGH OPTIMAL ROAD PRICING**

Generally, a highly effective way of improving travel demand management (TDM) is to make travellers pay for the full costs that their travel choices impose on society.

Optimal road pricing (where ‘optimal’ here refers to the charges being structured to vary between different parts of the city according to requirements, so that they would be higher in the more congested areas and lower in less congested areas) offer the potential to considerably reduce metropolitan motor vehicle emissions. The use of Intelligent Transport Systems (ITS) to apply optimal road user charges across metropolitan road networks offers a particularly effective combination of transport demand management (TDM) and advanced technology use – for recent discussion of this topic see chapter 5 of BTRE Report 107 (BTRE 2002).

Bureau analysis for Report 92 (BTCE 1996a) used network models to calculate the likely scale of optimal road charges for metropolitan Australia. This report derived average charges (across all road types in peak periods, for economically optimal congestion reductions) in the order of 10 cents per kilometre travelled - varying by local traffic level, to be as high as 75 c/km and \$1.26/km for the most congested parts of Sydney and Melbourne respectively.

Further Bureau work for Report 94 (BTCE 1996b) estimated that introducing congestion charges (along with the infrastructure to electronically collect the charges and vary them optimally across the road network) to Australian metropolitan areas, would result in significant reductions in total vehicle delays, total fuel use and urban emission levels – with an overall social cost calculation yielding a substantial net benefit (of around \$6 billion per annum, primarily from the value of travel time savings, over the next 20 years).

Based on the results of this network modelling for each of Australia’s major metropolitan areas (for BTE Report 92 and BTCE Report 94), the likely effects of levying such optimal charges across the 8 State and Territory capitals will be to:

- decrease total metropolitan VKT in 2020 by around 14 per cent below the level projected in the base case (where it is assumed that bus VKT increases by 30 per cent to help handle travel mode shifts);
- decrease average fuel intensity (L/100km) across metropolitan Australia in 2020 by around 7 per cent; and thus
- decrease total metropolitan fuel use in 2020 by around 20 per cent.

Using these changes to base case vehicle use in the Bureau’s emission models results in the ORP scenario having an estimated effect of:

- decreasing total metropolitan CO emissions from motor vehicles in 2020 by around 22 per cent below the base case projected level;
- decreasing NOx emissions in 2020 by around 18 per cent;
- decreasing VOC emissions in 2020 by around 23 per cent;
- decreasing PM emissions in 2020 by around 19 per cent; and
- decreasing SOx emissions in 2020 by around 22 per cent.

Figures 4.1 to 4.4 also present rough *indicative* estimates for a ‘combined’ scenario, that assumes TDM to be improved even further in the future by allying the introduction of ORP with other – typically non-pricing - measures (aimed at increasing the efficiency of the public’s decision-making with respect to transport mode choices).

Examples of such TDM measures include: individualised marketing to households to help travellers improve their transport planning; encouragement of logistics improvements for urban goods and services distribution; improvements in the provision of infrastructure for non-motorised transport (such as cycle lanes); promoting public transit use (and improving levels of service).

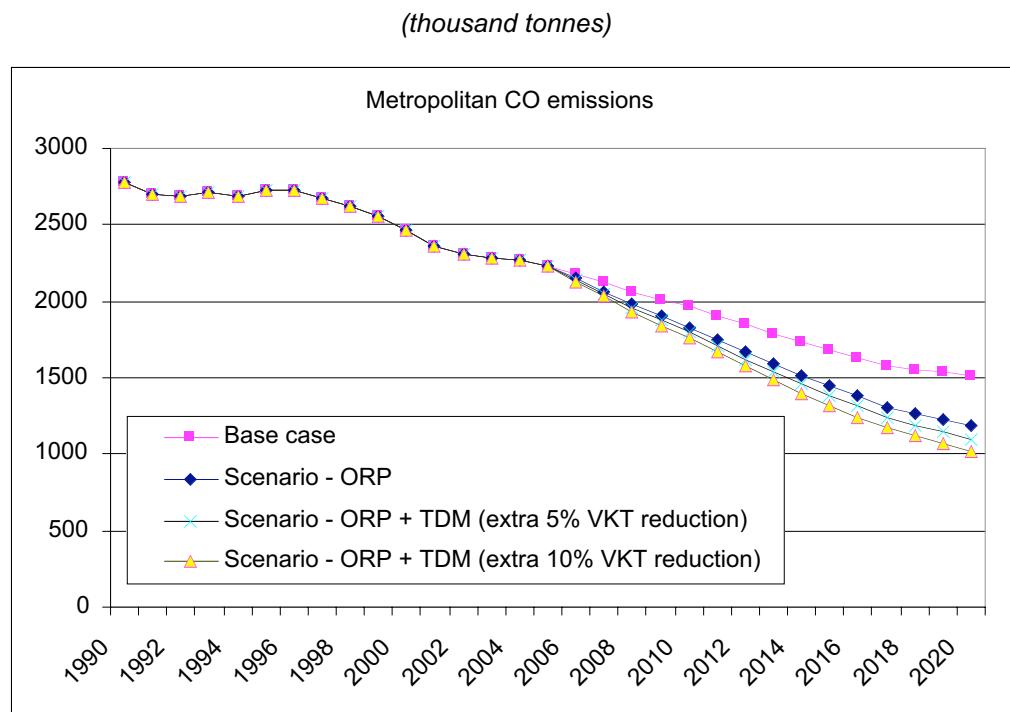
The likely magnitudes of the effects of TDM measures such as individualised marketing programs are difficult to accurately assess (see chapter 5 of BTRE Report 107), and more research and pilot testing in this area would be useful. For this scenario, two sensitivity levels are chosen. Emission calculations are done assuming that a package of TDM improvements, introduced in conjunction with ORP, is capable of reducing urban VKT by

- 1) a further 5 per cent below the ORP scenario level, and
- 2) a further 10 per cent below the ORP scenario level;

(with bus VKT increasing a further 10-15 per cent to cope with the extra mode shifts).

Under the ‘high’ assumption, of an extra 10% reduction, the ‘ORP + TDM combined’ scenario yields: a decrease in total metropolitan CO, VOC and SOx emissions from motor vehicles in 2020 of approximately 33 per cent below the base case projected level; a decrease in (2020) NOx emissions of around 27 per cent; and a decrease in (2020) PM emissions of around 26 per cent.

**Figure 4.1 Base case CO emissions and estimated reductions from Optimal Road Pricing (ORP) scenario and ORP combined with improved Travel Demand Management (TDM) scenario**



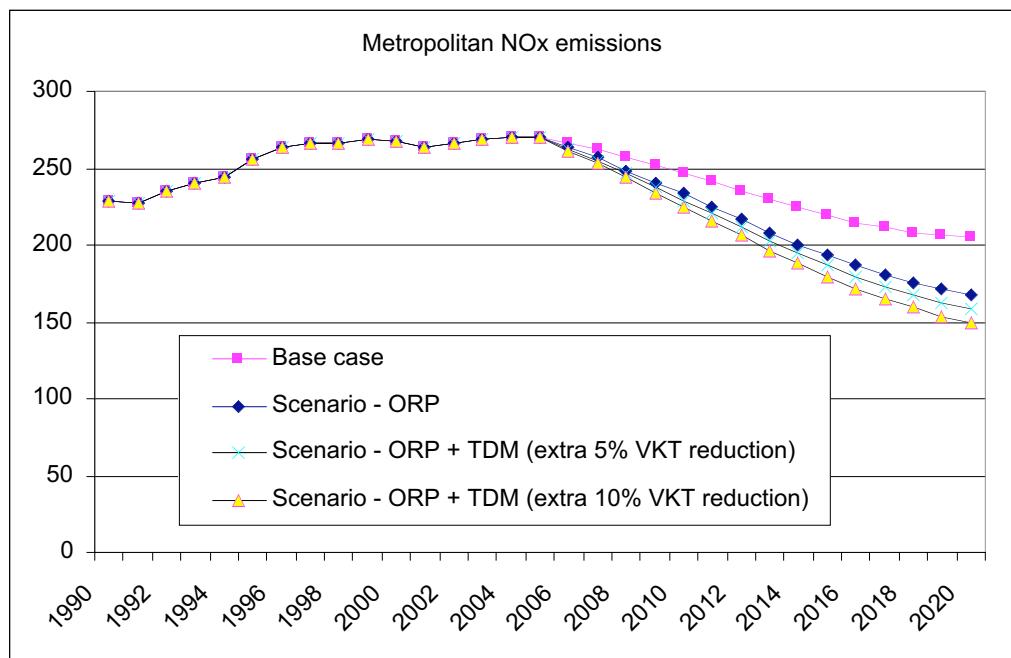
**Note:**

The 'Combined' scenario results are indicative estimates only. They are model results obtained by assuming that ORP combined with further improvements to urban TDM can reduce overall metropolitan VKT by a further 5-10 per cent (below the level obtained under the ORP scenario).

**Source:** BTRE estimates, BTCE (1996b).

**Figure 4.2 Base case NO<sub>x</sub> emissions and estimated reductions from Optimal Road Pricing (ORP) scenario and ORP combined with improved Travel Demand Management (TDM) scenario**

(thousand tonnes)



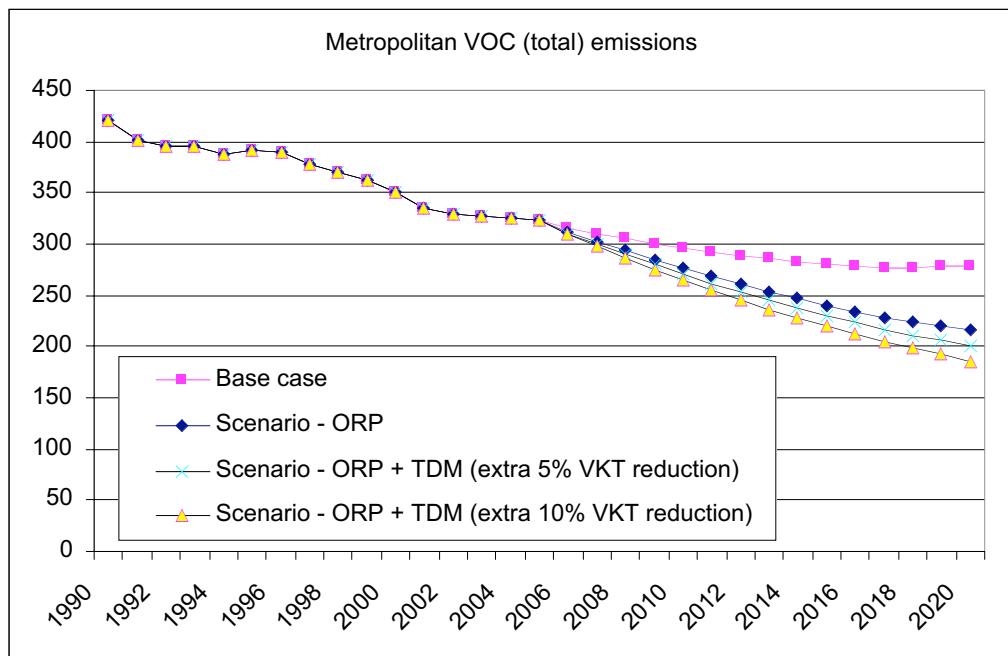
**Note:**

The 'Combined' scenario results are indicative estimates only. They are model results obtained by assuming that ORP combined with further improvements to urban TDM can reduce overall metropolitan VKT by a further 5-10 per cent (below the level obtained under the ORP scenario).

**Source:** BTRE estimates, BTCE (1996b).

**Figure 4.3 Base case VOC emissions and estimated reductions from Optimal Road Pricing (ORP) scenario and ORP combined with improved Travel Demand Management (TDM) scenario**

(thousand tonnes)



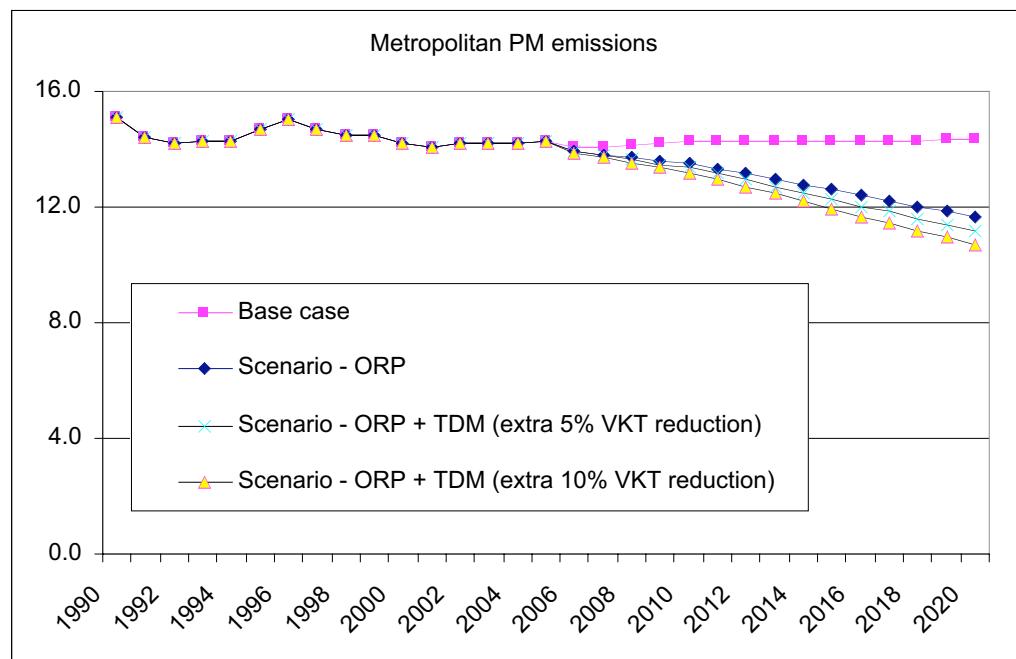
Notes: Total Volatile Organic Compounds (VOCs) – both evaporative and exhaust.

The 'Combined' scenario results are indicative estimates only. They are model results obtained by assuming that ORP combined with further improvements to urban TDM can reduce overall metropolitan VKT by a further 5-10 per cent (below the level obtained under the ORP scenario).

Source: BTRE estimates, BTCE (1996b).

**Figure 4.4 Base case Particulate Matter emissions and estimated reductions from Optimal Road Pricing (ORP) scenario and ORP combined with improved Travel Demand Management (TDM) scenario**

(thousand tonnes)

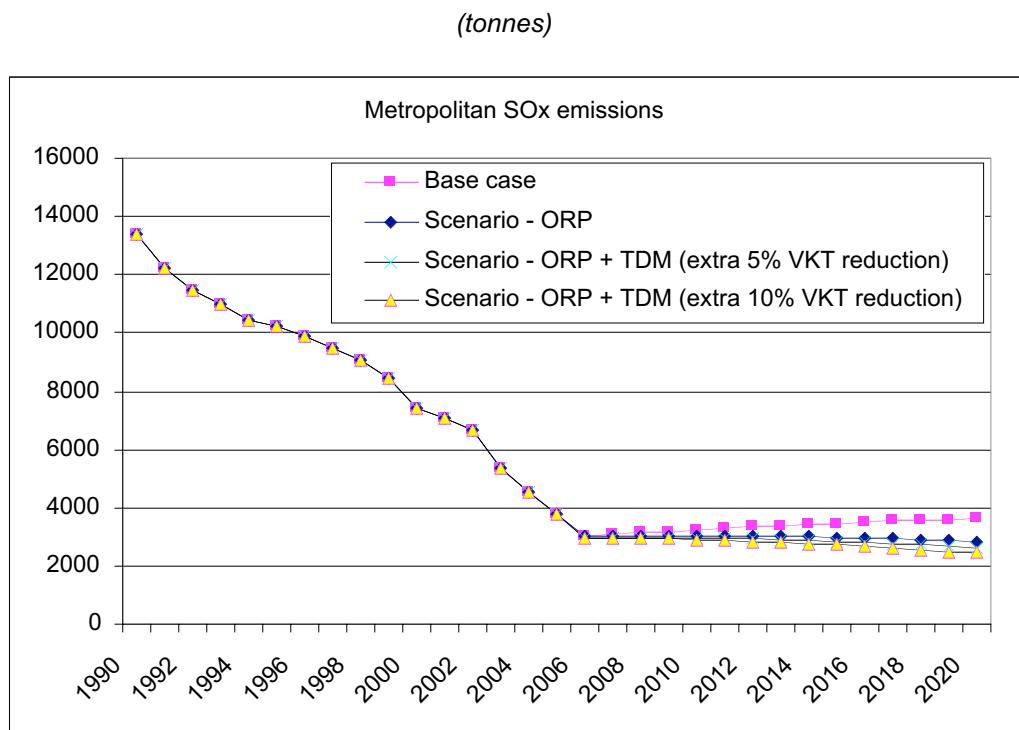


**Note:**

The 'Combined' scenario results are indicative estimates only. They are model results obtained by assuming that ORP combined with further improvements to urban TDM can reduce overall metropolitan VKT by a further 5-10 per cent (below the level obtained under the ORP scenario).

**Source:** BTRE estimates, BTCE (1996b).

**Figure 4.5 Base case SO<sub>x</sub> emissions and estimated reductions from Optimal Road Pricing (ORP) scenario and ORP combined with improved Travel Demand Management (TDM) scenario**



**Note:** The 'Combined' scenario results are indicative estimates only. They are model results obtained by assuming that ORP combined with further improvements to urban TDM can reduce overall metropolitan VKT by a further 5-10 per cent (below the level obtained under the ORP scenario).

SOURCES: BTRE estimates, BTCE (1996b).

TABLE 4.1 ORP SCENARIO PROJECTIONS OF METROPOLITAN VEHICLE  
KILOMETRES TRAVELED BY TYPE OF VEHICLE, 1990-2020  
(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles	Total
1990	73.43	12.20	4.13	0.69	0.59	0.84	91.88
1991	73.84	11.56	3.89	0.64	0.60	0.79	91.33
1992	75.07	11.67	3.80	0.67	0.60	0.78	92.60
1993	76.98	12.46	3.75	0.70	0.59	0.77	95.26
1994	78.56	12.65	3.77	0.75	0.62	0.76	97.11
1995	81.96	13.29	3.90	0.81	0.64	0.75	101.35
1996	84.30	14.49	3.89	0.86	0.66	0.78	104.98
1997	85.21	14.89	3.87	0.91	0.69	0.78	106.35
1998	86.92	15.22	3.79	0.94	0.72	0.78	108.38
1999	89.21	16.03	3.82	1.01	0.74	0.78	111.60
2000	91.24	15.88	3.73	1.02	0.79	0.79	113.44
2001	91.21	16.85	3.76	1.03	0.78	0.80	114.43
2002	93.33	17.79	3.90	1.08	0.79	0.80	117.70
2003	96.78	18.53	3.91	1.10	0.81	0.81	121.94
2004	100.12	19.26	3.99	1.14	0.82	0.82	126.15
2005	103.14	20.12	4.00	1.19	0.83	0.82	130.10
2006	103.78	20.68	4.03	1.24	0.86	0.83	131.41
2007	104.36	21.36	4.07	1.29	0.89	0.84	132.81
2008	104.88	21.95	4.10	1.34	0.92	0.84	134.02
2009	105.27	22.55	4.13	1.39	0.95	0.85	135.13
2010	105.58	23.29	4.17	1.45	0.99	0.86	136.33
2011	105.71	23.90	4.19	1.50	1.02	0.86	137.18
2012	105.78	24.53	4.21	1.55	1.05	0.87	137.98
2013	105.73	25.17	4.22	1.61	1.08	0.87	138.68
2014	105.62	25.83	4.23	1.66	1.11	0.88	139.34
2015	105.44	26.50	4.25	1.72	1.15	0.89	139.94
2016	105.18	27.17	4.26	1.78	1.18	0.89	140.46
2017	104.87	28.01	4.29	1.85	1.23	0.90	141.13
2018	104.50	28.72	4.29	1.91	1.26	0.90	141.58
2019	104.07	29.45	4.29	1.98	1.29	0.91	141.99
2020	103.59	30.19	4.30	2.04	1.34	0.91	142.37

*Note:* 'Metropolitan' results refer to all activity within the greater metropolitan areas of the 8 State and Territory capital cities.

Sources: BTRE estimates, BTRE (2002).

TABLE 4.2 ORP SCENARIO PROJECTIONS OF METROPOLITAN TOTAL VKT BY CITY,  
1990-2020

Year	(billion kilometres)									<i>Total</i>
	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr		
1990	30.17	27.07	11.51	7.92	10.30	1.45	0.64	2.82	91.88	
1991	29.99	26.89	11.47	7.96	10.19	1.41	0.65	2.78	91.33	
1992	30.21	27.14	11.76	8.03	10.44	1.45	0.68	2.89	92.60	
1993	31.09	27.90	12.10	8.25	10.77	1.49	0.70	2.97	95.26	
1994	31.68	28.45	12.34	8.39	11.00	1.52	0.71	3.03	97.11	
1995	33.05	29.68	12.90	8.74	11.50	1.58	0.74	3.16	101.35	
1996	34.23	30.69	13.39	9.03	11.96	1.64	0.77	3.28	104.98	
1997	34.73	31.07	13.56	9.12	12.12	1.65	0.78	3.32	106.35	
1998	35.15	31.90	13.82	9.51	12.27	1.63	0.80	3.31	108.38	
1999	36.09	32.88	14.41	9.63	12.62	1.70	0.82	3.45	111.60	
2000	36.90	33.34	14.47	9.82	12.89	1.74	0.84	3.46	113.44	
2001	37.26	33.58	14.65	9.82	13.06	1.72	0.85	3.48	114.43	
2002	38.35	34.53	15.12	10.05	13.47	1.75	0.88	3.56	117.70	
2003	39.74	35.73	15.73	10.35	14.00	1.79	0.91	3.68	121.94	
2004	41.12	36.92	16.34	10.66	14.52	1.83	0.94	3.81	126.15	
2005	42.43	38.03	16.92	10.94	15.02	1.87	0.97	3.92	130.10	
2006	42.79	38.37	17.18	11.04	15.19	1.87	0.99	3.98	131.41	
2007	43.19	38.73	17.45	11.14	15.36	1.89	1.01	4.03	132.81	
2008	43.52	39.05	17.71	11.22	15.52	1.89	1.03	4.08	134.02	
2009	43.82	39.33	17.94	11.30	15.66	1.90	1.05	4.13	135.13	
2010	44.15	39.63	18.20	11.38	15.82	1.91	1.06	4.19	136.33	
2011	44.36	39.83	18.40	11.44	15.93	1.91	1.08	4.23	137.18	
2012	44.55	40.02	18.61	11.49	16.03	1.91	1.10	4.27	137.98	
2013	44.71	40.18	18.80	11.53	16.13	1.91	1.11	4.31	138.68	
2014	44.86	40.32	18.98	11.58	16.21	1.91	1.13	4.35	139.34	
2015	44.98	40.45	19.16	11.61	16.29	1.91	1.14	4.39	139.94	
2016	45.08	40.55	19.33	11.65	16.37	1.91	1.16	4.42	140.46	
2017	45.23	40.68	19.52	11.69	16.46	1.91	1.18	4.46	141.13	
2018	45.30	40.76	19.69	11.72	16.52	1.90	1.19	4.50	141.58	
2019	45.36	40.82	19.84	11.75	16.57	1.90	1.21	4.53	141.99	
2020	45.41	40.88	20.00	11.77	16.63	1.90	1.22	4.57	142.37	

Sources: BTRE estimates.

TABLE 4.3 ORP SCENARIO PROJECTIONS OF METROPOLITAN FUEL INTENSITY  
BY TYPE OF VEHICLE, 1990-2020  
(billion kilometres)

Year	Cars	Light Commercial Vehicles	Articulated trucks	Rigid and other trucks	Buses	Motor cycles
1990	12.10	13.69	27.30	49.55	28.97	6.00
1991	12.04	13.62	27.31	49.34	28.47	6.00
1992	11.99	13.56	27.31	49.20	27.96	6.00
1993	11.97	13.54	27.36	49.23	27.63	6.00
1994	11.93	13.52	27.41	49.38	27.37	6.00
1995	11.92	13.53	27.50	49.70	27.17	6.00
1996	11.89	13.53	27.61	49.94	27.02	6.00
1997	11.84	13.51	27.68	50.03	26.82	6.00
1998	11.79	13.52	27.73	50.19	26.69	6.00
1999	11.72	13.51	27.72	50.45	26.58	6.00
2000	11.69	13.51	27.75	50.59	26.46	6.00
2001	11.69	13.57	27.91	50.81	26.32	6.00
2002	11.68	13.62	28.00	51.13	26.24	6.00
2003	11.69	13.68	28.10	51.48	26.21	6.00
2004	11.70	13.71	28.16	51.85	26.24	6.00
2005	11.72	13.77	28.29	52.19	26.28	6.00
2006	11.68	13.79	28.33	52.35	26.12	6.00
2007	11.64	13.81	28.38	52.50	26.24	6.00
2008	11.60	13.82	28.42	52.62	26.24	6.00
2009	11.55	13.83	28.47	52.72	26.25	6.00
2010	11.50	13.85	28.52	52.82	26.27	6.00
2011	11.43	13.85	28.56	52.88	26.29	6.00
2012	11.36	13.85	28.60	53.02	26.32	6.00
2013	11.29	13.85	28.64	53.14	26.34	6.00
2014	11.21	13.84	28.67	53.25	26.36	6.00
2015	11.13	13.83	28.71	53.34	26.38	6.00
2016	11.05	13.82	28.75	53.43	26.40	6.00
2017	10.96	13.81	28.80	53.54	26.43	6.00
2018	10.86	13.80	28.83	53.62	26.45	6.00
2019	10.76	13.78	28.87	53.70	26.47	6.00
2020	10.66	13.76	28.91	53.78	26.49	6.00

Sources: BTRE estimates, BTRE (2002).

## **4.2 Introduction of Euro 4 (Petrol) and Euro 5 (Diesel) standards by 2010**

This scenario assumes that as well as the currently mandated changes to future emission standards (see appendix tables I.8 and I.9), there will be a further tightening of the Australian design standards (ADRs) by 2010. Specifically:

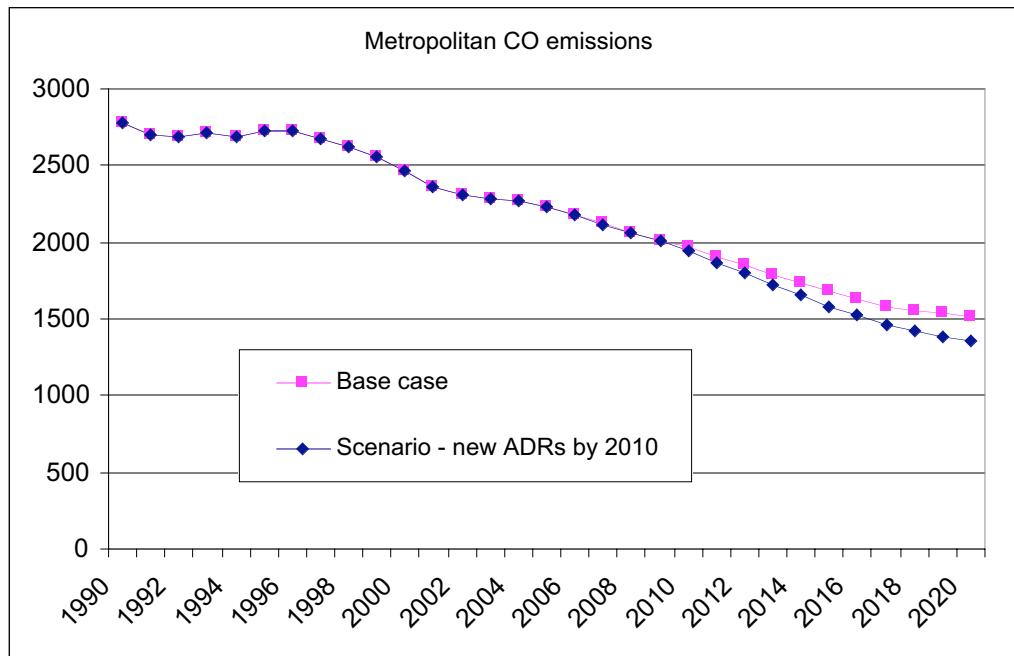
- the introduction of Euro 4 standards for light petrol/LPG/CNG vehicles in 2008/09 (which consists of 1 g/km for CO car emissions, 0.08 g/km for NOx, and 0.1 g/km for exhaust VOC emissions) and
- the introduction of Euro 5 standards for diesel vehicles in 2009/10 (which reduce the Euro 4 NOx standard for heavy vehicles of 3.5 g/kWhr to 2 g/kWhr).

It is assumed in this scenario that the introduction of Euro 4 and Euro 5 vehicle standards will require the provision of 50 ppm Sulfur petrol and 10 ppm Sulfur diesel fuel to the Australian market. This results in the 'New ADRs by 2010' scenario having 34 per cent lower SOx emissions in 2020 than the base case (figure 4.10).

For this scenario (see figures 4.6 to 4.8), it is estimated that the ADR changes would reduce 2020 emissions of metropolitan CO by around 11 per cent (below the base case projected level), NOx emissions by around 12 per cent and VOC emissions by around 9 per cent.

**Figure 4.6 Base case CO emissions and estimated reductions from scenario of tighter emission standards (ADRs) by 2010**

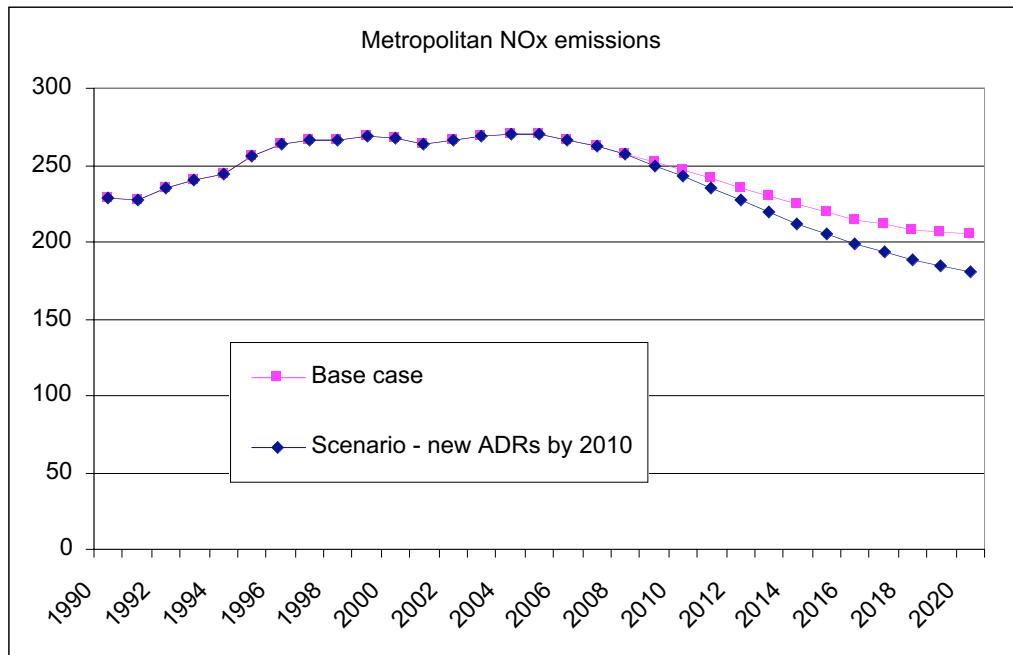
(*thousand tonnes*)



Source: BTRE estimates.

**Figure 4.7 Base case NO<sub>x</sub> emissions and estimated reductions from scenario of tighter emission standards (ADRs) by 2010**

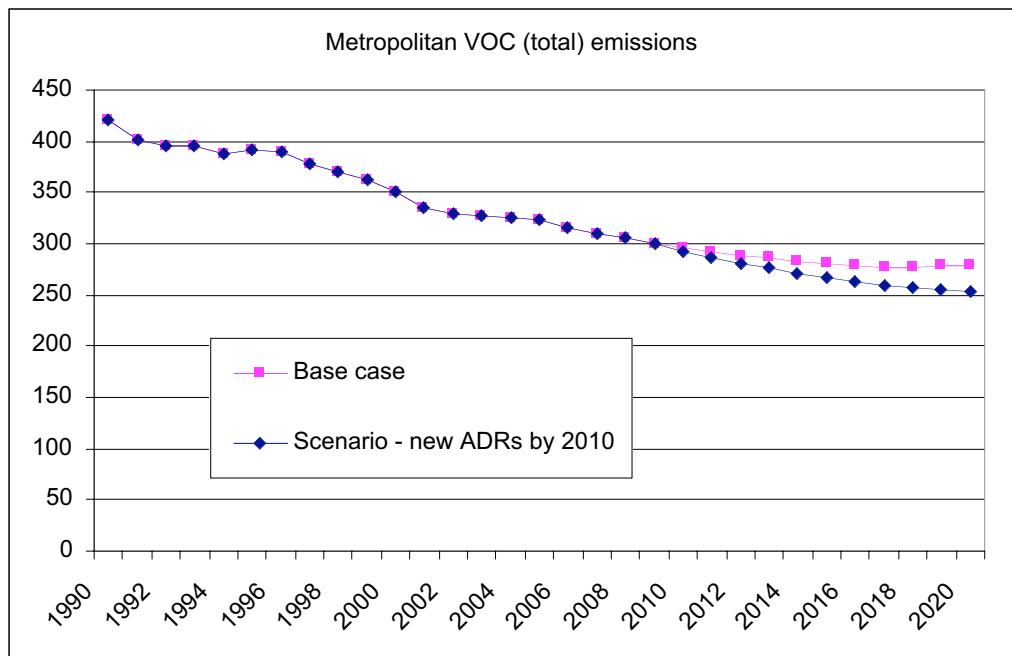
(thousand tonnes)



Source: BTRE estimates.

**Figure 4.8 Base case VOC emissions and estimated reductions from scenario of tighter emission standards (ADRs) by 2010**

(thousand tonnes)

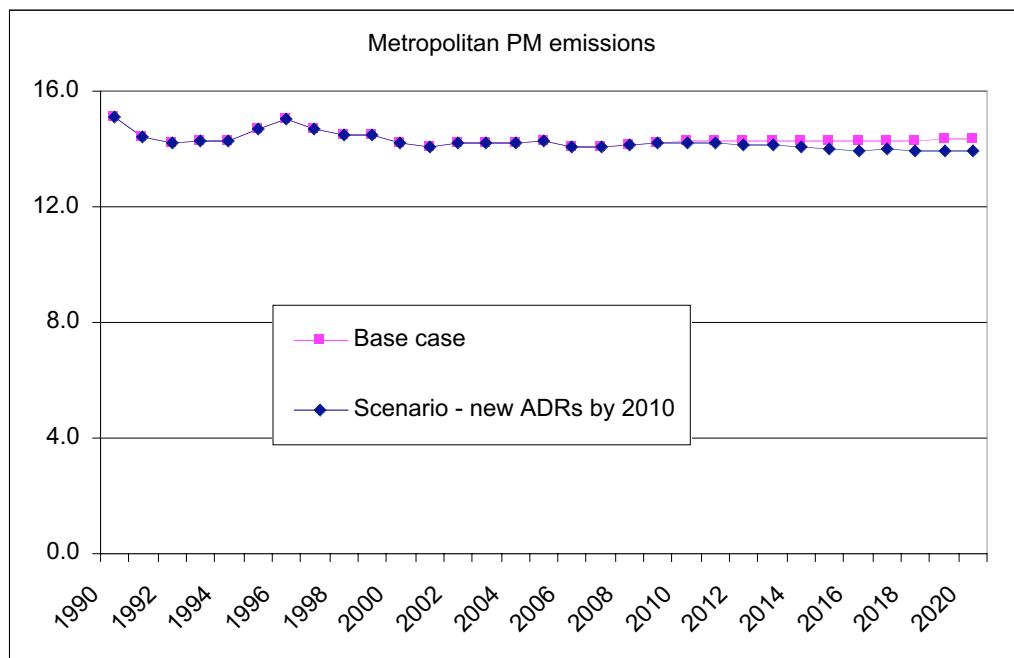


*Note:* Total Volatile Organic Compounds (VOCs) – both evaporative and exhaust.

*Source:* BTRE estimates.

**Figure 4.9 Base case Particulate Matter emissions and estimated reductions from scenario of tighter emission standards (ADRs) by 2010**

(thousand tonnes)

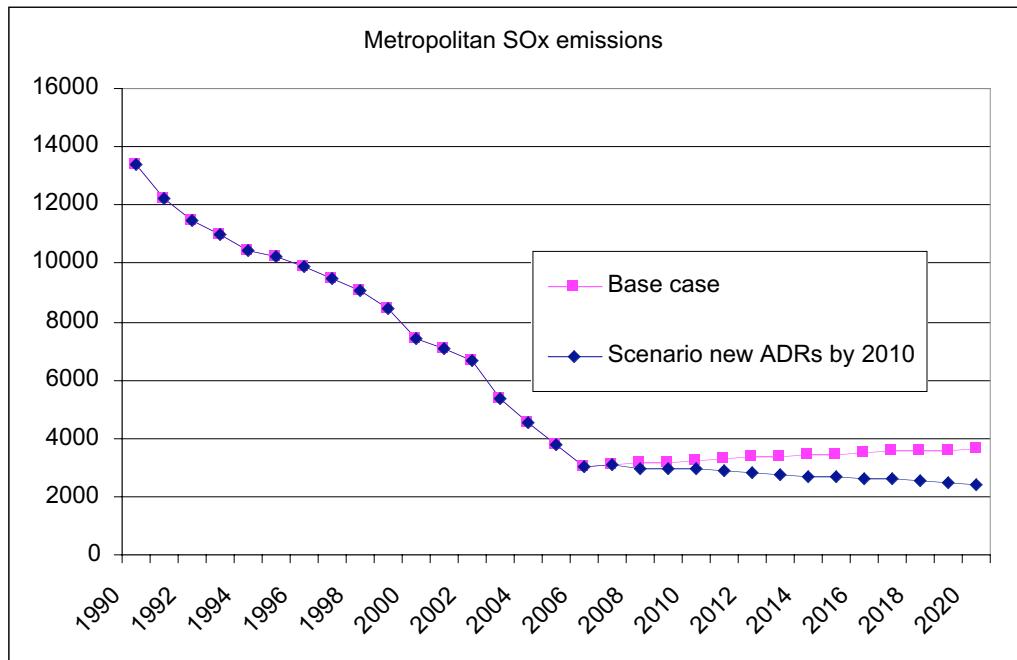


**Note:** This scenario assumes that the introduction of Euro 4 and Euro 5 vehicle standards will require the provision of 50 ppm Sulfur petrol and 10 ppm Sulfur diesel fuel to the Australian market. It is also assumed that the new design rules not only lower pollutants specifically regulated by the new standards, but that they slightly accelerate the introduction of new technology, serving to reduce other pollutants as well.

Source: BTRE estimates.

**Figure 4.10 Base case SO<sub>x</sub> emissions and estimated reductions from scenario of tighter emission standards (ADRs) by 2010**

(tonnes)



**Note:** This scenario assumes that the introduction of Euro4 and Euro 5 vehicle standards will require the provision of 50 ppm Sulphur petrol and 10 ppm Sulphur diesel fuel to the Australian market. It is also assumed that the new design rules not only lower pollutants specifically regulated by the new standards, but that they slightly accelerate the introduction of new technology, serving to reduce other pollutants as well.

**Source:** BTRE estimates.

## **CHAPTER 5 SENSITIVITY ANALYSES FOR TRANSPORT EMISSION PROJECTIONS**

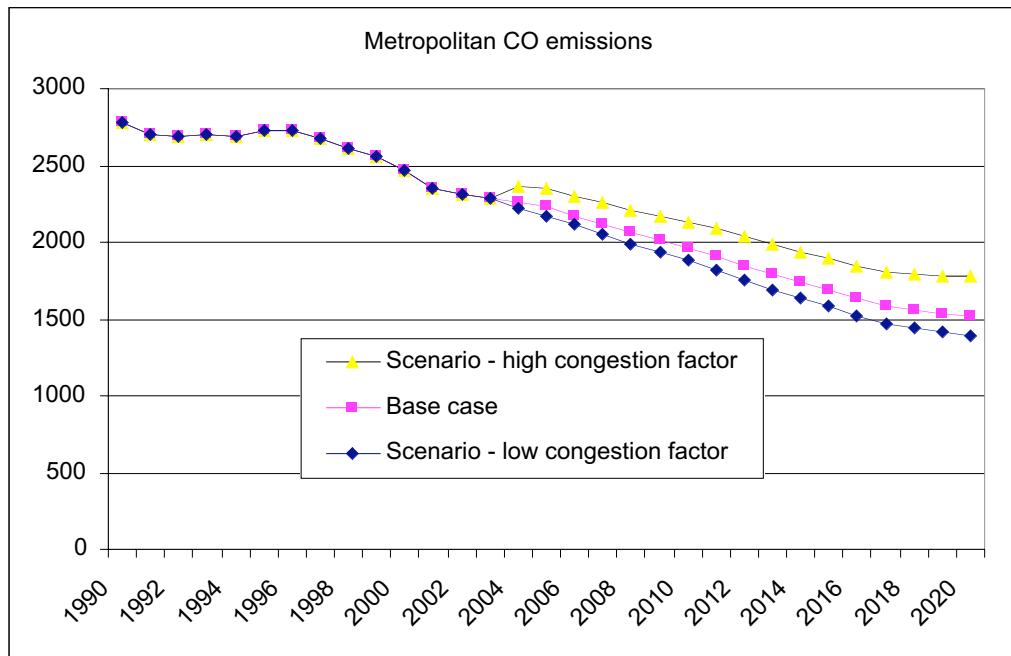
### **5.1 VARIATION OF CONGESTION EFFECT**

The model results are reasonably sensitive to assumptions made about how strongly fuel consumption and emission rates increase with increasing levels of traffic congestion. To give some idea of the sensitivity of the base case projections to this assumed response, model runs were conducted with the congestion factor - that is, the model factor relating the strength of the emission rate response to increases in vehicle traffic levels - set to high (at twice the base case response factor) and to low (at half the base case factor) settings.

Congestion increases in the future will, of course, not only depend on increases to traffic volumes but also on changes to road infrastructure. The majority of Bureau network modelling (on which these congestion analyses are based) was done using road network data calibrated to the mid-1990s. The base case estimates are derived by assuming that, on average, future metropolitan road capacity (through extra road provision and traffic management improvements) will increase by the order of 20 per cent over the projection period.

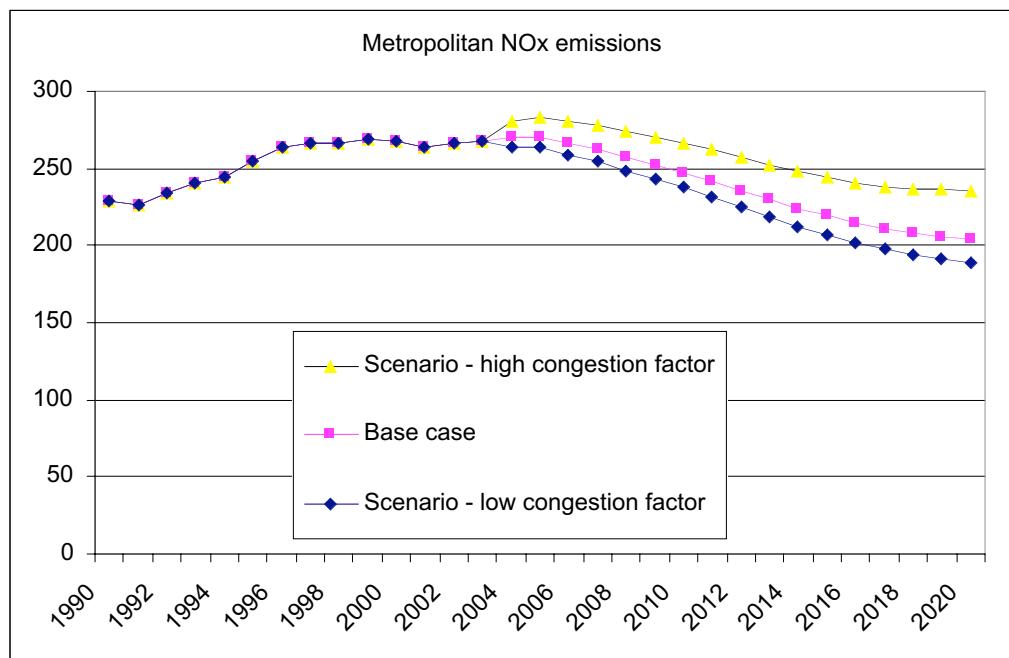
**Figure 5.1 Sensitivity of base case projections for CO emissions to future congestion effects**

(thousand tonnes)



Source: BTRE estimates.

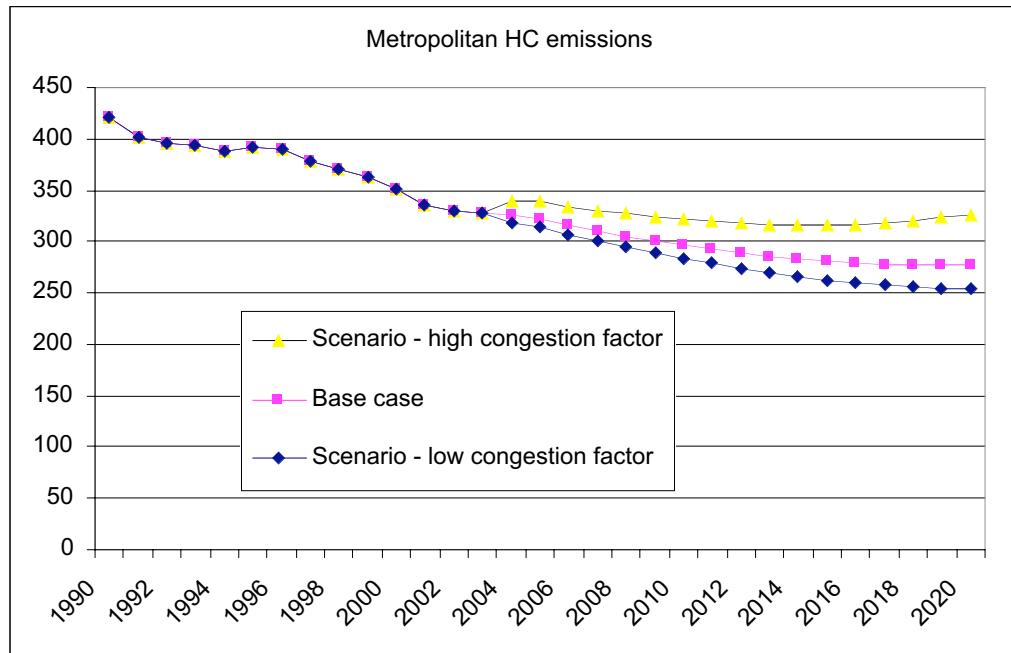
**Figure 5.2 Sensitivity of base case projections for NO<sub>x</sub> emissions to future congestion effects  
(thousand tonnes)**



Source: BTRE estimates.

**Figure 5.3 Sensitivity of base case projections for VOC emissions to future congestion effects**

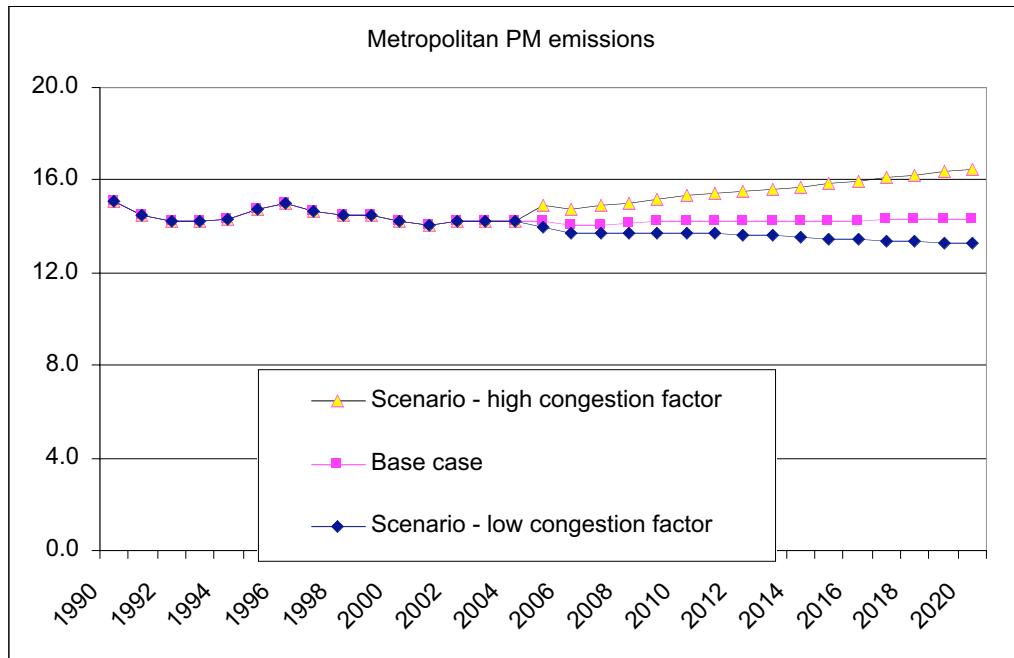
(thousand tonnes)



Notes: Total Volatile Organic Compounds (VOCs) – both evaporative and exhaust.

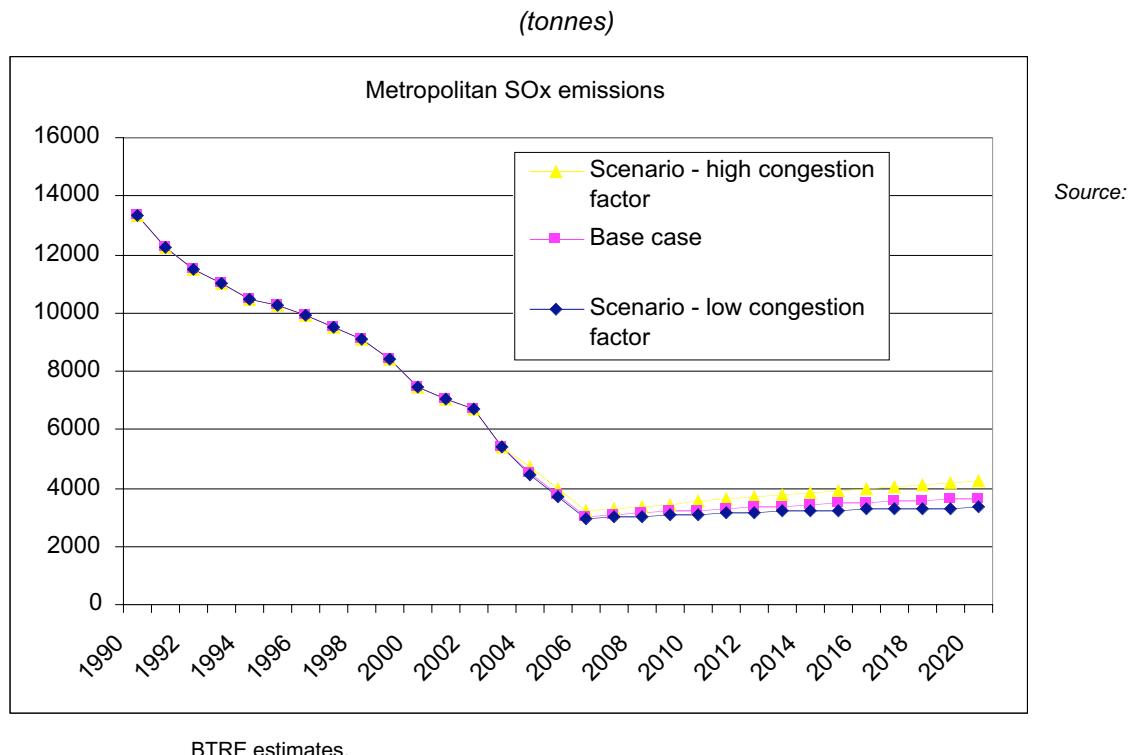
Source: BTRE estimates.

**Figure 5.4 Sensitivity of base case projections for PM emissions to future congestion effects**  
(thousand tonnes)



Source: BTRE estimates.

**Figure 5.5 Sensitivity of base case projections for SO<sub>x</sub> emissions to future congestion effects**



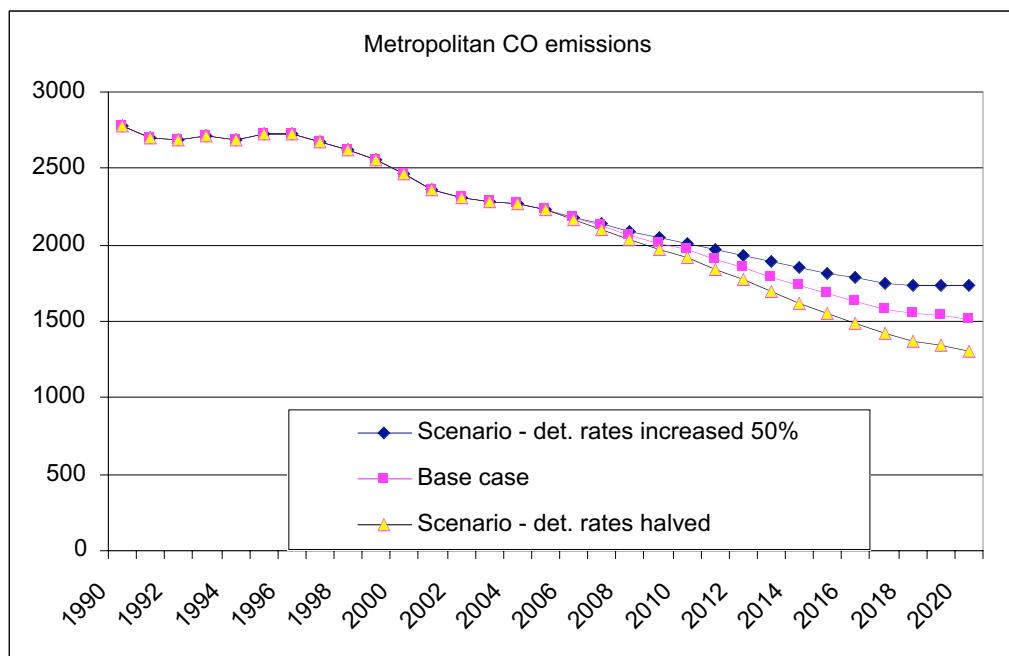
## 5.2 VARIATION OF EMISSION DETERIORATION RATES

The model results are also very sensitive to assumptions made about how strongly fuel consumption and emission rates increase as vehicles age.

To give some idea of the sensitivity of the base case projections to the assumed deterioration rates, model runs were conducted with the deterioration rates for post-2004 vehicles set to half the base case values (low emission case) and with the rates set at 50 per cent higher than the base case (high emission case).

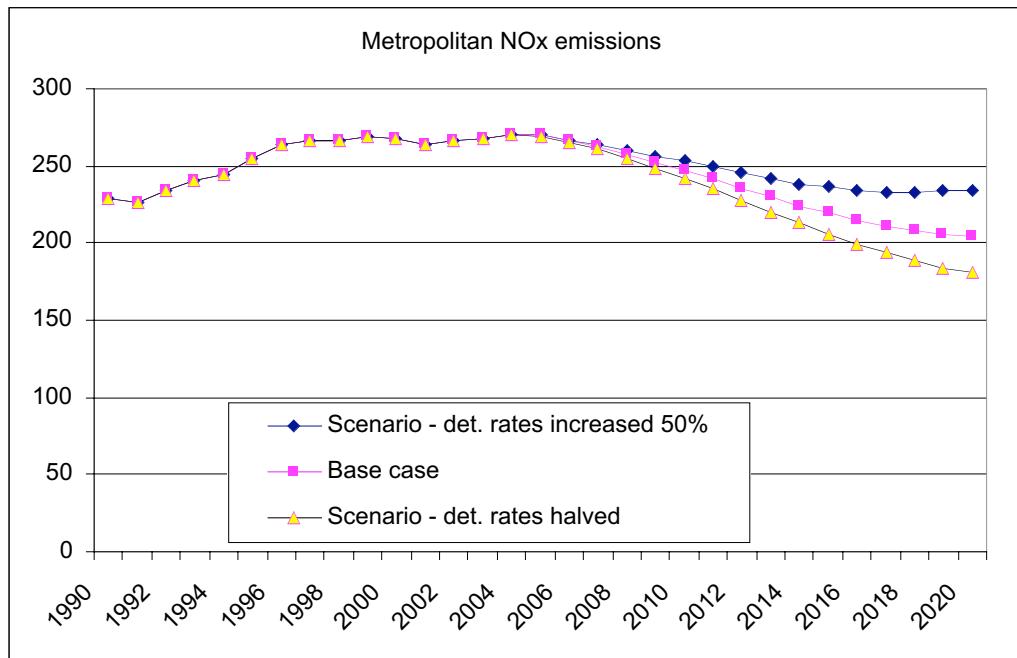
**Figure 5.6 Sensitivity of base case projections for CO emissions to average annual emission deterioration rates for future new vehicles**

(thousand tonnes)



Source: BTRE estimates.

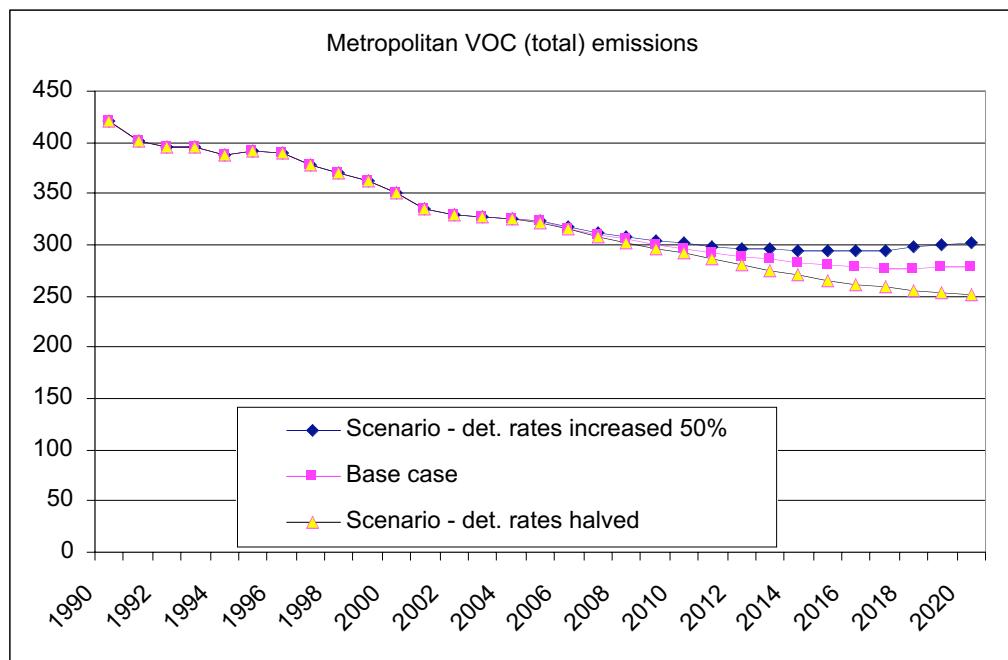
**Figure 5.7 Sensitivity of base case projections for NO<sub>x</sub> emissions to average annual emission deterioration rates for future new vehicles**  
(thousand tonnes)



Source: BTRE estimates.

**Figure 5.8 Sensitivity of base case projections for VOC emissions to average annual emission deterioration rates for future new vehicles**

(*thousand tonnes*)

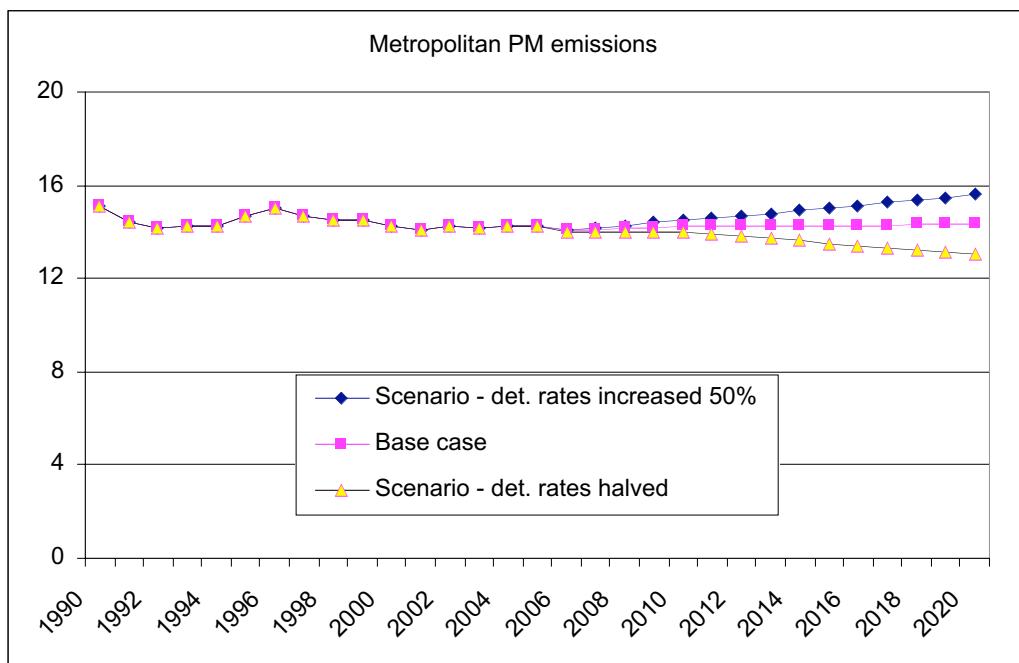


Note: Total Volatile Organic Compounds (VOCs) – both evaporative and exhaust.

Source: BTRE estimates.

**Figure 5.9 Sensitivity of base case projections for PM emissions to average annual emission deterioration rates for future new vehicles**

(*thousand tonnes*)



Source: BTRE estimates.

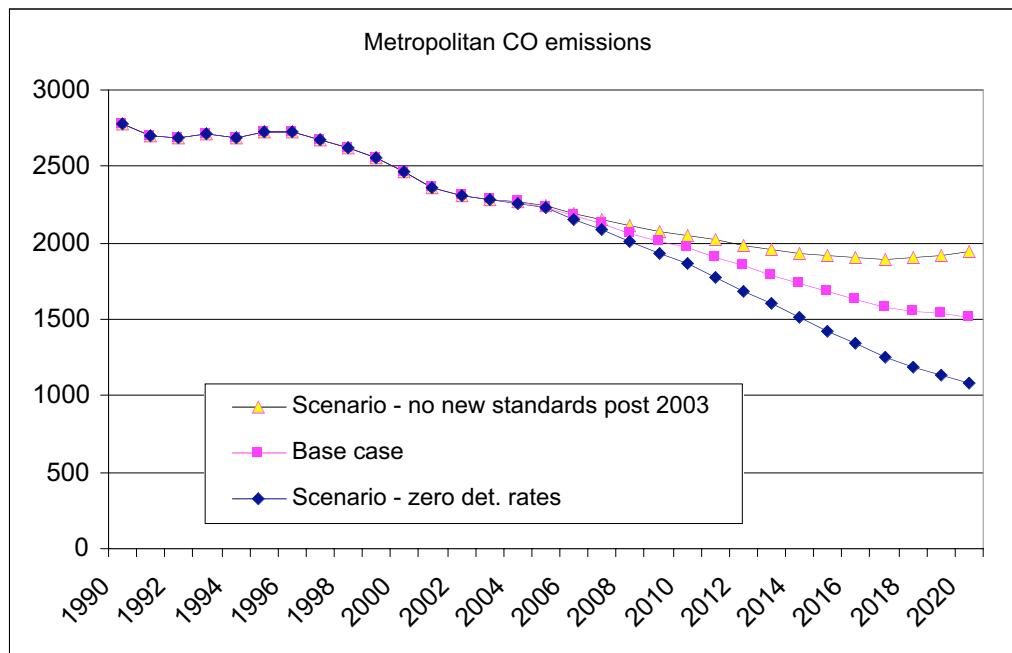
To give a further indication of the sensitivity of the base case projections to the assumed deterioration rates, model runs were also conducted with the deterioration rates set to zero for post-2004 vehicles and with the emission rates and deterioration rates for new models (post-2004) set at values found for current in-service motor vehicles (that is, as if the new standards had not been introduced).

The results of these sensitivity analyses (figures 5.10 to 5.13) imply that the package of new emission standards introduced in the revised ADRs (tightening limits out to 2006) should have the capacity to significantly reduce future emission levels. In fact, the estimates have that, in the absence of the new standards, 2020 metropolitan emission levels would have been:

- 28 per cent higher for CO;
- 46 per cent higher for NOx (and end up higher than current levels);
- 21 per cent higher for VOCs; and
- 21 per cent higher for PM (ending up substantially higher than current levels).

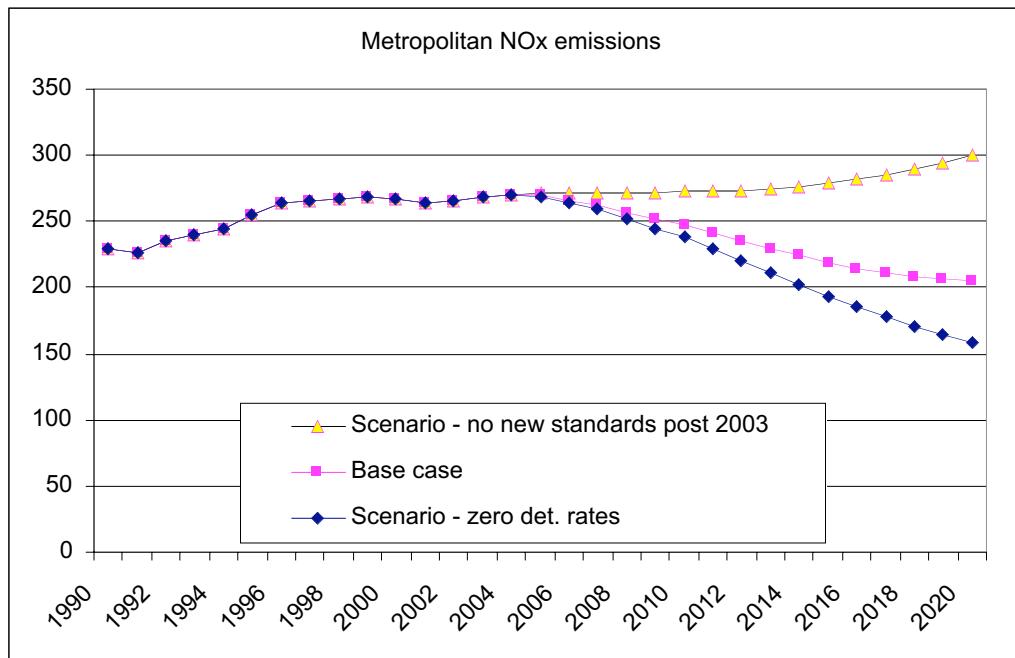
**Figure 5.10 Sensitivity of base case projections for CO emissions to average annual emission deterioration rates for future new vehicles**

(*thousand tonnes*)



Source: BTRE estimates.

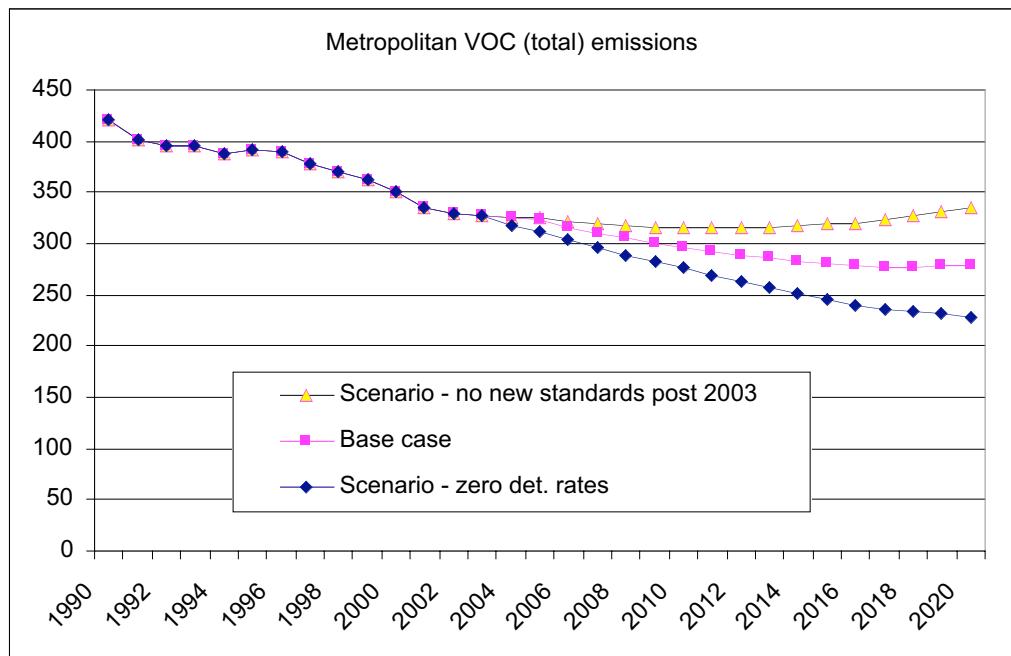
**Figure 5.11 Sensitivity of base case projections for NO<sub>x</sub> emissions to average annual emission deterioration rates for future new vehicles**  
(thousand tonnes)



Source: BTRE estimates.

**Figure 5.12 Sensitivity of base case projections for VOC emissions to average annual emission deterioration rates for future new vehicles**

(*thousand tonnes*)

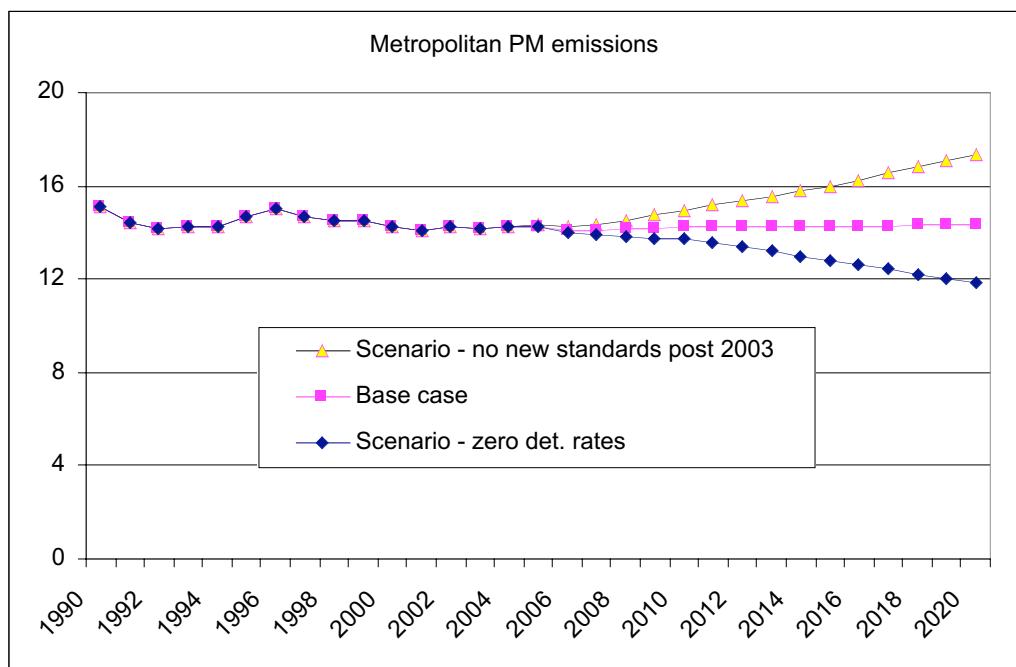


*Notes:* Total Volatile Organic Compounds (VOCs) – both evaporative and exhaust.

*Source:* BTRE estimates.

**Figure 5.13 Sensitivity of base case projections for PM emissions to average annual emission deterioration rates for future new vehicles**

(*thousand tonnes*)



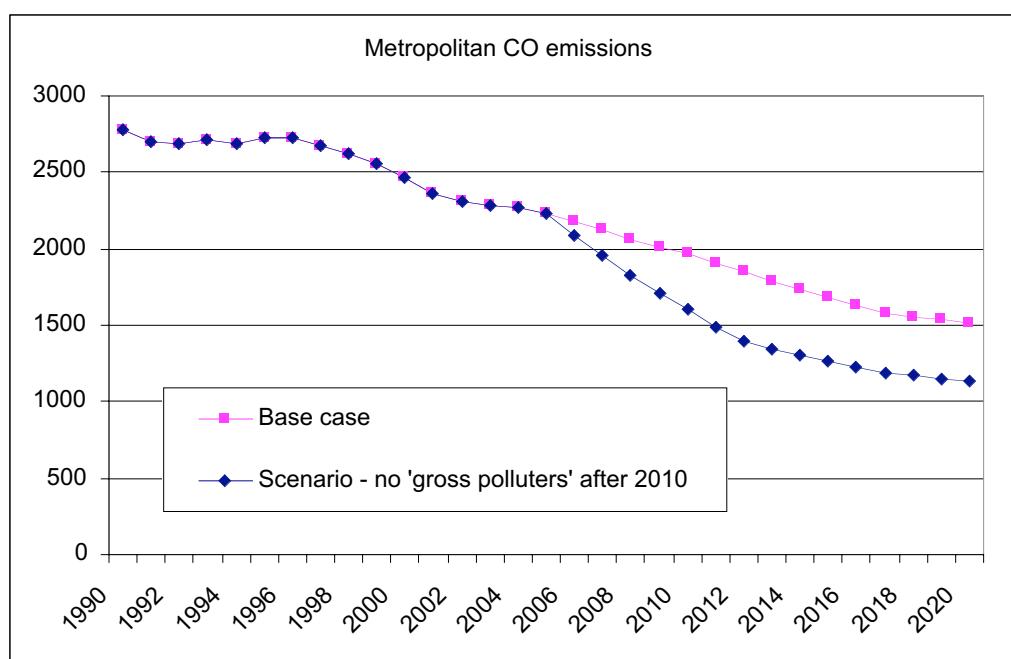
Source: BTRE estimates.

### 5.3 REDUCE 'GROSS POLLUTER' CONTRIBUTION

If allowance for the worst performing component of the vehicle fleet (where typically the worst 10 to 20 per cent of vehicles account for something like 30 to 50 per cent of total emissions) is removed after 2010 the following changes to the projected trend result.

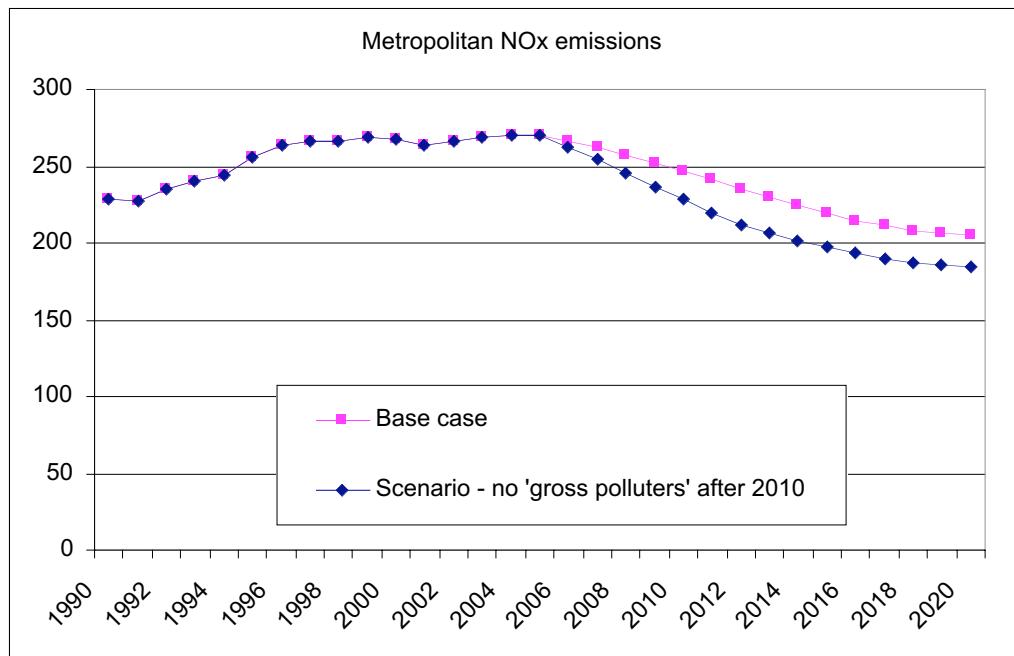
**Figure 5.14 Sensitivity of base case projections for CO emissions to removal of allowance for gross polluters**

(*thousand tonnes*)



Source: BTRE estimates.

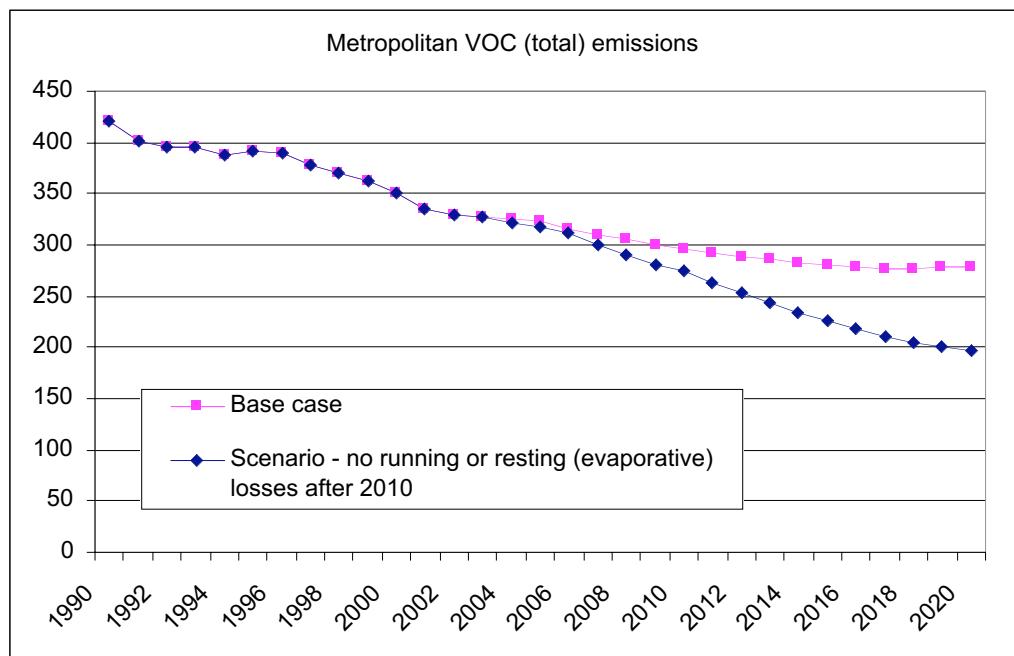
**Figure 5.15 Sensitivity of base case projections for NO<sub>x</sub> emissions to removal of allowance for gross polluters (thousand tonnes)**



Source: BTRE estimates.

**Figure 5.16 Sensitivity of base case projections for VOC emissions to removal of allowance for gross polluters**

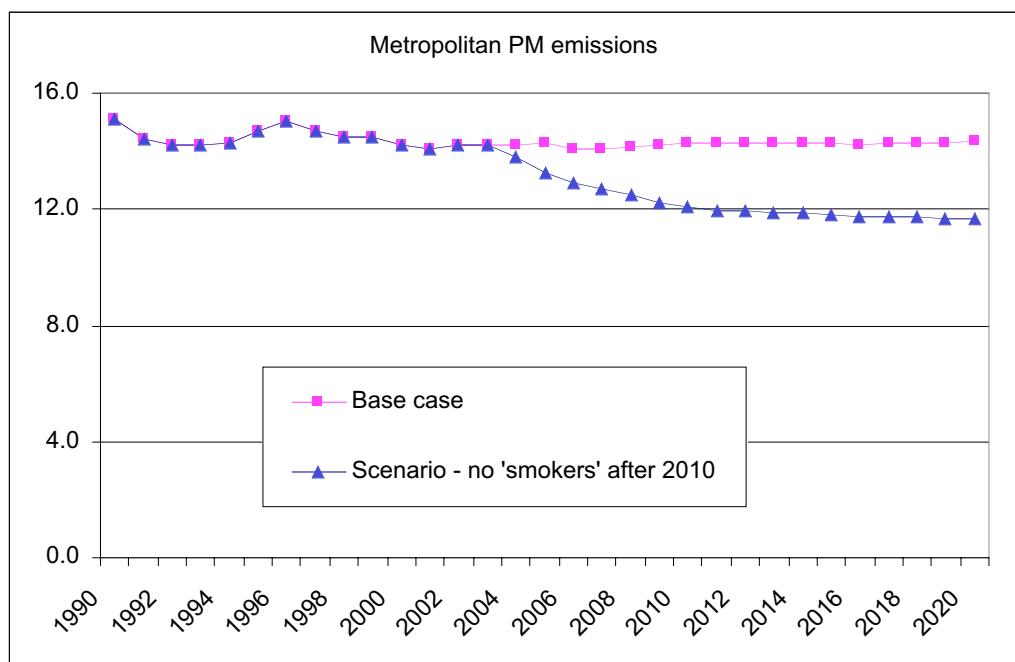
(thousand tonnes)



Notes: Total Volatile Organic Compounds (VOCs) – both evaporative and exhaust.

Source: BTRE estimates.

**Figure 5.17 Sensitivity of base case projections for PM emissions to removal of allowance for gross polluters**  
(thousand tonnes)



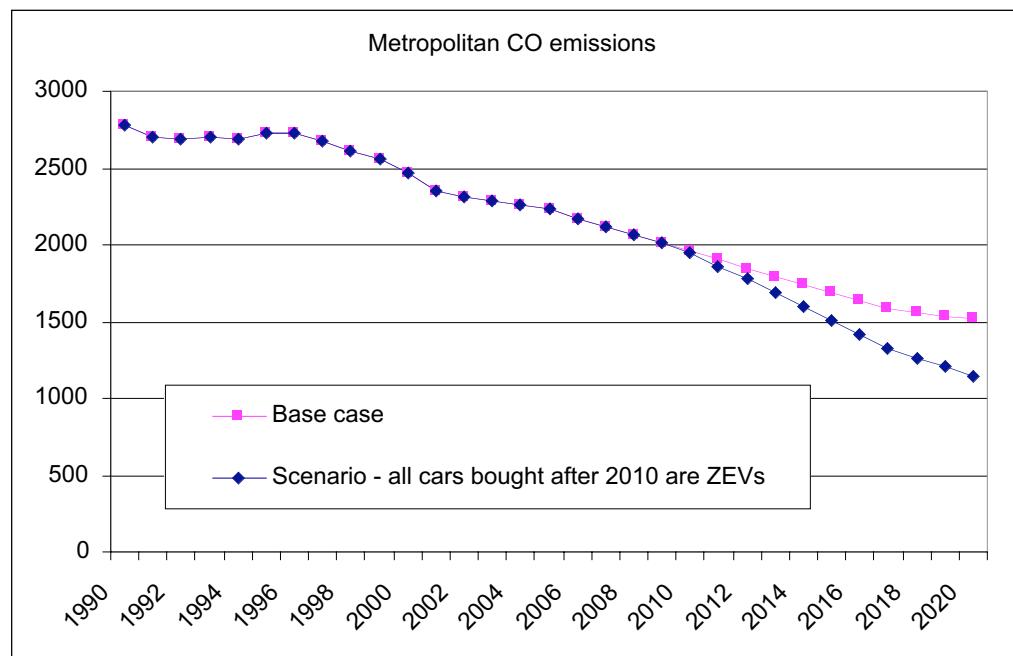
Source: BTRE estimates.

#### 5.4 FUTURE VEHICLE TECHNOLOGY POTENTIAL

Another sensitivity test was conducted where all cars bought after 2010 were assumed to be ZEVs (Zero Emission Vehicles), with the results shown in figures 5.18 to 5.20.

**Figure 5.18 Sensitivity of base case projections for CO emissions to increased penetration of ZEVs**

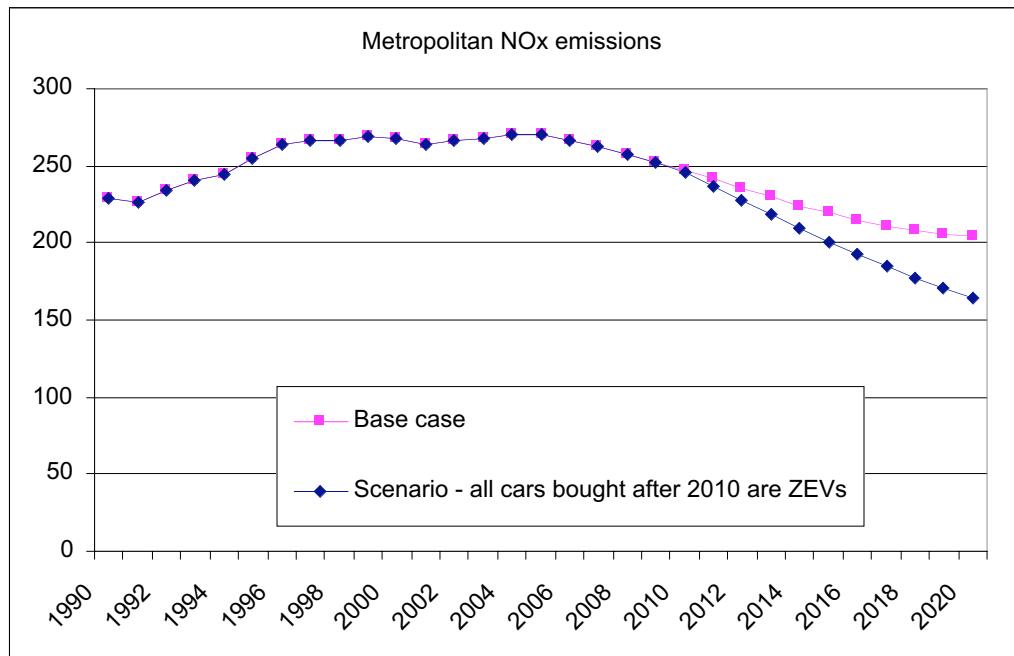
(*thousand tonnes*)



*Source:* BTRE estimates.

**Figure 5.19 Sensitivity of base case projections for NO<sub>x</sub> emissions to increased penetration of ZEVs**

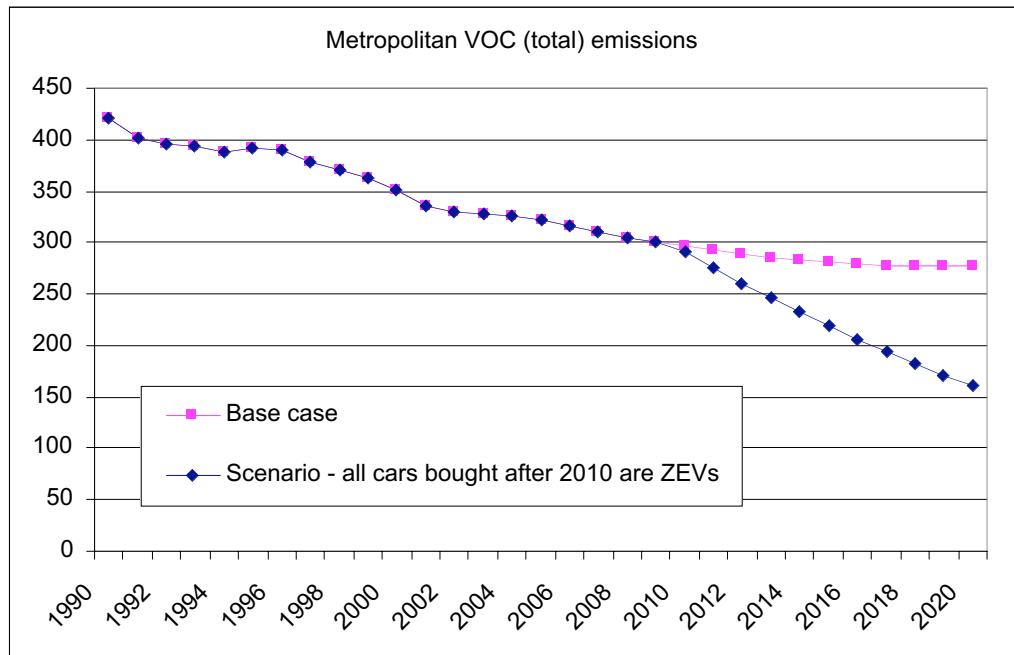
(thousand tonnes)



Source: BTRE estimates.

**Figure 5.20 Sensitivity of base case projections for VOC emissions to increased penetration of ZEVs**

(thousand tonnes)



Notes: Total Volatile Organic Compounds (VOCs) – both evaporative and exhaust.

Source: BTRE estimates.

A recently announced Government measure will have an impact on the efficiency of future new vehicles. This measure – a voluntary fuel efficiency target for vehicle manufacturers – aims to reduce new vehicle fuel intensity for cars (NAFC rating in L/100km) to 18 per cent below the year 2000 value by 2010. If this target is met, the trend improvement in new car fuel efficiency will be slightly faster than assumed in the BTRE base case – and could result in a reduction of about 2.5 per cent in total metropolitan fuel consumption (versus the 2020 base case projection).

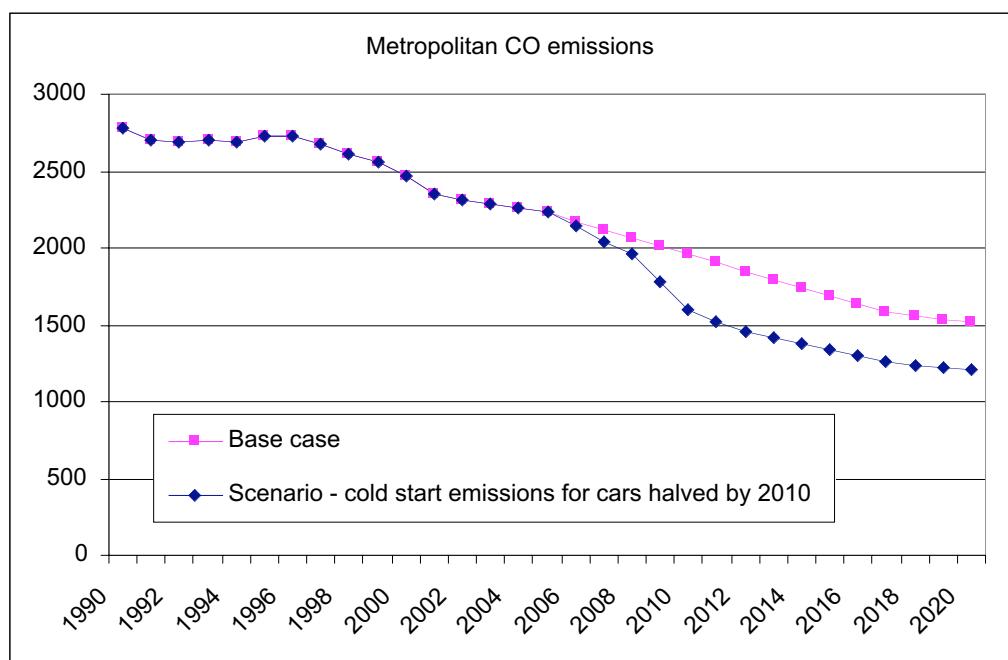
## 5.5 COLD START EMISSIONS

For short trips, cars with catalytic emission control can emit of the order of half the total emissions for that trip during the first few minutes of travelling – until the catalyst warms up to operating temperature.

As an example, this sensitivity estimates the effect on total CO emissions of halving cold start emissions by 2010. (Such a reduction could be obtained on new vehicles, with a slight fuel efficiency penalty, by requiring the fitting of technology such as pre-start catalyst-warming devices).

**Figure 5.21 Sensitivity of base case projections for CO emissions to cold starts**

(*thousand tonnes*)



Source: BTRE estimates.



## APPENDIX I AGGREGATE MODEL INPUTS

TABLE I.1 STATE AND TERRITORY POPULATION PROJECTIONS  
(*thousand persons*)

Year	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Total
1990	5832	4378	2905	1431	1615	462	164	283	17070
1991	5896	4415	2967	1444	1637	466	166	289	17280
1992	5955	4445	3039	1452	1658	469	168	295	17480
1993	6005	4464	3123	1459	1679	471	171	299	17670
1994	6056	4478	3194	1461	1705	472	173	301	17841
1995	6120	4507	3270	1464	1735	472	178	304	18050
1996	6242	4585	3365	1479	1779	476	184	309	18420
1997	6280	4612	3409	1479	1803	472	188	307	18550
1998	6358	4672	3470	1489	1840	472	191	308	18800
1999	6412	4712	3512	1493	1861	470	193	310	18964
2000	6488	4774	3568	1500	1891	469	196	313	19199
2001	6557	4828	3625	1506	1920	468	199	315	19418
2002	6618	4873	3682	1512	1947	468	202	318	19619
2003	6678	4913	3741	1517	1975	467	205	321	19817
2004	6738	4948	3802	1522	2003	466	209	323	20011
2005	6796	4982	3863	1527	2032	466	212	326	20203
2006	6852	5016	3924	1531	2060	465	215	328	20391
2007	6908	5048	3985	1535	2088	464	218	330	20576
2008	6962	5079	4045	1538	2116	463	222	332	20757
2009	7016	5109	4105	1541	2144	462	225	335	20935
2010	7068	5138	4164	1544	2172	461	228	337	21111
2011	7120	5167	4224	1546	2199	460	231	339	21285
2012	7171	5195	4283	1549	2226	458	235	341	21458
2013	7221	5223	4342	1551	2254	457	238	343	21628
2014	7271	5250	4401	1553	2281	455	241	344	21797
2015	7320	5276	4460	1555	2308	454	245	346	21964
2016	7369	5301	4519	1557	2335	452	248	348	22129
2017	7417	5326	4577	1559	2362	450	251	350	22292
2018	7464	5350	4636	1560	2389	448	255	352	22453
2019	7510	5374	4694	1561	2416	446	258	353	22612
2020	7556	5397	4751	1562	2442	444	262	355	22769

Sources: ABS (2001b) long-term projections (Series II), BTRE estimates.

TABLE I.2 CAPITAL CITY POPULATION PROJECTIONS  
(*thousand persons*)

<i>Year</i>	<i>Syd</i>	<i>Mel</i>	<i>Bne</i>	<i>Adl</i>	<i>Per</i>	<i>Hob</i>	<i>Dar</i>	<i>Cbr</i>	<i>Total</i>
1990	3632.1	3127.2	1330.6	1046.9	1173.7	188.8	75.2	282.8	10857.3
1991	3672.2	3153.3	1359.0	1056.3	1189.5	190.4	76.2	289.4	10986.2
1992	3711.9	3179.8	1389.5	1062.6	1207.4	191.8	76.6	294.8	11114.6
1993	3746.0	3198.6	1425.6	1067.7	1225.2	193.2	77.8	298.8	11232.8
1994	3781.5	3214.1	1455.9	1069.9	1246.4	193.8	78.2	301.2	11341.0
1995	3824.7	3240.7	1488.6	1071.8	1270.2	194.3	79.9	304.4	11474.6
1996	3903.8	3302.5	1530.4	1083.7	1305.3	196.3	82.5	309.5	11713.8
1997	3940.1	3327.2	1550.3	1083.1	1323.6	195.2	84.5	307.2	11811.2
1998	3996.5	3379.5	1580.7	1090.7	1347.9	195.0	86.6	308.3	11985.3
1999	4041.4	3417.2	1601.4	1092.9	1364.2	194.2	88.1	310.2	12109.6
2000	4102.7	3470.8	1628.1	1099.9	1388.1	193.7	89.8	312.7	12285.8
2001	4158.2	3517.4	1654.9	1106.3	1410.4	193.3	91.5	315.3	12447.3
2002	4207.5	3556.8	1681.8	1111.9	1430.9	193.0	93.2	318.0	12593.1
2003	4255.9	3592.6	1709.7	1117.2	1451.9	192.8	95.1	320.7	12735.9
2004	4303.3	3624.4	1738.5	1122.0	1473.2	192.8	96.9	323.2	12874.3
2005	4350.1	3655.7	1767.3	1126.5	1494.5	192.7	98.7	325.7	13011.2
2006	4396.2	3686.2	1795.9	1130.6	1515.5	192.6	100.6	328.0	13145.6
2007	4441.8	3716.1	1824.5	1134.5	1536.4	192.5	102.4	330.3	13278.5
2008	4486.6	3745.2	1852.8	1138.0	1557.0	192.3	104.2	332.4	13408.5
2009	4530.8	3773.8	1880.9	1141.4	1577.5	192.0	106.1	334.5	13537.0
2010	4574.8	3801.9	1909.1	1144.6	1597.9	191.8	107.9	336.6	13664.6
2011	4618.5	3829.5	1937.1	1147.7	1618.3	191.5	109.8	338.6	13791.0
2012	4661.9	3856.7	1965.2	1150.7	1638.6	191.2	111.7	340.5	13916.5
2013	4705.0	3883.4	1993.2	1153.5	1658.9	190.9	113.6	342.5	14041.0
2014	4747.9	3909.6	2021.2	1156.3	1679.1	190.5	115.5	344.3	14164.4
2015	4790.4	3935.4	2049.1	1158.9	1699.2	190.1	117.4	346.2	14286.7
2016	4832.7	3960.8	2077.0	1161.5	1719.2	189.7	119.4	348.0	14408.3
2017	4874.8	3985.9	2104.9	1163.9	1739.2	189.2	121.3	349.8	14529.0
2018	4916.5	4010.5	2132.7	1166.2	1759.0	188.7	123.3	351.5	14648.4
2019	4957.9	4034.7	2160.4	1168.4	1778.6	188.2	125.3	353.2	14766.7
2020	4999.0	4058.4	2188.0	1170.4	1798.1	187.7	127.2	354.9	14883.7

Sources: ABS (2001b) long-term projections (Series II), BTRE estimates.

TABLE I.3 BASE CASE PROJECTIONS OF NATIONAL FREIGHT TASK BY TYPE OF VEHICLE, 1990-2020

(billion tonne-kilometres)

Year	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Total
1990	4.65	22.71	64.59	91.94
1991	4.76	20.72	62.42	87.91
1992	4.74	20.49	63.76	88.99
1993	4.48	20.48	72.08	97.05
1994	4.55	21.63	77.40	103.57
1995	4.85	22.15	83.84	110.84
1996	4.75	22.73	86.15	113.63
1997	4.91	23.51	89.53	117.96
1998	5.27	24.31	96.63	126.20
1999	5.47	24.76	103.02	133.25
2000	5.66	25.22	106.46	137.35
2001	5.65	25.09	107.03	137.77
2002	5.92	25.82	113.92	145.66
2003	6.02	26.04	118.28	150.34
2004	6.23	26.71	124.97	157.91
2005	6.39	26.99	130.08	163.47
2006	6.58	27.48	136.38	170.43
2007	6.79	28.03	143.28	178.10
2008	6.98	28.44	149.77	185.19
2009	7.17	28.84	156.42	192.42
2010	7.43	29.38	164.13	200.93
2011	7.66	29.82	171.59	209.07
2012	7.89	30.22	179.14	217.25
2013	8.13	30.60	186.88	225.61
2014	8.38	30.97	194.85	234.20
2015	8.63	31.32	203.00	242.94
2016	8.88	31.69	211.22	251.79
2017	9.18	32.18	220.57	261.93
2018	9.45	32.47	228.79	270.70
2019	9.73	32.69	236.86	279.28
2020	10.01	32.86	244.84	287.71

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE I.4 BASE CASE PROJECTIONS OF METROPOLITAN FREIGHT TASK BY TYPE OF VEHICLE, 1990-2020

(billion tonne-kilometres)

Year	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Total
1990	2.52	11.91	9.61	24.03
1991	2.39	11.33	9.05	22.78
1992	2.37	11.17	9.45	22.98
1993	2.36	11.07	9.89	23.32
1994	2.41	11.31	10.64	24.36
1995	2.56	11.80	11.65	26.01
1996	2.69	11.89	12.38	26.95
1997	2.81	11.95	13.10	27.87
1998	2.90	11.84	13.66	28.40
1999	3.07	12.04	14.75	29.86
2000	3.09	11.87	14.89	29.85
2001	3.17	11.98	15.20	30.35
2002	3.37	12.48	16.04	31.88
2003	3.45	12.58	16.36	32.39
2004	3.61	12.81	17.05	33.47
2005	3.75	12.98	17.88	34.60
2006	3.90	13.27	18.73	35.90
2007	4.07	13.64	19.73	37.44
2008	4.22	13.95	20.66	38.84
2009	4.39	14.25	21.64	40.28
2010	4.58	14.64	22.78	42.00
2011	4.75	14.94	23.83	43.51
2012	4.93	15.23	24.93	45.09
2013	5.11	15.53	26.07	46.71
2014	5.30	15.83	27.26	48.40
2015	5.50	16.13	28.50	50.14
2016	5.70	16.43	29.79	51.92
2017	5.94	16.81	31.29	54.04
2018	6.16	17.10	32.69	55.95
2019	6.38	17.39	34.16	57.93
2020	6.62	17.68	35.68	59.98

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE I.5 BASE CASE PROJECTIONS OF NON-METROPOLITAN FREIGHT TASK BY TYPE OF VEHICLE, 1990-2020

(billion tonne-kilometres)

Year	Light Commercial Vehicles	Rigid and other trucks	Articulated trucks	Total
1990	2.14	10.80	54.98	67.91
1991	2.37	9.39	53.37	65.13
1992	2.37	9.32	54.32	66.01
1993	2.13	9.41	62.19	73.73
1994	2.14	10.32	66.75	79.21
1995	2.29	10.35	72.19	84.84
1996	2.06	10.84	73.78	86.67
1997	2.10	11.56	76.43	90.09
1998	2.36	12.47	82.97	97.80
1999	2.40	12.73	88.27	103.39
2000	2.58	13.35	91.57	107.49
2001	2.48	13.12	91.82	107.42
2002	2.55	13.34	97.88	113.78
2003	2.57	13.46	101.92	117.95
2004	2.62	13.90	107.92	124.44
2005	2.64	14.02	112.21	128.87
2006	2.68	14.20	117.65	134.53
2007	2.72	14.38	123.56	140.67
2008	2.75	14.50	129.11	146.36
2009	2.78	14.58	134.77	152.14
2010	2.85	14.74	141.35	158.94
2011	2.91	14.88	147.76	165.56
2012	2.97	14.98	154.21	172.16
2013	3.02	15.07	160.81	178.90
2014	3.07	15.14	167.59	185.81
2015	3.13	15.19	174.49	192.81
2016	3.18	15.26	181.43	199.87
2017	3.24	15.38	189.28	207.89
2018	3.29	15.36	196.09	214.75
2019	3.35	15.29	202.70	221.34
2020	3.40	15.17	209.15	227.72

Sources: BTRE estimates, BTRE (2002), BTE (1999), ABS (2003 and earlier).

TABLE I.6 NATIONAL AGGREGATE FREIGHT TASK PROJECTIONS BY STATE  
(billion tkm)

Year	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Total
1990	31.40	20.21	15.96	8.12	11.23	2.12	2.64	0.27	91.94
1991	29.97	19.21	15.50	7.74	10.71	2.00	2.53	0.26	87.91
1992	30.45	19.26	15.67	7.93	10.95	2.02	2.45	0.26	88.99
1993	32.91	21.08	17.41	8.80	11.85	2.15	2.59	0.26	97.05
1994	35.00	22.52	18.61	9.53	12.77	2.24	2.64	0.27	103.57
1995	37.29	23.85	20.31	10.02	13.79	2.40	2.90	0.28	110.84
1996	38.12	24.07	21.31	9.98	14.26	2.45	3.14	0.30	113.63
1997	39.70	24.89	22.48	10.19	14.67	2.50	3.22	0.31	117.96
1998	42.34	26.39	24.29	11.04	15.78	2.61	3.44	0.32	126.20
1999	44.71	27.91	26.05	11.28	16.49	2.74	3.74	0.34	133.25
2000	45.93	29.08	26.43	12.24	17.11	2.74	3.48	0.34	137.35
2001	45.92	29.14	26.75	12.20	17.22	2.71	3.50	0.35	137.77
2002	48.41	30.77	28.35	12.87	18.33	2.83	3.73	0.37	145.66
2003	49.86	31.69	29.36	13.25	19.04	2.89	3.87	0.37	150.34
2004	52.26	33.22	30.94	13.87	20.13	3.01	4.10	0.39	157.91
2005	53.98	34.32	32.15	14.32	20.97	3.08	4.27	0.40	163.47
2006	56.15	35.70	33.63	14.88	22.00	3.18	4.48	0.41	170.43
2007	58.54	37.23	35.27	15.50	23.14	3.29	4.71	0.43	178.10
2008	60.74	38.62	36.81	16.06	24.21	3.38	4.93	0.44	185.19
2009	62.96	40.04	38.39	16.63	25.31	3.48	5.15	0.45	192.42
2010	65.60	41.71	40.25	17.31	26.59	3.59	5.41	0.47	200.93
2011	68.09	43.30	42.05	17.94	27.84	3.70	5.66	0.49	209.07
2012	70.59	44.88	43.88	18.58	29.10	3.80	5.91	0.50	217.25
2013	73.14	46.50	45.76	19.22	30.40	3.91	6.18	0.52	225.61
2014	75.74	48.15	47.70	19.87	31.75	4.01	6.45	0.53	234.20
2015	78.38	49.82	49.70	20.53	33.13	4.12	6.72	0.55	242.94
2016	81.02	51.49	51.78	21.19	34.53	4.22	7.00	0.57	251.79
2017	84.06	53.41	54.15	21.95	36.12	4.34	7.32	0.59	261.93
2018	86.64	55.03	56.27	22.58	37.53	4.44	7.60	0.60	270.70
2019	89.15	56.61	58.36	23.19	38.94	4.53	7.88	0.62	279.28
2020	91.59	58.14	60.45	23.78	40.33	4.61	8.16	0.64	287.71

Sources: BTRE estimates, ABS (2003 and earlier).

TABLE I.7 CAPITAL CITY FREIGHT TASK PROJECTIONS  
(billion tkm)

Year	Syd	Mel	Bne	Adl	Per	Hob	Dar	Cbr	Total
1990	8.20	6.60	3.38	2.00	2.82	0.45	0.30	0.27	24.03
1991	7.78	6.26	3.20	1.90	2.68	0.43	0.29	0.26	22.78
1992	7.83	6.30	3.25	1.90	2.72	0.43	0.29	0.26	22.98
1993	7.94	6.38	3.33	1.91	2.78	0.43	0.29	0.26	23.32
1994	8.27	6.65	3.51	1.98	2.93	0.45	0.31	0.27	24.36
1995	8.81	7.07	3.78	2.10	3.16	0.47	0.33	0.28	26.01
1996	9.11	7.31	3.96	2.16	3.30	0.49	0.35	0.30	26.95
1997	9.41	7.55	4.10	2.21	3.44	0.50	0.36	0.31	27.87
1998	9.57	7.70	4.18	2.23	3.53	0.50	0.36	0.32	28.40
1999	10.06	8.11	4.40	2.32	3.74	0.52	0.38	0.34	29.86
2000	10.05	8.11	4.41	2.30	3.75	0.51	0.38	0.34	29.85
2001	10.22	8.25	4.49	2.33	3.82	0.51	0.38	0.35	30.35
2002	10.73	8.67	4.72	2.43	4.02	0.53	0.40	0.37	31.88
2003	10.90	8.81	4.81	2.46	4.10	0.53	0.41	0.37	32.39
2004	11.26	9.10	4.98	2.53	4.25	0.55	0.42	0.39	33.47
2005	11.63	9.41	5.16	2.61	4.40	0.56	0.43	0.40	34.60
2006	12.07	9.77	5.36	2.69	4.58	0.57	0.44	0.41	35.90
2007	12.58	10.19	5.60	2.80	4.79	0.58	0.46	0.43	37.44
2008	13.05	10.57	5.82	2.89	4.99	0.60	0.47	0.44	38.84
2009	13.54	10.97	6.05	2.99	5.19	0.61	0.49	0.45	40.28
2010	14.11	11.44	6.32	3.10	5.42	0.62	0.50	0.47	42.00
2011	14.62	11.86	6.56	3.20	5.64	0.64	0.52	0.49	43.51
2012	15.15	12.29	6.81	3.30	5.86	0.65	0.53	0.50	45.09
2013	15.69	12.73	7.07	3.41	6.08	0.66	0.54	0.52	46.71
2014	16.26	13.19	7.34	3.52	6.32	0.67	0.56	0.53	48.40
2015	16.84	13.67	7.62	3.63	6.57	0.68	0.57	0.55	50.14
2016	17.44	14.16	7.90	3.75	6.82	0.70	0.59	0.57	51.92
2017	18.15	14.74	8.24	3.89	7.12	0.71	0.61	0.59	54.04
2018	18.79	15.26	8.55	4.01	7.39	0.73	0.62	0.60	55.95
2019	19.45	15.81	8.86	4.14	7.67	0.74	0.64	0.62	57.93
2020	20.14	16.37	9.19	4.27	7.96	0.75	0.66	0.64	59.98

Note: For simplicity, all VKT within the ACT is assigned to 'metropolitan' travel.

Sources: BTRE estimates, ABS (2003 and earlier).

TABLE I.8 PETROL STANDARDS

Parameter	National standard	Grade	Date of effect
Sulfur	500 ppm (max)	ULP/LRP	1 Jan 2002
	150 ppm (max)	PULP	
	150 ppm (max)	All grades	1 Jan 2005
Research octane number (RON)	91.0 RON (min)	ULP	1 Jan 2002
	95.0 RON (min)	PULP	
	96.0 RON (min)	LRP	
Distillation	Final boiling point 210°C (max)	All grades	1 Jan 2005
Olefins	18% pool average over 6 months with a cap of 20%	All grades	1 Jan 2004
	18% max by vol		
		All grades	1 Jan 2005
Aromatics	45% pool average over 6 months with a cap of 48%	All grades	1 Jan 2002
	42% pool average over 6 months with a cap of 45%		
			1 Jan 2005
Benzene	1% max by vol	All grades	1 Jan 2006
Lead	0.005g/L (max)	All grades	1 Jan 2002
Oxygen content	2.7% m/m (max)	All grades (no ethanol)	1 Jan 2002
Phosphorus	0.0013g/L (max)	ULP, PULP	1 Jan 2002
MTBE (Methyl tertiary-butyl ether)	1% by volume (max)	All grades	1 Jan 2004
DIPE (Di-isopropyl ether)	1% by volume (max)	All grades	1 Jan 2002
TBA (Tertiary butyl alcohol)	0.5% by volume (max)	All grades	1 Jan 2002
Motor Octane Number (MON)	85.0 (min)	PULP	16 Oct 2002
	81.0 (min)	ULP	16 Oct 2002
	82.0 (min)	LRP	16 Oct 2002
Copper Corrosion (3 hrs @ 50°C)	Class 1 (max)	All	16 Oct 2002
Existent Gum (washed)	50 mg/L (max)	All	16 Oct 2002
Induction Period	360 minutes (min)	All	16 Oct 2002

Source: *Fuel Standard (Petrol) Determination 2001*, summarised by Environment Australia  
[www.ea.gov.au/atmosphere/transport/fuel/standardstable.html](http://www.ea.gov.au/atmosphere/transport/fuel/standardstable.html)

TABLE I.9 DIESEL STANDARDS

Parameter	Proposed standard	Date of effect
Sulfur	500 ppm	31 Dec 2002
	50 ppm	1 Jan 2006
Cetane Index	46 (min) index	1 Jan 2002
Density	820 (min) to 860 (max) kg/m <sup>3</sup>	1 Jan 2002
	820 (min) to 850 (max) kg/m <sup>3</sup>	1 Jan 2006
Distillation T95	370°C (max)	1 Jan 2002
	360°C (max)	1 Jan 2006
Polyaromatic hydrocarbons (PAHs)	11% m/m (max)	1 Jan 2006
Ash and suspended solids	100 ppm (max)	1 Jan 2002
Viscosity	2.0 to 4.5 centistokes @ 40°C	1 Jan 2002
Carbon Residue (10% distillation residue)	0.2 mass % max	16 Oct 2002
Water and sediment	0.05 vol % max	16 Oct 2002
Conductivity at ambient temperature	50 picosiemens per metre (Min) @ ambient temp. (all diesel held by a terminal or refinery for sale or distribution)	16 Oct 2002
Oxidation Stability	25 mg/L max	16 Oct 2002
Colour	2 max	16 Oct 2002
Copper Corrosion (3 hrs @ 50°C)	Class 1 max	16 Oct 2002
Flash point	61.5°C min	16 Oct 2002
Filter blocking tendency	2.0 max	16 Oct 2002
Lubricity	0.460 mm (max) (all diesel containing less than 500ppm sulfur)	16 Oct 2002

Source: Fuel Standard (Diesel) Determination 2001, summarised by Environment Australia  
[www.ea.gov.au/atmosphere/transport/fuel/standardstable.html](http://www.ea.gov.au/atmosphere/transport/fuel/standardstable.html)

## **ADRS**

The Australian Design Rules (ADRs) set emissions standards for new vehicles - the relevant ADRs for model years up to 2002 are:

- ADR37/01 and ADR36/00 for petrol engine vehicles; and
- ADR70/00 and ADR 30/00 for diesel engine vehicles.

The ADR 37/01 standard sets limits on exhaust emissions (of carbon monoxide, hydrocarbons and oxides of nitrogen), and evaporative emissions from light duty petrol vehicles. This standard was phased in over 1997-99 and requires all new vehicles to comply with US 1993 emissions limits.

ADR 36/00 sets limits on exhaust emissions of CO and HC from heavy duty petrol vehicles. This standard took effect in July 1998 and is based on US 1974 emission limits.

ADR 30/00 (introduced in 1976) sets limits on visible smoke for all diesel vehicles (consistent with European and US standards of the early 1970s); and ADR70/00 sets limits on exhaust emissions of CO, HC, NOx and particulates.

ADR 70/00 was introduced in 1995, and provides manufacturers the option of complying with various international standards: European regulations 83/01 and 49/02 (referred to as Euro 1), US EPA 1991 or 1994, and Japanese 1993/4.

New ADRs take effect from 2002 onwards – with the introduction of a package of new-vehicle emission standards (for petrol and diesel vehicles) based on European standards commonly referred to as Euro 2, 3 and 4. The package includes the adoption of:

Diesel vehicles:

- Euro 2 in 2002/03 for all new light diesel vehicles;
- Euro 3 in 2002/03 for all new medium and heavy duty diesel vehicles (also applies to new LPG and CNG vehicles);
- Euro 4 in 2006/07 for all new diesel vehicles (also applies to new LPG and CNG vehicles);

Petrol Vehicles:

- Euro 2 in 2003/04 for all new light petrol vehicles (also applies to new LPG and CNG light vehicles, with heavy petrol vehicles meeting US 1996 standard); and
- Euro 3 in 2005/06 for all new petrol light petrol vehicles (also applies to new LPG and CNG light vehicles, with heavy petrol vehicles meeting US 1998 standard);

(where, for example, 2002/03 here refers to the application of the new standards to new models introduced in 2002, and the application to all models produced on or after 2003).

Tables I.10a to I.10c summarise the differences in emission limits and test procedures for the new ADRs. Vehicle standards typically also include in-service compliance limits (ie a limit on how much deterioration is allowed in the emission rates over time). For example, light vehicles meeting Euro 3 compliance are not supposed to exceed the standards' emission rate levels for up to 80 thousand kilometres travel. For Euro 4, this limit is raised to 100 thousand kilometres. In practice, such in-service compliance is rarely tested – and manufacturers usually meet the standards by applying the 'deterioration factors' specified within the standards. These 'deterioration factors' (which are typically of the order of 10-20 per cent of the emission standard limit) determine by how much a vehicle must be below the standard when new, to fully comply with that standard (under the assumption that if the vehicle is say 10 per cent

below the limit at zero km, then it should still be below the limit by 80 000 km). More vehicle testing on the *actual* (as opposed to *assumed*) durability of new vehicle emission control technology would aid assessment of likely future emission levels for motor vehicle fleets.

TABLE I.10A EMISSION REQUIREMENTS FOR CARS (PETROL)

Standard	Absolute emission limits (g/km)				Emissions Test		Other Requirements
	Petrol Cars < 2.5t				Exhaust	Evaporative	
	CO	HC	NOx	Evap. HC (g / test)	•	•	•
ADR37/01	2.1	0.26	0.63	2	US EPA 1975 Federal Test Procedure	US EPA 2 hr "SHED" Test from 1975	80,000km durability requirement
ADR79/00 (Euro 2)	2.2	0.28	0.22	2	UN ECE Type I, II & III Tests	UN ECE Type IV Test (2hr "SHED")	80,000km durability requirement (Type V Test)
ADR 79/01 (Euro 3)	2.3	0.2	0.15	2	EC Type I, II, III & VI Tests	EC Type IV Test (2hr + 24hr "SHED")	80,000km durability requirement (Type V test), OBD requirement (initially for petrol vehicles only, phased in for diesels over 2003- 2006)
Euro 4	1.0	0.1	0.08	2	EC Type I, II, III & VI Tests <sup>4</sup>	EC Type IV Test (2hr + 24hr "SHED")	As for Euro 3 except 100,000km durability requirement

Notes: More relaxed limits apply for cars greater than 2.5t and less than 3.5t, see table I.10b.

SHED - Sealed Housing Evaporative Determination. OBD - On Board Diagnostics.

For Euro 1 and Euro 2, there is a combined limit for HC+NOx - split figures here assume a ratio of 55:45 (HC:NOx).

A Type I test is the principal cold start tailpipe emissions test; Type II test is CO at idle test; Type III is a crankcase gas test; Type VI is -7°C emissions test for HC and CO emissions.

No date has yet been set for the adoption of Euro 4 petrol vehicle standards. Diesel cars have to meet Euro 4 under ADR79/01.

Source: DOTARS summary ([www.dotars.gov.au/mve/emission\\_requirements.htm](http://www.dotars.gov.au/mve/emission_requirements.htm)).

TABLE I.10B EMISSION REQUIREMENTS FOR 4WDs AND LCVS

Standard	Emission Limits (g/km - unless otherwise specified)					
	CO	HC + NOx	HC	NOx	PM	Evap.
ADR37/01	6.2	NA	0.5	1.4	NA	2
ADR36/00	1% by vol	NA	180ppm	NA	NA	NA
ADR70/00	58-110g/test	19-28g/test	NA	NA	NA	NA
ADR79/00						
(Euro 2)	2.2, 4.0, 5.0	0.5, 0.6, 0.7	NA	NA	NA	2
Petrol	1.0, 1.25, 1.5	0.7, 1.0, 1.2	NA	NA	0.08, 0.12, 0.17	NA
Diesel						
ADR79/01						
(Euro 3)	2.3, 4.17, 5.2	NA	0.2, 0.25, 0.29	0.15, 0.18, 0.21	NA	2
Petrol	0.64, 0.8, 0.95	0.56, 0.72, 0.86	NA	0.5, 0.65, 0.78	0.05, 0.07, 0.1	NA
Diesel						
ADR79/01						
(Euro 4)	1.0, 1.81, 2.27	NA	0.1, 0.13, 0.16	0.08, 0.1, 0.11	NA	2
Petrol	0.5, 0.63, 0.74	0.3, 0.39, 0.46	NA	0.25, 0.33, 0.39	0.025, 0.04, 0.06	NA
Diesel						

**Notes:** In this table, the nominated standards cover:  
 Cars (including 4WDs) > 2.5t (ADR70/00 & Euro Standards),  
 LCVs - up to max 3.5t (ADR70/00 & Euro Standards),  
 4WDs and LCVs < 2.7t (ADR37/01),  
 4WDs and LCVs > 2.7t (ADR36/00).

Limits depend on the mass of the vehicle. For *Euro 2* the first value is the same as the limit for cars and is applicable to LCVs ≤ 1250 kg, the second to LCVs > 1250kg and ≤ 1700kg, the third to LCVs > 1700kg and cars > 2500 kg. For *Euro 3* and *Euro 4* the 3 mass cut points are ≤ 1305kg, >1305 ≤ 1760 and >1760 (LCVs) and >2500 (cars).

ADR79/01 adopts *Euro 3* for petrol vehicles and *Euro 4* for diesel vehicles.

Source: DOTARS summary ([www.dotars.gov.au/mve/emission\\_requirements.htm](http://www.dotars.gov.au/mve/emission_requirements.htm)).

Table I.10c Emission Requirements for Heavy Duty Vehicles

Standard	Absolute Emission Limits (g/kWh) (unless otherwise specified)				Emissions Test	Other Comments
	CO	HC	NOx	PM		
ADR36/00 (petrol)	1% by vol	180ppm	NA	NA	9 mode steady state engine dynamometer test	ADR36 reflects 1974 US EPA standards for heavy duty petrol engines.
ADR70/00 (diesel)	4.5	1.1	8.0	0.36	UN ECE 13 mode steady state test	US EPA 91 and Japanese 94 Standards accepted as alternatives
Euro 2 (1996-1998)	4.0	1.1	7.0	0.15	UN ECE 13 mode steady state test	
ADR80/00 (Euro 3)					Manufacturers have to meet 1 of 2 new test cycles:	US Model Year 2000 engines accepted as alternative to Euro 3 standards.
ESC Limit	2.1	0.66	5.0	0.10	Euro Stationary Cycle (ESC); or	
ETC Limit	5.45	0.78	5.0	0.16	Euro Transient Cycle (ETC)	
ADR80/01 (Euro 4)					Manufacturers have to meet both test cycles:	US 2004 standards accepted as alternative to Euro 4 standards.
ESC Limit	1.5	0.46	3.5	0.02	Euro Stationary Cycle (ESC); and	
ETC Limit	4.0	0.55	3.5	0.03	Euro Transient Cycle (ETC)	

Notes:

ADR70/00 allows compliance with ECE/EU standards, US EPA and Japanese Standards - the ECE (Euro 1) limits are used here as the basis for comparison.

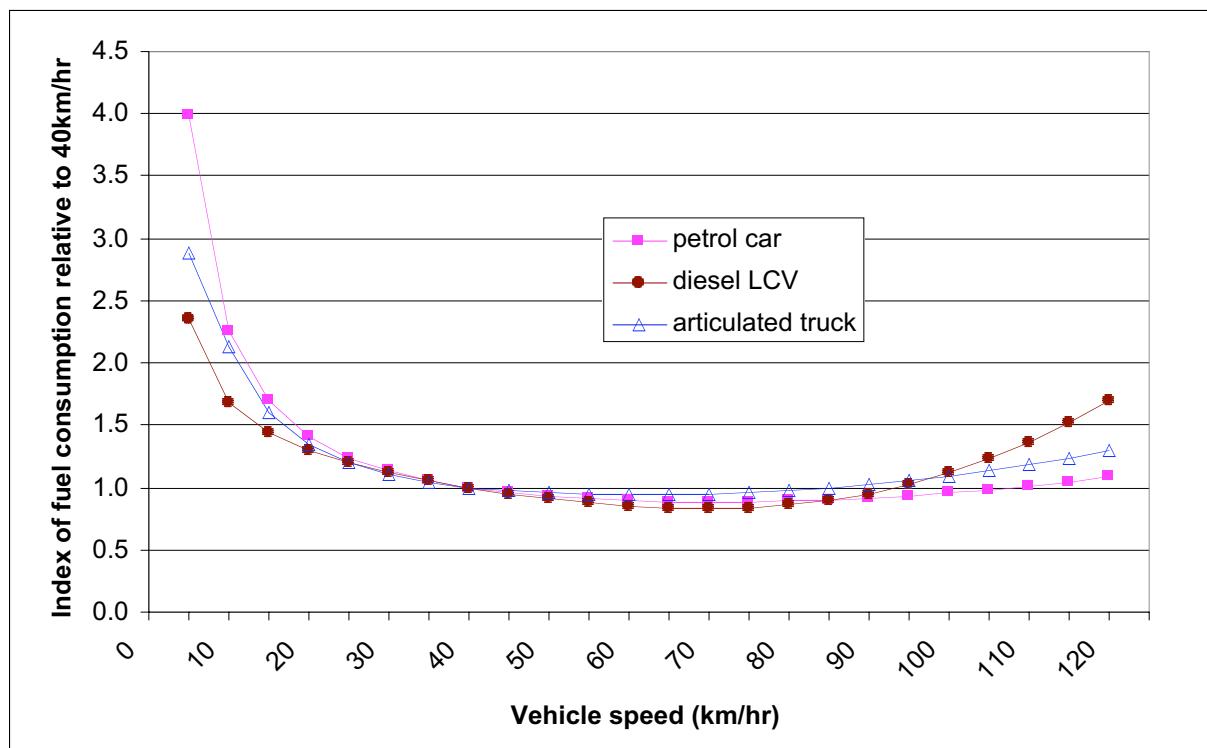
Euro 2 not adopted for heavy duty vehicles in the ADRs.

Original Euro 2 limit for PM was 0.25, which was reduced to 0.15 in 1998.

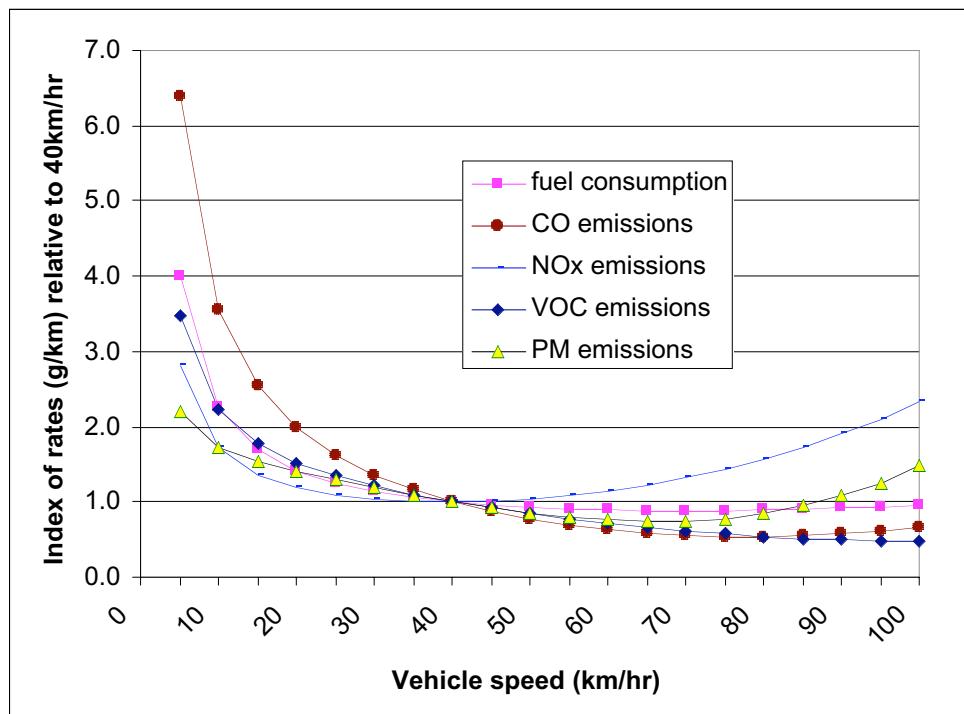
For Euro 3, smaller engines are subject to more relaxed PM limits - of 0.13 (ESC) and 0.21 (ETC).

Source: DOTARS summary ([www.dotars.gov.au/mve/emission\\_requirements.htm](http://www.dotars.gov.au/mve/emission_requirements.htm)).

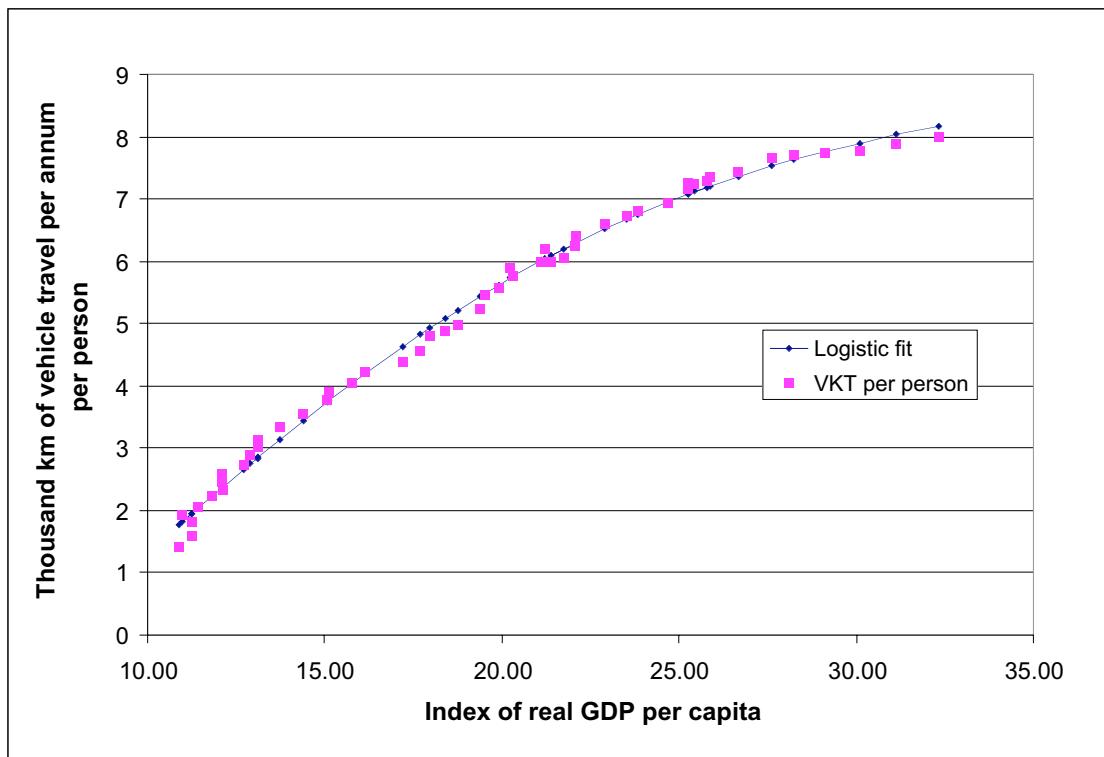
Figure I.1 Typical response curves for average fuel consumption to variation in vehicle speed, by vehicle type



**Figure I.2** Typical response curves for petrol car emission rates to variation in vehicle speed, by pollutant type

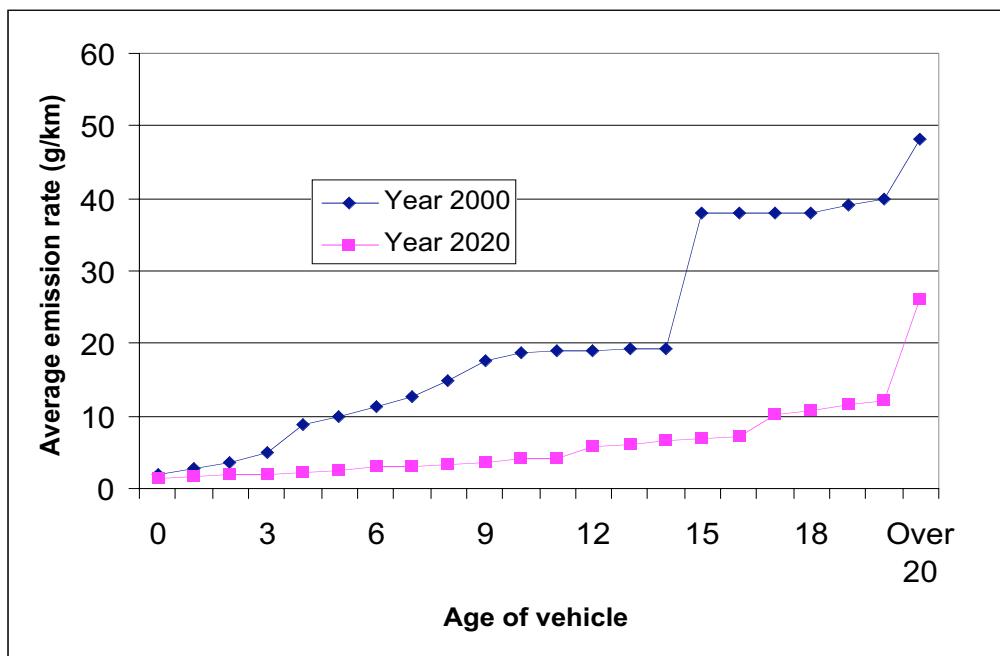


**Figure I.3 Per capita trend in annual passenger vehicle travel versus real income levels**



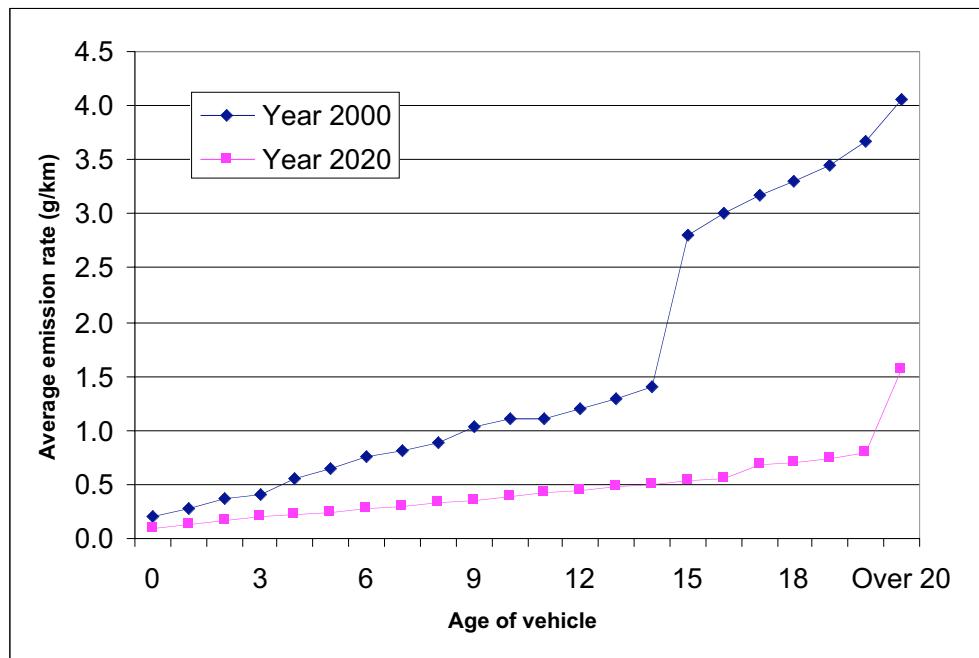
Source: BTRE (2002).

**Figure I.4 Example of fleet profiles used in BTRE emission models – Passenger car average CO emissions by age of vehicle, for 2000 and 2020**



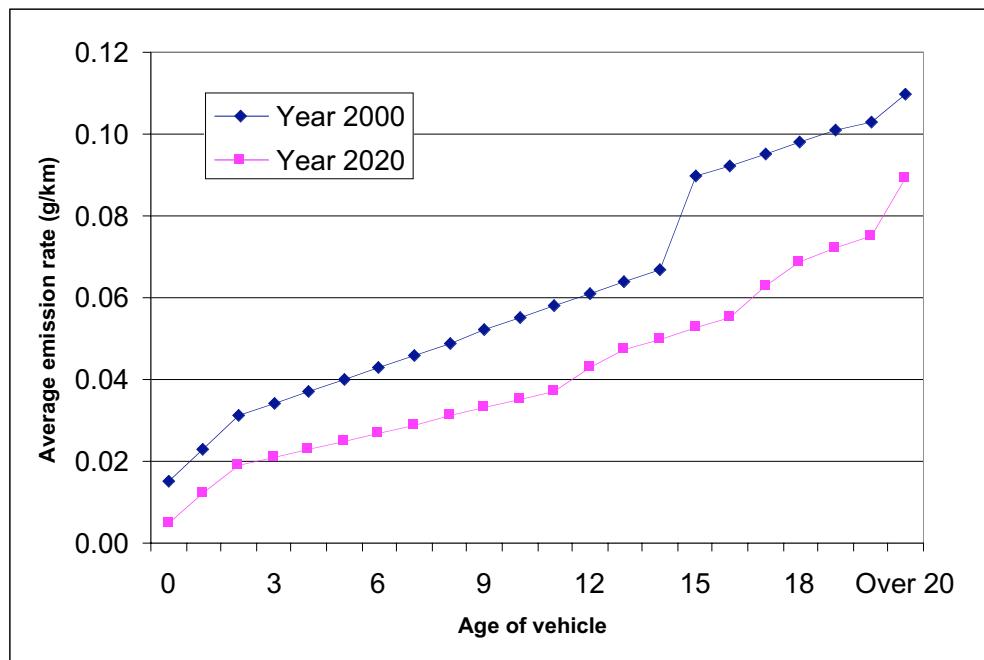
Source: BTRE estimates, BTRE CARMOD.

**Figure I.5 Example of fleet profiles used in BTRE emission models – Passenger car average VOC (exhaust) emissions by age of vehicle, for 2000 and 2020**



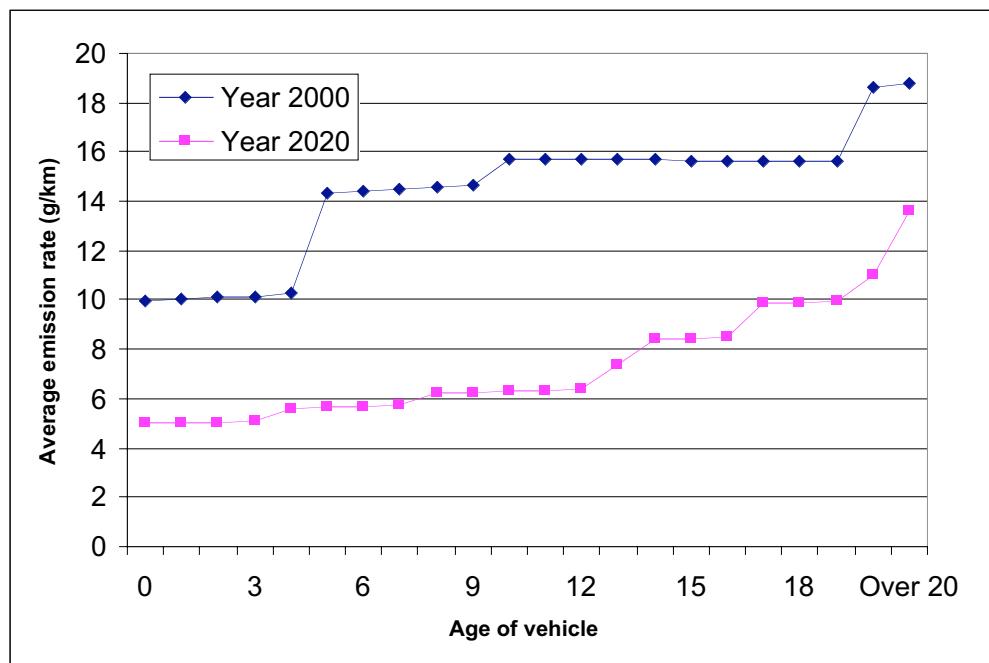
Source: BTRE estimates, BTRE CARMOD.

**Figure I.6 Example of fleet profiles used in BTRE emission models – Passenger car average PM (exhaust) emissions by age of vehicle, for 2000 and 2020**



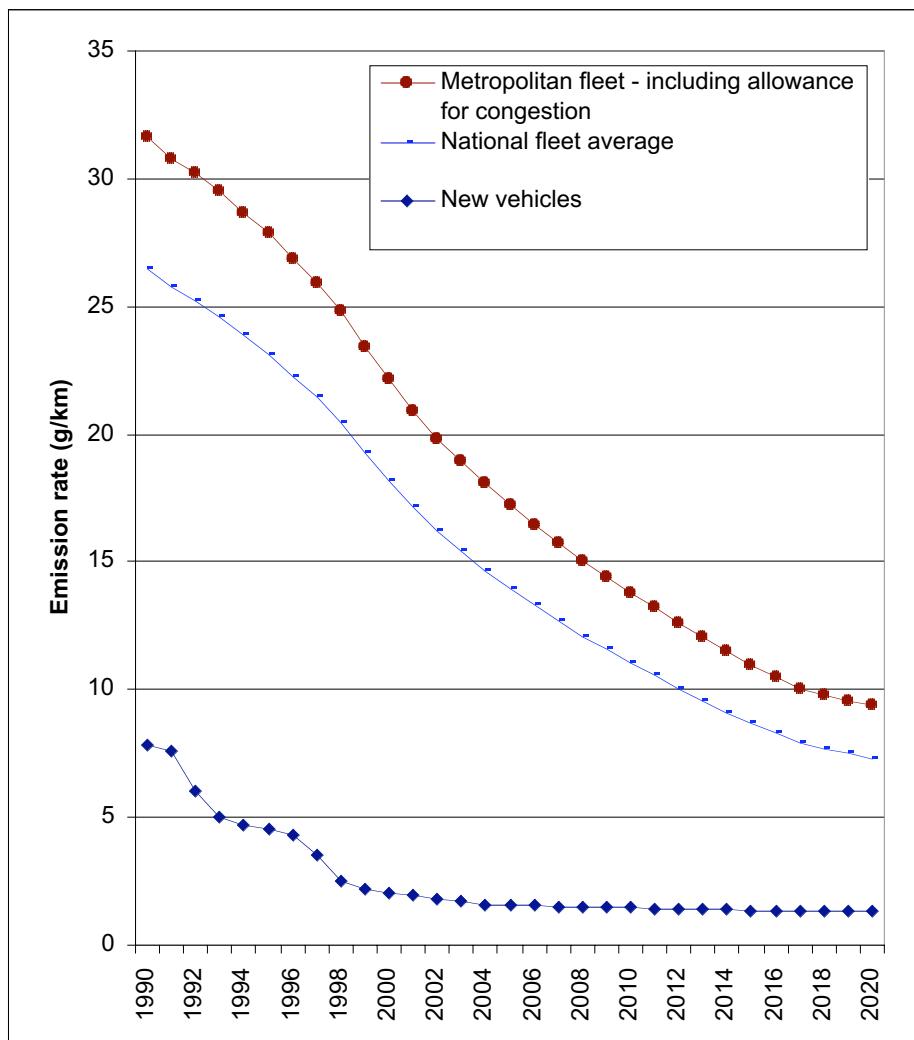
Source: BTRE estimates, BTRE CARMOD.

**Figure I.7 Example of fleet profiles used in BTRE emission models – Articulated truck average NOx emissions by age of vehicle, for 2000 and 2020**



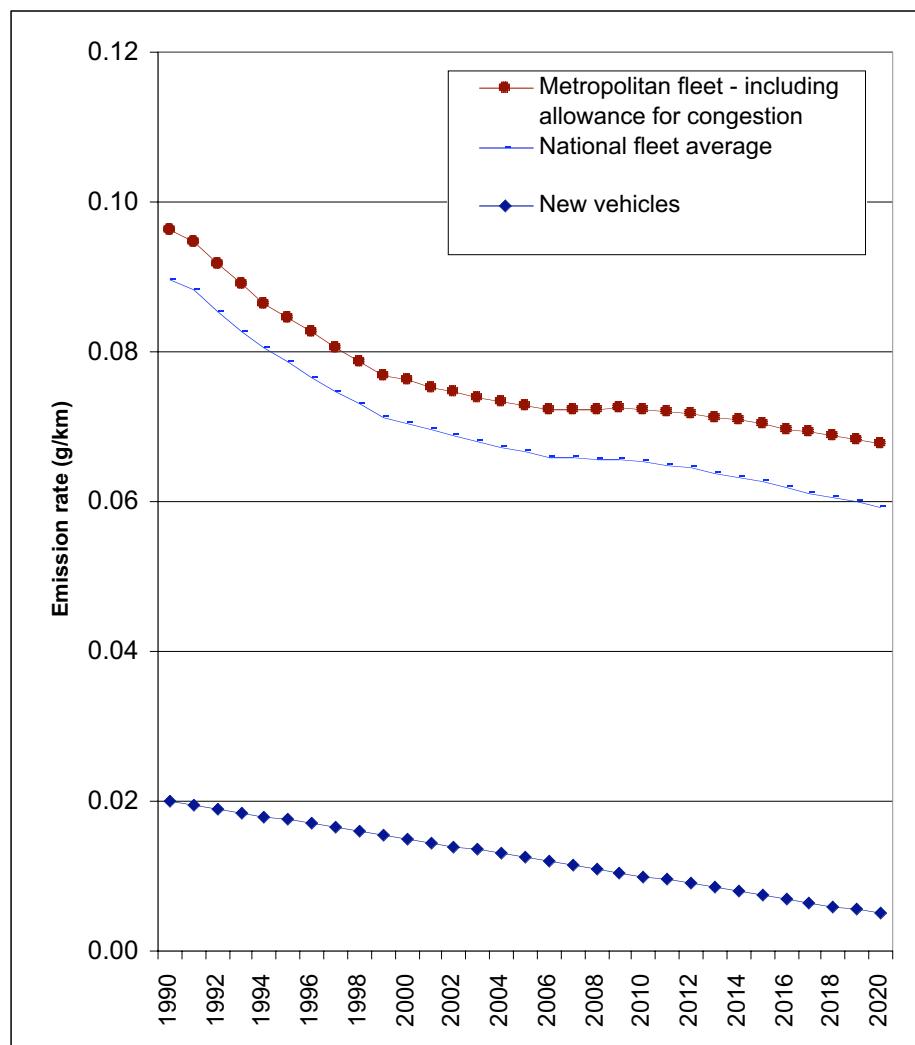
Source: BTRE estimates, BTRE TRUCKMOD.

**Figure I.8 Example of fleet output values from BTRE emission models – Passenger car average CO emission trends, 1990-2020**



Source: BTRE estimates, BTRE CARMOD.

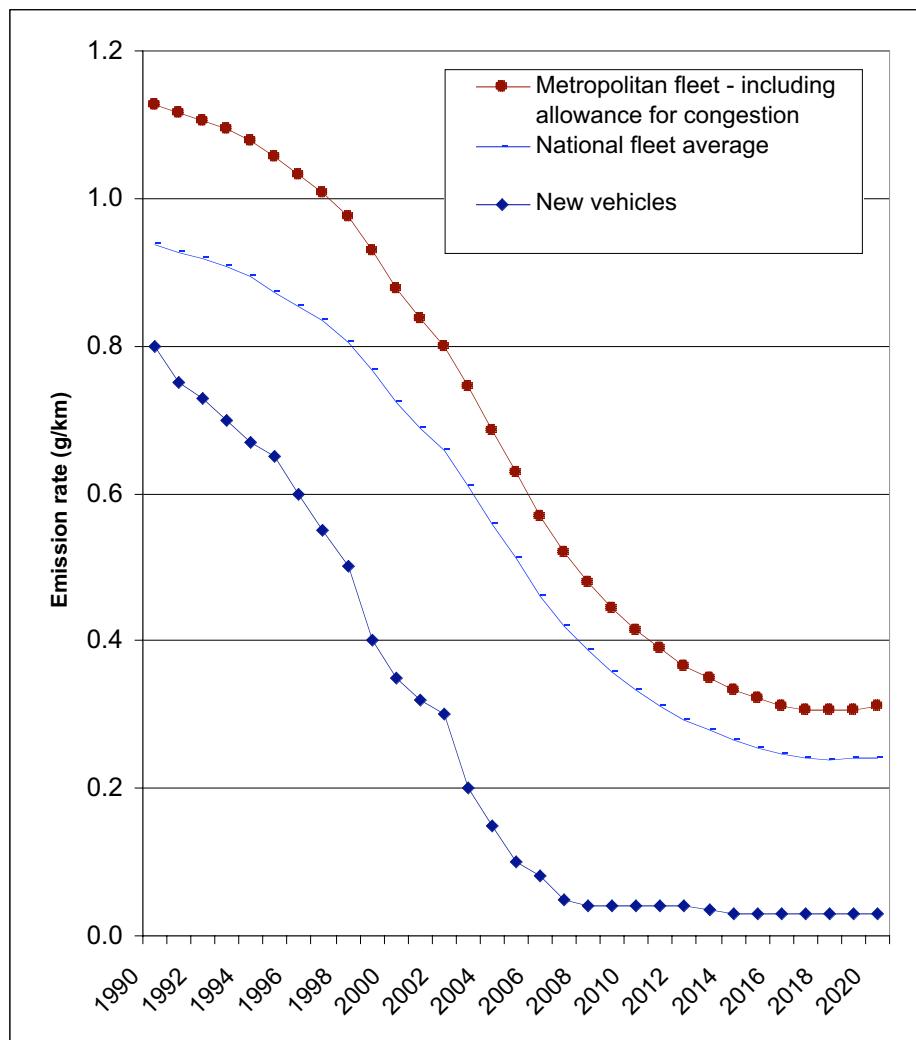
**Figure I.9 Example of fleet output values from BTRE emission models – Passenger car average PM emission trends, 1990-2020**



**Note:** Fleet averages include tyre and brake wear (but do not include stirring of road dust), and allowance for 2 per cent of the fleet to be 'smoking' vehicles.

**Source:** BTRE estimates, BTRE CARMOD, CARB (2002).

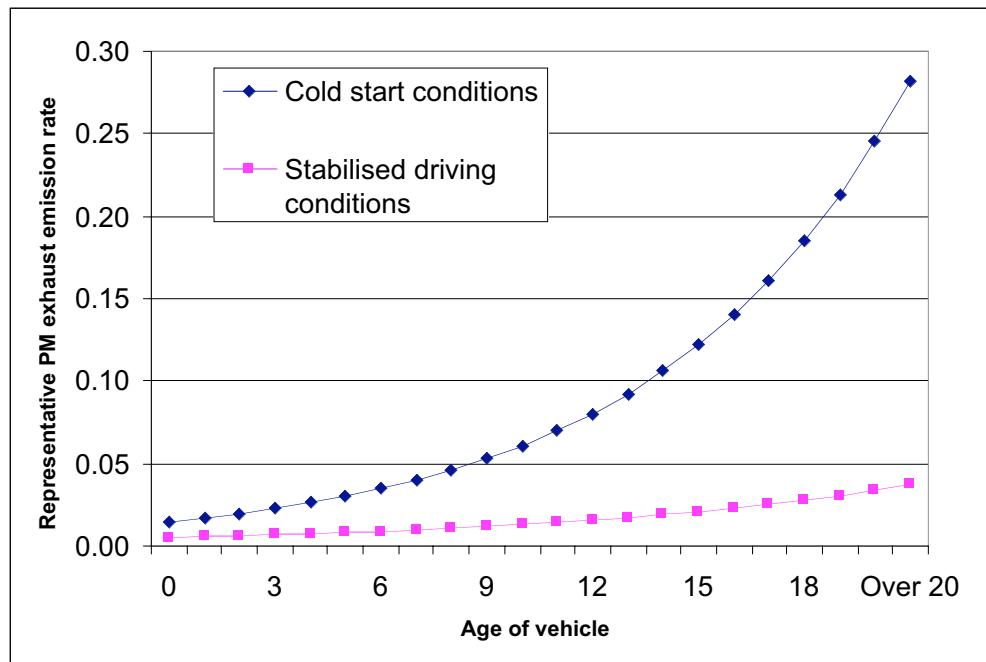
**Figure I.10 Example of fleet output values from BTRE emission models – Articulated truck average PM emission trends, 1990-2020**



*Note:* Fleet averages include tyre and brake wear (but do not include stirring of road dust).

*Source:* BTRE estimates, BTRE TRUCKMOD.

**Figure I.11 Estimated functional form for the age dependence of PM emission rates for catalyst-controlled passenger cars, by driving condition**



Source: BTRE estimates, BTRE CARMOD, CARB (2002).



## REFERENCES AND BIBLIOGRAPHY

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ABS	Australian Bureau of Statistics
AFIS	Automotive Fuels Information Service
AGO	Australian Greenhouse Office
AGPS	Australian Government Publishing Service
AIP	Australian Institute of Petroleum
ANGVC	Australasian Natural Gas Vehicles Council
ARRB	Australian Road Research Board
BTCE	Bureau of Transport and Communications Economics
BTE	Bureau of Transport Economics
BTR	Bureau of Tourism Research
BTRE	Bureau of Transport and Regional Economics
BTS	Bureau of Transport Statistics, US Department of Transportation
CARB	California Air Resources Board
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DISR	Department of Industry, Science and Resources
DOE	United States Department of Energy
DOTARS	Department of Transport and Regional Services
DPIE	Department of Primary Industries and Energy
DTLR	Department of Transport and Local Government and the Regions
FORS	Federal Office of Road Safety
EPAV	Environment Protection Authority of Victoria
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
NEPC	National Environment Protection Council
NGGIC	National Greenhouse Gas Inventory Committee
NPI	National Pollutant Inventory
USEPA	United States Environmental Protection Agency

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## **ABBREVIATIONS**

AAA	Australian Automobile Association
ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
Adl	Adelaide
ADR	Australian Design Rule
ADO	Automotive diesel oil
AFCP	Alternative fuels conversion program
AGO	Australian Greenhouse Office
AIP	Australian Institute of Petroleum
ANGVC	Australasian Natural Gas Vehicles Council
ARRB	Australian Road Research Board
BAU	Business-as-usual
Bne	Brisbane
BTCE	Bureau of Transport and Communications Economics
BTE	Bureau of Transport Economics
BTRE	Bureau of Transport and Regional Economics
CBD	Central business district
Cbr	Canberra
CH <sub>4</sub>	Methane
CNG	Compressed natural gas
CNGIP	CNG infrastructure program
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> -e	CO <sub>2</sub> -equivalent emissions (includes effects of emissions of carbon dioxide, methane and nitrous oxide)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFGS	Diesel and Alternative Fuels Grants Scheme
Dar	Darwin
DISR	Department of Industry, Science and Resources
DOE	United States Department of Energy
DOTARS	Department of Transport and Regional Services
DPIE	Department of Primary Industries and Energy
EPAV	Environment Protection Authority of Victoria
ESMVI	Environmental Strategy for the Motor Vehicle Industry
FFC	Full fuel cycle
FORS	Federal Office of Road Safety
GCM	Gross combination mass
g/pkm	grams per passenger-kilometre
g/tkm	grams per tonne-kilometre

Gg	Gigograms ( $10^9$ grams, equals 1000 tonnes)
GVM	Gross vehicle mass
GWP	Global Warming Potential
HC	Hydrocarbon
Hob	Hobart
IPCC	Intergovernmental Panel on Climate Change
km	Kilometres
kt	Kilotonnes
L	Litres
LCV	Light commercial vehicle
LNG	Liquid natural gas
LPG	Liquefied petroleum gas
LSD	Low sulphur diesel
m	Metres
Mel	Melbourne
MJ	Megajoules (million joules)
Mt	Megatonnes (million tonnes)
N <sub>2</sub> O	Nitrous oxide
NAFC	National Average Fuel Consumption
NEPM	National Environment Protection Measure
NG	Natural gas
NGV	Natural gas vehicle
NMHC	Non-methane hydrocarbons
NMVOC	Non-methane volatile organic compound
NO <sub>x</sub>	Nitrogen oxides
OEM	Original Equipment Manufacturers
ORP	Optimal road pricing
PCU	passenger car equivalent unit
Per	Perth
RON	Research octane number
pkm	passenger-kilometres
PJ	Petajoules ( $10^{15}$ joules)
PM	Particulate matter
PM10	Particulate matter with a diameter of $10\mu\text{m}$ (microns) or less
PM2.5	Particulate matter with a diameter of $2.5\mu\text{m}$ (microns) or less
PM1	Particulate matter with a diameter of $1\mu\text{m}$ (micron) or less
ppm	parts per million
SI	Spark-ignition
SMVU	<i>Survey of Motor Vehicle Use</i>
SO <sub>2</sub>	Sulphur dioxide
Syd	Sydney
t	Tonnes
tkm	tonne-kilometres
TDM	Transport demand management
THC	Total hydrocarbons
ULSD	Ultra low sulphur diesel
UK	United Kingdom
US	United States of America
ZEV	Zero Emission Vehicle

