



Corporate Greenhouse Action Plan

2009 to 2012

Glossary

CCP	Cities for Climate Protection. The Cities for Climate Protection Program is delivered worldwide by the International Council for Local Environmental Initiatives (CCP).
Corporate greenhouse gas emissions.	In this document refers to greenhouse gas emissions generated through the activities of the City of Armadale administration.
eCO ₂	Shorthand for equivalent carbon dioxide units. Some gasses such as methane also trap heat in earth's atmosphere and for ease of understanding gasses such as methane are converted to eCO ₂ based on their greenhouse impact.
FTEs	Full Time Equivalent employees. This figure takes into account that some people work part time (e.g. One FTE might comprise one person working two days a week (i.e. 0.4 FTE) and another three days a week (i.e. 0.6 FTE)).
GHG	Greenhouse Gas.
Green Power	A term for electricity that is generated from renewable sources, which is treated as generating no eCO ₂ . A system of Renewable Energy Certificates regulated by the Federal Government is used to authenticate Green Power.
ICLEI	International Council for Local Environmental Initiatives. ICLEI is a non government organisation that has been contracted by the Federal Government to deliver the Cities for Climate Protection (CCP) program.
kWh	Short for kilowatt hours. Overall electricity use is measured in Watthours (i.e. Watts times hours), and one kWh is one thousand Watthours.

Executive Summary

The City of Armadale signed onto the ICLEI's Cities for Climate Protection (CCP) program in 1999. The City committed to reducing emissions from its own operations (i.e. corporate) greenhouse gas emissions by 20 percent of 1998-99 levels by 2010 and a 15 percent reduction target for greenhouse gas emissions from the community.

In 1998-99 (the baseline year) the City of Armadale recorded 7,777 tonnes of eCO₂ Corporate greenhouse gas (GHG) emissions.

The 2006/07 re-inventory found that although Corporate GHG emissions have increased since 1998-99 levels, emissions are more than 300 tonnes eCO₂ less per annum than they would have been under a business as usual approach. Initiatives to date have abated a total of 1,452 tonnes eCO₂. In 2006/07 the City produced 9,160 tonnes of eCO₂, with decreases being recorded in the water and building sectors and increases in the fleet vehicle, streetlighting and waste sectors.

A 36.2% reduction in GHG emissions associated with the water sector has been achieved since the baseline year. Significant reductions in the buildings sector have also been achieved with the introduction of Green Power at six Council facilities.

The City has pursued and is continuing to pursue a vehicle downsizing policy in an effort to increase fuel efficiency and reduce GHG emissions. However, the increase in the number of vehicles in the City's fleet due to competitive labour markets and staff increases has resulted in an overall increase in GHG emissions from the vehicle fleet.

The increase in GHG emissions in the streetlighting sector reflects an increase in the number of roads and lit public spaces as a result of new subdivision developments.

Significant increases in the Corporate waste sector have resulted from changes to methods used to calculate Corporate waste in 2006/07.

This plan reviews the previous Corporate Greenhouse Action Plan and continues the recommendations of that plan where appropriate. Like its predecessor the plan is a mix of short term actions and long-term actions so that opportunities consistent with the long-term actions can be seized as they arise.

This Plan has quantified to the greatest extent possible the effectiveness of proposed actions in reducing Corporate GHG emissions in order to prioritise actions and determine the feasibility of achieving goals. A summary of the priority actions and their effectiveness appears below.

Action Plan No	Summary descriptor	Cost	Potential abatement per annum (tonnes eCO ₂)
8	Streetlights - conversion from 80W mercury vapour to 42 W compact fluorescent.	Complete current trial	519
3	Energy audits of high energy using buildings	\$15,000 plus cost of implementation	77 ± at least 38

Action Plan No	Summary descriptor	Cost	Potential abatement per annum (tonnes eCO₂)
4	Energy monitoring of 10 high energy sites	\$3,500 per annum	19 ± 42
7	Wind turbine & solar panel as at Shire of Serpentine-Jarrahdale Recreation Centre. The City could do much more than this.	Unknown	11 ± ?
10	Improve Council operated car park lighting	Unknown but minor	2
14	Zero increase in light vehicle fleet emissions to 2012. This is achievable.	Normal vehicle replacement cost	n.a
Sub-total Non-Green Power Actions			628
9	Green Power - 100% for streetlights	\$60 - \$180,000	3,113
2	Green Power - 100% at all sites	\$18 - \$54,000	884
1	Green Power - 100% at contestable (high energy using) sites only	\$24,000	387
Sub-total - Green Power			4,384

It is intended to pursue all of the non-Green Power options, and pursue the Green Power option when the regulatory and market situation changes so that Green Power can be purchased without a significant impact on energy costs for the City and its ratepayers. Implementation of all Green Power options would enable the City to meet the greenhouse gas reduction target set in 1998-99 but then there would be little scope to further reduce emissions.

Other non-priority actions outlined in this Plan will continue to be pursued so that the City can continue to demonstrate leadership in environmental management.

Based on the analysis in this plan the City has re-set its goals as follows:

The City will try to reduce Corporate greenhouse gas emissions to achieve reductions of:

- **in excess of 6% per capita from 2006/07 levels by 2012;**
- **20% from 1998-99 levels by 2022; and**
- **60% from 2000 levels by 2050.**

The final goal reflects the current goal adopted by the Federal and State governments across Australia.

Whilst actions to reduce greenhouse gas emissions are of the highest priority, it is clear that climate change adaptation planning is now an essential part of greenhouse action planning. The final action in this plan seeks to address this issue.

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1 Introduction

1.1 A brief introduction to the City of Armadale

The City of Armadale is located 28 kilometres South East of the Perth CBD in the foothills of the Darling Scarp. Armadale has a busy urban centre as well as mixed semi rural areas. The Council spans 545 square kilometres and contains many rich and diverse eco-systems such as wetlands, forests, heathlands, sedgeland, woodlands and the Canning river catchment. The City supports commerce, industry and agriculture.

This report uses data from the 2006/07 re-inventory of the City's Corporate Greenhouse Gas (GHG) emissions, so the character of Armadale in that year is significant.

In 2006/07 the City of Armadale had a population of 52,747 which is expected to grow by 25% to 65,723 by 2012. Growth is expected to continue with the population reaching over 119,000 by 2030.

In 2006/07 the City of Armadale employed 236 Full Time Equivalent employees (FTEs) across the municipality, an increase of 36 FTEs since 1998-99. It is expected that by 2012, there would be 266 FTEs.

1.2 Cities for Climate Protection

The City of Armadale in partnership with the City of Gosnells and the Shire of Serpentine Jarrahdale signed on to the Cities for Climate Protection™ program in July 1999. The CCP program is delivered by ICLEI (International Council for Local Environmental Initiatives) in conjunction with the Australia Greenhouse Office. The program assists local governments to reduce their Corporate and Community greenhouse gas (GHG) emissions.

Community emissions include all greenhouse gas emissions that result from commercial and residential activity within a municipality¹.

Corporate emissions are a subset of Community emissions and include any GHG emissions associated with Council's activities, facilities and operations¹.

To complete the CCP program local governments must achieve the following milestones;

- Milestone 1 - Conduct an emissions inventory of both Corporate and Community activity and forecast future emissions under a 'business as usual scenario.'
- Milestone 2 - Establish emissions reduction goals in consultation with the community and other stakeholders.
- Milestone 3 - Develop **Corporate and Community Greenhouse Action Plans**
- Milestone 4 - Demonstrate significant progress towards the implementation of the **Corporate and Community Greenhouse Action Plans**.
- Milestone 5 - Monitor implementation of **Corporate and Community Greenhouse Action Plans** and report on progress.

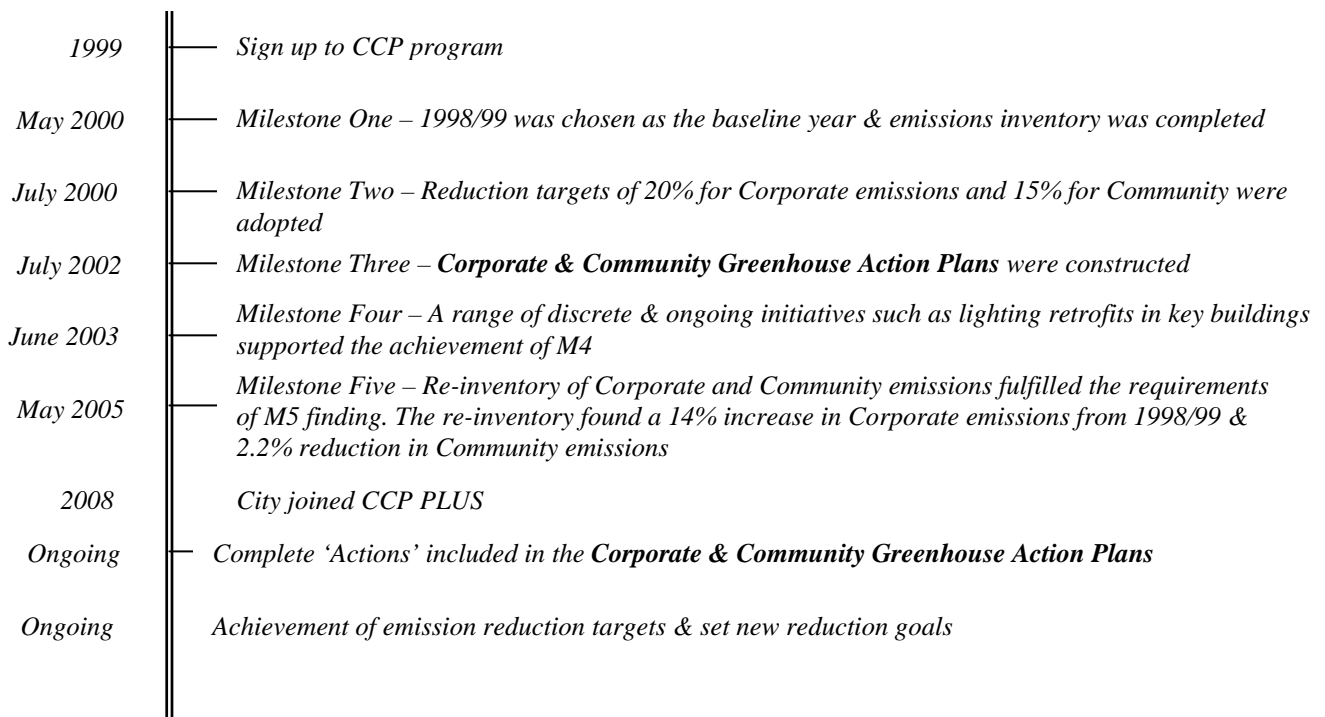
¹ Information cited from ICLEI website: Cities for Climate Protection Inventory Course, 2006, Glossary (Online) Available World Wide Web: URL <http://learning.ccp.iclei.org/mod/glossary/view.php?id=72> (accessed January 21, 2008)

- CCP Plus – Assess progress towards GHG emissions reduction targets and adjust *Corporate and Community Greenhouse Action Plans* if required.

The City of Armadale has successfully completed milestones one to five. Along with project partners (City of Gosnells and Serpentine Jarrahdale Shire) the City was the first local government in Western Australia to achieve Milestone Two and Three. This report is designed to fulfil the CCP Plus requirements.

The timeline overleaf depicts the City of Armadale’s CCP milestone progression.

Figure 1- City of Armadale CCP Timeline



SEREG Business Plan 2006/07 – 2008/09 City of Armadale, City of Gosnells and Serpentine Jarrahdale Shire

1.3 CCP Plus – Planning and Review Process

CCP Plus involves the formal review of Council’s progress towards Corporate emissions reduction targets and assesses the success of Council’s *Corporate Greenhouse Action Plan*. Undertaking a CCP Plus Review gives Council an opportunity to acknowledge current success, learn from previous shortfalls and clearly plan what actions will be required to reach emissions reduction goals. The review process includes the following steps:

1. Analysis of current Corporate and Community emissions trends in the context of emissions reduction strategies and initiatives
2. Quantification of abatement measures
3. Review and amendment of Corporate and Community Greenhouse Action Plans
4. Forward planning and recommendations

1.4 Corporate and Community GHG Emissions Reduction Goals

As part of Milestone Two the City of Armadale resolved to adopt “*the goal of trying to reduce corporate greenhouse gas emissions by 20% from 1998-99 levels by 2010-11*” and to try to “*reduce community greenhouse gas emissions within our region by 15% from 1998-99 levels by 2010-11...*” (CS 55/00 - bold emphasis not used in original resolution).

The community goal is not considered as part of this report. However, it is worth reporting that a part of the *Regional Community Greenhouse Action Plan* the City of Armadale along with partner councils Gosnells and Serpentine Jarrahdale created the multi-award winning *switch your thinking! (syt!)* program. Since the launch of *syt!* in 2002, many effective community initiatives have assisted local households, school communities and businesses to reduce their GHG emissions. The *syt!* brand has been successful in attracting Corporate sponsorship, securing funding and has been adopted by other local governments. During the re-inventory period the following community initiatives were delivered under the *syt!* brand:

1. The Green House Demonstration Home
2. 5-Star energy rated display village at Newhaven Estate
3. *syt!* Rebate Scheme
4. Green Light Schools Fundraiser
5. Regional Housing Retrofit project
6. Switched on living workshops

1.5 Key Abatement Measures

Table 1 shows key abatement actions undertaken by the City in 2006/07.

Table 1. Key Abatement Measures 2006/07

Measure	Description	Abatement (tonnes eCO ₂)
Green Power	Six facilities use Landfill Gas and Power’s <i>Green Power</i> product for 75 percent of their electricity needs.	1,693
Air Conditioner Replacement	The old air conditioning in the Administration Building was due for replacement in 2006/07. The new system is 10 percent more efficient than the former system. The new system saved 12.81 tonnes eCO ₂ in 2006/07 and is expected to save 38.44 tonnes eCO ₂ in 2007/08 when installation is complete. The new system will save the City approximately \$5,000 annually.	~13
Waste Measures	Council has made it compulsory for both the Corporate and Community sectors to separate green waste from general rubbish. The City then recycles the green waste by mulching it and providing it as free compost to ratepayers.	Qualitative Measure

Some GHG reduction strategies continue to deliver benefits after the initiative is implemented. Table 2 shows historical initiatives that are continuing to deliver GHG abatement in the 2006/07 re-inventory year.

Table 2. Key Historical Quantifiable Abatement Measures

Measure	Description	Years²	Abatement (tonnes eCO₂)
Lighting Retrofit	100W down lights in the Administration Building were replaced with 16 W compact fluorescents.	2000/01	1
		2001/02	11
		2002/03	11
		2003/04	11
		2004/05	11
		2005/06	11
		<i>2006/07</i>	<i>11</i>
		<i>2007/08</i>	<i>11</i>
		<i>2008/09</i>	<i>11</i>
		<i>2009/10</i>	<i>11</i>
<i>2010/11</i>	<i>10</i>		
Park Lighting	The quartz halogen lamps at Gwynne Park and William Skeet Reserve were replaced with more efficient metal halide lamps and a timer and photo sensitive switch were installed.	2002/03	34
		2003/04	34
		2004/05	34
		2005/06	34
		<i>2006/07</i>	<i>34</i>
		<i>2007/08</i>	<i>34</i>
		<i>2008/09</i>	<i>34</i>
<i>2009/10</i>	<i>34</i>		
Air - Conditioner Timer	A timer was installed on the old air conditioner in the Administration building in 1998-99. The timer ensured that the air-conditioner only ran during office hours, instead of 24 hours a day. Abatement for the air-conditioner timer applies to only half the year in 2006/07 as the new air-conditioner, which has an energy efficient management system was installed in December 2006.	1998/99	50
		1999/00	50
		2000/01	50
		2001/02	50
		2002/03	50
		2003/04	50
		2004/05	50
		2005/06	50
		<i>2006/07</i>	<i>25</i>

² Years in italics are predictions. These figures take into account when the measure started and the life of the product (e.g the pool blanket is expected to need replacement in 2015/16, so in that year the abatement is reduced).

Measure	Description	Years ²	Abatement (tonnes eCO ₂)
Triphosphor replacement program	70% of fluorescent tube lights in the Administration Building were replaced with more efficient triphosphor globes.	1998/99	5
		1999/00	63
		2000/01	63
		2001/02	63
		2002/03	63
		2003/04	63
		2004/05	63
		2005/06	63
		2006/07	63
		2007/08	63
		2008/09	63
		2009/10	63
2010/11	58		
Computer Conversion	Monitors on computers in the administration building, council depot, city libraries and pound were converted from CRT to LCD screens.	2005/06	44
		2006/07	66
		2007/08	66
		2008/09	66
		2009/10	22
Pool Blanket	A pool blanket was installed on the 50 metre pool at the Armadale Aquatic Centre. The pool blanket cost \$37,000 and produces energy saving of approximately \$13,000 p.a.	2005/06	68
		2006/07	101
		2007/08	101
		2008/09	101
		2009/10	101
		2010/11	101
		2011/12	101
		2012/13	101
		2013/14	101
		2014/15	101
2015/16	34		
Fleet Vehicle Replacement	1 fleet vehicle was replaced with a vehicle which had a smaller engine capacity.	2005/06	1
		2006/07	1

Based on the above table, by 2006/07 the initiatives to date abated 1,452 tonnes eCO₂, with future emissions of 1,388 tonnes eCO₂ also being abated. In 2006/07, 301 tonnes eCO₂ were abated.

2 Re-inventory 2006/07

In re-inventory year 2006/07 the City of Armadale used approximately 42,000 GJ of energy, at a cost \$1.6 million. Total Corporate GHG emissions in 2006/07 were 9,160 tonnes eCO₂ – 17.8 percent higher than baseline figures. Table 3 and Figure 2 show the breakdown of the Corporate GHG emissions into the following sectors:

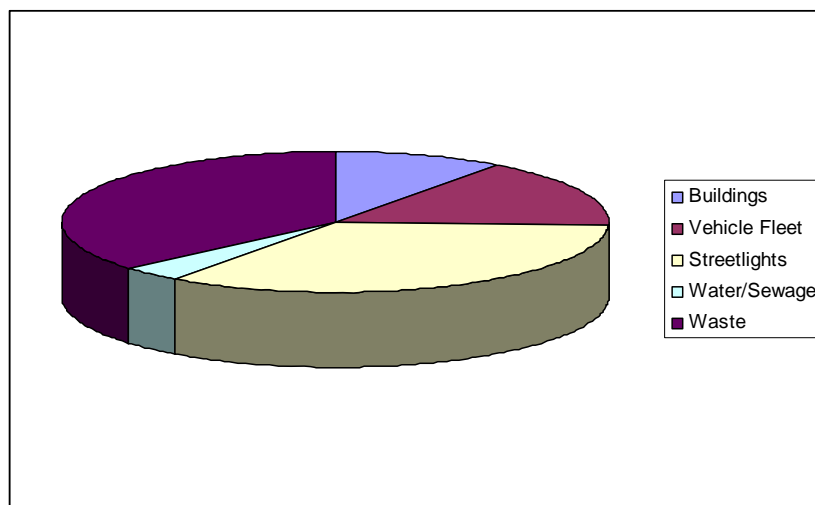
- Buildings – Includes the GHG emissions associated with energy use at all Council facilities.

- Vehicle Fleet – Includes the GHG emissions associated with fuel used by both fleet vehicles and plant operation.
- Streetlighting – Includes the GHG emissions associated with all public lighting within the municipality (costs in this sector include maintenance).
- Water – Includes the GHG emissions associated with pumping ground water for irrigation.
- Waste – Includes the GHG emissions associated with the break down of organic waste produced at all council facilities, collected from street bins and at special events within the City as well as illegally dumped litter collected by the Council.

Table 3. Armadale Corporate GHG Emissions 2006/07

Sector	e CO ₂ (tonnes)	e CO ₂ (%)	Energy (GJ)	Cost (\$)
Buildings	918	10	8,210	354,106
Vehicle Fleet	1,459	15.9	20,963	617,928
Streetlights	3,113	34	11,662	574,229
Water/Sewage	332	3.6	1,245	57,041
Waste	3,337	36.4		82,151
Total	9,160	100	42,080	1,685,456

Figure 2. Corporate GHG Emissions Sector Breakdown in 2006/07



2.1 Buildings Sector

The building sector created 918 t eCO₂ during the re-inventory year, accounting for 9.6 percent of total Corporate GHG emissions. Overall Council facilities used 8,210 GJ of energy in 2006/07, costing the Council approximately \$354,000.

Figure 3 below shows the changes to Corporate GHG emissions in the buildings sector since the base year (1998/99). Emissions levels resulting from the buildings sector in 2006/07 show a 45 percent decrease from 1998/99 levels.

Figure 3. Changes to Corporate Building Sector GHG Emissions since 1998/1999

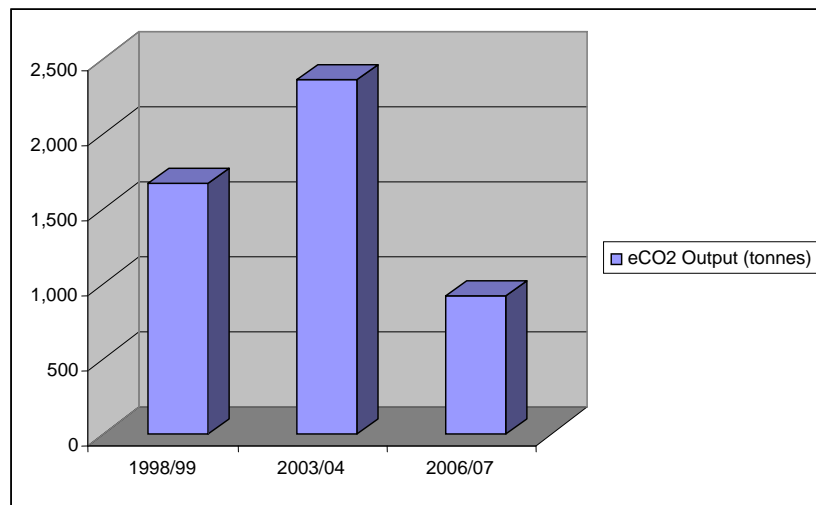
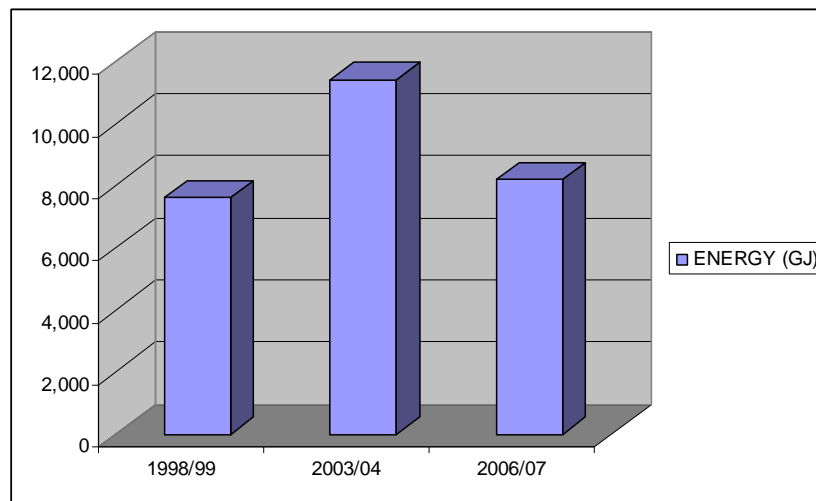


Figure 4 shows changes in energy use from the baseline year (1998/99) to the 2006/07 re-inventory year. There has been a 7.8 percent increase in energy use in the buildings sector between 1998/99 and 2006/07. This increase is not reflected in emissions levels (Figure 3) because of the introduction of *Green Power* in September 2005. *Green Power* is electricity produced from renewable sources. *Green Power* purchased from accredited providers is recorded as having an emissions factor of zero.

Figure 4. Changes to Corporate Building Sector Energy Use since 1998/1999



Significant decreases in GHG emissions produced by the buildings sector can be attributed to the conversion of the six heaviest power using facilities to *Green Power* and the purchase of a pool blanket for the Armadale Aquatic Centre.

Under the *Energy Operators (Electricity Retail Corporation) (Charges) By Laws 2006*, consumers with consumption levels in excess of 50,000 kWh annually are eligible to purchase electricity from a number of licensed retailers. The City of Armadale has taken advantage of this By Law and has converted the seven facilities to 75 percent *Green Power* supplied by Landfill, Gas and Power offset by CO Zero from the Alinta wind farm near Geraldton:

Green Power provided under this arrangement is similar in price to non-Green Power. The following facilities are supplied with Green Power, with the first six being supplied under a previous similar arrangement in 2006/07:

1. The Armadale Aquatic Centre
2. Gwynne Park Recreation Centre and Park Bore
3. The Harold King Community Centre
4. The New Administration building
5. Westfield Library
6. The Depot
7. Roleystone Hall

The Green Power initiative resulted in the abatement 1,693 tonnes of eCO₂ in the re-inventory year. In 2006/07 the Roleystone Hall (and adjacent park bores) consumed more than 50,000 kWh of electricity so could therefore be considered for conversion to green power.

In November 2005 a blanket was purchased for the 50 metre pool at the Armadale Aquatic Centre. The pool blanket cost \$37,000, the installation of the pool blanket resulted in the abatement of 101 t eCO₂ and a cost saving of approximately \$13,500 in 2006/07.

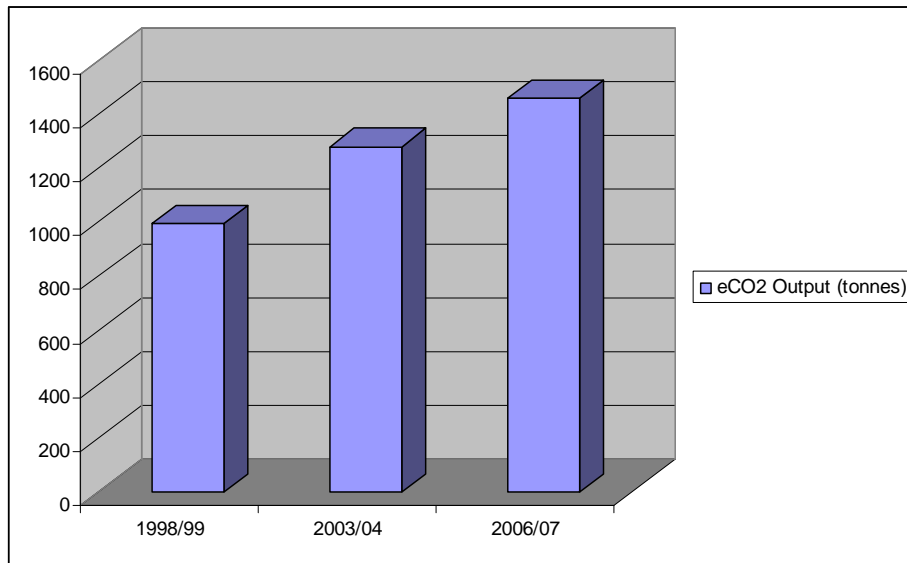
Initiatives such as lighting retrofits, equipment upgrades and the increased use of natural gas in some facilities has assisted the City in reducing Corporate GHG emissions in the building sector.

Additional to gains in energy efficiency, some facilities in the City of Armadale, such as the PCYC building, Gwynne Park Recreation Centre and John Dunn Complex experienced reduced use throughout the re-inventory period due to tenancy changes, renovation and short term closure. These facilities are now being used regularly. Future re-inventories will presumably reflect the increased use of these facilities.

2.2 *Vehicle Fleet Sector*

In 2006/07 the City of Armadale used approximately 124,000 litres of petrol and 433,000 litres of diesel. Fuel burned by the City's fleet produced 1,459 tonnes of eCO₂, accounting for 15.9 percent of Corporate GHG emissions. Fleet GHG emissions in 2006/07 exceeded 'business us usual' 2010/2011 forecasts by 262 t eCO₂.

Figure 5. Increases in Corporate Vehicle Fleet Sector GHG Emissions since 1998/1999



Since 2005 the City has converted 23 six-cylinder passenger vehicles to smaller more fuel efficient four-cylinder models, and where possible diesel engines have been chosen over LPG engines. However, due to staff increases and competitive labour markets the number of passenger and utility vehicles the City runs has increased masking the effectiveness of this initiative. Bio-diesel and other alternative fuel sources are being considered for use in plant machinery and vehicle fleet.

2.3 Streetlighting Sector

In 2006/07 the streetlighting sector created 3,113 tonnes of eCO₂, accounting for 34 percent of total Corporate GHG emissions and costing the City approximately \$574,000.

During the re-inventory it was discovered that the account listed as public lighting at the Bob Blackburn Oval also includes power use of a bore on the same site. However, to maintain consistency between inventories this account continues to be recorded in the streetlighting sector.

External security lighting on buildings and public lights at parks are often unmetered and are generally included in the building and water sectors respectively.

Figure 6. Changes in Corporate Street Lighting Sector GHG Emissions since 1998/1999

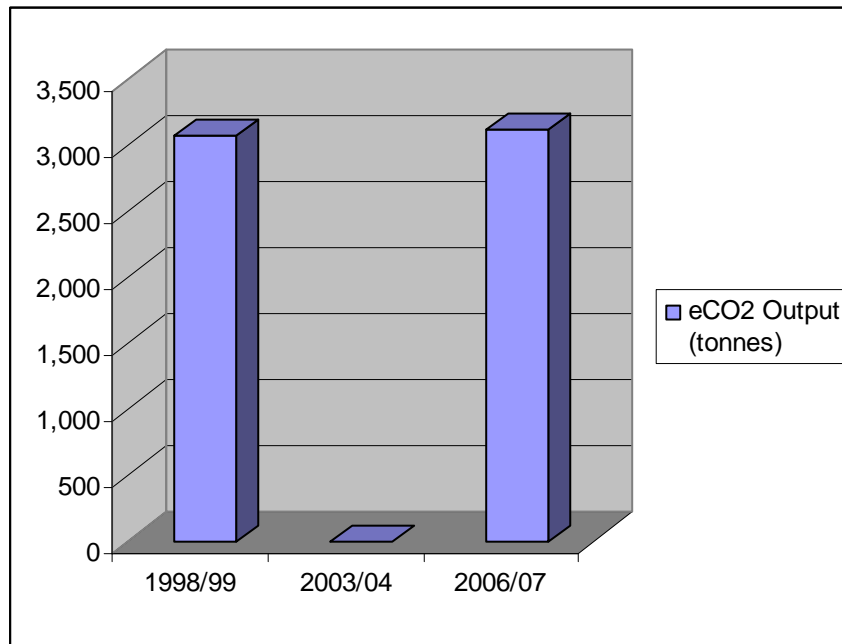


Figure 6 shows a 1.5 percent increase in the GHG emissions associated with the streetlighting sector since the baseline year, due to increased public lighting as a result of new subdivisions, buildings and parks. The data for 2003/04 has been deemed unreliable so has been shown as zero emissions. It is likely that there was no change between 1998/99 and 2003/04.

Due to the structure of the streetlighting industry, the City has little control over this sector. This is a problem common to all Local Governments in Western Australia.

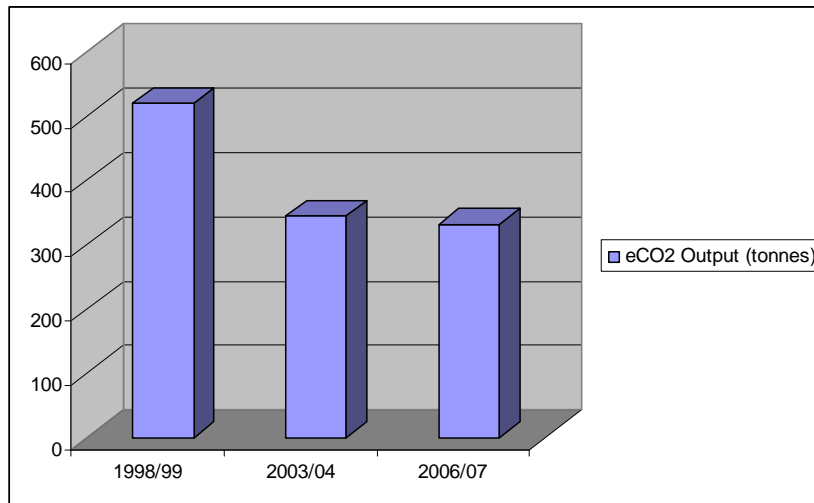
However, the City of Armadale has a Sustainable Public Lighting Action Plan (SPLAP) which highlights the need for increased research into the energy efficiency of streetlighting. Armadale's SPLAP was adopted by Council in March 2007.

The City of Armadale is currently embarking on a Sustainable Public Lighting Trial in partnership with Synergy. If successful this trial will demonstrate the suitability of new, more efficient lighting technology, resulting in Synergy offering this technology to all Western Australia Local Governments. Through this trial, the City of Armadale will emerge as a leader in Sustainable Public Lighting.

2.4 Water Sector

GHG emissions associated with the water sector refers to the energy use associated with the extraction of ground water for irrigation. Energy used by bores in the City's parks and gardens created 332 tonnes of eCO₂, accounting for 3.6 percent of Corporate emissions in 2006/07. This is a 36.2 percent decrease from the baseline (1998/99) levels.

Figure 7. Decreases in Corporate Water Pumping Sector GHG Emissions since 1998/1999



The City of Armadale uses water efficient design and native water saving plants in an effort to reduce water use in the City’s parks and gardens. Many of the City’s bores are low yield, limiting the amount of water available for irrigation. Low yield bores result in high energy use, as bores must pump into tanks from which water is pumped again through irrigation systems.

The City currently has a *Water Operation Strategy* which has been endorsed by the Department of Water. This strategy dictates how much water the Council can use (overall) for irrigation. Water use is recorded and reported to the Department of Water on a monthly basis. The next step in the *Water Operation Policy* is to construct individual Water Management Policies for each of the City’s Reserves.

Additionally, State Government legislation that came into effect in October 2007 required all Perth Metropolitan Councils to prepare water conservation plans by the 1st of July 2008. To fulfil these requirements the City has prepared a water budget.

2.5 Waste Sector

Corporate waste produced 3,337 t eCO₂ during the 2006/07 financial year. Corporate waste includes all waste produced at Council facilities and offices and waste that is collected from street bins and at special events arranged by the City. Illegally dumped litter, waste generated by Council construction and road kill is also included in Corporate waste. The hauling and tipping of Corporate waste cost approximately \$82,000 during the re-inventory period.

The significant increase in Corporate waste from 2003/04 to 2006/07 results from the use of a more robust auditing method in 2006/07. In previous re-inventory years only waste that was generated at the Council Administration building and Depot was included in this section. Only looking at these two facilities resulted in a significant understatement of the emissions and costs associated with Corporate waste. Future re-inventories should account for all Corporate waste.

It is impossible to compare re-inventory year 2006/07 with 2003/04 and the baseline data collected in 1998/99 as any reduction achieved will be lost by the inclusion of waste from other facilities.

The City has a number of waste minimisation strategies including compulsory green waste separation and a *Greenhouse Purchasing Action Plan*, which encourages bulk purchasing to minimise packaging, and highlights the importance of environmental considerations over the whole life cycle of a product, including its disposal.

The City's Waste Management Services have developed an innovative pricing strategy which encourages businesses and casual users of the Hopkins Road Landfill and Recycling Facility to separate their green waste and recyclables from general rubbish. Separated green waste is composted, dramatically reducing the amount of GHG emissions produced at the facility. Composting green waste and processing recyclables also increases the lifespan of the facility, saving the Council money.

Separated cardboard and recyclables can be deposited at the Hopkins Road Landfill and Recycling Facility free of charge. The City sells cardboard to AMCOR.

3 Review of Corporate Greenhouse Action Plan 2000 to 2010

The following table addresses the progress that has been made towards the actions set in the Corporate Greenhouse Action Plan 2000 to 2010. The 'Notes' section discusses what action have been taken to date. Where actions are superseded the appropriate documents are noted.

<i>Action</i>	<i>Implementation</i>	<i>Notes</i>
Energy audits of key buildings.	Partially Implemented	A basic audit of the City's administration office was done. Significantly greater expertise in this area has developed in the last decade, and this needs to be re-visited. The following three actions would normally be an outcome of any energy audit and reflect best practice that is now becoming standard practice at the City.
Enable energy saving devices on electrical office equipment.	Partially Implemented	The default power saving standby setting on computers in the Administration Building is switched off by IT when computers are set up for operational reasons. However, monitors are programmed to 'sleep' after 15 minutes. Energy saving modes on other office equipment is only used if it is the default setting.
Lighting retrofit of internal and external building lighting including installation of timers and motion sensors where appropriate.	Ongoing	The City of Armadale is replacing current lighting stock with tri phosphorus globes where appropriate.
Regularly prepare and publish building energy profiles for staff and Council.	Partially Implemented	No energy profiles for City buildings have been prepared or published. However, the City joined the 'Planet Footprint' program in November 2008 which will provide quarterly reports to assist managers to identify areas that require action. Increasing staff awareness of energy use and management would normally be a part of a building maintenance policy that emphasises energy efficiency.

<i>Action</i>	<i>Implementation</i>	<i>Notes</i>
Building maintenance policy and guidelines/ building maintenance contract specifications to include energy performance criteria.	Incomplete	The City of Armadale has no formal policy which dictates that energy efficiency should be sought through building maintenance. However, it is standard procedure for building energy efficiency to be considered during building maintenance. For example the new air-conditioner at the Administration building has a central management system which reduces energy use and inefficient electric hot water systems at Creyk Park Sport Pavilion were replaced with gas systems. It would be useful to formalise current practice.
Develop and implement a policy to include energy efficiency guidelines in tenders for new Council Buildings.	Incomplete	The City of Armadale currently has no formal new building energy efficiency policy. Rather the City relies on building codes and professional standards to ensure energy efficient design is used in new council buildings. It would be useful to formalise current practice and encourage demonstration level projects.
Consider purchase of NaturalPower when a healthy Revolving Energy Fund (REF) has been established.	September 2005	The City of Armadale currently purchases <i>Green Power</i> for six facilities. According to <i>Energy Operators (Electricity Retail Corporation) (Charges) By Laws 2006</i> , consumers who purchase more than 50,000 kWh of electricity per year can choose their retailer, which provides the City with cheaper options to achieve <i>Green Power</i> . In 2006/07 the Roleystone Hall's electricity consumption exceeded 50,000 kWh, so <i>Green Power</i> should be considered for this building too.
Actively support negotiations with Western Power by the Western Australian Municipal Association to improve the energy (and cost) efficiency of street lighting.	March 2007	In March 2007 Council endorsed the <i>City's Sustainable Public Lighting Action Plan (SPLAP)</i> . The City is currently undertaking a Sustainable Public Lighting Trial in partnership with Synergy and Western Power.

<i>Action</i>	<i>Implementation</i>	<i>Notes</i>
Amend Policy 2.3.7 <i>Floodlighting - Sports Reserves</i> to factor in energy efficiency capacity.	Not Applicable	This policy is superseded by the <i>Sustainable Public Lighting Action Plan (SPLAP)</i> .
Purchase alternatively fuelled vehicles for the City's light vehicle fleet.	Ongoing	Since 2005 the City has downsized 23 passenger vehicles to four-cylinder models. Where possible diesel engines are chosen over petrol or LPG powered engines.
Support and maintain the Regional Corporate Vehicle Group.	Not Applicable	This group only met a couple of times before folding in 2000/2001, as there was limited benefit in meeting.
Encourage the use of rail for meetings in Perth's Central Business District where appropriate	Not Implemented	Some of the City of Armadale's residents have been targeted by the Department of Planning and Infrastructure's <i>TravelSmart</i> Program. However, no Corporate actions have been taken to encourage alternative travel to and from work.
Evaluate the cost-benefits of alternative modes of travel, such as bicycles, for specific common journeys	Partially Implemented	Cost-benefits were evaluated for some alternative travel modes. It was found that for meetings in Perth where meeting locations were less than 15-20 minutes walk from the train station, and particularly if employees were able to utilise travel time doing work (e.g. reading professional journals etc), the benefits of using the train for travel exceeded the costs. However, there were a number of concerns and difficulties associated with issuing a directive to use the train, so it was not progressed. Overall this is not considered a priority item.
Continue the focus on irrigation efficiency	Not Applicable	Superseded by the <i>Water Operation Strategy</i> .
Minimise the need for irrigation of landscaping through good design	Not Applicable	Superseded by the <i>Water Operation Strategy</i> .

<i>Action</i>	<i>Implementation</i>	<i>Notes</i>
Establish an interdepartmental Energy Team whose role includes staff education, communication, and monitoring of energy use and action plan implementation	Not Applicable	This recommendation is superseded by Action 9a of the <i>Greenhouse Purchasing Action Plan</i> .
Establish an employee Energy Awards Scheme within the current framework of the Staff Suggestions Scheme and the Productivity Incentive Programme	Not Implemented	The City has not established an employee energy award scheme or incentive program. This would probably be an outcome of an energy audit.
Prepare a sustainable purchasing policy to replace the Environmental Purchasing and Recycled Paper Products policies (Policies 1.2.35 & 1.2.35 (A)).	March 2007	In March 2007 the City' executive supported implementation of the City's <i>Greenhouse Purchasing Action Plan</i> . Implementation of the Greenhouse Purchasing Action Plan would be assisted by an updated Procurement of Goods and Services Policy that defines sustainable procurement and ensures purchasing considers the environmental impact of the procurement process across the life cycle of the goods and services.
Encourage partnerships, especially with local business, to trial, demonstrate or promote the performance of energy saving products.	Not Implemented	This Action has been fulfilled on a community level by the <i>switch your thinking!</i> program. However, no progress has been made on a Corporate level.
Develop a system of monitoring energy use for buildings, vehicles and parks that links with financial management and provides feedback to Council and staff	Partially Implemented	No monitoring and recording system has been implemented. However, the City of Armadale's engagement in the 'Planet Footprint' program will result in new data capture techniques.

<i>Action</i>	<i>Implementation</i>	<i>Notes</i>
Establish a “Revolving Energy Fund” (Reserve Account) as a matter of priority	Partially Implemented	The Council has resolved to establish a Revolving Energy Fund and has created a bank account for this purpose. However, no seed funding has been supplied so the fund is not operational.
Ensure that greenhouse gas emissions are considered in the development of all new projects, maintenance and retrofits, and in consideration of all operational matters	Partially Implemented	This action will be partially implemented by the City’s <i>Greenhouse Purchasing Plan</i> .

4 Federal and State government activity

4.1 Federal and state government targets

Extracts from the Federal Government's White Paper "*Carbon Pollution Reduction Scheme: Australia's Low Pollution Future*" appear below:

"The Government remains committed to meeting its long-term target of a 60 per cent reduction in greenhouse gas emissions from 2000 levels by 2050.

It also commits to a medium-term national target to reduce Australia's greenhouse gas emissions by between 5 per cent and 15 per cent below 2000 levels by the end 2020.

The top of this range (5 per cent below 2000 levels) represents a minimum (unconditional) commitment to reduce emissions by 2020, irrespective of the actions by other nations. The bottom of this range (15 per cent below 2000 levels) represents a commitment to reduce emissions in the context of global agreement where all major economies commit to substantially restrain emissions and all developed countries take on comparable reductions to that of Australia."

In May 2007 the Government of Western Australia published the *Premier's Climate Change Action Statement* in which the (then) State government:

"committed to reducing Western Australia's total greenhouse gas emissions by 60 per cent of 2000 levels by 2050, consistent with the national target adopted by State and Territory leaders at the April 2007 meeting of the Council for the Australian Federation".

4.2 Proposed Emissions Trading Scheme

The Australian Federal Government has acknowledged that "*climate change poses a substantial threat to Australia's economy and our way of life*" and has chosen to implement the Carbon Pollution Reduction Scheme as a tool to help combat global warming. The Carbon Pollution Reduction Scheme puts a price on carbon pollution and will cap Australia's total carbon emissions. Through the Carbon Pollution Reduction Scheme Australian industry will be able to buy and sell carbon credits.

The Carbon Pollution Reduction Scheme is set to commence in 2010.

The expected increases in the cost of energy and fuel will increase financial incentives associated with investment in energy and fuel efficiency.

The business areas that will be most directly affected by the Carbon Pollution Reduction Scheme are public lighting, fleet and waste services.

Public lighting (including Streetlighting), accounted for approximately one third of the City of Armadale's annual expenditure on electricity in 2006/07. The City of Armadale, like all other Local Governments, has an obligation to supply public lighting within the municipality. It's unclear whether the Federal Government will provide any form of compensation for additional costs associated with the supply of public lighting.

At present, it is unclear how the Carbon Pollution Reduction Scheme will affect the cost of providing some staff members with a vehicle and fuel card as part of their salary package (e.g. fringe benefits).

The City of Armadale will most likely be covered by the Carbon Pollution Reduction Scheme, partly due to its ownership of the Hopkins Road Resource Recovery Facility.

It is currently unclear whether the Federal Government will channel monetary assistance to Local Governments through *Federal Assistance Grants*, or other forms of compensation.

It is also currently unclear what resources, if any (e.g. forestry offsets), will be available to the City to help offset carbon emissions.

4.3 Climate change adaptation activity

Both the Federal and State government have been active in promoting the need to plan and adapt to inevitable climate change.

The Federal Government has been actively promoting the need for local government to plan for and adapt to climate change, and has published "*Climate Change Impacts & Risk Management: A Guide for Business and Government*" which provides a how-to document for local government and other organisations to prepare for and adapt to climate change.

The Shire of Serpentine-Jarrahdale has received grant funding from the Federal Government to prepare a climate change adaptation strategy. The strategy is intended to include a focus on bush fires. Preliminary information suggests that in Perth soil moisture levels will be lower and winds will be stronger at high fire risk times thus increasing the risk of fire and the difficulty of fire control. Due to the topography and development patterns, the City of Armadale is particularly vulnerable to the threat of severe bush fire. Planning is needed to manage or reduce the increased threats.

The State Government has published several documents addressing the need for climate change adaptation planning including documents on the potential impacts of climate change on the Swan and Canning Rivers and "*Climate Change: How climate change could affect sport and recreation now and in the future*".

5 Greenhouse Action Plan - By sector

5.1 Corporate Buildings and Facilities

5.1.1 How are we travelling?

In 2006/07, the buildings sector contributed 918 tonnes of eCO₂ to Corporate GHG emissions, accounting for 10 percent of total 2006/07 emissions. This is a 752 tonne decrease (~45 percent) from the 1998/99 baseline year.

5.1.2 How can we reduce emissions?

Green Power

Currently under the *Energy Operators (Electricity Retail Corporation) (Charges) By Laws 2006*, sites that utilise more than 50,000kWh annually are contestable and so are eligible to purchase electricity from a number of licensed electricity retailers, some of whom offer competitively priced Green Power alternatives.

Electricity with Renewable Energy Certificates is known as Green Power, and the City has seven contestable sites.

In January 2009, the City entered into an 18 month contract (to 31 December 2010) for the City's seven contestable sites with Landfill Gas and Power and CO Zero that provides 75% of the City's electricity as Green Power. Providing 75% Green Power means that there is still incentive to achieve energy efficiency to reduce GHG emissions. However, even with 100% Green Power increasing energy efficiency reduces costs for the City.

	ACTION	RESPONSIBILITY	COMMENCEMENT DATE
1.	Consider increasing Green Power supply to 100 percent for facilities already on Green Power.	Manager Property Services	December 2010
2.	Consider purchasing Green Power for all Council facilities.	Manager Property Services	2011

Energy Audits

Key buildings and facilities with high energy consumption profiles, should have their energy consumption audited. Audits can identify energy inefficiencies and opportunities for improving efficiency, and can effectively repay their initial cost through financial savings achieved as a result of implementing audit recommendations. Audit findings can be used to prioritise efficiency measures, and for budget forecasting with regard to capital costs.

Measurement of energy performance

The City commissioned Planet Footprint in December 2008 to provide quarterly reporting on the City's 10 highest energy using sites, as well as historical data going back two years on the top six energy using sites. Planet Footprint advise that the average level of savings a Council achieves in its first year with Planet Footprint, based on acting on anomalies (such as identifying a poorly performing account that has spiked in the past 12 months and acting on it) or the account management process (such as identifying an account paid for unfairly by Council), can range from 1% to 30%, with perhaps a 5% saving being the norm. Given that the account management process has already been undertaken through the Cities for Climate Protection audits, and that only the 10 highest energy using sites are covered, a 1.5% saving is suggested as possible outcome of the current proposal to measure energy performance.

	ACTION	RESPONSIBILITY	COMMENCEMENT DATE
3.	Develop and implement a progressive cycle of energy audits of all high-energy consuming City buildings and facilities, and program implementation of subsequent energy efficiency measures.	Regional Greenhouse Coordinator	June 2009
4.	Measure building energy performance and address anomalies.	Manager Property Services	Commenced December 2008
5.	Develop a building maintenance policy that emphasises energy efficiency.	Manager Property Services	June 2009

New Buildings

New buildings create an opportunity for the City of Armadale to demonstrate its commitment to energy efficient design, to showcase best practices and to make significant monetary savings.

	ACTION	RESPONSIBILITY	COMMENCEMENT DATE
6.	Develop and implement a policy which ensures energy efficiency is a priority consideration in tenders for all new council buildings.	Manager Property Services	June 2009
7.	Investigate the production of renewable energy resources through solar panels and wind turbines on community buildings	Manager Property Services	June 2009

5.2 Corporate Streetlighting

5.2.1 How are we travelling?

Due to Synergy's management of public lighting and conflicts between commitments to meeting Australian Lighting Standards, product life cycle costs and existing infrastructure streetlighting is the sector that the City has least influence over. This is a problem that is common to all Local Governments in Western Australia. The City has direct control over some decorative lighting, security lighting on Council buildings and car parks, sporting grounds and parks, as well as lit signage.

The Streetlighting sector is the second largest contributor to Corporate GHG emissions. Public lighting in the City of Armadale accounts for 34 percent of all Corporate emissions, producing 3,113 tonnes of eCO₂. This is a 1.5 percent increase from the baseline year (1998/1999).

The City of Armadale has adopted a Sustainable Public Lighting Action Plan (SPLAP) and is currently undertaking a Sustainable Public Lighting Trial in partnership with Synergy.

5.2.2 How can we reduce emissions?

Sustainable Public Lighting Trial

Currently Western Australian Local Governments have limited choice with regards to public lighting. The City's participation in Sustainable Public Lighting Trial will encourage the adoption of more efficient lighting technology by Synergy benefiting all Councils in Western Australia and demonstrating the City's commitment to tackling climate change.

In 2006/07 the City of Armadale had 3,561 80 Watt Mercury Vapour streetlights, and a further 1,896 lights of varying wattages, consuming 3,235,123 kWh. If the 80 Watt Mercury Vapour streetlights were replaced with 42 Watt Compact Fluorescent Light globes (CFLs), currently being trialled, the City would save over 540,000 kWh of electricity per year and reduce its Corporate GHG emissions by 519 tonnes eCO₂.

The City of Gosnells has recently purchased Green Power for streetlighting. This option could be examined when the City of Armadale's streetlighting contract is renegotiated. The City's Streetvision contract is re-negotiated annually in June each year. It is proposed that the purchase of Green Power for street lighting be reconsidered in June 2011, because then the streetlighting trial will be complete which could result in significant reduction of energy usage and therefore a reduced cost for Green Power offsets, which are charged by the kWh.

	ACTION	RESPONSIBILITY	COMMENCEMENT DATE
8.	Continue to implement and review the Sustainable Public Lighting Plan and in particular progress the Sustainable Public Lighting Trial to encourage greater choice in public lighting technology.	Regional Greenhouse Coordinator & Manager Technical Services	Ongoing
9.	Investigate purchasing Green Power for streetlighting when the City's existing streetlighting contract is renegotiated.	Manager Technical Services	June 2010
10.	Investigate using sustainable lighting technology for Council buildings, car parks and parks.	Manager Technical Services, Manager Civil Works and Manager Parks	Ongoing

5.3 Corporate Vehicle Fleet

5.3.1 How are we travelling?

Vehicle Fleet and Plant account for 15.9 percent of Corporate GHG emissions, producing 1,459 tonnes of eCO₂ in 2006/07. This represents a 46.6 percent increase from the baseline year (1998/99).

Since 2005 the City has downsized 23 passenger vehicles. However competitive labour markets and increased Council services have resulted in the addition of extra vehicles to the City's fleet.

The City is currently predicting growth in the light vehicle fleet of one vehicle per three positions (City Strategy - Staff Establishment Report July 2008), which will mean four additional vehicles by 2012. Based on the estimated average emissions per vehicle, this would be expected to add 14 tonnes eCO₂ per annum.

5.3.2 How can we reduce emissions?

Measurement of energy performance

The City has experienced difficulty maintaining accurate records of fuel use. Accurate records of fuel use is vital to measuring efficiency gains (or losses) and policy evaluation. The policy evaluation of the effectiveness of Action 13 below (Use the Green Vehicle Guide to facilitate appropriate vehicle acquisition) has had to rely on a number of assumptions due to the poor quality of the available data. It is understood that the age of the equipment at the Depot is a factor hindering accurate recording, and that the equipment may be replaced in the next few years.

Investigate alternative fuels

Currently there is much scientific debate about the benefits of using alternative fuels such as bio-fuels. GHG emissions reductions can range from 49 percent to 80 percent over the life cycle of the fuel if bio-fuels are produced using ecologically sustainable land management practices. However, bio-fuel derived from unsustainable crops such as plantation palm oil has life cycle emissions higher than traditional fuels.

Increase flexibility in salary packages

Including a vehicle as a fringe benefit in staff salary packages is a common practice and is believed to be necessary to attract and retain staff. However, allowing greater flexibility to salary packages could increase the City's desirability as a potential employer, as well as saving the Council money and reducing Corporate GHG emissions.

Allowing staff the flexibility to choose other fringe benefits such as increased superannuation contributions, or the mixture of a smaller vehicle (eg. Scooter), and other benefits could increase the desirability of the City as an employer.

Alternative forms of transport could also be encouraged through salary packages. For example, staff members who wish to access public transport could be supplied with Smartriders instead of a vehicle, and cyclists and walkers could be provided vouchers for footwear and cycle gear.

	ACTION	RESPONSIBILITY	COMMENCEMENT DATE
11.	Establish and maintain an energy recording and reporting process to facilitate policy decisions and evaluation.	Fleet Manager	February 2009
12.	Investigate alternative fuel sources and include efficiency considerations in all tender options.	Fleet Manager	Ongoing
13.	Increase flexibility in salary packages where new options potentially reduce greenhouse gas emissions.	Human Resources	June 2009
14.	Use the Green Vehicle Guide to facilitate appropriate vehicle acquisition.	Fleet Manager	February 2009

5.4 Corporate Water

The previous version of the *Corporate Greenhouse Action Plan* included actions referring to the minimisation of energy use associated with the extraction of ground water used for irrigation. The City of Armadale is now working from a Department of Water endorsed *Water Operation Strategy*. This strategy dictates how much water the Council can use (overall) for irrigation.

Additionally State Government legislation that came into effect in October 2007 requires all Perth Metropolitan Councils to prepare water conservation plans by the 1st of July 2008. The City of Armadale's *Water Operation Strategy* and new State Legislation surpasses the water efficiency actions stated in the *Corporate Greenhouse Action Plan*, thus no new actions are given.

5.5 Corporate Waste

5.5.1 How are we travelling?

The City of Armadale produced 3,766 tonnes of Corporate waste that went to landfill. This included waste removed from all Council facilities, collected from street bins, at special events held by the City as well as waste from Council construction works and illegally dumped litter.

Changes in auditing methodology from previous re-inventories and the 2006/07 inventory prevents comparison between years.

When organic matter breaks down anaerobically in landfill facilities, methane is produced. Methane is a potent GHG gas with a Globe Warming Potential of 21. This means one tonne of methane gas is equivalent to 21 tonnes of carbon dioxide. Therefore reducing 'green' Corporate waste can significantly reduce total Corporate GHG emissions.

5.5.2 How can we reduce emissions?

Staff Education

While the Administration building and other Council facilities are supplied with a recycling service significant comingling occurs. Staff education and training is needed to rectify this situation.

	ACTION	RESPONSIBILITY	COMMENCEMENT DATE
15.	Implement staff education and training to ensure waste minimisation and recycling takes place at Council facilities	CCP Project Officer/ Coordinator Waste Services	February 2009
16.	Implement and review the Greenhouse Purchasing Action Plan	Environmental Officer	Ongoing

5.6 Corporate Actions

Implement the Revolving Energy Fund

The City of Armadale has a Revolving Energy Fund, however it is not operational due to lack of funds. Seed funding needs to be deposited so that energy efficiency initiatives / technology can be invested in. Initiatives should have quantifiable energy savings and a reasonable pay back period. Savings made due to the initiatives / technology should be returned to the Revolving Energy Fund and used to fund further energy saving actions.

	ACTION	RESPONSIBILITY	COMMENCEMENT DATE
17.	Deposit seed funds in the Revolving Energy Fund and utilise the fund.	Environmental Coordinator	August 2009

Greenhouse/ sustainable purchasing

Whilst the City is implementing a *Greenhouse Purchasing Action Plan*, implementation of the Plan would be assisted by an updated policy on the procurement of goods and services.

Council, in considering the Rivers Regional Council's *Strategic Waste Management Plan* in November 2008 endorsed the need to develop and implement a purchasing policy to promote the use of recycled and sustainable products.

	ACTION	RESPONSIBILITY	COMMENCEMENT DATE
18.	Prepare a Procurement of Goods and Services Policy that defines sustainable procurement and ensures purchasing considers the environmental impact of the procurement process across the life cycle of the goods and services.	Environmental Coordinator/ Manager Governance and Administration/ Coordinator Waste Services	March 2009

6 Greenhouse Action Plan - Other matters

6.1 Climate change adaptation

Whilst actions to reduce greenhouse gas emissions are of the highest priority, it is clear that climate change adaptation planning is now an essential part of greenhouse action planning.

	ACTION	RESPONSIBILITY	COMMENCEMENT DATE
18.	Monitor Climate Change Adaptation Strategies for their relevance to the City of Armadale and pursue funding and other opportunities to undertake climate change adaptation planning within the City.	Environmental Coordinator	Ongoing

7 Implementation, effectiveness, and cost/benefits

7.1 Analysis of effectiveness, potential reduction in emissions and cost/ benefits

The table below identifies the effectiveness, and potential cost/ benefit for each proposed action. Section 7.2 reorganises this information to identify priority actions.

	Action	Effectiveness	Potential reduction in tonnes eCO₂ per annum	Financial Year Starting	Budget implications - resources required and financial cost benefits (where relevant)
1.	Consider increasing Green Power supply to 100 percent for facilities already on Green Power.	<ul style="list-style-type: none"> Highly effective but reduces incentive to implement energy efficiency measures 	387	2010	<ul style="list-style-type: none"> Cost for 2010 would be about \$24,000.
2.	Consider purchasing Green Power for all Council facilities.	<ul style="list-style-type: none"> As above. 	918	2011	<ul style="list-style-type: none"> Cost would be \$18 - \$54,000³.
3.	Develop and implement a progressive cycle of energy audits of all high-energy consuming City buildings and facilities, and program implementation of subsequent energy efficiency measures.	<ul style="list-style-type: none"> Typically energy audits reduce energy use by 10 to 30%. Significantly reduces costs over the long-term, particularly if Carbon Pollution Reduction Scheme comes into effect. Not effective if 100% Green Power. Potential reduction assumes six buildings with highest GHG emissions audited and recommendations implemented to achieve 20% reduction in emissions. 	77 ± 38	2009	<ul style="list-style-type: none"> Need sufficient funds to undertake projects with significant energy savings and a rapid payback period. Recommend \$100,000 seed funding be deposited in the Revolving Energy Reserve Fund (Action 16 below).

³ Cost depends on whether accredited Australian Renewable Energy Certificates are used or “International Renewables” which rely on funding projects overseas are used.

	Action	Effectiveness	Potential reduction in tonnes eCO₂ per annum	Financial Year Starting	Budget implications - resources required and financial cost benefits (where relevant)
4.	Measure building energy performance and address anomalies.	<ul style="list-style-type: none"> • Anomalies quickly picked up (e.g. leaking hot water pipes, poorly performing equipment) leading to reduced energy costs. • Replaces need to do re-inventory every two years (usually costs in the order of \$10,000). • Potential reduction estimate assumes a 1.5% saving in energy use for buildings and water (see Section above) 	19 ± 42	2008	<ul style="list-style-type: none"> • Staff resources for establishment. • Ongoing reporting by consultant (Planet Footprint) \$3,500 per annum - funded from operational budget.
5.	Develop a building maintenance policy that emphasises energy efficiency.	<ul style="list-style-type: none"> • Technology upgrades at maintenance can significantly reduce energy needs. • Lighting upgrades saved 100 tonnes eCO₂ per annum to date. 	Not quantifiable (but see effectiveness column)	2009	<ul style="list-style-type: none"> • Staff resources • Expect payback over time.
6.	Develop and implement a policy which ensures energy efficiency is a priority consideration in tenders for all new council buildings.	<ul style="list-style-type: none"> • Demonstrates leadership; • Reduces the increase in GHG emissions from growth. • Significantly reduces costs over the long-term, particularly if Carbon Pollution Reduction Scheme comes into effect. 	Not quantifiable (but see effectiveness column)	2009	<ul style="list-style-type: none"> • Staff resources

	Action	Effectiveness	Potential reduction in tonnes eCO₂ per annum	Financial Year Starting	Budget implications - resources required and financial cost benefits (where relevant)
7.	Investigate the production of renewable energy resources through solar panels and wind turbines on community buildings.	<ul style="list-style-type: none"> • May provide Renewable Energy Certificates cost effectively. • Potential reduction estimate conservative but based on installing the wind/ solar system used for the Serpentine-Jarrahdale Recreation Centre at City of Armadale Administration Centre. • Demonstrates leadership. 	11	2009	<ul style="list-style-type: none"> • Staff resources • If options with reasonable payback period found, a separate report would be provided to Council.
8.	Continue to implement and review the Sustainable Public Lighting Plan and in particular progress the Sustainable Public Lighting Trial to encourage greater choice in public lighting technology.	<ul style="list-style-type: none"> • Significantly reduces costs over the long-term, particularly if Carbon Pollution Reduction Scheme comes into effect. • Potential reduction based on replacement of 80 W mercury vapour globes with 42 W compact fluorescents. 	519	Ongoing	<ul style="list-style-type: none"> • Sustainable Public Lighting Plan implementation costs under budget . Recommend remaining funds to be used as seed funds for revolving energy fund.
9.	Investigate purchasing Green Power for streetlighting when the City's existing streetlighting contract is renegotiated.	<ul style="list-style-type: none"> • Highly effective but reduces incentive to implement energy efficiency measures. For example, Action 7 above would be negated. 	3,113	2010	<ul style="list-style-type: none"> • Preliminary investigations suggest Green Power offsets could be purchased for the streetlights from \$60,000 to \$180,000 depending on the source of the offsets, and the MWh used.

	Action	Effectiveness	Potential reduction in tonnes eCO₂ per annum	Financial Year Starting	Budget implications - resources required and financial cost benefits (where relevant)
10.	Investigate using sustainable lighting technology for Council buildings, car parks and parks.	<ul style="list-style-type: none"> Significantly reduces costs over the long-term, particularly if Carbon Pollution Reduction Scheme comes into effect. Current GHG emissions 5 tonnes eCO₂, potential effectiveness assumes 40% efficiency gain. 	2	Ongoing	<ul style="list-style-type: none"> Staff resources. Whole of life costs reduced.
11.	Establish and maintain an energy recording and reporting process to facilitate policy decisions and evaluation.	<ul style="list-style-type: none"> Enables proper evaluation of policy measures (e.g. Actions 12 & 13 below). 	Not quantifiable at this stage	2009	<ul style="list-style-type: none"> Cost for 10 highest energy using sites \$3,500 per annum for data. Staff resources
12.	Investigate alternative fuel sources and include efficiency considerations in all tender options.		Not quantifiable at this stage.	Ongoing	<ul style="list-style-type: none"> Staff resources
13.	Increase flexibility in salary packages where new options potentially reduce greenhouse gas emissions.	<ul style="list-style-type: none"> Effectiveness depends on employee uptake of options. If one employee opted to take a public transport smart card instead of a vehicle would save 4 tonnes eCO₂ per annum if 20,000 km of travel was avoided per annum. 	Not quantifiable (but see effectiveness column)	2009	<ul style="list-style-type: none"> Staff resources. No costs as options will generally be of equivalent or lesser value.

	Action	Effectiveness	Potential reduction in tonnes eCO₂ per annum	Financial Year Starting	Budget implications - resources required and financial cost benefits (where relevant)
14.	Use the Green Vehicle Guide to facilitate appropriate vehicle acquisition.	<ul style="list-style-type: none"> • 		2009	<ul style="list-style-type: none"> • No additional costs. • Reduced fuel costs an outcome.
15.	Implement staff education and training to ensure waste minimisation and recycling takes place at Council facilities.	<ul style="list-style-type: none"> • Staff awareness may result in implementation of other energy saving measures. 	Not quantifiable at this stage, nor measured by CCP Program	2008	<ul style="list-style-type: none"> • Staff resources. • Cost for this recommendation and Recommendation 15 about \$2,000 per annum for materials etc. Funded from existing operational budget.
16.	Implement and review the Greenhouse Purchasing Action Plan.	<ul style="list-style-type: none"> • As above 	As above	Ongoing	<ul style="list-style-type: none"> • As above.
17.	Deposit seed funds in the Revolving Energy Fund and utilise the fund.	<ul style="list-style-type: none"> • The effectiveness of this measure should increase over time as savings are fed back into the fund, increasing available funds. • Initially short payback period (i.e. 2 years or less) projects will be pursued. 	Depends which Actions implemented first.	2009	<ul style="list-style-type: none"> • \$30,000 one-off cost. • Able to be refunded in future years.

	Action	Effectiveness	Potential reduction in tonnes eCO₂ per annum	Financial Year Starting	Budget implications - resources required and financial cost benefits (where relevant)
18.	Prepare a Procurement of Goods and Services Policy that defines sustainable procurement and ensures purchasing considers the environmental impact of the procurement process across the life cycle of the goods and services.	<ul style="list-style-type: none"> • Whole of life product procurement focus tends to favour purchase of energy efficient goods and services. • Not measured by CCP program. 	Not quantifiable at this stage, nor measured by CCP Program	2009	<ul style="list-style-type: none"> • Report to City Strategy November 2008 (on Rivers Regional Council Strategic Waste Management Plan) estimated cost at \$5,000 and noted cost could be accommodated in waste management budgets.
19.	Monitor Climate Change Adaptation Strategies for their relevance to the City of Armadale and pursue funding and other opportunities to undertake climate change adaptation planning within the City.	Not applicable	Not applicable	Ongoing	<ul style="list-style-type: none"> • Staff resources. Cost depends on opportunities that may arise.

7.2 Identification of priority actions and options

The table below summarises the information in Section 7.1 above.

Action Plan No	Summary descriptor	Cost	Potential abatement per annum (tonnes eCO ₂)
8	Streetlights - conversion from 80W mercury vapour to 42 W compact fluorescent.	Complete current trial	519
3	Energy audits of high energy using buildings	Suggest \$100,000 to permit effective investment	77 ± at least 38
4	Energy monitoring of 10 high energy sites	\$3,500 per annum	19 ± 42
7	Wind turbine & solar panel as at Shire of Serpentine-Jarrahdale Recreation Centre. The City could do much more than this.	Unknown	11 ± ?
10	Improve Council operated car park lighting	Unknown but minor	2
14	Zero increase in light vehicle fleet emissions to 2012. This is achievable.	Normal vehicle replacement cost	n.a
Sub-total Non-Green Power Actions			628
9	Green Power - 100% for streetlights	\$60 - \$180,000	3,113
2	Green Power - 100% at all sites	\$18 - \$54,000	884
1	Green Power - 100% at contestable (high energy using) sites only	\$24,000	387
Sub-total - Green Power			4,384

Based on the above assessment, implementation of all of the non Green Power options (but including the City generating renewable energy itself) and assuming no increase in emissions from the vehicle fleet, a reduction of about 628 tonnes eCO₂ per annum could be achieved. The greatest reductions would come through implementing the Sustainable Public Lighting Plan (Action 8), doing and implementing energy audits (Action 3) and measuring energy use (Action 4). Implementing the energy audits relies on adequate seed funding being provided for the Revolving Energy Fund (Action 17). Clearly these are the priority actions.

Whilst Green Power is an easy way of achieving emissions reductions, under the current regulatory regime and in the current market, it is an option that would add considerable expense to the City's energy bill. Whilst increased electricity costs would increase the incentive for energy efficiency to reduce costs back to current levels, at this stage there appear to be limited opportunities to reduce energy use and it is intended that those opportunities be taken now.

It is believed that as the Federal government pursues its goal of reducing greenhouse gas emissions, the ability to purchase Green Power at costs comparable to other electricity will increase. The City will maintain a "watching brief" and purchase Green Power when prices are comparable to other power.

8 Greenhouse Action Plan - City of Armadale goals

8.1 About goals

Council sets goals as desirable outcomes that City officers and Council will work towards by implementing action plans, by evaluating opportunities that will help achieve the goals and then implementing suitable opportunities.

The City will strive to achieve specified goals, but goals are not targets to be achieved at any cost.

In this context this Greenhouse Action Plan identifies short-term actions for implementation and longer-term actions so that opportunities consistent with those actions can be seized as they arise.

8.2 Rationale for review of current goal

As noted above, a goal of a 20% reduction in GHG emissions from 1998/99 levels by 2010 was set by Council in 2000.

Since 1998/99 there has been little progress at a Federal or state level to reduce GHG emissions, and this has significantly hindered progress at a local government level.

The current goal could be achieved now if the City purchased Green Power for all of the City's electricity use. However, (as noted above) under the current regulatory regime and market conditions this option would add considerably to the City's energy bill. Furthermore, if Green Power was purchased for all of the City's electricity use, the only effective way to further reduce GHG Emissions would be to reduce emissions from the vehicle fleet, which depends on significant change happening in the automotive industry. Using Green Power remains a key goal and will occur when the regulatory and market situations are right.

Therefore it is considered appropriate to review the current goal.

This plan seeks to identify a short term goal for 2012 when this plan expires, a medium term goal for 2021 and a long-term aspirational goal in view of the goals set by the Federal and State governments.

8.3 Goal for 2012

8.3.1 Estimate of Corporate GHG emissions 2012

A wide range of factors are likely influence the City's Corporate GHG emissions including:

- the number of Full Time Equivalent (FTE) staff employed;
- the energy efficiency of the buildings staff are housed in and the equipment that staff use;
- the number of and nature of facilities provided for the community. For example if more floodlit ovals, streetlights or aquatic centres are provided they increase the City's GHG emissions. Facility provision can be measured on a per capita basis, and can vary significantly between local governments;

- the management of community facilities. For example, the extent and efficiency of irrigation in parks, and the number of hours of operation of lights in car parks affect Corporate GHG emissions;
- responsibility for facility management and costs. For example, responsibility for management of the City's recreation centre has switched between community and City management over recent years along with responsibility for the associated GHG emissions; and
- the extent to which Green Power is used.

For the purposes of estimating potential increases in Corporate GHG emissions, both the increase in FTE and population are explored below, using data from Armadale, Gosnells and Serpentine-Jarrahdale.

For 2006/07 Corporate GHG emissions per capita and per FTE were as follows:

Local Government	Corporate GHG Emissions per capita (tonnes eCO₂)	Corporate GHG Emissions per FTE (tonnes eCO₂)
Armadale	0.174	38.8
Gosnells	0.136	39.3
Serpentine-Jarrahdale	0.120	18.4

It is understood that Corporate GHG emissions for Serpentine-Jarrahdale are significantly lower than Armadale and Gosnells because all power bought by Serpentine-Jarrahdale is Green Power.

The number of staff per 10,000 population varies between local governments, and over time. For example, in 2008 Gosnells had 49 staff per 10,000 population and Armadale had 46 staff per 10,000 population. Armadale has increased its staff from one of the lowest ratios in the Metropolitan area of 42 per 10,000 population to 46 per 10,000 population in recent years.

From 1998/99 to 2006/07 City staff numbers increased from 200 Full Time Equivalent (FTE) to 236 FTE (i.e. 36 FTE or 18%), which matches the 18% increase in GHG emissions over this period. Although this appears to provide a direct correlation between the increase Corporate GHG emissions and FTEs over this period, such a correlation is unlikely due to the variables noted in previous paragraphs and is not borne out by similar analyses for Gosnells and Serpentine-Jarrahdale. During this period significant changes included construction of a temporary building to house the Community Development Directorate and installation of a pool blanket at the aquatic centre.

At the City of Armadale population increased from around 49,600 in 1998/99 to 52,747 in 2006/07. If there was a direct linear relationship between population and Corporate GHG emissions (i.e. through increased demand for facilities) this would account for an increase of about 500 tonnes eCO₂ per annum (i.e. 7% increase), whereas the total increase was 18% over this period.

By 2012 staff levels are expected to increase from 2006/07 levels by around 30 FTE and the population is expected to increase to 65,723 requiring a significant increase in the provision of community facilities (e.g. parks, community buildings etc). If the rate of increase in GHG emissions per FTE that occurred between 1998/99 and 2006/07 were to be maintained there

would be an increase of 1,100 tonnes eCO₂ to 2012. If there was linear relationship between population and Corporate GHG emissions the population increase would result in an increase of 2,253 tonnes eCO₂ per annum to 2012.

The difference between the two estimates using different calculation methods is significant (1,100 to 2,253 tonnes eCO₂). However, given that the City expects growth in FTE's and population the higher estimate of 2,253 tonnes eCO₂ is suggested as the likely increase in Corporate GHG emissions per annum in 2012.

8.3.2 Proposed goal for 2012

Based on implementation of all the non-Green Power options identified in Section 7.2 and the likely increase in Corporate GHG emissions in Section 8.3.1 above, it is considered that at least a 5.5% decrease in per capita Corporate GHG emissions can be achieved, from the current 0.174 tonnes eCO₂ down to 0.164 tonnes eCO₂ per person. The City would strive to achieve a greater decrease in emissions. The proposed short-term goal therefore is:

The City will try to reduce Corporate greenhouse gas emissions to achieve reductions of: in excess of 6% per capita from 2006/07 levels by 2012.

8.4 Medium term goal (for 2022)

It is highly desirable to keep the goal of a 20% reduction in GHG emissions from 1998-99 levels, but a realistic timeframe for achievement of this goal needs to be set. Achievement of a 20% reduction in GHG emissions from 1998-99 levels can be achieved by using Green Power, which remains a key goal and will occur when the regulatory and market situations are right. Other programs such as the State Government's program to work towards zero waste by 2020 would also assist the City to reach the 20% goal.

A new goal needs to tie in with the proposed review dates of the Corporate and Community Greenhouse Action Plans, which are proposed to be reviewed every four years commencing 2012.

Although it is difficult to predict the future, the proposed medium term goal therefore is:

The City will try to reduce Corporate greenhouse gas emissions to achieve reductions of: 20% from 1998-99 levels by 2022.

8.5 Long-term goal (for 2050)

As noted above, the Federal and State Governments have adopted a goal of reducing emissions by 60% by 2050.

The table below compares expected population growth rates for Australia, Western Australia and the City of Armadale to provide a context for the Federal and State government long-term goal.

Level	Current population	Population in 2050	Population increase
Australia	21,000,000	30,000,000 - 42,000,000	43-100%
Western Australia	2,100,000	3,500,000 to 5,300,000	66-153%
Armadale	56,000	130,237	132%

The City's population growth is less than the higher projections for Western Australia, but more than the higher projections for Australia, so in the context of City growth it would be expected that the long-term goal would be achievable if it is achieved at a Federal and State level.

Achieving a 60% reduction would mean Corporate GHG emissions of 3,110 tonnes eCO₂.

If the City was on 100% Green Power by 2050, emissions would virtually only come from the vehicle fleet and waste sectors, as use of gas by the City is currently only responsible for 34 tonnes eCO₂ per annum. It would not be unreasonable to expect zero emission vehicles to be commonly available by 2050. The State Government is working towards zero waste by 2020, which if reached by 2050 would mean significantly reduced emissions from waste sector. City waste is currently responsible for 3,337 tonnes eCO₂ per annum. There may be a legacy issue with GHG emissions from the City's landfill site, but as emissions decrease over time they would be significantly less than current GHG emissions.

Given the above analysis of population and likely trends in the sectors that affect the City's GHG emissions, it is considered that the long-term goal set by the Federal and State governments could be adopted by the City with a reasonable level of confidence. However, achievement of the long-term goal depends on change in the transport and waste management industries being driven by the Federal and State Government.

The proposed long term goal therefore is:

The City will try to reduce Corporate greenhouse gas emissions to achieve reductions of: 60% from 2000 levels by 2050.

