

# **Corporate Greenhouse Action Plan 2014/15 to 2019/20**



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## Executive Summary

The City of Armadale's previous Corporate Greenhouse Action Plan was finalised in 2009 and ran until the end of 2012 (the '2009 to 2012 Plan'). Consequently, a new Plan is due for council consideration and approval. Given that the next emissions reduction milestone occurs in 2019/20, this document is to run from 2014/15 to 2019/20.

In the previous Plan, the City set the following targets in relation to greenhouse gas emissions:

*"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 2009 to 2012 Plan made recommendations to enable achievement of the 2012 target. A number of these actions have been completed, including lighting retrofits in City facilities and the offset of emissions from high energy consuming council buildings.

Since the adoption of the previous Plan, the changing nature of carbon legislation has seen the City's responsibilities change significantly. For example, emissions associated with the landfill are now fully reportable, resulting from the application of the 'operational control' concept. The landfill facility dominates the emissions profile of the City (c88%), but was reported differently in the 2009 to 2012 Plan. Conversely, streetlights are not deemed to be under the operational control of local government. Consequently, although previously reported in the 2009 to 2012 Plan, they are no longer relevant.

To enable the City to perform a meaningful comparison against 2006/07 emissions, it is imperative to restate historical carbon emissions. This ensures consistency and comparability between baseline and milestone years. Given that the profile is dominated by landfill, increasing green waste segregation between 2006/07 and 2011/2 has led to reduced levels of tip deposition. This has resulted in the avoidance of methane production. Consequently, the City has made significant progress towards achieving its target of a 6% decrease in emissions per capita of population. The target has narrowly been missed, per capita emissions decreasing by 5.9% from 0.5080tCO<sub>2</sub>-e (carbon dioxide equivalent) to 0.4781tCO<sub>2</sub>-e.

In the period subsequent to finalisation of the 2009 to 2012 Plan, Australia became a signatory to the Kyoto Protocol. This resulted in the endorsement of clear national emission reduction targets. Consequently, the City's previous targets are not aligned to

national objectives. Targets for future emissions have been revised to match national goals;

***“19% per capita reduction in 2000 levels by 2020”***

For the period covered by this Plan, the City has budgeted for projects that will make significant reductions in corporate carbon emissions. Circa \$400k has been allocated by Council for the construction of a flaring system at the Armadale Landfill and Recycling Facility site.

In its first full year of operation (2014/15), it is forecast that the flare will reduce carbon emissions by 10,000tCO<sub>2</sub>-e, with 70,000tCO<sub>2</sub>-e avoided over the next 9 years. The key action of this Plan is to complete the implementation of this project. This will result in the achievement of circa 7-10% of the 19% target. Hence, additional measures may be necessary, although this largely depends on the status of construction of the alternative waste treatment facility by Rivers Regional Council.

Other recommendations to assist in achieve the target include investigating the expansion of flaring infrastructure and investment in solar panels. Finally, if there is any shortfall in achieving the 19% target, this could be addressed through the purchase of carbon offsets. However, the strategy in relation to the use of carbon credits must be investigated and formalised.

## **Introduction**

The City of Armadale became a signatory to the International Council for Local Environmental Initiatives (ICLEI) Cities for Climate Protection (CCP) program in 1999. This presented an opportunity to make voluntary commitments in relation to reducing greenhouse gas emissions. The City adopted a goal of reducing corporate emissions by 20% of 1998-99 levels by 2010.

However, in the '*Corporate Greenhouse Action Plan 2009 to 2012*' (the '2009 to 2012 Plan'), the targets were revised and are summarised 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 expiry of the 2009 to 2012 Plan necessitates the creation of a new Corporate Greenhouse Action Plan. Consequently, it is appropriate to report on the extent to which the targets of the 2009 to 2012 Plan have been achieved, in conjunction with associated actions and recommendations. In addition, it is also necessary to identify new actions that may contribute to further reductions in the City's carbon footprint.

The form of carbon legislation has changed considerably since the previous Plan was introduced. This has impacted on how the City accounts for emissions. It has influenced the focus of carbon abatement measures in the last five years and will continue to do so for the duration of the current (this) Plan. Consequently, the nature of these changes must be explained to put the achievements of the last five years and future strategies into context.

## Regulatory Changes and Impacts

The following sections summarise the changing nature of carbon legislation and how this affects the City of Armadale.

### Carbon Legislation

An evolving regulatory regime and shifting calculation methodologies mean that, in retrospect, emissions figures for 1998/99 and 2006/07 were understated. Consequently, they are not an appropriate baseline upon which to measure performance. For a reasonable indication of trends in City emissions over time, it is imperative to restate historical figures to reflect current practice. This provides an opportunity for direct comparison and an indication of whether emissions targets have been achieved.

Details of the changing regime and the impacts on the City are provided as part of a discussion paper in Appendix 1. Key points are summarised as follows:

1. The introduction of the *National Greenhouse and Energy Reporting Act 2007* defined the concept of operational control, which determines responsibility for the reporting of carbon emissions;
2. The application of this concept means that the City now accounts for all emissions from the landfill site, including those arising from public refuse/other sources and not just council activities<sup>1</sup>;
3. Conversely, the City no longer accounts for carbon emissions arising from street lighting;
4. In relation to the tip, the changes mean that the City now exceeds emissions thresholds under the *Clean Energy Act 2011*. Consequently, this triggers a liability under the 'carbon tax'; and:
5. Previously set targets do not align to national goals, given Australia's commitment under the Kyoto Protocol.

The impact of the changes are reflected in variances to the emissions profile. The carbon footprint for 2006/07 was originally calculated as 9,160 tCO<sub>2</sub>-e. Under the current regime, this figure equates to 27,295 tCO<sub>2</sub>-e. This is explored in more detail in the following section.

In relation to point 4, all City of Armadale targets will be aligned to Australian commitments. Consequently, 1998/99 will be no longer used as a baseline year. In addition, given that the next national target is in 2019/20, this plan will expire at the end of the 2019/20 financial year.

<sup>1</sup> Landfill waste is decomposed under anaerobic conditions. This produces methane, a powerful greenhouse gas. Methane quantities are converted into carbon dioxide equivalent (tCO<sub>2</sub>-e) and reported as carbon emissions. One tonne of methane currently equates to c21 tonnes of carbon.

The year 2006/07 was quoted as a baseline year in the previous Plan, with a 6% emission reduction target to be achieved by 2012. Although this bears no relation to national targets, an assessment will be performed as to whether this has been achieved. The impacts of regulatory changes on the City's emissions profile are explored below, for the purpose of identifying achievements to date and setting future targets.

### City of Armadale Emissions Profile

It is now clear that a comparison of emissions between 2006/07 and 2011/12 is meaningless. Significant carbon sources have been added and removed from the profile in this period due to legislative changes. Enhanced methods of calculation also make a like for like comparison impossible.

Historical emissions can be restated to reflect a scenario where:

- 1) The current legislative requirements are applied to 1999/00 and 2006/07;
- 2) Similar calculation methods are used ; and:
- 3) The emissions profiles reflect the concept of 'operational control'; that is, streetlights are excluded but all emissions arising from the tip site are accounted for.

This results in an adjusted historical baseline for 2006/07, as stated in the table below.

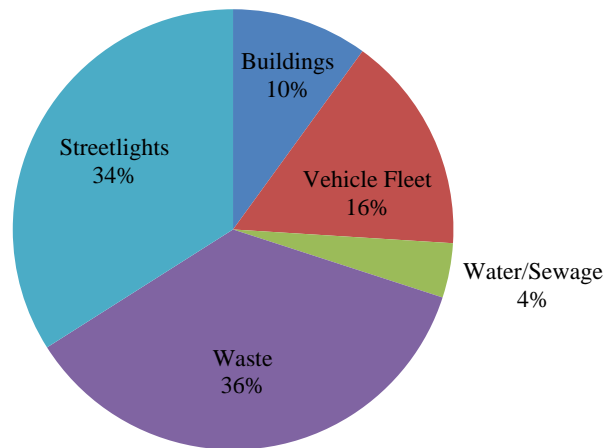
**Table 1: Originally Reported vs Restated Greenhouse Gas Emissions**

<b><i>ORIGINALLY REPORTED Corporate Greenhouse Gas Emissions 2006/07 – tCO<sub>2</sub>-e</i></b>					
<b>Buildings</b>	<b>Vehicle Fleet</b>	<b>Water/Sewage</b>	<b>Waste</b>	<b>Streetlights</b>	<b>Total</b>
918	1,459	332	3,337	3,113	<b>9,160</b>
10%	16%	4%	36%	34%	
<b><i>RESTATED Corporate Greenhouse Gas Emissions 2006/07 – tCO<sub>2</sub>-e</i></b>					
<b>Buildings</b>	<b>Vehicle Fleet</b>	<b>Streetlights</b>	<b>Water/Sewage</b>	<b>Waste</b>	<b>Total</b>
1,925	962	Nil	102	24,306	<b>27,295</b>
7%	4%	0%	0%	89%	

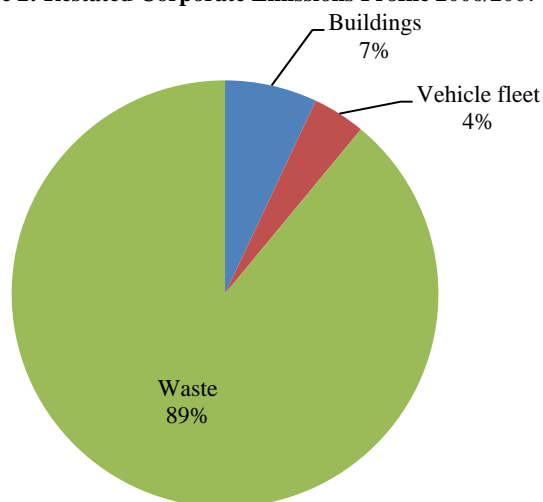
Due to limitations in the quality and completeness of data in relation to Buildings, Vehicle Fleet and Water/Sewage, the figures for 2012/13 have been historically extrapolated using population figures. It is unlikely that this would have a significant and material impact on historical emissions profiles, given that collectively these only represent 11% of emissions in 2012/13.

A comparison of the original and restated emissions profile for 2006/07 is also presented as follows:

**Figure 1: Originally Reported Emissions Profile 2006/2007**



**Figure 2: Restated Corporate Emissions Profile 2006/2007**



*Note; Streetlights no longer included in analysis and water/sewage makes up less than 1%*

Hence, there has been a monumental shift in total emissions (c300% increase) and the relative importance of waste in the profile.

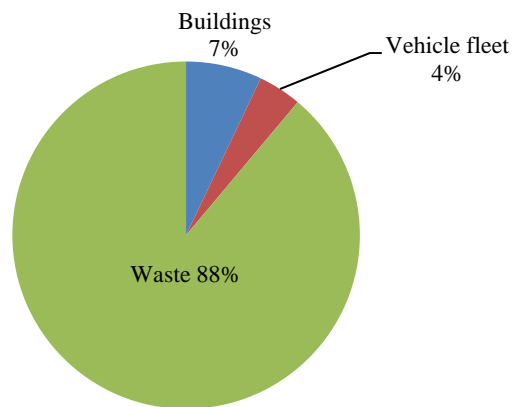
A key target of the 2009 to 2012 Plan involved a reduction in emissions by 2011/12 relative to 2006/07. Accordingly, emissions for 2011/12 are highlighted below.



**Table 2: 2011/12 Corporate Greenhouse Gas Emissions**

<b>Corporate Greenhouse Gas Emissions 2011/12 – tCO<sub>2</sub>-e</b>					
<b>Buildings</b>	<b>Vehicle Fleet</b>	<b>Streetlights</b>	<b>Water/Sewage</b>	<b>Waste</b>	<b>Total</b>
2,497	1,248	Nil	132	29,626	<b>33,503</b>
7%	4%	0%	0%	88%	

**Figure 3: Corporate Emissions Profile 2011/2012**



*Note; Streetlights no longer included in analysis and water/sewage makes up less than 1%*

The relative importance of emissions sources has remained fairly consistent between 2006/07 (restated) and 2011/12.

For further information, restated emissions for 1999/00 are highlighted in Appendix 3. This is an important baseline year for the purpose of measuring achievements in 2020 and 2050. Emissions for 2012/13 are also included as Appendix 4.

## Goals of the 2009 to 2012 Plan

As discussed above, the 2009 to 2012 Plan included targets in relation to greenhouse gas emissions. These were underpinned by key abatement measures and other actions to facilitate their achievement.

### Key Actions in the Plan

A synopsis of implementation progress is summarised below:

**Table 3: Summary of Progress on Key Actions of the 2009 to 2012 Plan**

<b>Action Plan No</b>	<b>Summary Description</b>	<b>Status</b>
1	Green Power - 100% at contestable (high energy using) sites only	<i>Alternative approach adopted and completed</i> – Green Power is priced at a premium compared to normal ‘black power’. The results of a competitive quotation highlighted that it is more cost effective to offset purchased black power with carbon credits. This has been implemented for the calendar years 2010 to 2014. The end outcome is the same as purchasing green power (nil carbon footprint).
2	Green Power - 100% at all sites	<i>Not completed, further work proposed for 2014/15-2019/20</i> – In 2011/12, total building emissions were 2,497tCO <sub>2</sub> -e of which circa 1,760tCO <sub>2</sub> -e related to contestable sites. These were offset at a cost of \$10k. It would cost a further \$4k to offset the remaining buildings. Provided that prices remain stable, this option will be pursued in future years.
3	Energy audits of high energy using buildings	<i>Alternative approach adopted and completed</i> - Energy Audits would cost the City circa \$5k per building. The focus has been on implementing ‘quick wins’ and learning from the ‘Switched on Staff’ Program (see below). Internal LED lighting retrofits have been delivered for the Aquatic centre and

Action Plan No	Summary Description	Status
		Seville Grove library. Retrofits at the Champion Centre and Admin Centre are in progress.
4	Energy monitoring of 10 high energy sites	<p><b><i>Alternative approach adopted and in progress</i></b> - The City completed the 'Switched on Staff' Program and monitored energy use in the Admin Centre through the 'Greensense View Platform'.</p> <p>Energy use from high energy contestable sites is offset (see action 1 above). Consequently, the residual carbon footprint is nil.</p>
7	Wind turbine & solar panel as at Shire of Serpentine-Jarrahdale Recreation Centre. The City could do much more than this	<p><b><i>In progress and further work proposed for 2014/15-2019/20</i></b></p> <p>Installation of a 30kW solar system on the City's Administration building is in progress. This is costing \$55k and saves circa \$17k per annum on energy costs. Hence, the payback period is just over three years.</p> <p>Further work is proposed for this area in the period 2014/15 to 2019/20 (see below).</p> <p>A desktop analysis on wind turbines has been performed, supplemented with discussions with other Councils. The intermittent nature of wind makes it difficult to accurately predict the benefits of turbines. In urban areas the efficiency of wind turbines is compromised by friction and payback periods are generally quite high (&gt;10 years). No further work is proposed.</p>

Action Plan No	Summary Description	Status
8	Streetlights - conversion from 80W mercury vapour to 42 W compact fluorescent.	<p><b>Complete</b> - As a result of the <i>Syt!</i> Sustainable Street Lighting trial, Western Power expanded their range to include 42W Compact Fluorescent Luminaires (CFLs).</p> <p>Under its' maintenance programs, Western Power will change existing 80W Mercury Vapour luminaires to 42W CFLs when they are beyond repair. Luminaires housing MV globes have a life span of approximately 15 years.</p> <p>Local Governments are also able to pay to upgrade to CFL's, but the cost per light is between \$440 and \$1,400. This is not considered economically viable by the City.</p> <p>In 2011, the CFL became Western Powers standard light, meaning it will be used in scheduled luminaire replacements and new residential areas.</p>
9	Green Power - 100% for streetlights	<p><b>No longer applicable</b> – the WALGA position paper stipulates that streetlights are not under the operational control of the City. Here, Western Power has the 'greater authority' to introduce operational policies in respect of streetlights. Hence, the City does not have responsibility for these emissions. This is not being pursued further.</p>
10	Improve Council operated car park lighting	<p><b>In progress</b> – Car park lighting is in the process of being retrofitted. LED lights have been fitted at the Admin Centre and Seville Grove library. Final building to be addressed is the</p>

Action Plan No	Summary Description	Status
		Champion Centre.
14	Zero increase in light vehicle fleet emissions to 2012. This is achievable	<p><i>Not completed, further work proposed for 2014/15-2019/20</i> – Fleet emissions have increased from 962tCO<sub>2</sub>-e in 2006/07 to 1,248tCO<sub>2</sub>-e in 2011/12.</p> <p>Further work is proposed for this area in the period 2014/15 to 2019/20 (see below).</p>

### Non-Key Actions

Appendix 5 details the progress of other actions.

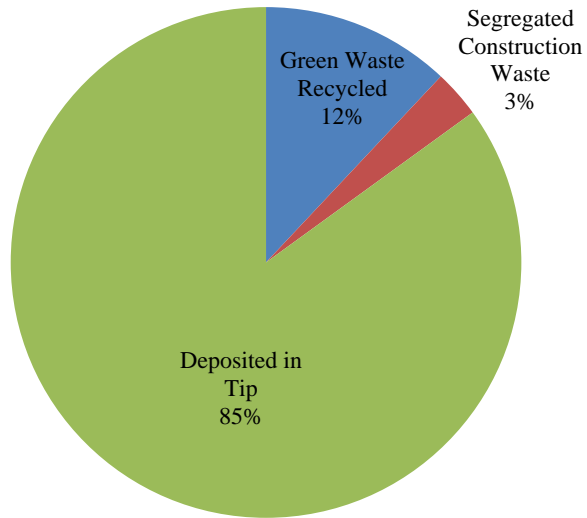
### Additional Initiatives

As discussed above, the significance of emissions from the tip were not recognised in the 2009 to 2012 Plan. At this point, the concept of operational control had only recently been introduced. As a result, methane emissions from corporate waste were calculated, but methane from residential and other sources were not. Consequently, tip emissions were vastly understated (3,337tCO<sub>2</sub>-e compared to the more accurate 24,306tCO<sub>2</sub>-e). As a result, mitigation strategies were focused elsewhere in the previous Plan.

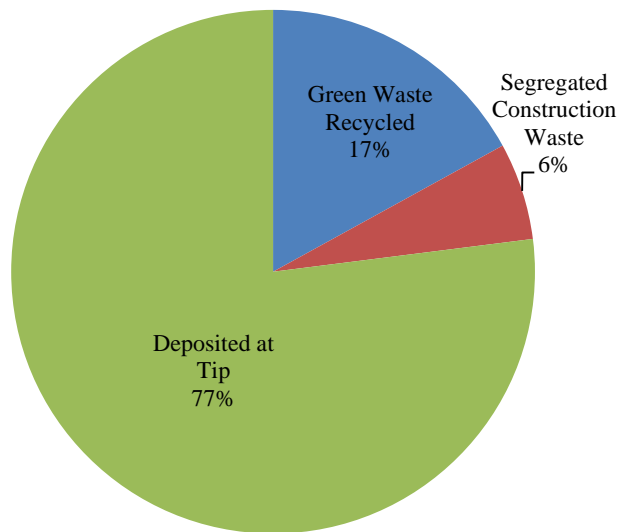
Irrespective of this, throughout the period 2006/07 to 2012/13, the City continued to sort and segregate green waste at the tip, as well as performing two green waste pick-ups per annum. This is mulched and provided to residents free of charge. Mulching green waste is considered an emissions reduction activity as it avoids anaerobic decomposition and methane generation. Negligible amounts of CO<sub>2</sub> are produced during the mulching process compared to the methane produced from the tip.

Green waste segregation increased from 6,110 tonnes in 2006/07 (12% of waste collected) to 9,655 tonnes in 2011/12 (19% of waste collected). The risk arises that these financial years are isolated examples and not reflective of consistent trends at the tip site. Appendix 6 provides details on segregation at the tip in the decade between 2002/03 and 2011/12. This is reflected as follows, split into two separate five year periods:

**Figure 4: 2002/03 to 2006/07  
Waste Analysis (averages)**



**Figure 5: 2007/08 to 2011/12  
Waste Analysis (averages)**



When analysing the five-year period including the 2009 to 2012 Plan, segregated green waste amounted to 17% of waste collected, compared to 12% from 2002/03 to 2006/07.

Here, the annual average from 2007/08 to 2011/12 was 8,257t, compared to 5,320t for 2002/03 to 2006/07.

Hence, the volume and percentage of green waste segregated in 2011/12 compared to 2006/07 increased significantly. This trend is also supported by the averages over the five years before and after 2006/07. This demonstrates that this is a consistent trend over time, and not just isolated occurrences.

Municipal waste collected from households over the period 2006/07 to 2011/12 increased from 24,153t to 26,170t. This equates to an 8% increase over a period when population increased by circa 29%. Furthermore, Appendix 6 highlights that overall waste deposited to the tip (including other sources such as commercial waste), has decreased from 44,005t in 2006/07 to 40,372t in 2011/12. Consequently, waste collections have not increased in line with population growth, and the City's enhanced waste segregation has resulted in an overall decrease in deposits at the tip.

### Achievement of Targets

Using the restated figures for 2006/07, the extent to which targets were achieved in 2011/12 is highlighted as follows:

**Table 4: Comparison of 2011/12 to 2006/07 Emissions**

<b>Year</b>	<b>Emissions tCO<sub>2</sub>-e</b>	<b>Population of City</b>	<b>Per Capita Emissions tCO<sub>2</sub>-e</b>
<b>2006/07</b>	27,295	53,735 (Ref 4)	<b>0.5080</b>
<b>2011/12</b>	33,113 <sup>2</sup>	69,260	<b>0.4781</b>

This constitutes a 5.9% reduction in per capita emissions, driven by trends in waste deposition and recycling (see above). The City has very narrowly missed the target of 6% by the year 2011/12. However, initiatives have commenced to significantly decrease future emissions at the tip (see below). These have already necessitated a significant injection of funds for capital infrastructure and will greatly reduce the amount of per capita emissions.

<sup>2</sup> Note, 2011/12 includes gross emissions of 33,503 less additional offset from carbon credits of 390 = 33,113tCO<sub>2</sub>-e. Offsets purchased from Southern Metropolitan Regional Council (SMRC) equate to 6,359tCO<sub>2</sub>-e over the 4 years from 2009 to 2012. In 2010, 3,099 were purchased, constituting two years of electricity use for contestable sites. In 2012, a further 3,260 were purchased for two years (1,560tCO<sub>2</sub>-e per annum). This represents 100% offset of contestable sites, compared to 75% in 2006/07. Hence, this constitutes an extra 25% x 1,560 = 390tCO<sub>2</sub>-e per annum of abatement.

## **Future Targets and Milestones for 2014/15 to 2019/20**

The discussion paper in Appendix 1 highlights that Australia has adopted the following targets in relation to emissions:

- 5% percent reduction in emissions by 2020 relative to the year 2000; and:
- 80% percent reduction relative to 2000 by 2050.

It is logical for the City to align to these targets. The rationale is that the Federal Government will provide incentives to enable the achievement of national goals. In this respect, business cases for adopting alternative technologies will become attractive and enable the City to reduce emissions.

However, the 2009 to 2012 Plan advocated that emissions targets be assessed on a per capita, rather than an absolute basis. Given that the population of the City is due to rapidly expand over the next 20 years, this plan suggests a similar approach.

The rationale for using local population is that the bulk of the profile is dominated by waste emissions. Given that these are primarily generated from public refuse, this is a more practical approach than using employee numbers.

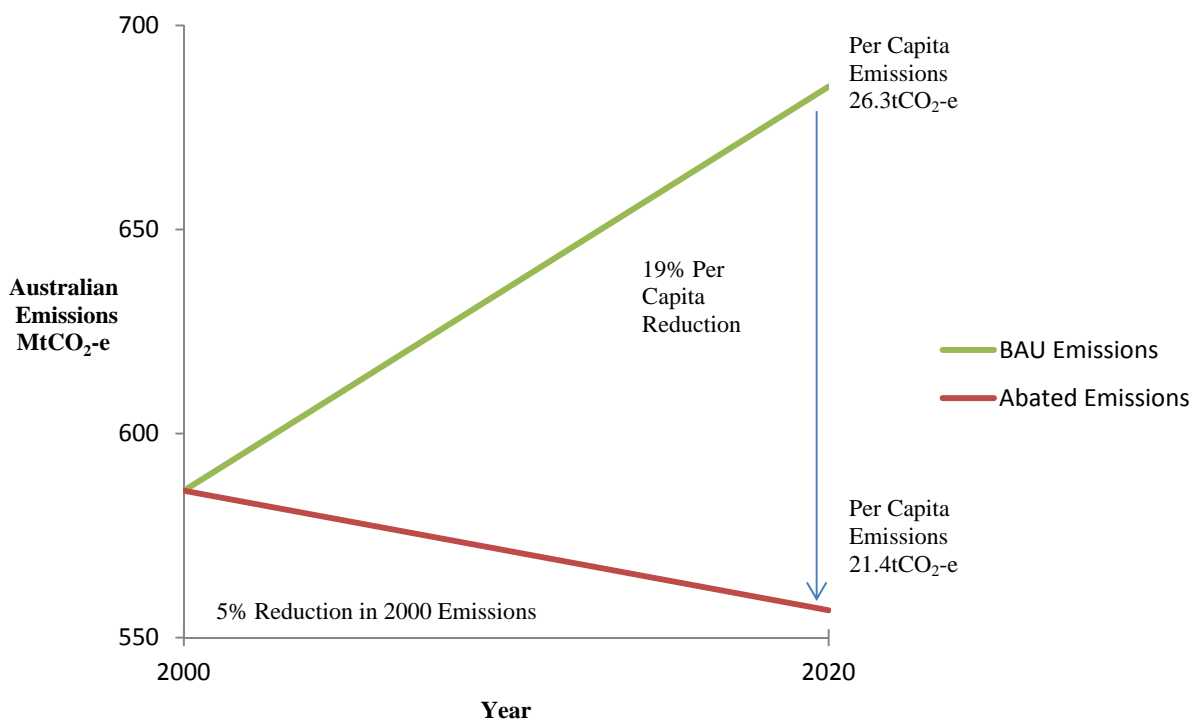
The Australian Government has a target to reduce emissions to 95% of 2000 levels by 2020. Over this period, the population of Australia is due to increase from 19 to 26 million (37%) (References 1 and 2). Over the same time period, the City of Armadale's population will grow from 51,334 to 98,268 (91%). Consequently, the rate of growth in Armadale far outstrips national trends. For this reason, the application of absolute national emissions targets will prove too ambitious.

City of Armadale emissions in 1999/00 were 18,978tCO<sub>2</sub>-e, or 0.37tCO<sub>2</sub>-e per capita (population – 51,334). If the City continues on the same trajectory, emissions in 2019/20 will be 36,359tCO<sub>2</sub>-e. If proposed greenhouse gas reductions are aligned to national objectives, 95% of year 2000 emissions are equal to 18,029tCO<sub>2</sub>-e. This means per capita emissions figures would need to be 50% lower in 2020 at 0.19tCO<sub>2</sub>-e. This is simply not realistic or achievable.

However, national targets can be analysed on a per capita basis, stripping out the overall effect of localised and uneven population growth or decline. This is represented in the following graph:



**Figure 6: National Emissions Targets in Per Capita terms**



The green line depicts the emissions profile projected by the Department of the Environment under a ‘Business as Usual’ setting (i.e. each person contributes 26.3 tCO<sub>2</sub>-e per annum). Baseline figures for 2000 are also provided in the same source (Reference 3).

The absolute national emission target of 95% of 2000 levels by 2020 equates to a 19% reduction per capita; 21.4 tCO<sub>2</sub>-e versus 26.3 tCO<sub>2</sub>-e (see Appendix 7 for the detailed calculations underpinning the above analysis). If the City were to adopt this target, it would not be disadvantaged by higher than average population growth. Consequently, the next target is as follows:

***‘19% per capita reduction in 2000 levels by 2020’***

Targets in relation to 2050 will be set as part of the next Corporate Greenhouse Action Plan in 2020.

## Key Strategies 2014/15 to 2019/20

Given that the emissions profile of the City is dominated by the landfill site, it follows that efforts to reduce emissions must focus on this area. Projects at the landfill site must be considered in the context of activities within the Rivers Regional Council (RRC), who make strategic waste management decisions on behalf of member councils. The RRC represents the Cities of Armadale, Gosnells, Mandurah, South Perth and the Shires of Murray, Serpentine Jarrahdale and Waroona.

Their aim is to construct an Alternative Waste Treatment or Resource Recovery Facility. This will result in the diversion of municipal waste from the Armadale tip. Consequently, this could have a greater impact than any proposed abatement measure on the City's carbon footprint. Nevertheless, initiatives associated with the tip are discussed below. In addition, there are other non-waste related projects that have been identified.

### Landfill Flaring System

As discussed above, Council has approved funding for the development of a methane flaring system at the tip. As part of the July 2013 Technical Services Committee, Council resolved to:

***Award the contract for landfill gas management services to Landfill Gas and Power Pty Ltd, in accordance with their (amended) proposal submitted in May 2013 at a cost of \$390,000 (excluding GST). (T49/7/13).***

The overarching objectives of the project are to; i) significantly reduce the City's carbon footprint; ii) avoid carbon liabilities under the Clean Energy Act by bringing the City below the 25,000tCO<sub>2</sub>-e emissions threshold; and: iii) earn carbon credits and generate revenue streams under the *Carbon Credits (Carbon Farming Initiative) Regulations 2011*. These objectives are achieved by capturing and burning methane generated by the tip (converting the methane into carbon dioxide) through a network of wells that feed a flare.

### *Abatement from System*

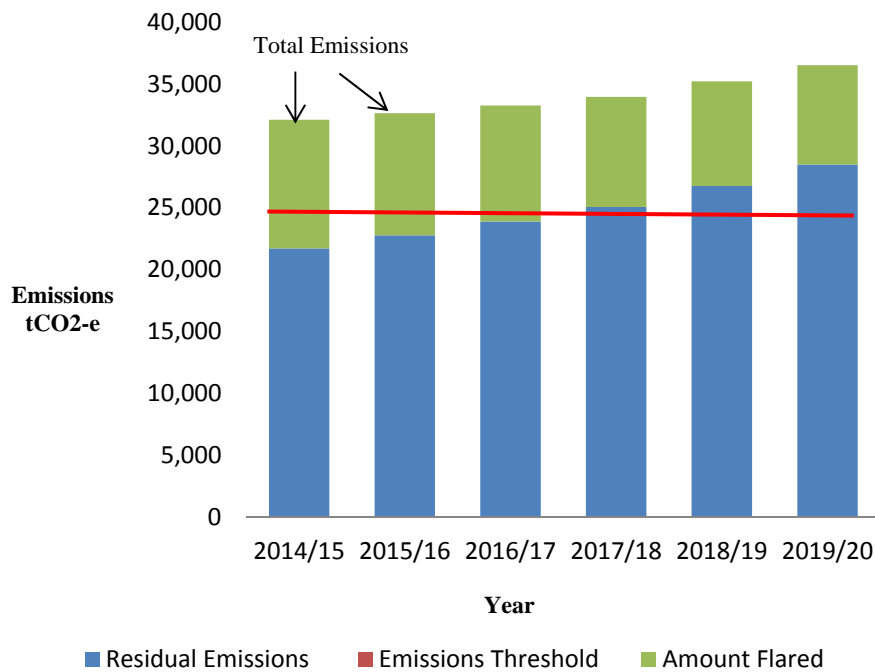
The following table illustrates forecasted flaring quantities up to 2019/20. The per capita waste tonnage to the tip in 2012/13 was 0.62 tonnes (see Appendix 6). If this figure remains constant and is applied to population projections until 2020, emissions from the tip are forecasted as follows (using Version 2.0 of the Solid Waste Calculator):

**Table 5: Forecast Emissions and Flaring Quantities from the Tip Site**

<b>Year</b>	<b>Population</b>	<b>Waste to Tip (tonnes)</b>	<b>Emissions tCO<sub>2</sub>-e</b>	<b>Amount Flared tCO<sub>2</sub>-e</b>	<b>Residual Emissions tCO<sub>2</sub>-e</b>
2012/13	71,238	44,142	30,322	0	30,322
2013/14	75,004	46,502	31,662	0	31,662
2014/15	78,766	48,834	32,117	10,406	21,711
2015/16	82,617	51,222	32,655	9,881	22,774
2016/17	86,556	53,664	33,275	9,383	23,892
2017/18	90,414	56,056	33,975	8,911	25,064
2018/19	94,271	58,448	35,219	8,464	26,755
2019/20	98,268	60,926	36,529	8,040	28,489
2020/21	102,270	63,407	37,907	7,638	30,269

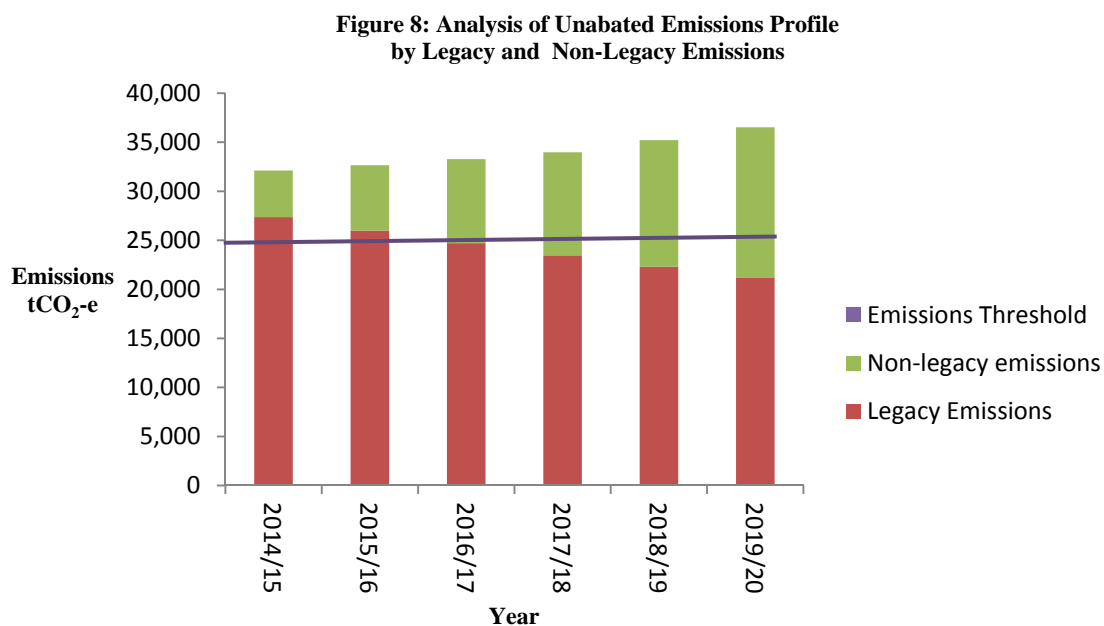
This is also presented as follows:

**Figure 7: Forecast Total Emissions by Amounts Flared and Residual Emissions**



This demonstrates that flare efficiency diminishes over time. It also highlights that the tip will, once again, exceed the 25,000tCO<sub>2</sub>-e threshold from 2017/18. Under current legislation, a carbon price will be payable from this time forward on non-legacy emissions

from waste deposited after 1<sup>st</sup> July 2012. The analysis of emissions between legacy and non-legacy waste is presented in Appendix 8, and as follows:



In order to have confidence over forecasted emissions and any resultant carbon liabilities, it is imperative to perform a periodic review of actual flaring rates. This exercise should be performed after the first full year of operation and reported to Council to identify future liabilities and/or carbon credit income streams.

*Recommendation 1: Provide a report to Council a year after the flaring system has been commissioned giving an updated forecast on flaring rates and carbon liabilities. The analysis should feature the latest available regulatory guidance in relation to the future of the carbon price mechanism.*

*Responsibility: Environmental Manager*

A business case for the extension of flaring infrastructure should be presented before the carbon reporting threshold is exceeded in 2017/18. The basis of this case will be the avoidance of a carbon liability. However, the analysis above also demonstrates that the initially installed flaring system is unlikely to achieve the target of a 19% reduction in per capita emissions by 2020. A reduction of 7-10% is considered more achievable. Consequently, the extension of flaring infrastructure may be necessary to avoid carbon liabilities and achieve the City’s emissions targets.

*Recommendation 2: At the appropriate juncture, present a business case to Council for the extension of flaring infrastructure at the landfill site.*

*Responsibility: Environmental Manager and Waste Services Manager*

### Carbon Farming Initiative ('CFI')

The Carbon Credits (Carbon Farming Initiative) Act 2011 introduced the ability to register carbon abatement projects with the Clean Energy Regulator. To be eligible to register, the primary objective of a project must be greenhouse gas abatement. Subject to a range of criteria for acceptance, projects can generate carbon credits for each tonne of carbon abated. Given that the landfill system converts methane to carbon dioxide, it can achieve regulatory approval under the '*Capture combustion of methane in landfill gas from legacy waste*' determination.

There are three stages to securing approval:

1. Apply to become a Recognised Offsets Entity;
2. Open a registry account on the Australian National Register of Emissions Units;  
and:
3. Obtain approval for an Eligible Offsets Project.

The first step involves Federal Government checking on the integrity of the project proponent (the City and the CEO). The second step is merely an extension of step one and involves the City being awarded an account on the national database for the trading of carbon permits and credits. The final step involves registering the specifics and technical detail of the proposed project. The City has completed the first two steps and now that the contract for flaring infrastructure has been awarded, step 3 has commenced.

Once the City's application has been reviewed and approved by the Clean Energy Regulator, the City can claim carbon credits on emissions abated by landfill flaring project. This is via an 'Offsets Report', accompanied by a 'Certificate of Entitlement', reviewed by an approved Clean Energy Regulator auditor.

There is currently a great deal of uncertainty over the value of carbon credits and the future of carbon legislation. However, once the project has been operational for a year, an assessment will be performed to determine when a Certificate of Entitlement should be lodged. This provides the City with an opportunity to achieve a return on investment and create value for ratepayers. This is, of course subject to the CFI remaining in force.

*Recommendation 3: Report to Council as per recommendation 1, also incorporating a recommended strategy on the completion of an Offsets Report and the submission of a Certificate of Entitlement. This should take into account the forecasted value of carbon credits and conclude on when it is economically advantageous to submit the claim.*

*Responsibility: Environmental Manager*

### Gate Price Modelling

There are a number of factors that have an influence on the level of the City's financial liability under the carbon price mechanism. These include but are not limited to:

- The form of carbon legislation;
- Legislated emissions thresholds;
- Future waste volumes and rate of population growth in the City;
- Timescales for the Rivers Regional Council solution to be commissioned;
- The efficiency of flaring at the tip;
- The price of carbon permits and the value of carbon credits; and:
- Market forces in the European Union.

In relation to the final point, from the 1<sup>st</sup> July 2014, the Australian carbon market will have a link to the European Union. Here, 37.5% of carbon liabilities may be extinguished using carbon permits sourced in Europe. In addition, 12.5% can be met from carbon credits generated under the Kyoto Protocols 'Clean Development Mechanism'. These are generated through abatement projects in developing countries. As a result, it is likely that the price of Australian carbon permits and credits will be influenced by the European market.

Once waste has been deposited at the tip, it continues to generate methane for upwards of 100 years. Under current legislation, this potentially leads to a long lasting liability for the City. However, the opportunity to recover money from the customer is lost as soon as they leave the landfill site. Consequently, the extent of any future liability must be recovered from the tip user, in the form of an additional gate fee. However, as discussed above there are a number of significant uncertainties associated with predicting what the liability will be.

Considering this uncertainty, the only transparent way to calculate an appropriate gate fee is to use a model that accounts for the above factors. The model must allow for these parameters to vary. For example, the Federal Treasury Department will provide forecasts on the likely price of carbon permits and may regularly revise these. As a direct consequence, any future liability will change and a recalculation will need to be performed. Following this, the gate fee may change annually. However, the use of a

model provides a transparent, objective and methodical technique to determine pricing structures.

There is uncertainty over the future of current carbon legislation given a recent change in Federal Government. Thus, the extent to which the flaring project will negate or extinguish the City's liability is unclear. It would therefore be prudent to know the future of carbon legislation before developing or purchasing a model to calculate gate fees.

*Recommendation 4: Engage the services of a specialist consultant to construct a model to determine gate prices to be charged at the tip. This should be developed within a year of this Plan being approved, subject to having certainty over the form of carbon regulations.*

*Responsibility: Environmental Manager and Waste Services Manager.*

#### Marginal Abatement Cost Curve

As long as landfill emissions dominate the City's profile, it is obvious to focus abatement activities on this area. However, there is a tool widely used to assess the effectiveness and economic viability of potential abatement options in an organisation. The *Marginal Abatement Cost Curve* (MACC) seeks to compare the options available for emissions reduction. Here, total abatement achieved by a particular option is graphically represented, in conjunction with the cost. The key parameter analysed in the MACC is the cost (\$) per tCO<sub>2</sub>-e abated. Consequently, an organisation is able to channel funds into the most efficient option or options available.

To date, a MACC has not been conducted. It is assumed that the abatement options explored in this Plan will feature favourably in the MACC. However, if alternative strategies are identified as being more advantageous, resources can be redirected accordingly. Consequently, it is imperative that the completion of the MACC is performed early in the timescales of this Plan to enable the future direction of abatement options.

*Recommendation 5: Prepare a Marginal Abatement Cost Curve within one year of council approval of the 2014/15 to 2019/20 Corporate Greenhouse Action Plan. This should be accompanied by calculations of payback periods for the initiatives analysed. Present this to the Executive Director Technical Services with a recommendation on appropriate abatement strategies.*

*Responsibility: Environmental Manager*

## Photo Voltaic Solar Energy System

Environmental Services have met with a WALGA preferred supplier to discuss the possibility of installing solar panels on specific buildings. As City buildings are not private residences, they do not qualify for Synergy's Renewable Energy Buyback Scheme. Consequently, the City is restricted to buildings that use power consistently during daylight hours (opposed to community buildings with fluctuating electricity consumption patterns).

Installation of a 30kW solar system on the City's Administration building is in progress. This is costing \$55k and will save circa \$17k per annum on energy costs. Hence, the payback period is just over three years. This system is capable of expansion in the coming years to potentially provide solar power to tenants in the new Landmark building.

Discussions with the supplier have suggested that other City facilities may also be appropriate for solar installation, with payback periods in the region of 6-7 years. Furthermore, In addition, WALGA have also introduced suppliers that provide the option to lease the panels. In this scenario, there will be no initial up front capital cost to the City. Assuming that solar panels appear favourably in the MACC as an abatement option, they should be pursued as a greenhouse gas reduction strategy.

*Recommendation 6: Complete the preparation of a Business Case for investment in solar panels within two years of council approval of the 2014/15 to 2019/20 Corporate Greenhouse Action Plan. This must cover the Administration building/Civic precinct and other City facilities with the potential for favourable payback periods. This should be presented to the Executive Director Technical Services and include a consideration of purchase versus leasing options.*

*Responsibility: Environmental Manager*



## Policy Approach

The recommendations of the 2009 to 2012 Plan included:

- Developing a building maintenance policy that emphasises energy efficiency; and:
- Developing and implementing a policy which ensures energy efficiency is a priority consideration in tenders for all new council buildings:

These have not been completed. Consequently, they are required to be scheduled as part of the 2014/15 to 2019/20 Plan.

*Recommendation 7: Develop a policy/ies that addresses the areas of building maintenance/retrofits and energy efficiency requirements in tenders in relation to new council buildings. This should be completed within four years of council approval of the 2014/15 to 2019/20 Corporate Greenhouse Action Plan.*

*Responsibility: Property Services Manager*

The City recently commenced an initiative for Environmental Services to input into the specification criteria for contract tenders. This provides an opportunity for future compliance against energy efficiency and for general environmental criteria to be demonstrated in tender submissions.

## Offsets Strategy

The City currently offsets 100% of emissions associated with contestable sites (those using in excess of 50 megawatts of electricity per annum). This constitutes circa 63% of all electricity use within City buildings. The current cost of this initiative to the City is circa \$9,000 per annum.

This approach could be extended to all electricity used at council buildings, at a cost to the City of an additional circa 5k per annum (assuming a similar price per offset unit). Assuming that the price of carbon credits remains at a similar level, this is a relatively cost effective method for abatement and should be pursued in the future.

Further to this, it is important for the City to formally document an approach to the purchase of offsets. For example, when will they be purchased, what for and from whom? As highlighted above, by 2020 7-10% of the City's 19% reduction target will be achieved through the flaring project. Additional projects discussed above may contribute towards reaching the target. However, the extent of this is unknown at this stage. If there is a shortfall, the City may 'plug this gap' through the purchase of offsets.

There are a broad range of offset providers and different types of offsets (e.g. from carbon sequestration to landfill flaring). The prices also vary widely and may be sourced from international or domestic markets. Under the Clean Development Mechanism, carbon credits sourced from overseas are available for as little as \$1/tonne. Credits from the domestic market may be more expensive, but funds are retained within the Australian economy. Consequently, preferred options for the purchase of carbon credits need to be explored and formalised.

*Recommendation 8: Continue to offset carbon emissions associated with the City's contestable sites and also offset non contestable sites, depending on the price of carbon credits.*

*Responsibility: Environmental Manager*

*Recommendation 9: Complete an exercise to formalise when and how offsets are to be used/purchased by the City of Armadale, including an indication of where they are to be sourced from. This should be presented to Council for consideration within three years of approval of the 2014/15 to 2019/20 Corporate Greenhouse Action Plan.*

*Responsibility: Environmental Manager*

## Conclusion and Recommendations

The 2014/15 to 2019/20 Corporate Greenhouse Action Plan includes a number of recommendations to enable the City of Armadale to reduce their greenhouse gas emissions. A summary of these is provided in table 6 below.

**Table 6: Recommendations of the 2014/15 to 2019/20 Corporate Greenhouse Action Plan**

<b>Recommendation</b>		<b>Responsibility</b>	<b>Cost</b>
1	Provide a report to Council a year after the flaring system has been commissioned giving an updated forecast on flaring rates and carbon liabilities. The analysis should feature the latest available regulatory guidance in relation to the future of the carbon price mechanism.	Environmental Manager	Nil
2	At the appropriate juncture, present a business case to Council for the extension of flaring infrastructure at the landfill site.	Environmental Manager/Waste Services Manager	Nil
3	Report to Council as per recommendation 1, also incorporating a recommended strategy on the completion of an Offsets Report and the submission of a Certificate of Entitlement. This should take into account the forecasted value of carbon credits and conclude on when it is economically advantageous to submit the claim.	Environmental Manager	Nil
4	Engage the services of a specialist consultant to construct a model to determine gate prices to be charged at the tip. This should be developed within a year of this Plan being approved, subject to having certainty over the form of carbon regulations.	Environmental Manager/Waste Services Manager	\$40k (one-off)
5	Prepare a Marginal Abatement Cost Curve within one year of	Environmental Manager	Circa \$10k (one-off)

<b>Recommendation</b>	<b>Responsibility</b>	<b>Cost</b>
Council approval of the 2014/15 to 2019/20 Corporate Greenhouse Action Plan. This should be accompanied by calculations of payback periods for the initiatives analysed. Present this to the Executive Director Technical Services with a recommendation on appropriate abatement strategies.		
6 Complete the preparation of a Business Case for investment in solar panels within two years of council approval of the 2014/15 to 2019/20 Corporate Greenhouse Action Plan. This must cover the Administration building/Civic precinct and other City facilities with the potential for favourable payback periods. This should be presented to the Executive Director Technical Services and include a consideration of purchase versus leasing options.	Environmental Manager	Nil
7 Develop a policy/ies that addresses the areas of building maintenance/retrofits and energy efficiency requirements in tenders in relation to new council buildings. This should be completed within four years of council approval of the 2014/15 to 2019/20 Corporate Greenhouse Action Plan.	Property Services Manager	Nil
8 Continue to offset carbon emissions associated with the City's contestable sites and also offset non contestable sites, depending on the price of carbon credits.	Environmental Manager	Circa \$14k per annum

<b>Recommendation</b>		<b>Responsibility</b>	<b>Cost</b>
9	Complete an exercise to formalise when and how offsets are to be used/purchased by the City of Armadale, including an indication of where they are to be sourced from. This should be presented to Council for consideration within three years of approval of the 2014/15 to 2019/20 Corporate Greenhouse Action Plan.	Environmental Manager	Nil

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4. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3218.02012-13?OpenDocument>, 'Population Estimates by Local Government Area (ASGS 2013), 2003 to 2013' Data Cube, 10<sup>th</sup> April 2014.

## **Appendix 1: Changing Regulatory Regime and Impacts**

The last five years has incorporated a raft of new legislation. A synopsis of these is provided below, in conjunction with implications for the City.

### ***The National Greenhouse and Energy Reporting (NGER) Act 2007***

In 2007, the Australian Federal Government introduced the *National Greenhouse Energy and Reporting Act* ('NGER Act'). This introduced a national framework for reporting greenhouse gas emissions. The NGER Act facilitated the production of baseline emissions data, ultimately used to formulate the basis of an Emissions Trading Scheme. The first annual reporting period under the NGER Act began 1<sup>st</sup> July 2008.

#### ***Reporting Thresholds and Operational Control***

All organisations that exceed or are likely to exceed emissions reporting thresholds must register and report under NGER. There are two ways in which reporting obligations are triggered;

1. As a corporation, total CO<sub>2</sub>-e emissions exceed 50,000tCO<sub>2</sub>-e (carbon dioxide equivalent in tonnes) per annum; or:
2. A single 'facility' within the corporation emits in excess of 25,000tCO<sub>2</sub>-e tonnes per annum.

The definition of a 'facility' is '*an activity or activities that are situated in or attributable to a single physical location*' or '*an activity or activities that form part of a single production process*'. However, the emissions of a facility are only reportable by a corporation if they have 'operational control'. A corporation has operational control over a facility if it has the greatest authority to introduce and implement any or all of the following;

- operating policies;
- health and safety policies; and:
- environmental policies.

Consequently, if a corporation has operational control over a facility and emissions exceed 25,000tCO<sub>2</sub>-e, they are responsible for reporting these emissions under the NGER Act.

### ***The Clean Energy Act 2012***

The Clean Energy Act (CEA), introduced in 2012 incorporated the concept of a price on carbon (commonly referred to as the 'carbon tax'). The CEA quantified the cost of a tonne

of carbon for the first three years of the scheme, known as the 'fixed price period'. This encompassed the period 2012/13 to 2014/15 in which prices were set at \$23, \$24.15 and \$25.40 per tonne CO<sub>2</sub>-e respectively. The CEA stipulated commencement of a flexible price period from 1<sup>st</sup> July 2015. This has subsequently been revised to 1<sup>st</sup> July 2014. Irrespective of the start date of the flexible price period, the underlying concept remains the same; that is, the price of carbon will be set by market forces.

The thresholds applying under the CEA correspond to those in the NGER Act. For example, if facility or corporate emissions exceed 25,000 and 50,000tCO<sub>2</sub>-e respectively, controlling corporations face a carbon price liability. This is calculated by multiplying the tonnes emitted by the price per unit of carbon. The concept of operational control also applies under the CEA.

### ***International Climate Initiatives***

On 3<sup>rd</sup> December 2007, the Australian Government ratified the Kyoto Protocol. The aim of the international agreement was to reduce the collective greenhouse gas emissions of developed countries by at least five per cent below 1990 levels by 2012. This is referred to as the first commitment period. However, under the agreement, Australia had a target of restricting greenhouse gas emissions to 108 per cent of 1990 levels during the commitment period. Consequently, Australia was allowed to increase emissions during this period.

In late 2012, the Australian Government announced they had signed up to a second commitment period under the Protocol at the United Nations Climate Change Conference in Doha. The second commitment period commenced in January 2012 and will end in 2020. Australia agreed to the bipartisan target of reducing emissions to five per cent below 2000 levels by 2020, although the option was retained for the target to be adjusted to anywhere in the range between 5 and 15%. The Prime Minister, Tony Abbott has committed to cut domestic emissions by only five percent by 2020.

Australia has also legislated a target of reducing domestic emissions by 80% compared to 2000 levels by 2050. Hence, the City's reduction targets in the 2009 to 2012 Plan are not aligned to the national goal. Furthermore, the use of 1998/99 as a basis for future comparison has no correlation at national level.

### ***The Direct Action Plan***

The Federal Government is currently attempting to repeal the Clean Energy Act. This process is still in its early stages with a White paper released for comment. Consequently, the precise details of the repeal and any alternative scheme are still being defined. However, it is thought the price on carbon will be abolished. Central to any new



legislation will be the creation of an Emissions Reduction Fund. This will be set up by the Government to fund carbon abatement projects.

### ***Impact of the Changes on the City of Armadale***

The evolving regulatory environment has resulted in changes to the City's responsibilities for greenhouse gas accounting, and also challenges the validity of previous targets. The introduction of the NGER Act and CEA, in conjunction with the availability of improved calculation tools prompted a thorough review of the emissions profile. The concept of operational control led to a re-evaluation of emissions reporting requirements for streetlights and the Armadale Landfill and Recycling Facility.

#### ***Streetlights***

The Western Australian Local Government Association (WALGA) performed an assessment on the extent to which streetlights are under the control of local governments. This is reflected via the Operational Control Scorecard Assessment contained in Appendix 2. The conclusion of this review is that Western Power has operational control. Consequently, streetlights are no longer considered part of the City's carbon footprint.

Hence, the City has ceased accounting for streetlight emissions.

#### ***Landfill Site***

Previously, the City only accounted for corporate waste deposited at the tip, but not waste sourced from elsewhere. The rationale was that control is not exercised over individual households and other users of the tip. Hence, the emissions associated with Municipal Solid Waste (MSW) and other sources not related to Council operations were not quantified. However, given that the City exercises operational control over the landfill site, the carbon footprint of all waste deposited at the site must be accounted for. This is contrary to the strategy adopted in the 2009 to 2012 Plan that reflected legislation in force at the time.

#### ***The Carbon Price***

The most significant impact on the City is accounting for all waste emissions at the tip. This means that the City breaches the facility threshold in the NGER and Clean Energy Acts. Here, the price on carbon becomes payable for emissions on waste deposited after 1<sup>st</sup> July 2012. For example, in the financial year 2014/15 the liability will be circa \$70k. In the absence of abatement activities at the tip, this may continue to rise year on year. Consequently, the City has sought to introduce a flaring system at the tip with the objectives of reducing carbon emissions, avoiding a carbon price liability and creating carbon credits under the Carbon Credits (Carbon Farming Initiative) Regulations 2011.

### ***Relevance of Targets***

The City has targets to reduce emissions relative to 1998/99, 1999/00 and 2006/07 levels by 2022, 2006/07 and 2050 respectively. These are not aligned to current national targets. For example, the national target employs 2020 relative to 2000 (rather than 2022 and 1998/99). In addition, the target for 2050 relative to 2000 is 80%, rather than the City's 60%. There has never been a national target using 2006/07 as a base year.

It follows that it is prudent for the City to have some consistency with the above national and international commitments. The rationale for the City adopting these targets is that the Federal Government will provide incentives to enable the achievement of national goals. In this respect, business cases for adopting alternative technologies will become attractive and enable the City to reduce emissions.

The above revision in the targets means that using 1998/99 as a baseline year is no longer valid. Although emission reductions relative to 2006/07 (due to be achieved in 2012) bear no resemblance to national targets, an assessment has been performed on the extent to which they have been achieved.

## Appendix 2: Operational Control Scorecard for Streetlights

	Policy	Policy Score (0-30)	LGA	Western Power
Operating Policies	Responsibility for provision of lighting services (ERA governed)	20	20	0
	Authority to commission lighting	30	0	30
	Specification of road type (and therefore lighting requirements)	20	20	0
	Design of lighting	30	30	0
	Approval of lighting design	30	30	0
	Establishment of lighting options	20	20	0
	Lamp selection	30	20	10
	Luminaire selection	30	20	10
	Pole selection	10	20	10
	Installation of lighting	30	15	15
	Establishment of operating hours	30	NA	NA
	Meeting operation hours	30	NA	NA
	Responsibility for paying electricity bills	30	30	0
	Establishment of maintenance schedule	30	0	30
	Maintenance of luminaires	30	0	30
	Replacement of lamps	30	0	30
<b>TOTAL</b>	<b>430</b>	<b>225</b>	<b>165</b>	
Environment Policies	Efficiency of lighting	20	20	0
	GreenPower purchase	10	20	0
	Environment management system (e.g. ISO14001)	30	15	15
	<b>TOTAL</b>	<b>60</b>	<b>55</b>	<b>15</b>
OH&S Policies	Provision of safety equipment	20	0	20
	Establishment of personnel safety requirements during installation	20	10	10
	Implementation of personnel safety requirements during installation	20	10	10
	Establishment of personnel safety requirements during maintenance	20	0	20
	Implementation of personnel safety requirements during maintenance	20	0	20
	Road traffic safety	30	15	15
	Safe globe disposal	30	0	30
	OHS Systems & Processes	30	0	30
<b>TOTAL</b>	<b>190</b>	<b>35</b>	<b>155</b>	
<b>OPERATIONAL CONTROL TOTAL</b>		<b>680</b>	<b>315</b>	<b>335</b>

**Appendix 3: 1999/00 Restated Emissions**

<b><i>RESTATED</i> Corporate Greenhouse Gas Emissions 1999/00 – tCO<sub>2</sub>-e</b>					
<b>Buildings</b>	<b>Vehicle Fleet</b>	<b>Streetlights</b>	<b>Water/Sewage</b>	<b>Waste</b>	<b>Total</b>
1,884	942	Nil	100	16,052	<b>18,978</b>
<i>10%</i>	<i>5%</i>	<i>0%</i>	<i>0%</i>	<i>85%</i>	

#### Appendix 4: 2012/13 Emissions

<b>Armadale Corporate Greenhouse Gas Emissions 2012/13 – tCO<sub>2</sub>-e</b>				
<b>Buildings</b>	<b>Vehicle Fleet</b>	<b>Water/Sewage</b>	<b>Waste</b>	<b>Total</b>
2,569	1,284	136	30,322	<b>34,311</b>

**Appendix 5: Progress - Non-Key Actions of the 2009 to 2012 Plan**

	<b>Action</b>	<b>Responsible Officer</b>	<b>Status</b>
5.	Develop a building maintenance policy that emphasises energy efficiency.	Manager Property Services	Not completed. Will be pursued in the 2014/15 to 2019/20 Plan.
6.	Develop and implement a policy which ensures energy efficiency is a priority consideration in tenders for all new council buildings.	Manager Property Services	Not completed. Will be pursued in the 2014/15 to 2019/20 Plan.
11.	Establish and maintain an energy recording and reporting process to facilitate policy decisions and evaluation.	Fleet Manager	Completed. The WALGA platform has been introduced and includes details of energy/fossil fuel usage across City areas.
12.	Investigate alternative fuel sources and include efficiency considerations in all tender options.	Fleet Manager	Further work required in relation to investigation of fuel sources – included as a recommendation for the next five years.
13.	Increase flexibility in salary packages where new options potentially reduce greenhouse gas emissions.	Human Resources	Not pursued
14.	Use the Green Vehicle Guide to facilitate appropriate vehicle acquisition.	Fleet Manager	Completed, but using the online tool for fleet management on the IPWEA website. CO <sub>2</sub> emissions form part of the procurement criteria, in conjunction with other factors (e.g. resale value).

	<b>Action</b>	<b>Responsible Officer</b>	<b>Status</b>
15.	Implement staff education and training to ensure waste minimisation and recycling takes place at Council facilities.	CCP Project Officer / Coordinator Waste Services	Completed. The <i>'Switched on Staff'</i> initiative was delivered at the City of Armadale and covered recycling initiatives. Included the implementation of under desk recycling bin in Admin Centre and some out stations
16.	Implement and review the Greenhouse Purchasing Action Plan.	Environmental Officer	Not completed. There are 29 actions in the Greenhouse Purchasing Action Plan with inadequate resources to bring to completion. Alternative approach has been taken to educate staff through the <i>'Switched on Staff project'</i> , with resources also allocated towards completion of the landfill flaring project (greater ability to impact City emissions figures).
17.	Deposit seed funds in the Revolving Energy Fund and utilise the fund.	Environmental Coordinator	Completed. \$100k deposited into the REF and has been used towards lighting retrofits.
18.	Prepare a Procurement of Goods and Services Policy that	Environmental Coordinator /	Completed. Recommendation

	<b>Action</b>	<b>Responsible Officer</b>	<b>Status</b>
	defines sustainable procurement and ensures purchasing considers the environmental impact of the procurement process across the life cycle of the goods and services.	Manager Governance and Administration / Coordinator Waste Services	reflected in full within Policy ADM19 <i>'Procurement of Goods and Services'</i> and supporting management practice.
19.	Monitor Climate Change Adaption Strategies for their relevance to the City of Armadale and pursue funding and other opportunities to undertake climate change adaption planning within the City.	Environmental Coordinator	In progress. Climate Change Adaptation Plan is in draft.



## Appendix 6: Waste Statistics 2002/03 to 2011/12

<b>Waste Deposition Statistics 2002/03 to 2006/07</b>						<b>5 year average (and % of waste received)</b>	
<b>Year</b>	<b>2002/03</b>	<b>2003/04</b>	<b>2004/05</b>	<b>2005/06</b>	<b>2006/07</b>		
Waste Received (excl final cover)	<b>47,480</b>	<b>46,702</b>	<b>40,692</b>	<b>43,491</b>	<b>51,110</b>	<b>45,895 (100%)</b>	
Green Waste Recycled	(5,177)	(4,242)	(5,057)	(6,015)	(6,110)	<b>(5,320) (12%)</b>	
Segregated Construction Waste	(1,667)	(2,667)	(1,061)	(1,543)	(995)	<b>(1,586) (3%)</b>	
Deposited in Tip	<b>40,636</b>	<b>39,793</b>	<b>34,574</b>	<b>35,933</b>	<b>44,005</b>	<b>38,988 (85%)</b>	
Population						<b>57,735</b>	
Per Capita Waste Deposition						<b>0.76</b>	

‘Deposited in Tip’ figures can be analysed as follows:

<b>Year</b>	<b>2002/03</b>	<b>2003/04</b>	<b>2004/05</b>	<b>2005/06</b>	<b>2006/07</b>
Deposited in Tip (see above)	<b>40,636</b>	<b>39,793</b>	<b>34,574</b>	<b>35,933</b>	<b>44,005</b>
Municipal Solid Waste	24,075	24,057	24,053	23,605	24,153
Commercial and Industrial	8,017	7,417	4,172	5,070	9,385
Construction and Demolition	8,545	8,319	6,350	7,258	10,467

**Appendix 6 (continued): Waste Statistics 2002/03 to 2011/12**

<b>Waste Deposition Statistics 2007/08 to 2011/12</b>						<b>5 year average (and % of waste received)</b>
<b>Year</b>	<b>2007/08</b>	<b>2008/09</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	
Waste Received (excl final cover)	<b>44,457</b>	No data for 2008/09	<b>48,150</b>	<b>49,144</b>	<b>50,748</b>	<b>48,124 (100%)</b>
Green Waste Recycled	(6,233)		(8,741)	(8,397)	(9,655)	<b>(8,257) (17%)</b>
Segregated Construction Waste	(8,459)		(1,134)	(985)	(721)	<b>(2,825) (6%)</b>
Deposited in Tip	<b>29,765</b>	<b>36,269</b>	<b>38,274</b>	<b>39,762</b>	<b>40,372</b>	<b>36,888 (77%)</b>
Population						<b>69,260</b>
Per Capita Waste Deposition						<b>0.58</b>

‘Deposited in Tip’ figures can be analysed as follows:

<b>Year</b>	<b>2007/08</b>	<b>2008/09</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>
Deposited in Tip (see above)	<b>29,765</b>	<b>36,269</b>	<b>38,274</b>	<b>39,762</b>	<b>40,372</b>
Municipal Solid Waste	27,016	No data for 2008/09	25,344	25,996	26,170
Commercial and Industrial	2,895		3,673	4,248	4,172
Construction and Demolition	7,202		9,257	9,515	10,032

The ‘Deposited in Tip’ figure for **2012/13** is 44,142t. This can be calculated as  $44,142/71,238 = \mathbf{0.62t \text{ per capita}}$

## Appendix 7: National Emissions Per Capita Calculations

<b>Year</b>	<b>Australian Emissions MtCO<sub>2</sub>-e</b>	<b>Actual/Projected Population</b>	<b>Per Capita Emissions tCO<sub>2</sub>-e</b>
<b>2000</b>	586	19m	<b>30.8</b>

Projected Population of Australia in 2020: 26m.

Projected BAU Emissions of Australia in 2020 = 685MtCO<sub>2</sub>-e. This equates to 685 MtCO<sub>2</sub>-e /26m = 26.3MtCO<sub>2</sub>-e per capita in 2020.

2020 Target Emissions 95% of 2000 levels: 95% x 586 = 557 MtCO<sub>2</sub>-e. This equates to 557 MtCO<sub>2</sub>-e /26m = 21.4MtCO<sub>2</sub>-e per capita in 2020.

Difference per capita between abated and unabated emissions: (26.3-21.4)/26.3 x 100 = 19%

All figures from [http://www.environment.gov.au/system/files/resources/51b72a94-7c7a-48c4-887a-02c7b7d2bd4c/files/abatment-task-summary-report\\_1.pdf](http://www.environment.gov.au/system/files/resources/51b72a94-7c7a-48c4-887a-02c7b7d2bd4c/files/abatment-task-summary-report_1.pdf)

**Appendix 8: Analysis of Forecast Waste Emissions by Legacy and Non-Legacy Waste Sources**

<b>Year</b>	<b>Total Emissions tCO<sub>2</sub>-e</b>	<b>Legacy Emissions tCO<sub>2</sub>-e</b>	<b>Non Legacy Emissions tCO<sub>2</sub>-e</b>
2014/15	32,117	27,362	4,755
2015/16	32,655	25,997	6,659
2016/17	33,275	24,703	8,573
2017/18	33,975	23,476	10,499
2018/19	35,219	22,314	12,906
2019/20	36,529	21,211	15,318
2020/21	37,907	20,166	17,740