



# Climate Change Strategy

October 2010

A pathway for Mitigation and Adaptation

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# 1 Executive Summary

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This Climate Change Strategy 2010 (Strategy) frames Western Water's response to climate change. It encompasses our progress and plans in:

- Climate change mitigation – our contribution to reducing the greenhouse gas emissions that are causing climate change, and
- Climate change adaptation – how we are preparing for the impacts on our business, and our customers, of changes in the climate that have already commenced.

This Strategy recognises that climate change is not just an environmental issue – it is a business one as well. This revised Strategy builds on our Greenhouse Gas Reduction Strategy 2007, which set Western Water on a pathway to achieving zero net greenhouse gas emissions by 2017/18. We have already achieved over a 30% percent reduction in our net emissions against the base line year of 2004/05. We remain committed to continued net reductions in our carbon footprint, despite the need to service a rapidly growing population.

The 2007 Strategy was written at a time when the world appeared to be heading towards agreement on global greenhouse gas emissions targets. Since then, global action has stalled. Scientists say that some climate change is now inevitable. In south-eastern Australia, we can expect higher temperatures, lower rainfall and more extreme weather events.

This revised Strategy therefore recognises that we have to adapt to the reality of climate change, as well as reducing our net greenhouse gas emissions. The impacts of climate change will include lower inflows into our reservoirs, poorer water quality in our catchments, higher peak flows of stormwater, higher risks of heat-related asset failures and higher energy costs.

We face major uncertainties in planning how to manage those impacts. There is no way to predict exactly how much temperatures will rise and when, precisely how much water will flow into our reservoirs and what the scale and timing of extreme weather events will be.

This means we need new tools that allow us to make decisions that will assist across a wide range of possible outcomes, rather than deliver an optimum result for just one outcome. These tools are key parts of our risk based Adaptation Framework and response.

The revised Strategy maintains the existing target of net zero emissions by 2017/18, but also incorporates an eight step process to develop our adaptation program. It also provides an Adaptation Roadmap that illustrates how the process will be implemented.

Future progress will depend not just on our actions in managing the business. It will also depend on how well we work with other Government authorities and the community. Without community involvement and support, adaptation cannot be successful.

Western Water is committed to reducing our carbon footprint and adapting to climate change in a way that is socially, environmentally and economically sustainable. Four key areas of focus in our adaptation response are; Capacity to Adapt; Building Resilience; Managing Climate Change related Risks; and Using Robust Decision Making Processes.

The revised Strategy is consistent with, or exceeds, the new Victorian Climate Change White Paper. Progress against the Strategy will be updated monthly in the Balanced Scorecard and annually to the Board and Community via the Annual Report.

The 2010 Climate Change Strategy actions in progress and planned, are expected to progress Western Water to achieve Milestone 2, that is a 50% reduction in net emissions by 2012/13 with the ultimate goal of net zero emissions by 2017/18. A key risk beyond Milestone 2 is community support for investment in further mitigation actions into the next Water Plan 2013-2018. ESC acceptance of investment projects will require such community support for inclusion in future pricing and tariff proposals.

The Strategy should again be reviewed at Milestone 2 (2012/13) or earlier in the event that the Commonwealth introduces a national emissions trading scheme, or a price on carbon.

## 2 Introduction

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Western Water responded to the threat of climate change in 2007 with the Greenhouse Gas Reduction Strategy. At the time, the world appeared to be heading towards international agreement on greenhouse gas emission reduction targets. The 2007 Strategy was designed to contribute to those reductions and was focused on reducing our carbon footprint. We have been successful in cutting our emissions by over 30%, although there is more to be done.

In the past year, global action on greenhouse gas emissions has stalled. The weight of scientific evidence is that some climate change is inevitable. Higher global temperatures and an increase in extreme weather events are being experienced, even if we could stop all greenhouse gas emissions today. Australia is likely to be severely affected, as will Western Water and the communities it serves.

Western Water's Vision is "To be a leading service provider working with our community towards a sustainable future". We therefore have a responsibility to:

- Mitigate our greenhouse gas emissions to reduce our contribution to climate change; and
- Adapt to the reality of its impacts on our operations and our customers.

This Strategy is our response to that responsibility. It aims to best position Western Water in terms of both mitigation and adaptation.

To be effective, mitigation has to be addressed at the global level. The impacts of climate change however will differ from region to region and locality to locality. Adaptation is therefore addressed at a local level. Given the failure of the international community to reach meaningful mitigation commitments, Western Water must place an increased emphasis on adaptation. This is because the less mitigation action taken globally, the more adaptation will be required locally to counter increased impacts.

Western Water must operate within Victorian Government Policy and Legislation. All our actions must be consistent with the Statement of Obligations. When actions have cost or pricing implications, they must be consistent with the determinations of the Essential Services Commission (ESC) under the terms of the Water Industry Regulatory Order 2003.

In effect, we have to deliver value to customers through innovation and rigorous planning and management and through prudent investment and efficient operations. These obligations are central to the development and implementation of this Strategy.

The Strategy therefore focuses on:

- Mitigation - investments that reduce our exposure to long-term carbon price risks by reducing the energy and emissions intensity of the services we offer.
- Adaptation - projects that minimise or remove unacceptable risks to water security (including price) and the long-term security of our operations and assets in the context of an operating environment impacted by climate change.

## 3 Western Water's Exposure

### 3.1 Climate impacts

South-eastern Australia faces a combination of higher temperatures, lower rainfall, more extreme weather events and more bushfires as a result of climate change. This creates a range of challenges including:

- Lower inflows into our reservoirs
- Increased customer demand for water – consumption rises in higher temperatures
- Deterioration in catchment water quality as a result of lower inflows
- Higher peaks flows of stormwater potentially entering sewerage systems
- Higher risk of heat and storm related asset and power failures.

Importantly, climate change is not expected to be smooth or linear, rather it will be characterised by abrupt changes and extreme events, which are hard to predict or manage. These challenges will require a different approach to water supply planning.

All these issues have implications for service delivery, including water distribution, maintaining water quality, water treatment, recycling water, water storage, sewage collection, along with general asset management and maintaining good customer relationships.

Climate Change, however, presents us with a new set of issues in managing uncertainty. For example, scientists are predicting higher temperatures and rises in sea level – but they cannot tell us how great the changes will be or when they will happen.

There is growing awareness that better climate modelling will not reduce all the uncertainty surrounding future climate impacts for decision-makers, as the results are based on a wide set of scenario assumptions and produce far too great a range of possible impacts.

The breadth of possible climate futures for Sunbury is illustrated in Table 1 below as an example. The projections are from the outcomes of two separate emissions scenarios run through two separate climate models.

*Table 1: Range of percentage changes in total rainfall (%) against 1990 base year for Sunbury*

Range (Models)	2020 (CSIRO)	2020 (UKMO)	2030 (CSIRO)	2030 (UKMO)	2050 (CSIRO)	2050 (UKMO)
Low (Best Case)	-1.5	-1.9	-2.0	-2.5	-3.1	-3.7
High - (Worst Case)	-7.7	-2.6	-11.5	-4.3	-26.1	-8.9

### 3.2 Interaction between population growth and climate change impacts

Western Water serves one of the fastest growing residential regions in Victoria with an annual average growth rate exceeding three percent. This growth is set to accelerate, primarily in and around the existing large towns of Sunbury and Melton.

The combination of climate change and rapid growth creates complex challenges. We have already had some experience of what that will be like with the population growth and drought of the past decade. We have had to respond to a number of critical challenges including:

- A reduction in water usage income.
- Increased costs for bulk water purchases from external sources
- A strong emphasis on promoting community conservation and awareness programs.
- A need to impose restrictions to limit water supply to customers.
- Asset failures such as sewer blockages, burst water mains and sewer corrosion.
- Facilitate access to alternative resources.

The Strategy is based on current Corporate Plan predictions for water usage, high growth and reducing restriction levels. These current predictions lead to further increases in our emissions profile as shown in section 8.

## 4 Mitigation

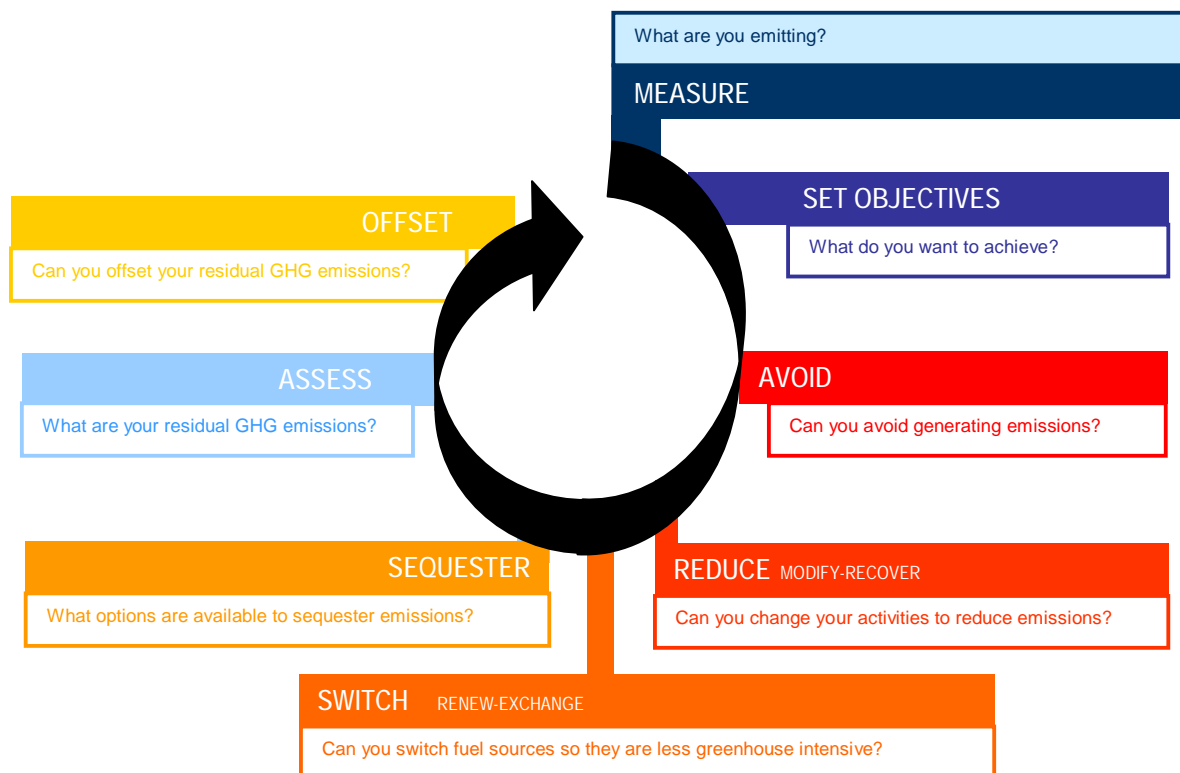
### 4.1 Actions to date

In 2007, Western Water’s Greenhouse Gas Reduction Strategy set an aspirational target of zero net carbon emissions by 2017/18. The Strategy continues to commit the business to the same milestones from a base line year of 2004/05 for which 30,434 tCO<sub>2</sub>e of emissions were reported:

- Milestone 1: Reduce Net Greenhouse Gas Emissions by 25% in 2008/09
- Milestone 2: Reduce Net Greenhouse Gas Emissions by 50% in 2012/13
- Milestone 3: Reduce Net Greenhouse Gas Emissions by 75% in 2014/15
- Milestone 4: Reduce Net Greenhouse Gas Emissions by 100% in 2017/18.

Western Water is tracking well against these milestones however the 2008/09 milestone was not achieved due to additional emissions generated from Emergency Bulk Water Transfers to third parties. An approval from the Board has accounted for this increase with an adjustment to the 2009/10 and 2010/11 targets. Western Water is currently progressing towards Milestone 2 with net greenhouse gas emissions reduced in aggregate by 31% in 2009/10.

To guide action planning and investment decisions, Western Water has adopted a carbon management model adapted from EPA Victoria’s Carbon Management Principles. The diagram below represents a continuous improvement model to ensure new practices and technologies are captured as they emerge over time. The diagram reflects the prioritisation of emissions reduction ahead of the purchase of offsets.



Implementation of the revised Strategy Actions, should progress Western Water towards meeting the 2012/13 Milestone 2 of a 50% reduction. Further reviews of the Strategy will be required to deliver the aspirational goal of zero net emissions by 2017/18.

Our emissions mitigation program has been overseen by Western Water's Environment Committee, and has drawn on ideas generated by employees through the Green Ideas Program and Workshops.

The reductions have been achieved through a range of initiatives including:

- Energy efficiency audits and retrofits at depots and offices
- Improving pumping efficiencies along water and sewerage pipelines by converting to gravity systems
- Installation of biodiesel facilities to use as a substitute to diesel for use by outdoor fleet vehicles
- Investing in technologies such as cogeneration and solar power
- Purchase of Green Power and other offsets.

It is estimated that approximately 1 tCO<sub>2</sub>-e is generated for every megalitre of water supplied. A further estimated 2 tCO<sub>2</sub>-e is generated for every megalitre of sewage treated. Over the last three years, total bulk drinking water demand and sewage inflows into Western Water's water recycling facilities have remained relatively stable while regional population growth has increased due primarily to customer conservation efforts and the introduction of water restrictions.

There is still considerable uncertainty associated with future carbon regulation in Australia. However, any future emissions trading or mandatory renewable energy targets will have an impact due to the energy dependence of our operations and our broader exposure to a carbon price. Without future efficiency improvements a \$10/tCO<sub>2</sub>e emission permit price equates to an estimated increase in our electricity costs of \$200k (under a full pass-through scenario, based on 2008/09 consumption).

Although carbon reporting and reductions are yet to be made mandatory, it is prudent to track and quantify our greenhouse gas emissions and the associated carbon cost of our activities, and then implement appropriate mitigation actions. This will assist us to keep our energy costs lower in the future, easing pressure to increase future water prices for our customers.

## 4.2 Future actions

Western Water will continue to mitigate its greenhouse gas emissions in line with the milestones established in the 2007 strategy. We have developed a preliminary list of potential projects to further cut emissions. In considering these, Western Water will target projects that reduce our exposure to long-term carbon price risks by reducing the energy and emissions intensity of our operations.

Future emissions mitigation projects include:

- Installation of new energy efficient aerators at the Sunbury and Melton Recycled Water Plants. This project is due for completion before the end of 2011.
- Installation of a belt filter press biosolids dewatering facility at the Sunbury Recycled Water Plant to cater for an increased capacity whilst generating fewer greenhouse gas emissions. This project is due for completion in November 2010.

- Installation of a new biodiesel filling station located at the Sunbury Depot and Recycled Water Plant for diesel outdoor fleet and off-road machinery to utilise as an alternative low-carbon emitting fuel. This project is due for completion in December 2010.
- Implementation of energy efficiency measures at remaining site offices and outdoor facilities. This project is ongoing.
- Construct a groundwater bore to supplement the Romsey Township with a local water supply. This project will largely replace the need to pump water from the Melbourne system and is due for completion in September 2011.
- Influence water consumption patterns and raise community awareness of the energy intensity of water supply through participation in the Energy Saver Incentive Scheme (Victorian Energy Efficiency Target – VEET) through the WaterTight Program. This project is ongoing.
- Conduct a feasibility assessment for wind power generation. The investigation is due for completion in October 2010.

For a summary list of all proposed mitigation actions, refer Appendix 3.

## 5 ADAPTATION

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### 5.1 Actions to date

Western Water's actions to date have focussed on ensuring we have access to alternative sources of water to supplement the water available from our own reservoirs to increase the resilience of our water supply. This has involved considerable investment in upgrading water supply, sewerage and recycled water systems and assets. Such work has included:

- Building pipelines from Melbourne to provide greater water security and improving interconnections to the Melbourne system that is planned to be supplemented by the Wonthaggi desalination plant by the end of 2011. The desalination plant will provide further water security with greater access to "climate independent" drinking water for a growing population
- Increasing storage and supply capacity of recycled water facilities. In 2009/10, Western Water recycled 85% of its water. This led to the replacement of 1,528 million litres of drinking water with recycled water where it was fit for the purpose.
- Water Sensitive Urban Designing (WSUD) and third pipe recycled water supply in large scale residential developments to provide drinking water alternatives.
- Providing community education for water conservation and efficiency, water recycling and cleaner production.
- Planning for Integrated Water Management in new growth areas.

### 5.2 Future actions

The development of Western Water's climate change adaptation program represents a challenge for the business. We have to plan for a future which is uncertain. In fact, adaptation can be defined as risk management under uncertainty.

As Section 3 of this Strategy illustrates, there is a very wide range of possible climate impacts in the areas in and around Melbourne that we serve.

We do not know exactly how much temperature in those areas will increase, when they will increase, how much water inflows will be reduced, and when. We also do not know what the scale and nature of future extreme weather events will be.

The traditional planning and decision making tools that we have used will not work for us in dealing with this uncertainty. Those traditional tools work best when there is only one or a few possible different scenarios to plan for, and when the differences between competing scenarios are relatively small.

This means we need to develop new tools that allow us to make robust decisions – that is decisions which will work across a wide range of possible outcomes. It also means that we will have to be ready to change our strategies and plans quickly as events unfold. This will require us to work closely with the community and other Government organisations. For example, if the federal government introduces a national emissions trading scheme or price on carbon, this Strategy will need to be further revised.

For further details on planning for uncertainty and robust decision making, please see Appendix 1.

The planning, implementation and review of an adaptation program proposed is an eight step process, illustrated below:



Western Water is developing a series of initiatives as the basis for its climate change adaptation strategy. These initiatives include:

- Undertaking an asset management review to assess and prioritise actions required to make them more resilient in the face of climate change.
- Undertaking a project to identify climate change risks associated with water treatment, maintaining water quality, sewage collection, recycling water and water storage. This project will consider risks posed by a wide range of climate variables. Risks to be explored will include:
  - the impact of extreme wet weather events on capacity to store recycled water
  - technologies and practices for water use efficiency improvement across our service areas
  - continuing to protect key assets from bushfire and undertake further assessments on storm impacts (flash flooding, high winds etc.)
  - the impact of inlet works to treatment plants and risk of grit retrieval systems being overloaded in extended periods of low flows and then extreme flows
  - the impact of altered patterns of sewer flushing and sewer temperature
  - the impact of additional heat on chemicals used in the treatment process, such as sodium hypochlorite, known to degrade faster under hotter conditions. For example, how this impacts treatment plants and booster pump stations
  - assess the capacity of plant processes to cope with higher hydraulic and biological loads.
- Reviewing opportunities to improve security of water supply, including:
  - integrating demand and population growth scenarios into future infrastructure development
  - investing in upgrades and new developments of recycled water facilities to maximise water recycling opportunities
  - establishment and upgrade of pipelines seeking alternative water resources such as stormwater harvesting and recycling and identifying groundwater supplies
  - setting water conservation targets and investing in water conservation programs with customers
  - developing an updated Water Supply-Demand Strategy, Drought Response Plan and Bushfire Preparedness.
  - Updating the current water supply optimisation model to determine preferred sources of drinking water and appropriate restriction levels.

The final step in climate change adaptation involves monitoring and reassessing adaptation actions that have already been implemented. We will consider how effective each action has been in the light of extreme events such as intense flooding rains and higher winds and temperatures.

Western Water's roadmap for implementation of its adaptation strategy is outlined in Appendix 2.

## 6 The future of our climate change approach in the context of Victorian, National and International developments

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Over the last 3 years the development of Victorian, National and International policy, science and direction highlight the likely impact climate change may have for core business operations, future planning and decision making processes.

Western Water's 2010 Strategy has been developed in line with current Victorian, National and International policy and the most up to date climate change science. Nationally, policies are still evolving and debate is anticipated to continue for some time yet, however, the Victorian Climate Change White Paper and Actions proposed are important considerations for this Strategy.

### 6.1 Victorian Climate Change White Paper

In 2007, the Victorian Government released an update of the Our Water Our Future Water Plan, originally published in 2004. The update reinforces the challenges identified in 2004 of securing Victoria's water future in the context of climate change and drought combined with the competing demands of a growing economy and population.

The Victorian Government's Climate Change White Paper provides additional policy impetus to drive the way in which Western Water responds to climate change. The White Paper focuses on three main areas:

- Complementing the Australian Government's proposed Carbon Pollution Reduction Scheme (CPRS) – recent developments at the Commonwealth level have significantly increased the uncertainty around Australia's national policy response to greenhouse gas mitigation
- Taking advantage of the opportunities created by a carbon-constrained economy
- Adapting to the impacts of climate change.

While current projections of unmitigated climate change are concerning for water managers and our general community, a strong global mitigation effort will reduce climate change impacts. However, it is recognised that even with a strong global mitigation effort, climate changes already "in the pipeline" are likely to have a continued adverse effect on our water supplies. Adaptation is now a primary focus of the Victorian Government. Through this Strategy, this shift is being reflected in Western Water's approach to climate change. The release of the White Paper in 2010 provides the formal policy position of the state government.

Victoria has recently passed its *Climate Change Act 2010*. It passes into law a number of the recommendations and actions contained in the Climate Change White Paper, entitled Victoria's Climate Change Action Plan. The Act contains sections relating to both mitigation and adaptation. It sets out an ambitious greenhouse gas emissions target of 20% of 2000 levels by 2020 and calls for a Statewide climate change adaptation plan, which will establish state-wide priorities and strategic responses. It also amends the *Environment Protection Act* to allow greenhouse gases to be regulated as a waste.

This Strategy reflects or exceeds the Victorian Government's increased focus on climate change adaptation, particularly in relation to best practice water management technologies and water efficient practices in order to secure the long-term sustainability of our water supplies.

## 6.2 Climate Change Policy in Australia and Internationally

A three pillars approach to climate change policy has been adopted by the Australian Government:

- Mitigation - to reduce Australia's greenhouse gas emissions.
- Adaptation - to adapt to the climate change we cannot avoid.
- Global Solution - to help shape a collective international response.

### 6.2.1 Carbon Pollution Reduction Scheme

The Australian Government released its White Paper, the Carbon Pollution Reduction Scheme: Australia's Low Pollution Future, in December 2008. The CPRS is a cap-and-trade scheme designed to reduce Australia's greenhouse gas emissions. Under this proposal, every year liable businesses will have to surrender enough permits to meet their emissions liability. For some businesses, it will be cheaper to reduce emissions than to buy and surrender permits, and consequently these businesses will reduce their emissions. Other businesses will find it more expensive to reduce their emissions and will pay for permits instead.

The use of a trading market combined with the initial auctions means that emissions reductions are likely to be achieved at the cheapest and most efficient point. Businesses will also try and "pass through" the costs of their emissions reductions and permit purchases, subsequently making high-emissions products and services more expensive than other available substitutes.

To date, the CPRS has been blocked in the Parliament and is therefore not yet effective. The result of the recent Federal election has increased the uncertainty about the future of greenhouse gas mitigation policy at a national level in Australia.

Western Water's emissions reduction actions will be evaluated from the perspective of good financial management with a focus on "no regrets" actions that increase our energy efficiency and renewable energy generation and prepare us for the potential increases in supply chain input costs that may follow an introduction of a CPRS in the future.

### 6.2.2 National Greenhouse and Energy Reporting System

The Australian Government introduced the National Greenhouse and Energy Reporting System (NGERS) in 2007. NGERS has been designed to underpin the future introduction of an emissions-trading or taxation scheme by setting up the systems and methodologies by which emissions can be accurately calculated and attributed to liable businesses. NGERS is designed to progressively capture more companies through falling reporting thresholds.

Western Water is currently registered for NGERS in a voluntary capacity to ensure transparent and robust carbon footprint calculations. However, falling reporting thresholds combined with expected population growth may result in compulsory reporting requirements for Western Water in the future.

Western Water is currently voluntarily reporting under NGERs, which is beyond best practice for our sector and over and above our regulatory requirements. As a result, Western Water is well placed to satisfy any reporting requirements that NGERs specifies should our involvement in the program become mandatory.

### 6.2.3 Renewable Energy Target

From 1 January 2010, Western Water has been paying an additional, mandatory charge for its electricity consumption. This supplementary cost is designed to reflect the increasing costs of electricity production, bought on by the introduction of additional renewable energy sources (such as wind and hydro). The introduction of these renewable energy sources has been legislated by the introduction of the Federal Government's expanded Renewable Energy Target Scheme (RET), which provides a guaranteed market for additional renewable energy generation of 20% of Australia's generation mix by 2020. Western Water has received communication from its electricity retailer, AGL, outlining the estimated increase in charges that we can expect as a result of the RET in the next three years. These figures are presented in the Table below.

Year	Estimated increase range, \$/MWh	Estimated cost increase range (based on 2009/10 usage)
2010	\$1.00 - \$2.46	2.8% - 3.9%
2011	\$1.40 - \$3.20	3.8% - 6.4%
2012	\$2.00 - \$4.00	5.4% - 9.5%

Increased electricity costs as a result of the RET will combine with increasing utility costs associated with the likely introduction of a price on carbon. This will subsequently raise carbon intensive operational costs and place upward pressure on water prices. Further investment in mitigation actions beyond 2013 are subject to the ESC determination of Western Water's next Water Plan 2013-2018. Community support will be critical to ESC acceptance of additional expenditure on future projects and actions.

### 6.2.4 National Carbon Offset Standard

Western Water set an aspirational target of achieving zero net carbon emissions by 2017-18. The purchase of carbon offsets will play a significant role in achieving this aspirational target in addition to the implementation of greenhouse gas mitigation initiatives.

The Department of Climate Change released a new National Carbon Offset Standard (NCOS) in November 2009. NCOS came into effect in July 2010 and outlines the requirements that organisations must adhere to in order to be able to claim "carbon neutrality". NCOS allows for a reduction in greenhouse gas emissions beyond what will be achieved by the operation of the proposed CPRS. This will require examination of Western Water's carbon aspirations and the kinds of offsets that may be purchased in future.

NCOS provides clear guidance for organisations that seek to become carbon neutral, by stipulating organisational boundaries, emission calculation methodologies and offset mechanisms. Western Water will align its zero net emissions aspirations with NCOS.

### 6.2.5 International Developments

The United Nations Climate Change Conference, the Conference of Parties 15 (COP 15), held in December 2009 in Copenhagen was expected to deliver a detailed agreement to replace the existing Kyoto Protocol, which is due to expire in 2012. The talks fell short of delivering an accord with legally binding emission reduction targets, but did result in the recognition of the need to *'stabilise greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.....that the increase in global temperature should be below 2 degree Celsius'*.

Two Conferences of the Parties are due to be held before the Kyoto Protocol expires, COP 16 in Mexico in 2010 and COP 17 in South Africa in 2011. These may provide more direction in relation to international climate change policy, which will subsequently influence Australia's mitigation response, the likely caps that may be introduced with the CPRS and the speed with which they will be lowered. Such changes to Australian mitigation policy as well as the further development of future international markets for offsets that may be used under NCOS will resolve some of the policy uncertainty under which Western Water currently operates.

In spite of any greenhouse gas emissions reductions that take place now and in the future, our world is already experiencing a level of climatic change based on past emissions. Climate change presents major risks and adaptation challenges to the water sector and recent research and analysis in 2009 indicate future impacts of climate change are likely to have been underestimated, and are projected to be severe. This will include the continuation of the last decade's drying trend in the south-east of Australia.

The Intergovernmental Panel on Climate Change (IPCC) in its Fourth Assessment Report (AR4) released during 2007, advised that the atmospheric carbon dioxide concentration in 2005 (379 parts per million) far exceeded the natural concentration range over the previous 650,000 years (180 to 300 ppm).

The IPCC states that if a carbon dioxide concentration of 450 ppm is reached, an average global temperature increase of 2 degrees above pre-industrial temperatures can be expected. In order to limit atmospheric carbon dioxide concentrations in the atmosphere to 450 ppm, developed countries must reduce their emissions by between 25-40% below 1990 levels by 2020, and by between 80-95% by 2050. COP 15 in December last year resulted in an in principal agreement to limit the rise in global temperatures to below 2 degrees.

Regardless of the outcomes of the national debate on emissions trading and the international agreements following from the most recent international negotiations in Copenhagen, Western Water will plan for the introduction of best practice water management technologies and water efficient practices to minimise future emissions whilst securing the long-term sustainability of the region's water supply.

## 6.3 Australia's Climate Futures

In July 2009, the Australian Government Department of Climate Change (DCC) published a report Climate Change 2009: Faster change and more serious risks. The report emphasised that key adaptation issues relevant to the water sector include the threat of recurring severe droughts, the drying trends in major parts of the country and the likely increase in extreme climatic events like heatwaves, floods and bushfires. Importantly, climate change is not expected to be smooth or linear, rather it will be characterised by abrupt changes and extreme events, which are hard to predict or manage.

The outcomes of COP15 in Copenhagen indicate that, with a global agreement on emissions mitigation some time away, the likelihood of climate change impacts at the more severe end of the scale has increased.

While more fine-scale climate projections are becoming available, the debate in climate adaptation is now shifting away from biophysical impacts, towards broader issues around adaptive capacity, behaviour change and resilience. Climate impacts are combining with other threats, such as population growth and energy security to present more complex problems.

Western Water will again review this Climate Change Strategy at the earlier of achievement of Milestone 2 (2012/13), or immediately upon the introduction by the Commonwealth of a national emissions trading scheme, or price on carbon.

## 7 Western Water's 2009/10 Greenhouse Gas Emissions and Energy Use

### 7.1 Greenhouse Gas Emissions

Western Water's total greenhouse gas emissions for the 2009/10 financial year were 24,286 tonnes CO<sub>2</sub>e. These emissions are displayed in Figure 2 below.

*Figure 2 – Western Water's 2009-10 Greenhouse Gas Emission Profile*

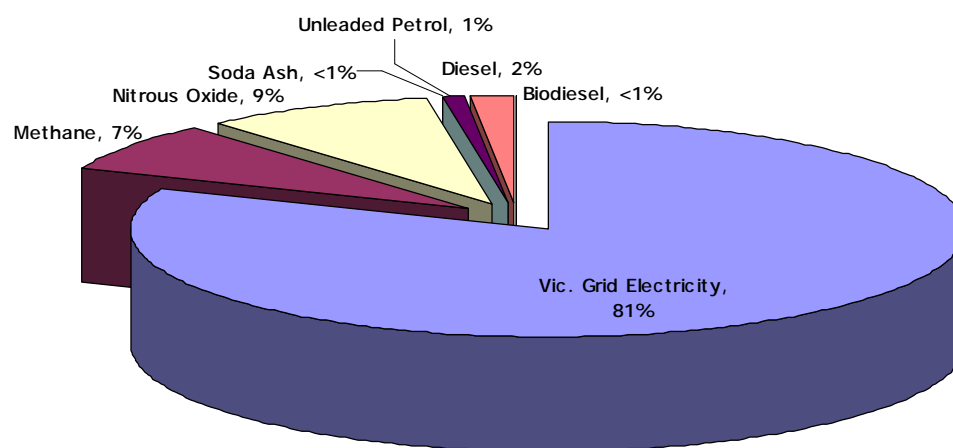


Figure 2 shows that electricity consumption was the largest source of Western Water's greenhouse gases, accounting for 81% of our emissions. Methane and Nitrous Oxide emissions from sewage treatment facilities were the next largest contributors to the organisation emissions profile, accounting for 7% and 9% respectively. Diesel (Transportation and Stationary Energy) added 2%, while Petrol (Transportation and Stationary Energy) added 1%. The consumption of Soda Ash and Biodiesel contributed negligible greenhouse gasses to Western Water's emission profile.

Western Water negated some of these emissions via the purchase of offsets that were generated in China and accredited under the Voluntary Carbon Standard. These offsets, totalling 2,494 tonnes CO<sub>2</sub>e, in addition to the 793 tonnes CO<sub>2</sub>e from the purchase of GreenPower, resulted in net greenhouse gas emissions of 20,999 tonnes CO<sub>2</sub>e for 2009/10.

## 7.2 2009/10 Energy Consumption Profile

Western Water's energy consumption profile is presented in Figure 3 below.

*Figure 3 – Western Water's 2009-10 Energy Consumption Profile*

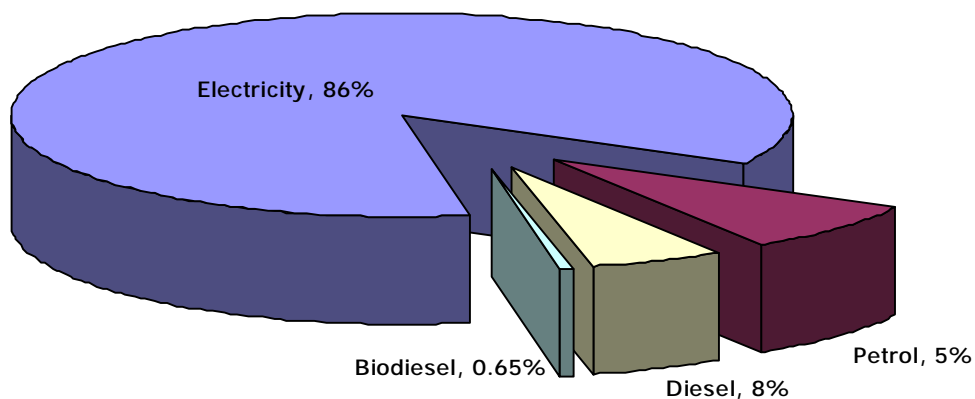
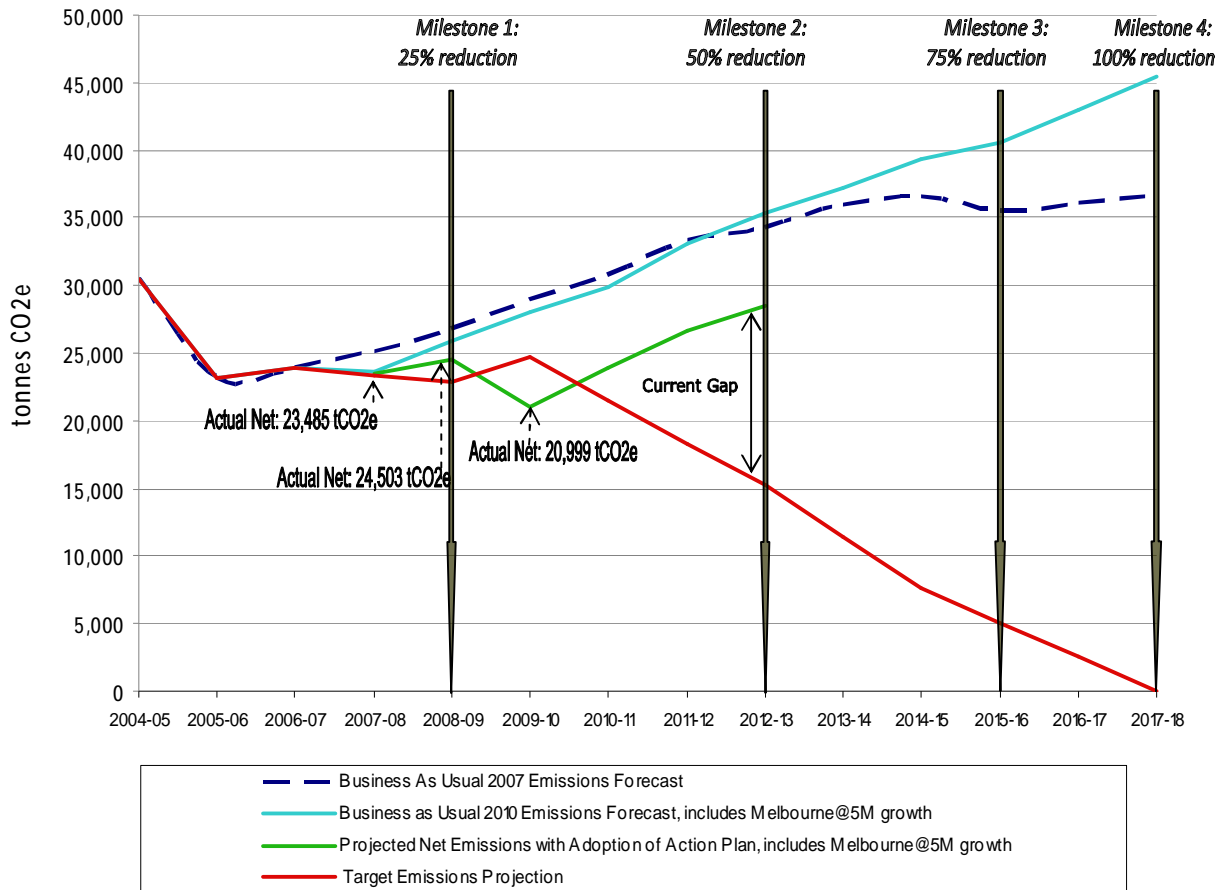


Figure 3 shows that 86% of Western Water's energy consumption is related to its use of electricity. Diesel and Petrol account for 8% and 5% respectively of the organisation's energy consumption, while Biodiesel accounts for 0.65%.

Full impact of major projects recently completed or underway including the Cogeneration Facility, Blamey Drive sewer pump station decommissioning and replacement of blowers at Sunbury and Melton RWPs are yet to be reflected in the charts above.

## 8 Greenhouse Gas Milestones and Targets

Western Water's greenhouse gas reduction achievements to date are outlined below.



The higher growth from Melbourne @ 5 Million has increased the challenge of meeting net zero emissions by 2017/18. The chart above demonstrates the expected impact by 2017/18 of increased emissions without action of almost 10,000 tCO<sub>2</sub>e per year.

As per the original Strategy, a gap exists between planned emissions and milestone targets. This gap is anticipated to be closed as new projects are identified, through GreenPower and offset purchases and as reductions on planned actions are further quantified. Close monitoring of emissions via the monthly Balanced Scorecard will continue.

Milestone targets to meet the aspirational goal of zero net emissions by 2017/18 are outlined in Table 3 below.

Milestone	Target Net Emission	Actual Net Emissions	Variance from Target
Baseline Yr 2004/05	Baseline Emissions = 30,434 tCO <sub>2</sub> e	30,434 tCO <sub>2</sub> e	0%
Tracking 2007/08	23,392 tCO <sub>2</sub> -e	23,485 tCO <sub>2</sub> e	0.4% above target, 93 tCO <sub>2</sub> e
Milestone 1 2008/09	25% reduction = 22,826 tCO <sub>2</sub> e	24,505 tCO <sub>2</sub> e	7.3% above target, 1,679 tCO <sub>2</sub> e
Tracking 2009/10	20,923 tCO <sub>2</sub> e; Adjusted to 24,662 tCO <sub>2</sub> e due to bulk transfers	20,999 tCO <sub>2</sub> e	0.4% above target, 76tCO <sub>2</sub> e; 15% under adjusted target, -3,663 tCO <sub>2</sub> e
Tracking 2010/11	19,021 tCO <sub>2</sub> e; Adjusted to 21,514 tCO <sub>2</sub> e due to bulk transfers	As at September 2010, tracking at 3% above the adjusted target.	
Tracking 2011/12	17,119 tCO <sub>2</sub> e Adjusted to 18,365 tCO <sub>2</sub> e due to bulk transfers		
Milestone 2* 2012/13	50% reduction = 15,217 tCO <sub>2</sub> e		
Milestone 3 2014/15	75% reduction = 7,609 tCO <sub>2</sub> e		
Milestone 4 2017/18	100% reduction = 0 tCO <sub>2</sub> e		

\* Trigger for next review of Strategy subject to earlier introduction by the Commonwealth of a national emissions trading scheme, or a price on carbon.

The original Strategy (with the exception of emissions associated with emergency bulk water transfers to the Bacchus Marsh Irrigation District and local storages) has essentially delivered on the first key Milestone 1, with a 31% reduction in total net emissions by 2009/10.

Successful implementation of this Strategy is expected to progress Western Water towards the goal of net zero emissions by 2017/18, and specifically, achieve the second key Milestone 2 of a 50% reduction by 2012/13.

## Appendix 1: Planning for uncertainty and robust decision making

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Sound adaptation policy is essentially a matter of establishing robust risk management frameworks and decision making processes. Basic information on a given risk, including timing and magnitude, are helpful in exploring our understanding of a risk and how to prioritise it. However, to minimise the chances of flawed risk management, the broader context of a risk must also be investigated.

This includes information relating to, for example, how the risk will interact with other social or economic stressors, current preventative measures that may influence the risk's impact, and Western Water's adaptive capacity in relation to that risk. This more comprehensive understanding is also essential to establishing risk management processes that are robust – an essential characteristic of risk management in the face of deep uncertainty. Robust decisions are those that:

- Remain viable under the widest range of probable climate futures.

*Climate models can tell us which future scenario is most likely, but they cannot guarantee this scenario will eventuate. Unfortunately, traditional decision-making techniques focus on this 'most likely' case. In situations of deep uncertainty, the probability of such a scenario eventuating is small. Planning for that outcome alone can result in making decisions that will prove to be disastrously wrong. A safer option, and one consistent with robust decision making, is to choose actions that remain viable under the widest range of probable climate futures. This minimises the chance of getting the decision wrong and over-, under- or mal-adapting to climate change.*

- Are most insensitive to broken assumptions.

*This is particularly important in the context of deep uncertainty. Where the effectiveness of a solution is less dependent on assumptions relating to a particular future state, that solution is more likely to succeed, given the low probability of any one scenario or assumption proving accurate.*

- Increase flexibility and keep options open

*This is important to ensure Western Water increases its resilience to uncertain climate impacts. Because the exact timing and scale of climate impacts is not known, Western Water needs to build flexibility, redundancy and options to change its approach to climate adaptation into its strategies.*

- Maximise their value when planned as part of a portfolio of actions.

*A sound investor spreads his or her investments across a diversity of industries and companies to protect themselves from unexpected market fluctuations. Sound risk management in the context of climate change requires a similar approach to ensure protection is maintained even if one option fails due to unforeseen circumstances.*

- Build resilience and redundancy into physical, organisational and social systems.

*Resilience is key to maintaining infrastructure, ensuring water security in the context of the deep uncertainty presented by climate futures. Organisational resilience will also be key to continuing Western Water's innovative approach to delivering quality water services in the face of change.*

- Can be implemented within planned budgets or are based on evidence that is good enough to justify budget/revenue increases.

*Western Water's adaptation actions must be consistent with our Statement of Obligations. Where our adaptation actions have cost or pricing implications, they must be consistent with the expectations of the Essential Services Commission (ESC) under the terms of the Water Industry Regulatory Order 2003.*

## Planning well for uncertain climate futures

Broadly speaking, there are two ways to plan well for uncertain climate futures. Each works well for different kinds of risks and asset systems, and produces robust outcomes. Together these two approaches form the ends of a spectrum.

- Resilient strategies are those that are designed to perform well across the widest range of futures, although they will not necessarily be the 'best' strategy for any one possible future. They are suited for decisions involving investments or commitments where a decision now cannot be easily changed in future.
- Adaptive Strategies try to maintain the flexibility to change course as the climate changes and more information becomes available about future climatic conditions. An adaptive strategy actively works to avoid being 'locked-in' to any one way of adapting to climate change. These are best for decisions that do not require major investment or where flexibility can be built-in to a plan from the start.

## Appendix 2: Adaptation Roadmap









# Western Water - Adaptation Roadmap - Page One

	Now-2 years	2-5 years	5-15 years
Identify current and possible future climate changes relevant to Western Water's operations	<ul style="list-style-type: none"> <li>Build stronger links with relevant organisations (such as CSIRO, DSE etc) to ensure access to the most up-to-date information on relevant climate impacts</li> <li>Remain a part of cross-industry initiatives such as the Drought Response Committee</li> <li>Identify sources and organisations from which to obtain additional information on the links and interactions between population growth and climate change, in addition to projections of other relevant social, economic or environmental trends (particularly with reference to uncertainties in these trends)</li> </ul>	<ul style="list-style-type: none"> <li>Review progress and ensure climate change adaptation has been "mainstreamed" across Western Water so that assessment of climate risk is part of all organisational areas</li> <li>Regularly review new climate science and projections of climate change and other trends relevant to Western Water's operations and assets</li> </ul>	<ul style="list-style-type: none"> <li>Continuously monitor and review success of mainstreaming climate change adaptation decision-making across Western Water</li> <li>Continuously monitor and review new climate science and new climate projections</li> </ul>
Identify vulnerabilities and risks to infrastructure, assets and service provision	<ul style="list-style-type: none"> <li>Assess how vulnerable or robust all assets are to climate change impacts and record this information in MARRS, include asset design standards in the review and identify all relevant asset attributes</li> <li>Extend MARRS to include asset information and assessment of robustness to climate change impacts to all Western Water assets (e.g. sewage treatment plants)</li> <li>Identify changes to asset monitoring schedules required to address climate change risks</li> <li>Review the adequacy of Western Water planning and budgeting processes particularly in relation to longer term planning:                             <ul style="list-style-type: none"> <li>(1) to determine whether it is adequate to incorporate climate change concerns</li> <li>(2) to assess Western Water's ability to incorporate climate modelling into strategic planning</li> </ul> </li> <li>Implement community education and outreach to assess concerns and raise awareness of potential impacts of climate change on Western Water's operations.</li> </ul>	<ul style="list-style-type: none"> <li>Establish an Asset Management System that builds upon MARRS and incorporates all Western Water assets</li> <li>Review changes to asset monitoring schedules</li> <li>Review changes to planning and budgeting processes</li> <li>Review community education and outreach program</li> </ul>	<ul style="list-style-type: none"> <li>Conduct 5 yearly reviews of the Asset Management System, and how well it is operating in the context of managing climate risk</li> <li>Evaluate effect of including climate risk and adaptation study in all business cases for new major projects.</li> </ul>
Assess risk of climate change impacts on all infrastructure, assets and elements of service delivery	<ul style="list-style-type: none"> <li>Finalise the current review of Western Water's risk management system, and assess how it would incorporate climate change risks, in particular whether it is consistent with ISO31000 to enable the full range of climate uncertainties to be incorporated;</li> <li>Establish processes to ensure change risk assessments and risk re-evaluations are conducted regularly and on an ongoing basis.</li> </ul>	<ul style="list-style-type: none"> <li>Assess effectiveness of risk management process for identifying climate risk</li> <li>Conduct an internal awareness campaign to inform employees about the climate risk assessment and management process</li> </ul>	
Develop initial adaptation actions (risk treatments) using a risk-based prioritization approach	<ul style="list-style-type: none"> <li>Assess the limits of Western Water's responsibility and ability to adapt - including regulatory limits and internal planning or budgetary limits.</li> <li>Develop processes for linking adaptation actions to specific climate change related risks.</li> <li>Establish processes to assess the adequacy and robustness of proposed adaptation actions.</li> <li>Develop internal guidelines on appropriate assessment of adaptation actions that are consistent with ESC requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Continue researching and investigating alternative water supply sources to limit the dependence on water pumped from Melbourne.</li> <li>Implement changes to asset management cycles identified during risk and vulnerability assessments.</li> <li>Implement relevant adaptation actions identified in years one and two.</li> </ul>	





# Western Water - Adaptation Roadmap - Page Two

	Now-2 years	2-5 years	5-15 years
<p><b>Where appropriate, link adaptation actions to capital and asset management cycles, and service strategies</b></p>	<ul style="list-style-type: none"> <li>Review current documents, processes and strategies (including future water plans) to identify:                             <ol style="list-style-type: none"> <li>possible linkages with climate change adaptation, and</li> <li>opportunities to incorporate adaptation planning and actions into these existing documents;</li> </ol> </li> <li>Link expenditure to risk management potential of adaptation action including impact of uncertainty (i.e. does action deliver robust response to climate risk)</li> <li>Use balanced scorecard to manage links between delivery of adaptation actions and other organisational planning cycles</li> </ul>	<ul style="list-style-type: none"> <li>Review progress and identify any requirements for new financial analysis tools that explicitly incorporate uncertainty.</li> </ul>	<ul style="list-style-type: none"> <li>Continuously monitor and review success of linking adaptation actions and planning to capital and asset management cycles and services strategies.</li> </ul>
		 ONGOING	 ONGOING
<p><b>Identify opportunities for coordination and delivery with other organisations</b></p>	<ul style="list-style-type: none"> <li>For each risk, determine other organisations who might have an interest in monitoring it, or working towards a solution.</li> <li>Continue to form links with appropriate organisations who may have some responsibility for or interest in climate change risks.</li> <li>Hold specific climate change related scenario-based workshops with those organisations to clarify roles and responsibilities.</li> </ul>	<ul style="list-style-type: none"> <li>Review results of coordination and linkage with other organisations.</li> </ul>	<ul style="list-style-type: none"> <li>Conduct 5 yearly reviews of the success of engagement with other organisations.</li> </ul>
		 ONGOING	 ONGOING
<p><b>Prepare adaptation plans and implement adaptation actions</b></p>	<ul style="list-style-type: none"> <li>Prepare adaptation plans and implement adaptation actions using an appropriate project management methodology.</li> <li>Establish internal processes to ensure that new Western Water projects or initiatives do not unnecessarily impinge on adaptation plans or actions.</li> </ul>	<ul style="list-style-type: none"> <li>Assess effectiveness of implementation of adaptation plans</li> <li>Incorporate lessons learnt into future adaptation planning cycles.</li> </ul>	
			 ONGOING
<p><b>Monitor and reassess</b></p>	<ul style="list-style-type: none"> <li>Ensure adaptation plans and implementation processes incorporate appropriate evaluation mechanisms for on-going organisational learning.</li> <li>Establish processes to regularly review, monitor and reassess adaptation actions and plans to determine whether they need to be reinforced, reevaluated or repeated.</li> <li>Evaluate adaptation actions already implemented.</li> </ul>	<ul style="list-style-type: none"> <li>Assess effectiveness of implementation of adaptation plans</li> <li>Incorporate lessons learnt into future adaptation planning cycles.</li> </ul>	
			 ONGOING

## Appendix 3: Summary action plan for future greenhouse gas emissions mitigation projects

Item	Action	Description	Reduction tCO <sub>2</sub> e/yr	Est. \$'000	Responsible Area	Completion Date
1	<b>Melton Biogas Cogeneration Project</b>	<i>Construct a Biogas Cogeneration Facility at Melton Recycled Water Plant utilising methane produced within the anaerobic digester to generate heat and electricity.</i>	1,800	2,100	Capital Investments	Completed. Tracking emissions reductions
2	<b>Sunbury Biosolids Dewatering</b>	<i>Construct a Belt Filter Press Biosolids Dewatering Facility at the Sunbury Recycled Water Plant to cater for an increased capacity whilst reducing greenhouse gas emission.</i>	53	BAU	Capital Investments/ Water Systems	Nov-10
3	<b>Wind Power Generation</b>	<i>Undertake a feasibility assessment for Wind Power Generation at one of Western Water sites including the opportunities and risks for such a facility.</i>	NA	10	Renewable Resources	Nov-10
4	<b>Sunbury Biodiesel Filling Station</b>	<i>Install a biodiesel filling station at the Sunbury Depot and Recycled Water Plants for diesel vehicles to utilise as an alternative fuel.</i>	20	20	Renewable Resources	Dec-10
5	<b>Zero Net Carbon Communications Plan</b>	<i>Update the Zero Net Carbon Communications Plan for internal and external communication and engagement activities and a guide to reduce the Carbon Footprint of Western Water events (including customer surveys to gauge level of understanding and awareness and willingness to pay).</i>	NA	10	Comms & Renewable Resources	Dec-10
6	<b>Green Travel Plan</b>	<i>Develop and implement a Green Travel Plan to reduce greenhouse gas emissions by encouraging public transport use, cycling and walking for commuters and during work hours, teleconferencing and use of alternative fuels.</i>	NA	10	Renewable Resources	Dec-10
7	<b>Rotary Park Sewer Pump Station</b>	<i>Investigate the opportunity to install variable speed drives as part of the upgrade to Rotary Park sewer pump station that will increase capacity whilst reducing greenhouse gas emissions.</i>	11	BAU	Capital Investments	Dec-10
8	<b>Energy Intensity Maps</b>	<i>Develop regional maps that illustrate the energy intensity of different supply and treatment regimes that will enable easier and more informed decision making for planning, future growth and carbon cost to the business.</i>	NA	5	Asset Management	Jan-11
9	<b>Online Energy Performance Monitoring</b>	<i>Develop and implement a plan that identifies key facilities to install online power monitoring and responsible persons to monitor the facilities performance.</i>	NA	10	Asset Management	Mar-11
10	<b>Carbon Off-Set Trading and Investment Guideline</b>	<i>Develop a Carbon Off-Set and Trading Guide to enable best value off-set and trading and investment opportunities for Western Water to move towards its target of Zero</i>	750	10	Renewable Resources	Apr-11

Item	Action	Description	Reduction tCO <sub>2</sub> e/yr	Est. \$'000	Responsible Area	Completion Date
		<i>Net CO<sub>2</sub>e. Purchase and trade offsets or undertake alternative investments according to guideline.</i>				
11	<b>Pump Station Efficiency</b>	<i>Implement energy efficiency measures identified from audit (MWH 2009) of the "Top 11" pumping stations.</i>	127	80	Asset Management	May-11
12	<b>Energy Efficient Aerators</b>	<i>Install energy efficient aerators/blowers at Sunbury and Melton recycled water plants. Audit, investigate and recommend high energy efficiency measures for aeration control at all water and recycled water plants.</i>	1,300	1,730	Capital Investments	June-11
13	<b>Toolern Integrated Water Management Strategy</b>	<i>The Toolern IWM Strategy estimates a 70% reduction in drinking water consumption through mandatory energy efficiency measures, substitution with Class A recycled water, local rainwater and stormwater harvesting and regional stormwater harvesting. Direct reduction in energy intensity for this initiative is relatively small compared to the indirect reduction in total energy consumed and particularly the associated carbon cost of supply from Melbourne Water which is likely to increase significantly once Desalinated Water is available post 2011.</i>	82	BAU	Capital Investments	June-11
14	<b>Zero Net Carbon Procurement Framework</b>	<i>Review design, tendering and purchasing procedures for incorporation of energy efficiency requirements to minimise the carbon impact of new projects and purchases and off-set Scope 1 and 2 emissions from all new, upgraded projects, developer works and purchases (i.e. adopt no net increase in emissions going forward).</i>	NA	5	Renewable Resources/ Capital Investments	June-11
15	<b>Biodiversity Sequestration Program</b>	<i>Establish procedures and calculation methodologies to enable reporting of the amount of carbon sequestered through our Biodiversity Program.</i>	60	10	Water Systems	June-11
16	<b>Research and Development Partnerships</b>	<i>Investigate opportunities to partner in research and development projects through industry forums including research into fugitive emissions associated with biosolids processing and reuse, development of a water industry specific Eco-Footprint and Carbon Cost- Abatement tool.</i>	NA	15	Renewable Resources	Jul-11
17	<b>Sustainable Fleet Procurement</b>	<i>Become an active participant on Sustainability Victoria's working group to investigate and develop a guide for the sustainable procurement of fleet vehicles.</i>	NA	0	Renewable Resources	August-11

Item	Action	Description	Reduction tCO2e/yr	Est. \$'000	Responsible Area	Completion Date
18	Local Water for Romsey	Investigate the opportunity to supply the Romsey Township with a locally sourced water supply. Construct a bore to supplement supply to Romsey.	313	BAU	Capital Investments	Sept-11
19	Algae Cultivation Research at Water Recycling Plants	Investigate the potential to grow and harvest Algae at Water Recycling Plants. The growth of Algae can act as a low energy intensive option to reduce nutrient loads in recycled water, whilst the harvested algae can be converted into biofuels and/or used as feed for bio-digesters.	NA	15	Renewable Resources/ Water Systems	Sept-11
20	Renewable Energy Generation	Undertake a review of renewable energy opportunities for Western Water large/small scale, wind, solar and micro-hydro generation.	NA	30	Renewable Resources	Dec-11
21	Renewable Energy at Bacchus Marsh Recycled Water Plant	Investigate the best opportunity to use renewable energy such as solar or wind at one of Western Waters smaller recycled water plants.	67	50	Water Systems	Dec-11
22	Outdoor Buildings Energy Efficiency	Implement actions as identified from the energy audits for remaining outdoor administration buildings and undertake an energy efficiency review for non-office outdoor facilities	NA	20	Renewable Resources	Jan-12
23	Carbon Investment and Affirmation Action Plan	Undertake community consultation and preparation for investments beyond June 3013 to meet ESC Regulatory requirements for next pricing determination.	NA	BAU	Renewable Resources & Comms	Dec-12
24	Participate in Energy Saver Incentive	Influence water consumption patterns and raise community awareness of the energy intensity of water supply through the Watertight Program and participation in the Energy Saver Incentive Scheme including the creation of Victorian Energy Efficiency Certificates.	13	4	Comms/ Renewable Resources	Ongoing
25	Office Carbon Smart Initiatives	Investigate opportunities for energy efficiency within the office including timers on hot water urns, de-lamping, more efficient computer use (i.e. greater use of lap tops), refrigeration, air conditioning, heating.	NA	10	Environment Committee	Ongoing
26	Greenhouse Case Study Portal	Develop a portal for storing Greenhouse Gas Reduction Initiatives for future reference and development.	NA	0	Renewable Resources	Ongoing

A Marginal Abatement Cost Curve (MACC) is being prepared for Western Water to compare the effectiveness of greenhouse gas abatement projects relative to their costs. This will provide a snap-shot of comparative data required to evaluate options, prioritise actions and make informed abatement investment decisions in pursuit of the aspirational target of zero net emissions by 2017/18.