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Department of the Environment and Heritage
Australian Greenhouse Office

Climate Change Impacts & Risk Management

A Guide for Business and Government

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Department of the Environment and Heritage
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Climate Change Impacts & Risk Management

A Guide for Business and Government

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Department of Environment and Heritage by:
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Minister's Foreword

Climate change is a significant global challenge that requires a strategic approach from both government and private enterprise to ensure our nation's future. Our climate has changed and this will continue as a result of the greenhouse gases already in the atmosphere. In Australia average temperatures have risen by around 0.7°C over the last century, and there has been an average sea-level rise of between 120mm and 160mm. Future climate change could well bring higher temperatures and less rainfall to southern Australia, and more frequent extreme weather events such as storms, heatwaves and drought.

These changes are likely to affect a wide range of human activities and natural ecosystems. Early thinking about how to adapt can put governments, businesses and communities in the very best position to minimise risks from the impacts of climate change.

Australia is fortunate to have an internationally recognised risk management standard that is already widely used by government, business entities, and other organisations. This guidance demonstrates how the standard can be used to systematically manage the risks associated with climate change impacts. A risk management approach enables an organisation to manage adaptation to climate change as one of several risks it may face in the future. This approach ensures that adaptation is 'mainstreamed' as part of normal business operations and integrated with other existing business strategies.

The Government's $14.2 million National Climate Change Adaptation Programme ensures the nation takes early steps to successfully adapt to the unavoidable impacts of climate change. Working in conjunction with this, the Australian Government has a comprehensive climate change strategy, supported by funding of almost $2 billion, to responsibly reduce Australia's greenhouse gas emissions and build an effective global response to climate change.

This publication is complemented by Climate Change Scenarios for Initial Risk Assessment, prepared by the CSIRO for 10 Australian regions, to assist in the risk management process.

I am delighted to recommend this publication to you as a valuable resource to help business, government and the community manage the risks associated with climate change impacts and give strong direction to how we face the challenges of climate change in the years ahead.

Senator the Hon. Ian Campbell
Australian Minister for the Environment and Heritage

CONTENTS

PART A

What This Guide Is About

1. Introduction

A 1.1

1.1 Purpose of this Guide

The global climate is changing, and will continue to change, in ways that affect the planning and day to day operations of businesses, government agencies and other organisations[1]. The manifestations of climate change include higher temperatures, altered rainfall patterns, and more frequent or intense extreme events such as heatwaves, drought, and storms.

This document is a guide to integrating climate change impacts into risk management and other strategic planning activities in Australian public and private sector organisations. The purpose of this Guide is to assist Australian businesses and organisations to adapt to climate change[2].

The Guide is directed to:

- **elected representatives and directors** who wish to ensure their organisations are aware of their risks from climate change impacts and that suitable management responses are put in place;
- **general management** of organisations who need to understand the nature of the risks associated with climate change impacts and to know that these are identified and incorporated into processes for management and strategic planning; and
- **specialist risk managers or external risk experts** who must apply risk management frameworks to ensure their organisations or those they are advising have identified and considered the risks of climate change impacts.

The Guide is consistent with the Australian and New Zealand Standard for Risk Management, AS/NZS 4360:2004, which is widely used in the public and private sectors to guide strategic, operational and other forms of risk management. The Guide describes how the routine application of the Standard can be extended to include the risks generated by climate change impacts.

1 We use the term 'organisation' in this Guide to include public sector agencies, semi-Government businesses, private companies and communities. The general approach to climate change risk management is the same for all kinds of organisations, although there may be differences in detail.

2 It is not concerned with policy and other actions aimed at mitigating the extent or speed of climate change.

1.2 Scope of the Guide

The Guide provides a framework for managing the increased risk to organisations due to climate change impacts. The prime focus of the Guide is on the initial assessment and prioritisation of these risks.

The Guide aims to help businesses and organisations:

- enumerate risks related to climate change impacts;
- prioritise risks that require further attention; and
- establish a process for ensuring that these higher priority risks are managed effectively.

In most instances this initial assessment level of risk appraisal can be undertaken by people with a sound professional knowledge of the relevant organisation, together with a general understanding of the likely directions and magnitudes of climate change.

Climate change scenarios for risk assessment accompany this Guide. These scenarios have been developed by CSIRO for the Australian region using current best understanding of climate change and are designed specifically for use in the process of the initial strategic assessment of risks arising from climate change. The Australian Greenhouse Office will update and extend these scenarios from time to time[3].

The planning horizon suggested for this Guide is, in the first instance, a period of approximately 25 years hence. This coincides with the strategic planning horizon of many organisations and also with the investment period for many long-lived assets. Users of the Guide may however, choose to adopt an even longer-term focus - for example, climate scenarios can be constructed for 50 and even 100 years into the future using information that is easy to access.

The Guide is not intended to address:

- risks associated with 'normal' variable states of climate; nor
- measures and actions aimed at mitigating climate change itself, such as reducing greenhouse emissions or introducing emission trading schemes.

This Guide was developed through a series of case studies with four partner organisations, including a large private company, a public utility, a government agency and a local government. The recommendations in this Guide are based largely on the experience gained through these case studies.

3 Thus, most organisations seeking to apply this Guide to undertake an initial assessment of risks do not need to develop their own climate change scenarios or to draw on external expert support on climate change science.

A 1.3

1.3 Structure of the guide

The Guide is separated into three parts.

Part A describes what the Guide is about. In addition to the items covered in the Introduction, it discusses why there is a need to assess climate change risk (Chapter 2) and the fundamentals of risk assessment and management (Chapter 3).

Part B outlines how to conduct an initial strategic assessment centred on a workshop process. Chapter 4 describes the tasks and necessary steps that must be taken in preparation before the workshop. Chapter 5 describes the workshop process itself and how to effectively identify, analyse and evaluate the risks to the organisation arising from changes in climate. Chapter 6 describes the actions and responses required post-workshop in order to treat the identified risks. It notes that the 'treatment' of risks may involve more detailed analyses of some specific risks.

Part C deals with other considerations. Chapter 7 briefly outlines some of the considerations that arise if a more detailed analysis of some specific risks is required. Chapter 8 sets the risk assessment in the broader context of strategic planning and management, and therefore deals with the wider questions of the preparation, planning and integration of the risk assessment in an organisation's normal processes for planning and management.

A summary checklist of tasks and hints and a glossary of climate change and risk management terms are provided as appendices.

2. Why assess the risks of climate change?

2.1 Climate change and risk[4]

Each year there are climatic events that represent risks to people and organisations. These risks arise from 'normal' day-to-day, seasonal, and year-to-year variability in climate as well as regional climate differences.

Most organisations have practices and strategies in place to deal with this routine climate variability. For these organisations, climate variability will continue to raise challenges and risks that have to be managed.

However, when managing climate variability in the future, organisations cannot simply rely on the assumption that the prevailing climate will be more or less the same as it was over the past 50 or 100 years.

Climate change is likely to invalidate this assumption, with changes in both average conditions and the frequency and severity of extreme climate events. We can expect to live and operate in a climate that is warmer, with different patterns of rainfall, less available moisture retained in the soil and more severe storms – in short, a climate that progressively will become different from the current climate in many ways, albeit with many similar but more acute challenges and risks posed by climate variability.

Climate change is likely to have pervasive affects. These affects will be felt in some way by every person and every organisation, public or private, and at all levels, from strategic management to operational activities. The affects will impact across environmental issues, economic performance, social behaviour, infrastructure and other aspects of human existence. Changes are likely to develop gradually but could be abrupt.

Examples of the risks from climate change that may be faced by Australian organisations or communities are provided in Table 1 (over page).

While experience in dealing with natural climate variability may be valuable in formulating strategies for dealing with climate change, there are important differences. With climate change, the timescale is longer, the affects may be more far reaching and the changes will not go away or be reversed in the foreseeable future.

As climate changes, human behaviour will need to (and will) adapt to accommodate it – that is the natural tendency of people and organisations. Effective adaptation however, requires an awareness of the risks posed by climate change and, importantly, an understanding of the relative significance of those risks. This Guide will assist organisations gain that awareness and understanding.

4 As noted, users of the Guide do not need to have a detailed understanding of the science of climate change to undertake the risk assessment process described in this Guide. Nevertheless, users may wish to refer to more detailed information on the science and impacts of climate change. Information can be obtained from a number of sources including the Australian Greenhouse Office website, which lists numerous publications relating to climate change science, impacts and adaptation in Australia. See **http://www.greenhouse.gov.au/science/index.html**.

A 2.2

Table 1: Examples – risks arising from climate change

1.	For urban planners, more frequent heatwaves may increase the stress on emergency services and hospitals while more intense storms and rising sea levels may increase the vulnerability of coastal housing and infrastructure.
2.	For the electricity sector, an increase in the number of days over 35°C and over 40°C would further stimulate air-conditioning demand. Increased peak demands on generation and distribution systems will challenge system reliability. Since investment needs are strongly driven by peak demand rather than by average levels of consumption, the per unit cost of electricity can be expected to increase in response to the increased peak demand.
3.	For Australian agriculture, increases in temperature and net reductions in average rainfall across Southern and Eastern Australia could make drought sequences more common, while the impact of increased temperatures would make them more damaging to plant and livestock viability and production. To the extent that these increases in drought frequency or severity result from continental impacts, then drought management based on shipping livestock and fodder between areas of localised drought may not be possible.
4.	For local government, climate change may affect the economic base of the local region, for instance, by reducing the viability of pasture growth and therefore carrying capacity or perhaps causing the southward spread of pests and diseases previously limited to tropical areas. Climate change may also create new demands for services, for instance, due to more frequent heatwave conditions. Thus, some local governments may be faced with a reduced ability to raise income accompanied by increased demands for services, ranging from geriatric care to emergency services.

2.2 Major aspects of climate change

There is strong and increasing scientific consensus that the global climate is changing. In 2001, the Intergovernmental Panel on Climate Change (Houghton et al. 2001), acknowledged as the most authoritative analysis of information on climate change, concluded that:

- the present global climate is significantly warmer than at the beginning of the 20th Century, with global temperatures having increased by around 0.6°C;
- it is likely that 1990-1999 was the warmest decade in the last 1,000 years, at least in the Northern Hemisphere;
- most of the observed warming in the last 50 years is attributable to human activities – notably the release of greenhouse gases, such as carbon dioxide, methane and nitrous oxide, into the atmosphere; and
- due to the long atmospheric lifetime of major greenhouse gases and time lags in the ocean-atmosphere system, climate change will continue for decades or even centuries to come, even if large scale action to mitigate greenhouse gases was taken in the near future.

Scientific information compiled since 2001 confirms and strengthens the conclusions of the IPCC assessment and earlier assessments by the CSIRO. Global temperatures, for example, have increased by around 0.4°C since 1990 and 2005 was the hottest year on record for Australia.

2.2.1 Temperature and sea level

The IPCC (Houghton et al. 2001) projected additional global warming of 1.4 to 5.8°C by 2100 relative to 1990[5]. It also projected sea level rise of 9 to 88 cm by 2100, due mainly to thermal expansion of sea water but also from some melting of glaciers.

Temperature trends in Australia over the past century are consistent with global trends in showing a more or less steady warming, totalling 0.8°C over the last century. The warming trend is observed across the continent, with the exception of a small region in the northwest. All climate modelling undertaken for Australia projects future average temperature increases.

The range of projected temperature increase for Australia in the near term (to 2030) is about 0.5 to 2.0°C above the 1990 level (CSIRO 2001), For the longer term (to 2070), the CSIRO (2001) projected temperature increase of about 1 to 6°C above 1990.

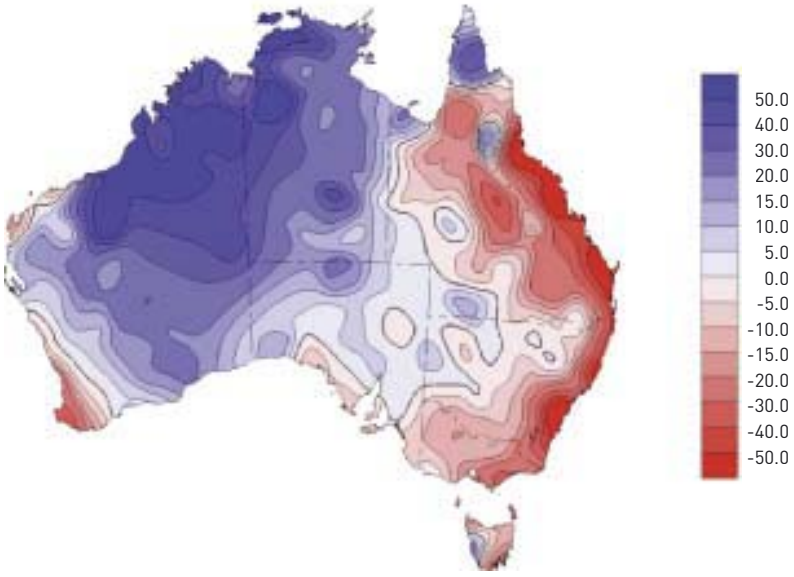
All regions in Australia are projected to experience similar increases in temperature, although inland areas are likely to experience slightly higher temperature increases than coastal areas. Greater warming is expected to occur in spring and summer than in winter.

2.2.2 Rainfall

Regional projections for rainfall are less certain than for temperature. Average rainfall is expected to decrease or remain about the same in most of southern and eastern Australia but may increase in northern-western Australia. However, when increased evaporation due to higher temperatures is taken into account, drier conditions are expected even in places where there is more rain.

In Australia, rainfall trends over the past half century indicate a drying of the east coast, southwest and southeast of the continent and increases in rainfall over northwest and central Australia (Figure 1), although drying is not as evident over a period of one hundred years. These drying trends are consistent with most climate model projections associated with a warmer Australia in the 21st Century.

Figure 1: Trend in rainfall based on 1950 to 2003 (mm/10 yrs)



Source: Australian Bureau of Meteorology

5 The range of projected warmings reflects both uncertainties in projections of future greenhouse gas missions and limitations in the ability of models to represent how the climate will respond to these changes. These sources of uncertainty contribute in approximately equal measure to the range.

A 2.2

The historical evidence also indicates that abrupt or stepped changes in rainfall and associated stream flows are possible. The south west region of Western Australia is the best known example of such a down-step (Figure 2).

Higher temperatures are likely to increase evaporation. The difference between potential evaporation and rainfall gives net moisture or water balance. Most parts of Australia have a net water balance deficit – potential evaporation is greater than rainfall. Projections by the CSIRO (2001) indicate that in all regions of Australia annual water balance is likely to decrease, regardless of whether rainfall increases or decreases. Average decreases in water balance range from 15 to 150 mm by 2030 and 40 to 500 mm by 2070, with the greatest decreases occurring in spring. This means reduced run-off and greater moisture stress for most parts of Australia.

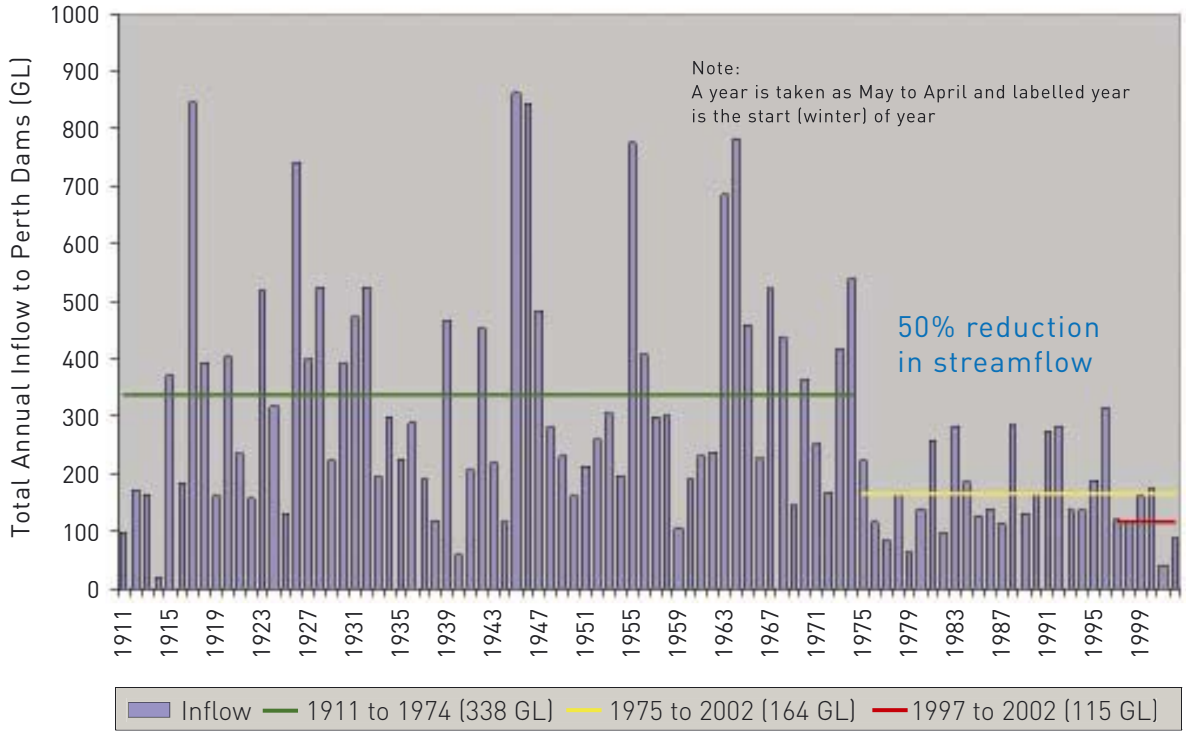
2.2.3 Extreme events

Climate change is likely to result in increases to the frequency or intensity of extreme weather events such as heat waves, tropical cyclones and storms.

The relationship between averages and extremes is often non-linear. For example, a shift in average temperature is likely to be associated with much more significant changes in very hot days. The disproportionate increase in the frequency of extreme events is not limited to the frequency of very hot days but could occur with many other climate extremes. Figure 3 illustrates the proportionally greater impact on building damages from a relatively smaller increase in peak wind gust speed.

In some instances the frequency of extreme events could increase even when there are small declines in averages – this is likely to be the case for rainfall (Risbey et al. 2006).

Figure 2: Abrupt changes to dam inflows, Perth

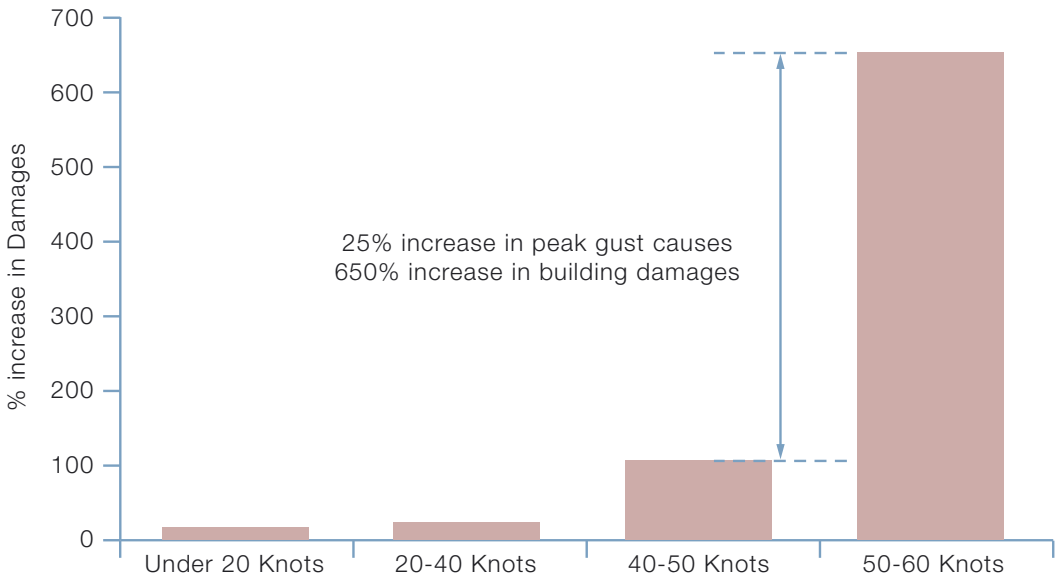


Source: Water Corporation, Western Australia

Examples of how climate change could affect climate extremes are:

- more frequent very hot days;
- more frequent and longer droughts;
- more frequent and larger floods;
- more frequent and more intense heavy rain;
- more intense tropical cyclones;
- more intense storms;
- higher peak wind speeds; and
- higher storm surges.

Figure 3: Non-linear damage functions from extreme events



Hazard	Cause of Change in Hazard	Resulting Change in Damage/Loss
Windstorm	Doubling of windspeed 2.2°C mean temperature increase	Four-fold increase in damages Increase of 5-10% in hurricane wind speeds
Floods	25% increase in 30 minute precipitation	Flooding return period reduced from 100 years to 17 years
Bushfire	1°C mean temperature increase Doubling of CO_2	28% increase in wildfires 143% increase in catastrophic wildfires

Source: *The Impact of Climate Change on Insurance against Catastrophes*, Tony Coleman, Insurance Australia Group, 2003. Presentation to the Institute of Actuaries of Australia.

A
2.3

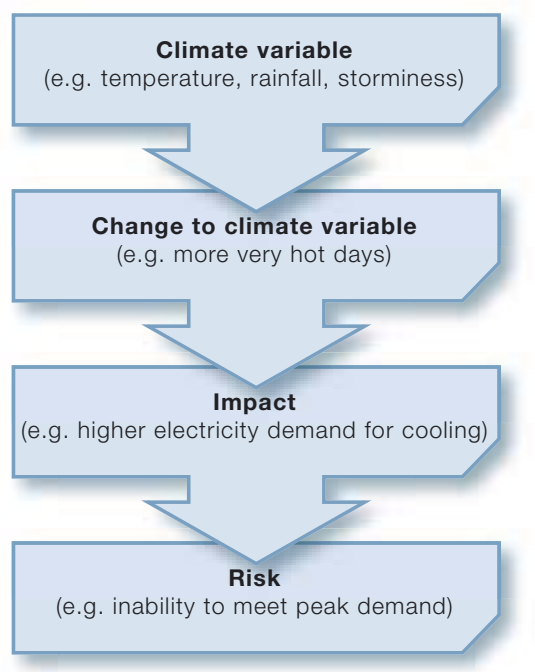
2.3 Understanding the links between climate change and risk

2.3.1 Overview

The risks of climate change to an organisation – for instance, to its reputation as a reliable provider of products or services or its ability to meet its statutory mandate – do not arise directly from changes to climate and climate related variables per se, but from a chain of consequences like those illustrated in Figure 4.

These consequences may affect directly the organisation's capacity to serve its customers or clients or affect other stakeholders of the organisation.

Figure 4: Links between climate change and risk



In order to assess the risks of climate change, users of this Guide should understand the causal links in this chain as they affect their organisation.

2.3.2 Impacts of climate change

Table 2 illustrates the link between changes to specific climate variables (likely to occur in many parts of Australia) and resulting bio-physical and social impacts. Some impacts are linked to changes to more than one climate variable or derive from other impacts. For example, droughts are linked not only to a decrease in rainfall but also to warmer temperatures, which, for example, exacerbated the severity of the 2002 Australian drought (Risbey *et al.*, 2003; Nicholls, 2004).

Table 2: Impacts associated with changes to climate variables

Change to climate variable	Examples of impacts
Higher mean temperatures	→ Increased evaporation and decreased water balance. → Increased severity of droughts (see below). → Reduced alpine winter snow cover. → Reduced range of alpine ecosystems and species. → Increased stress to coral reefs.
Higher maximum temperatures, more hot days and more heat waves	→ Increased incidence of death and serious illness, particularly in older age groups. → Increased heat stress in livestock and wildlife. → Increased risk of damage to some crops. → Increased forest fire danger (frequency and intensity). → Increased electric cooling demand and reduced energy supply reliability.
Higher minimum temperatures, fewer cold days and frost days	→ Decreased cold-related human morbidity and mortality. → Decreased risk of damage to some crops and increased risk to others. → Extended range and activity of some pest and disease vectors. → Reduced heating energy demand.
Decrease in precipitation	→ Decreased average runoff, streamflow. → Decreased water quality. → Decreased water resources. → Decrease in hydro-power potential. → Impacts on rivers and wetland ecosystems.
Increased severity of drought	→ Decreased crop yields and rangeland productivity. → Increased damage to foundations caused by ground shrinkage. → Increased forest fire danger.
Decreased relative humidity	→ Increased forest fire danger. → Increased comfort of living conditions at high temperatures.
More intense rain	→ Increased flood, landslide and mudslide damage. → Increased flood runoff. → Increased soil erosion. → Increased pressure on disaster relief systems.
Increased intensity of cyclones and storms	→ Increased risk to human lives and health. → Increased storm surge leading to coastal flooding, coastal erosion and damage to coastal infrastructure. → Increased damage to coastal ecosystems.
Increased mean sea level	→ Salt water intrusion into ground water and coastal wetlands. → Increased coastal flooding (particularly when combined with storm surge).

A 2.3

2.3.3 Risks to an organisation arising from climate change

Users of this Guide are ultimately seeking to identify those activities and assets that are at risk from a changing climate. In order to do so they must:

1. consider (based on their professional knowledge) which activities and assets of the organisation are sensitive to climate change; and
2. form a judgement as to whether climate change is a significant source of risk to the assets and activities relative to other sources of risk. This judgement will be reached with reference to the objectives and success criteria of the organisation (discussed in detail in Part B).

Risk is generally defined as a combination of the **likelihood** of an occurrence and the **consequence** of that occurrence.

In practice, neither likelihoods nor consequences are known with certainty. In the context of climate change risk assessment, uncertainty arises because, although we can be confident the climate is changing, we do not know precisely the magnitude of the changes or their associated impacts and in some regions it is not clear whether rainfall will increase or decrease. As well, uncertainty may arise because decision makers do not know the exact point (or threshold) at which a climate change impact has a particular level of consequence for their organisation.

For the majority of users of this Guide, these sources of uncertainty will not be so great as to prevent them understanding, at least qualitatively, the likelihood and consequences (and therefore risks) to their organisation that are associated with climate change.

Risk assessment may involve quantitative or qualitative techniques and information to describe the nature of risks. Qualitative techniques are particularly useful in circumstances, such as with climate change, where there is uncertainty about likelihoods or consequences. Notwithstanding sources of uncertainty, the initial assessment process discussed in Part B of this Guide will provide a comprehensive and rigorous means of identifying and prioritising risks of climate change. The process requires only standard climate scenarios, a general understanding of the impacts of climate change, comprehensive understanding of the business or organisation and sound professional judgement.

Some users of the Guide, having undertaken the initial risk assessment process, will decide that there are a small number of risks to their organisation that warrant further analysis in order to reduce uncertainties. General issues surrounding this more detailed analysis are discussed further in Chapter 7.

3. Climate change
risk management: framework and overview

A 3.1

3.1 The risk management framework

The recommended framework for risk management is provided by the Australian and New Zealand Standard AS/NZS 4360 Risk Management (Figure 5).

Figure 5: Steps in the risk management process

Following is a summary of each step in this process.

Establish the context by:

- defining the business or organisation to be assessed and the scope of the assessment;
- clarifying explicitly the objectives of the organisation;
- identifying the stakeholders and their objectives and concerns;
- establishing success criteria against which risks to the organisation's objectives can be evaluated;
- developing key elements of the organisation (such as its major areas of responsibility) as a means of structuring the process; and
- determining relevant climate change scenarios for the assessment.

Identify the risks by:

- describing and listing how climate changes impact on each of the key elements of the organisation.

Analyse the risks by:

- reviewing the controls, management regimes and responses already in place to deal with each specific risk;
- assessing the consequences of each risk against the organisation's objectives and success criteria, taking into account the extent and effectiveness of existing controls;
- forming a judgement about the likelihood of each identified risk leading to the consequences identified; and
- determining the level of risk to the organisation, for each of the climate change scenarios used in the analysis.

A 3.2

Evaluate the risks by:

- re-affirming the judgements and estimates;
- ranking the risks in terms of their severity;
- screening out minor risks that can be set aside and which would otherwise distract the attention of management; and
- identifying those risks for which more detailed analysis is recommended.

Treat the risks by:

- identifying relevant options to manage or adapt to the risks and their consequences; and
- selecting the best options, incorporating these into forward plans and implementing them.

3.2 Communication and consultation

Communication and consultation are key components of any risk management process and are required at each step. Success relies on achieving a high level of creative input and involving all parties with a role to play in identifying, assessing and managing climate change risks. In both the planning and execution of the risk management process it is important to ensure that all those who need to be involved are kept informed of developments in the understanding of risks and the measures taken to deal with them.

At the very beginning, it will be necessary to engage personnel in the process and help them understand the need for climate change risk management to become part of routine management activity. The communication and consultation process will contribute towards the long term development of risk management and help to establish a foundation for its continuing maintenance.

With both the effectiveness of the initial implementation and the long term quality of the process in mind, it is important to pay close attention to the team chosen to participate in the process. Reasons to include someone in the team may be that he/she:

- is a source of relevant information about the organisation's susceptibility to climate change, providing climate change expertise or an understanding of how the organisation's activities will be affected by climate change;
- is the organisational owner of important functions or assets;
- has the authority to act on or sanction action on treatment requirements; and
- is required to ensure that the process itself proceeds smoothly with personnel and other resources being made available as required to participate in the process and manage the administration of the exercise.

3.3 Monitoring and review

The outputs of all steps of the risk management process must be kept under review so that, as circumstances change and new information comes to hand, plans can be maintained and kept up to date.

Several aspects of the monitoring and review activity are important, including:

- keeping the analysis and evaluation up to date, including updating climate change scenarios or incorporating new information about climate change impacts;
- reviewing progress on actions flowing from the process, including implementing treatment actions to reduce risks or undertaking further and more detailed analyses; and

→ ensuring that the process itself is implemented in a timely and cost-effective fashion with documents produced, meetings held, plans reviewed and so on. The focus of this Guide is firmly on the framework and process for an initial strategic assessment.

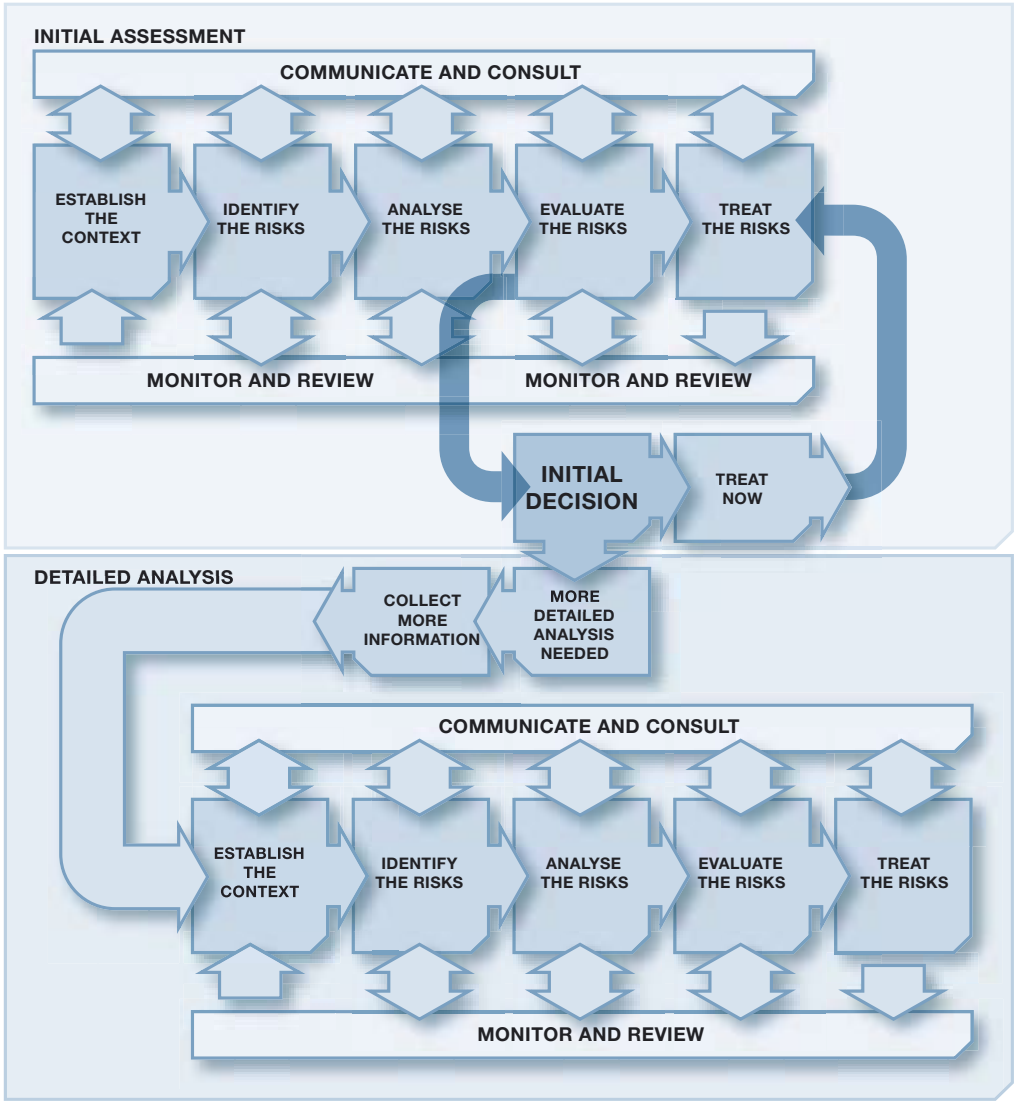
3.4 Initial assessment and detailed analysis

To allow effort to be directed towards the highest priority issues, a two-stage approach to risk assessment is recommended to users of this Guide.

1. An initial assessment identifies and sifts risks quickly, followed by treatment planning and implementation for those risks that clearly require it.
2. Detailed analysis is used where additional information is needed to determine whether treatment is required or what form of treatment to adopt.

Essentially, the same process as outlined in 3.1 above should be followed in both the initial assessment and detailed analysis stages of the process (Figure 6).

Figure 6: Initial assessment and detailed analysis



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3.5

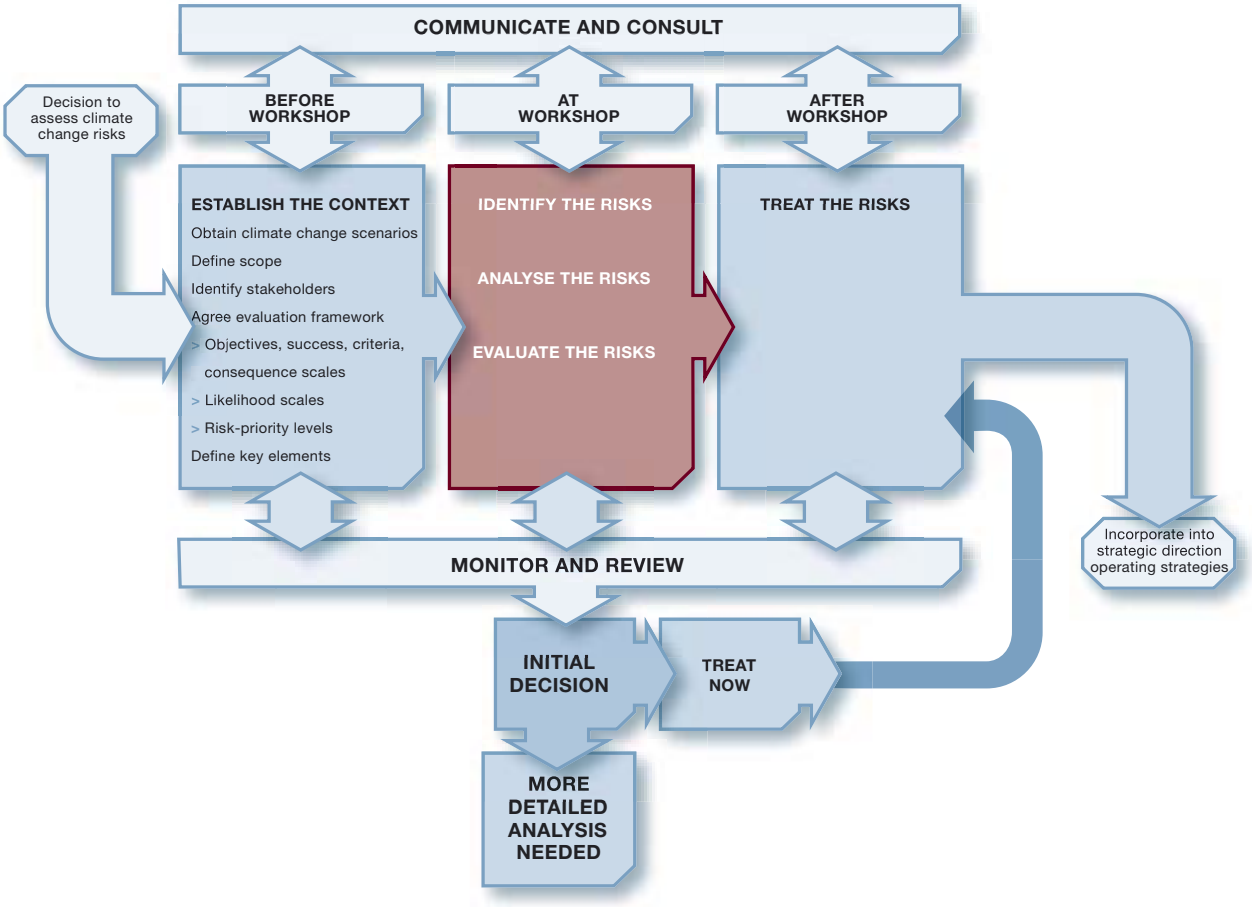
3.5 Overview of initial assessment

The stage at which most users of this Guide will be able to make the greatest gain with the least effort is in the initial assessment. This is where, with relatively simple summary climate change information and a straightforward risk management approach, significant insights may be generated leading to early and effective action.

An initial assessment is a cost effective, yet rigorous method of identifying and appraising risks – whether new or pre-existing. The use of an initial assessment stage is intended to:

- capitalise on any immediate insights arising from a simple analysis where, once a risk is documented, it is clear that it needs to be addressed through adaptation or other treatment measures;

Figure 7: The initial assessment is centred on a workshop process



- permit issues not requiring any further consideration to be set aside as early as possible; and
- allow for more detailed technical analysis of risks to determine if they require attention or to determine the most effective treatment.

Experience, both in preparing this Guide and in other risk assessment work, shows that with careful preparation, a workshop is generally the most efficient method for undertaking the initial assessment. Figure 7 (see opposite) recasts the standard risk management process diagram, giving primacy to a workshop as the method for identifying, analysing and evaluating climate change risks in the initial assessment.

The initial assessment process effectively falls into three overall stages:

- Before holding a workshop, it is essential to **establish the context** of the initial assessment process including by: determining climate change scenarios that will be used in the assessment; defining the scope of the assessment; considering stakeholders; and establishing the evaluation framework.
- The risk workshop is a focused activity designed to **identify, analyse and evaluate risks** so that the highest priority issues can be addressed with an appropriate level of effort and urgency.
- After the workshop, the most severe risks can be tackled with **treatments** to reduce their likelihood or deal with the consequences of the risks if they do arise.

Part B sets out, step by step, these stages of the initial assessment process.

PART B

Conducting An Initial Assessment

-The Workshop Process

4. Before the workshop
—establish the context

B 4.1

4.1 Overview

The context for risk management sets up a framework for identifying and analysing risks. It places the assessment on a clear foundation so that everyone works from a common understanding of the scope of the exercise, how risks are to be rated and how the analysis is to be approached.

Establishing the context consists of five parts:

- **Climate change scenarios** – defining how the climate will be assumed to change in the future.
- **Scope** – defining the scope of the assessment including activities to be covered, geographic boundaries and the time horizon.
- **Stakeholders** – determining whose views need to be taken into account, who can contribute to the analysis and who needs to know its outcomes.
- **Evaluation framework** – defining how risks will be evaluated by clarifying the objectives and success criteria for the organisation and establishing scales for measuring consequences, likelihoods and risk priorities.
- **Key elements** – creating a framework that will assist in identifying risks by breaking down the organisation's concerns into a number of areas of focus and relating them to the climate scenarios.

The participants in a climate change risk management exercise must have a common view of all these matters for the exercise to operate efficiently, be repeatable from one review to the next and for the outputs to be communicated clearly to others.

4.2 Climate change scenarios

To manage the risks of climate change it is necessary to define how climate is projected (or assumed) to change in the future. This is achieved by using climate change scenarios.

Climate change scenarios provide a plausible summary of the changes to climate variables that could apply in your geographical region and timescale of interest[6]. Scenarios can provide a consistent and efficient basis for assessing climate-related risks across different organisations without affecting the integrity of the analysis.

A set of standard climate change scenarios is available in an accompanying volume to this Guide. These scenarios have been developed by CSIRO to reflect broad regional differences in climate and alternative paths of projected climate changes. Scenarios will be updated from time to time as new climate change information becomes available; the latest version of the scenarios can be obtained from the Australian Greenhouse Office website. However, users of the Guide should note that small changes in climate projections are unlikely to make a significant difference at the initial assessment stage of the risk assessment process.

Table 3 (see page 28) contains information that may be used to construct a climate change scenario such as those used in developing and testing this Guide.

6 Refer to the Glossary for a definition of 'climate change scenario'.

The scenarios generally provide information on the direction of change in climate variables using a time horizon of approximately 25 years. Where feasible, estimates of the magnitude of change to those variables are also provided. In practice, to make a climate change scenario meaningful to your organisation it is useful to accompany the bare 'factual' information of the scenario with a 'word picture' outlining the conditions that would prevail in each scenario.

While the majority of users of this Guide will find the standard scenarios entirely suitable for the identification and assessment of climate-related risks in the initial assessment stage of the process, there is nothing that precludes you from developing tailored scenarios or extending the standard scenarios to include additional climate variables[7].

A general rule is that only a limited number of scenarios should be used. One or two scenarios covering the major plausible climate changes will generally be sufficient. This rule was confirmed during the case studies that tested the application of the Guide. The rule applies regardless of whether standard scenarios or tailored scenarios are used.

7 If users of this Guide choose not to use the standard scenarios, it is important to note that the information on the climate features listed in a scenario should, as a minimum, include information on the direction of change and information on the timing and magnitude of change and correlations between changes in two or more parameters. All of the information provided in a scenario should be:

- plausible (i.e. it should be within the range of change indicated by best available scientific information);
- internally consistent (i.e. a change indicated in a scenario to one climate feature should not be contradicted by a change indicated to another climate feature, also based on the best available scientific information);
- unidirectional (i.e. information presented on the climate feature should indicate that it will either increase or decrease under the scenario, but not both).

B 4.2

Change in climate for Victoria by 2030, relative to 1990[a]

Victoria is likely to become **warmer**, with **more hot days** and fewer cold nights. For example, the number of days above 35°C could average 10-16 in Melbourne (now 9) and 36-50 in Mildura (now 33), while the number of days below 0°C in Mildura could average 1-4 in (now 6)[1].

Increased peak summer energy demand for cooling is likely, with reduced energy demand in winter for heating[2].

Warming and population growth may increase annual heat-related deaths in those aged over 65, e.g. from 289 deaths at present in Melbourne to 582-604 by 2020 and 980-1318 by 2050[3]. Higher temperatures may also contribute to the spread of vector-borne, water-borne and food-borne diseases.

Water resources are likely to be **further stressed** due to projected growth in demand and climate-driven changes in supply for irrigation, cities, industry and environmental flows. A **decline in annual rainfall** with higher evaporative demand would lead to a tendency for **less run-off into rivers**, i.e. a decline of 0-45% in 29 Victorian catchments[4]. For Melbourne, average streamflow is likely to drop 3-11% by 2020 and 7-35% by 2050[5].

Droughts are likely to become **more frequent** and more severe, with **greater fire risk**, e.g. by 2020, the number of days with very high or extreme fire danger could average 10-11 in Melbourne (now 9), 16-18 in Laverton (now 15) and 84-91 in Mildura (now 80)[6].

A 10-40% **reduction in snow cover** is likely by 2020[7], with impacts on ski resorts and alpine ecosystems.

Research experiments have shown grain yield increases under elevated atmospheric carbon dioxide concentrations. However, it is not known whether this will translate to field conditions in Australia due to water and nutrient limitations and elevated temperatures.

Low to moderate warming may also **help plant growth** especially **frost sensitive crops** such as wheat, but more hot days and a decline in rainfall or irrigation could reduce yields. Warmer winters can **reduce the yield of stone fruits** that require winter chilling and **livestock** would be adversely affected by greater **heat stress**[8].

In forestry, the CO_2 benefits may be offset by decreased rainfall, increased bushfires and changes in pests[9].

In cities, changes in average climate and sea-level could affect building design, standards and performance, energy and water demand, and coastal planning[10].

Increases in extreme weather events are likely to lead to **increased flash flooding**, strains on sewerage and drainage systems, greater insurance losses, possible black-outs, and **challenges for emergency services**.

1 Suppiah *et al.* 2006;
2 Howden and Crimp 2001;
3 McMichael *et al.* 2003;
4 Jones and Durack 2005;
5 Howe *et al.* 2005;
6 Hennessy *et al.* 2006;
7 Hennessy *et al.* 2003;.
8 Howden *et al.* 2003;.
9 Howden *et al.* 1999;
10 PIA 2004.
a These scenarios should not be used in detailed impact assessments (consult CSIRO for model specific scenarios);

Table 3: Change in climate for Victoria by 2030

Feature		Low Global Warming Scenario		High Global Warming Scenario	
		Estimate of Change	Uncertainty	Estimate of Change	Uncertainty
Annual average temperature		+0.5°C	±0.2°C	+1.1°C	±0.4°C
Average sea level rise		+3 cm		+17 cm	
Annual average rainfall		-1.5%	±5%	-3.5%	±11%
Seasonal average rainfall	Summer	0%	±6.5%	0%	±15%
	Autumn	-1.5%	±5%	-3.5%	±11%
	Winter	-1.5%	±5%	-3.5%	±11%
	Spring	-5%	±5%	-11%	±11%
Annual average potential evaporation		+2.2%	±1.1%	+5.0%	±2.5%
Annual average number of hot days (>35°C)		+1		+10 days (near coast) +20 days (inland)	
Annual average number cold nights (<0°C)		-1 day		-10 days (inland) -20 days (highlands)	
Annual average number of very high & extreme forest fire danger days[b]		+1 day		+11 days	
Extreme daily wind speed (95th percentile)		0.0	±1.6%	0.0%	±3.7%
Extreme daily rainfall intensity (1 in 20 year event)[c]		+5%		+70%	
Carbon dioxide concentration		+73ppm		+102ppm	

b % changes for forest fire danger are for 2020 (2030 changes unavailable);
c Results for 2050 (changes for 2030 not available).

Recommendations

Using climate change scenarios

1. Apply climate change scenarios as the basis for assessing risks in the initial assessment stage of the risk assessment process. Standard scenarios accompany this Guide, and will be updated periodically as new information about climate projections becomes available.
2. When applying climate change scenarios to the risk assessment ensure that workshop participants are provided with both quantitative and descriptive information on the scenarios.
3. Limit the number of scenarios used to one or two.
4. More specific and detailed climate change information than is provided in the standard climate change scenarios may need to be used for detailed analysis.

B 4.3

4.3 Scope

It is important to be clear what the initial assessment is to encompass and what it is to exclude. The scope description should cover:

- the operational activities to be included, which may be everything an organisation does or a specific subset of its activities;
- the geographical area covered by these activities;
- the organisational boundaries of the assessment; and
- the time horizon to be covered, which has a strong bearing on the definition of climate change scenarios.

Table 4 provides some examples.

An organisation with geographically or operationally diverse activities may choose to break them into sections for the assessment. Some care is required when doing this to ensure that sections and activities that only make sense across the entire organisation are not overlooked. Ways to deal with the scope of the analysis that are likely to meet most requirements include:

- one exercise that covers the entire scope of the organisation or all of that part of the organisation under consideration; or
- a number of separate exercises that cover distinct geographical or operational parts of the entire scope, possibly with a further high level exercise spanning the entire scope to deal with strategic and organisation wide issues, carefully defined to ensure that, taken together, they leave nothing out.

Table 4: Examples – scope definitions

Scope definition for a public utility
→ The process will consider all matters associated with maintaining current operations and meeting future requirements within existing service level agreements and regulations, including the management, forecasting and planning functions required to direct efforts to meet future requirements and the operation of regulatory price setting mechanisms for the next 25 years.
Scope definition for a Government agency with policy responsibility
→ The process will consider the activities of all organisations falling within the Department's responsibility, and the Department's capacity to deliver the outputs expected by Government over the next 25 years
Scope definition for the State operations of an Australian manufacturing business
→ The process will consider all current State operations as well as any developments that have been approved for the next 25 years, including dependencies on interstate raw material suppliers and the worldwide market for our products.

Recommendations

When defining the scope

5. Try to address the entire scope of the organisation's operations in one assessment exercise if you can.
6. If it is necessary to split the scope into parts, look carefully for potential gaps between the parts and consider whether you need a separate, high level assessment to deal with issues that are not confined to one area.
7. Make sure the geographical area, organisational boundaries, operational boundaries and timeframe are specified explicitly.

4.4 Stakeholders

Stakeholders are any individuals, groups or organisations whom it is useful to take into account to achieve a successful outcome for your organisation. These will usually include internal groups such as the executive management, staff and workforce, as well as obvious external groups such as local communities, suppliers, associates, clients or customers, competitors, and legal or regulatory authorities.

Many people may have or feel that they have a stake in your organisation. Some will be able to exercise direct influence while others may make their presence felt through indirect pressure in the public arena, perhaps via the media.

Stakeholders may include:

- customers or clients;
- individuals or groups living or operating in your region or neighbouring regions who may be affected by your activities;
- visitors and others who make use of natural and other resources that you rely upon or are required to maintain and protect;
- your organisation's personnel;
- suppliers and service providers;
- associates and partners;
- regulatory agencies and authorities; and
- political and special interest groups who may share a common interest in your activities for reasons of policy or in pursuit of independent agendas.

Stakeholder analysis is typically concerned with identifying the main stakeholder groups and what they wish to happen.

B 4.4

Table 5: Example – stakeholder summary for a local government authority

Stakeholder	Summary of objectives and concerns
Residents within the authority's region	Maintenance of employment opportunities, protection of the environment, local authority service levels and containment of rates and other charges.
Businesses based in or operating in the region	Quality of infrastructure, availability of staff and customers, local authority service levels and containment of rates and other charges.
Visitors to the region	Availability of services, quality of infrastructure, accessibility, protection of the environment.
Local authority workforce	Maintenance of employment and earning levels, conditions of employment.
State and Federal Government agencies	Compliance with policies that overlap jurisdictions.

Table 6: Example – stakeholder summary for a transport company

Stakeholder	Summary of objectives and concerns
Customers	Prices, service levels, safety, comfort and reliability
Shareholders	Earnings, long term viability of the business
Workforce	Rates of pay, conditions, security of employment
Suppliers	Prices, levels of activity, stability of demand
Regulators	Compliance with standards and other regulations

Recommendations

When defining the stakeholders

8. Start with broad groups of stakeholders rather than small groups or individuals.
9. Break groups down if they contain two or more distinctly separate sets of motivations and concerns.
10. Group together stakeholders with essentially the same motivations and concerns.
11. Think widely about anyone who is not directly involved but could have an affect on the success of your organisation.
12. List the stakeholders with a short summary of their motivations and concerns.

4.5 Evaluation framework

There are three components of the framework used to evaluate risks in the initial assessment:

- scales to describe the level of consequence of a risk if it should happen;
- a scale to describe the likelihood of suffering that level of consequence; and
- a means of assigning a priority rating, given this consequence and likelihood.

If your organisation has an existing risk management framework, use this or stay as close to it as possible, so that the output of the climate analysis is comparable with other risk assessments you carry out.

4.5.1 Objectives, success criteria and consequence scales

An organisation's objectives are linked into the risk management process via criteria for measuring success. Success criteria are essentially a summary of the organisation's long term objectives. By combining success criteria with a consequence scale it is possible to describe the level of consequence to an organisation of a risk associated with climate change, should it happen.

Table 7 (over page) provides examples of success criteria for different types of organisations. Experience shows that an organisation's long term success can usually be summarised in a small number of criteria, usually four to six. They will generally cover:

- financial or economic matters;
- outputs, service or product delivery;
- regulatory or ethical compliance; and
- image, reputation and public relations.

Most organisations will be able to construct a set of success criteria around these four themes. To check if your set of success criteria is adequate, consider two questions:

1. If we are successful against all of these criteria, is there any way we could still fail to achieve overall success for our organisation? If so, something may be missing from the set.
2. Do any of these criteria only matter because they affect one of the others? For example, the level of income generated is usually only a component of budget compliance or profit generation rather than being a key issue in its own right; if so, it may be possible to combine some criteria.

B 4.5

Table 7: Examples – success criteria

Success criteria for a local authority:
→ Maintain public safety
→ Protect and enhance the local economy
→ Protect existing community structures and the lifestyle enjoyed by the people of the region
→ Sustain and enhance the physical and natural environment
→ Ensure sound public administration and governance
Success criteria for a public utility:
→ Maintain service quality
→ Ensure reliable service delivery
→ Manage interaction with other providers to achieve cost-effective operation
→ Ensure that community and regulatory standards of administration are met
→ Maintain and strengthen community confidence in the organisation
Success criteria for a business:
→ Build shareholder value
→ Achieve planned growth
→ Protect the supply chain
→ Maintain required human resources
→ Ensure regulatory and legislative compliance

Once the success criteria have been established, it is necessary to describe how badly a risk would affect any one of the criteria. This is usually achieved by defining a five point scale that describes levels of consequences for each criterion ranging from:

→ catastrophic, the level that would constitute a complete failure;

to

→ insignificant, a level that would attract no attention or resources.

Scales like those in Table 8, Table 9 and Table 10 are proven mechanisms for describing the consequences of risks. Note that they contain no firm numbers but use simple descriptions that are understood by the participants in the process. There may be occasions where numbers are appropriate, such as in describing levels of financial loss, but even here descriptions of how the organisation would react may be adequate: for example, Catastrophic may equate to closure of operations or replacement of the senior management team, Major to having to carry a financial burden over into future years, Moderate to having to curtail planned expenditure in the short to medium term and so on.

Table 8: Example – consequence scales for a local authority

Rating	SUCCESS CRITERIA				
	Public safety	Local economy & growth	Community & lifestyle	Environment & sustainability	Public administration
Catastrophic	Large numbers of serious injuries or loss of lives	Regional decline leading to widespread business failure, loss of employment and hardship	The region would be seen as very unattractive, moribund and unable to support its community	Major widespread loss of environmental amenity and progressive irrecoverable environmental damage	Public administration would fall into decay and cease to be effective
Major	Isolated instances of serious injuries or loss of lives	Regional stagnation such that businesses are unable to thrive and employment does not keep pace with population growth	Severe and widespread decline in services and quality of life within the community	Severe loss of environmental amenity and a danger of continuing environmental damage	Public administration would struggle to remain effective and would be seen to be in danger of failing completely
Moderate	Small numbers of injuries	Significant general reduction in economic performance relative to current forecasts	General appreciable decline in services	Isolated but significant instances of environmental damage that might be reversed with intensive efforts	Public administration would be under severe pressure on several fronts
Minor	Serious near misses or minor injuries	Individually significant but isolated areas of reduction in economic performance relative to current forecasts	Isolated but noticeable examples of decline in services	Minor instances of environmental damage that could be reversed	Isolated instances of public administration being under severe pressure
Insignificant	Appearance of a threat but no actual harm	Minor shortfall relative to current forecasts	There would be minor areas in which the region was unable to maintain its current services	No environmental damage	There would be minor instances of public administration being under more than usual stress but it could be managed

Table 9: Example - consequence scales for a public utility

Rating	SUCCESS CRITERIA				
	Service quality	Service delivery	Interaction with other providers	Administration	Community confidence
Catastrophic	Services would fall well below acceptable standards and this would be clear to all	Services would be incorrectly targeted, delivered late or not at all in a large number of cases	The organisation would be in conflict with other providers and this would directly affect services	Administration of the organisation would be seen to have failed and in need of external intervention	There would be widespread concern about our capacity to serve the community
Major	The general public would regard the organisation's services as unsatisfactory	There would be isolated instances of services being incorrectly targeted, delivered late or not delivered at all	The effort of managing relations with other providers would drain resources and badly degrade service delivery	Administration of the organisation would be seen to be deficient and in need of external review	There would be serious expressions of concern about our capacity to serve the community
Moderate	Services would be regarded as barely satisfactory by the general public and the organisation's personnel	There would be isolated but important instances of services being poorly targeted or delivered late	Unnecessary overheads arising from relations with other providers would be a drain on resources but the public would be unaware of this	Administrative failings might not be widely seen but they would cause concern if they came to light	There would be isolated expressions of concern about our capacity to serve the community
Minor	Services would be regarded as satisfactory by the general public but personnel would be aware of deficiencies	There would be isolated instances of service delivery failing to meet acceptable standards to a limited extent	Unnecessary overheads in dealing with other providers would absorb some effort but the public would be unaware of this and would not be affected	There would be some administrative shortcomings demanding attention but they would not be regarded as serious failures	There would be some concern about our capacity to serve the community but it would not be considered serious
Insignificant	Minor deficiencies in principle that would pass without comment	Minor technical shortcomings in service delivery would attract no attention	Minor unnecessary overheads arising from relations with other providers but no material effect	There would be minor areas of concern but they would not demand special attention	There would be minor concerns but they would attract no attention

Table 10: Example - consequence scales for a commercial business

Rating	SUCCESS CRITERIA				
	Shareholder value	Growth	Supply chain	Human resources	Compliance
Catastrophic	The business would have to be wound up	The business would contract markedly placing its long term viability in question	Loss of a key source of supply or distribution channel, threatening the business	Severe shortages of personnel or workplace disruption would make it difficult to sustain operations	Obvious and proven breaches of legal and regulatory requirements with the prospect of corporate or individual penalties
Major	Shareholder value would decline markedly and necessitate significant remedial action	The business would contract and require significant remedial action	Disruption of a key source of supply or distribution channel, having a serious effect on the business	Operations would be severely affected by shortages of personnel or poor industrial relations	Significant amounts of management and advisers' effort would be required to answer charges of compliance failures
Moderate	Shareholder value would stagnate	There would be no growth	Components of the supply chain would require more than normal levels of management attention to protect the business	Parts of the workforce and staff team would require more than normal levels of management attention to protect the business	Formal action would be required to answer perceived breaches or charges of compliance failure
Minor	Shareholder value would increase but fail to meet expectations	Growth would be achieved but it would fail to meet expectations	Isolated difficulties would arise in the supply chain but would be resolved	Isolated personnel shortages or poor workplace relations would be resolved	Minor perceived or actual breaches of compliance would be resolved
Insignificant	There would be a minor shortfall in meeting expectations for shareholder value but they would pass unnoticed	There would be a minor shortfall in growth but this would not attract much attention	Minor issues with the supply chain would pass without any special attention	Minor workforce issues would pass without any special attention	Concerns about compliance would be resolved without special action

B 4.5

Where two or more climate scenarios are employed, consequences must be interpreted as if each scenario has arisen. The consequences of one risk may differ depending on which scenario is being considered.

Recommendations

When developing consequence scales

13. If you have an existing risk management framework, stay as close to it as you can while satisfying the following recommendations.
14. Aim for four to six criteria.
15. Test the criteria before developing the scales to make sure they are a complete set and there are not too many of them.
16. Define the extremes of the consequences, Catastrophic and Insignificant, before specifying the Major, Moderate and Minor levels.

4.5.2 Likelihood scales

It is necessary to describe the likelihood of a risk arising if a particular climate change scenario comes about. This is a conditional likelihood, to be assessed as if the climate change scenario was going to happen. The likelihood of the scenario actually arising and how to take this into account in the analysis is discussed later.

Likelihood scales for risk analysis are less dependent on the details of the application than are consequence scales. A five point scale has proved effective for likelihood ratings just as it has for consequences. The extreme ends of the scale in this case are risks that are almost certain to happen and those that are almost, but not quite, certain not to happen.

There is one potential source of confusion to be addressed concerning how often the same risk might occur. Some risks are most realistically thought of as events that could happen once, such as the loss of an endangered plant or animal species at the centre of a tourism business or a permanent move of population from increasingly arid land to regional centres and major cities. Other risks make more sense when considered as recurring events such as structural damage to domestic buildings from severe storms or episodes of heat related deaths.

A scale that can be used to rate the likelihood of both single and recurrent events is shown in Table 11. This has been used widely, including in the case studies undertaken in preparing this Guide, and is likely to be relevant to most applications.

Where two or more climate scenarios are employed, the likelihood of the risk arising must be interpreted as if the climate change scenario has arisen. The likelihood of a specific risk arising may differ depending on which scenario is being considered.

Table 11: Likelihood (given that the climate scenario arises)

Rating	Recurrent risks	Single events
Almost certain	Could occur several times per year	More likely than not – Probability greater than 50%.
Likely	May arise about once per year	As likely as not – 50/50 chance.
Possible	May arise once in ten years	Less likely than not but still appreciable – Probability less than 50% but still quite high.
Unlikely	May arise once in ten years to 25 years	Unlikely but not negligible – Probability low but noticeably greater than zero.
Rare	Unlikely during the next 25 years	Negligible – Probability very small, close to zero.

The timescale used for the recurrent events should be comparable with the time horizon of the analysis. Subject to ensuring this alignment between timescales, the scale has proved very reliable as an effective workshop tool.

It is not very common but if the highest likelihood you face will be a lot less than one, say a maximum probability of 10% or even less, it may be more effective to:

- set the highest likelihood (level A) at a value you believe will equal or just slightly exceed the highest you might face; and
- use the levels between this and the bottom of the scale (levels B, C and D) to discriminate between risks in the narrower range applicable to your situation.

This will usually only be relevant to situations where all risks under consideration are 'rare' in common parlance, such as catastrophic structural failures, major transport disasters or widespread and severe health system failures.

Such events will usually form only part of an analysis alongside several more likely risks. However, there may be situations in which, due to the nature of the matter under consideration, all the risks that will arise would all fall into the bottom one or two levels of Table 11. If this were to happen, the likelihood scale would not be serving any useful purpose as all risks would have the same likelihood rating.

There are other considerations that arise when events all have very low probabilities. It would be advisable to seek expert advice on analysing risks in these circumstances.

Recommendations

When developing likelihood scales

17. If you have an existing risk management framework, stay as close to it as you can while satisfying the following recommendation.
18. Use the default scale shown here unless there is a pressing reason not to, such as there being an established scale in use already or the range of likelihoods you face being very low.

B 4.5

4.5.3 Risk priority levels

Use a matrix, similar to that in Table 12, to define the level of priority associated with each combination of consequence and likelihood.

Table 12: Priority (given that the scenario arises)

	Consequences				
Likelihood	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Medium	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	Medium
Rare	Low	Low	Low	Low	Medium

The interpretation of the priority levels is usually as follows:

- **Extreme** risks demand urgent attention at the most senior level and cannot be simply accepted as a part of routine operations without executive sanction.
- **High** risks are the most severe that can be accepted as a part of routine operations without executive sanction but they will be the responsibility of the most senior operational management and reported upon at the executive level.
- **Medium** risks can be expected to form part of routine operations but they will be explicitly assigned to relevant managers for action, maintained under review and reported upon at senior management level.
- **Low** risks will be maintained under review but it is expected that existing controls will be sufficient and no further action will be required to treat them unless they become more severe.

When first setting up the framework, think about each cell in the priority matrix and consider whether the initial priority rating is appropriate given the meaning of the consequence and likelihood and the interpretation of the priority set out above. Depending on the attitude of the organisation towards risk, the boundaries between the priority regions in the matrix may be moved. There is an opportunity to adjust priorities at the end of the risk identification and analysis but the more initial priorities that are acceptable on the first pass the more efficient the overall process will be.

The most common pitfall in defining the priority matrix is to make the Extreme region too large and the Low region too small. Careful reflection on a few example risks is a good way to test this before putting the matrix to use.

Recommendations

When developing a priority matrix

19. If you have an existing risk management framework, stay as close to it as you can while satisfying the following recommendations.
20. If you need to start afresh, use the examples here as a foundation.
21. Create a few examples of risks to test the scales.
22. If in doubt, err on the side of making the Extreme and High regions of the matrix smaller rather than larger, as severe risks that are understated will usually be picked up in the review at the end whereas it is often more difficult to downgrade risks that are overstated and they can clog the process.

4.6 Key elements

To ensure that the process of risk identification is systematic and efficient, break the issues facing your organisation into discrete elements or areas. The key elements provide a framework for thinking about risks efficiently and making good use of the time and resources devoted to the subsequent activities of risk assessment, analysis and evaluation.

Key elements are a set of topics that can be considered one by one during the risk identification step of the process. Each topic is somewhat narrower than the whole scope being addressed, allowing those performing the identification to focus their thoughts and go into more depth than they would if they tried to deal with everything in one go. A well designed set of key elements will stimulate creative thought and ensure that all important issues are raised, with effort being balanced between the different topics.

The set of key elements must be complete, in that it covers all significant issues. However, as the number of key elements tends to drive the duration of the risk identification activity, it must also be contained to an appropriate scale. Finally, it must balance the need for sufficiently specific language to stimulate the identification of risks against ensuring enough generality to avoid prejudging the identification process. For example, a key element presented under the label "Climate induced fatalities" is likely to be perceived as a risk statement in itself and so limit creative thought on the subject, whereas the label "Health impacts of climate change" might be expected to stimulate a broader discussion.

There are many ways to derive a set of key elements. They can be based on any concept that makes it possible to break down your organisation's activities into separate areas. For example:

- organisational functions or activities;
- geographical areas or different land uses within the region of interest;
- technologies or assets employed (eg. IT, electronic, electrical, mechanical, human systems); or
- service or product types.

A useful set of topics may include items of different types. The main requirement is to be comprehensive, cover everything, leave scope for creative input and achieve an appropriate level of detail.

Table 13: Examples – key elements

Key elements for a transport organisation:
→ Assets (vehicles, maintenance facilities)
→ Infrastructure
→ Demand (current and forecast usage, population demographics, land use and growth)
→ Users
→ Staff
→ Funding (development and maintenance)
Key elements for a water company:
→ Water sources
→ Infrastructure & resources
→ Customers
→ Environment & community
→ Business environment
Key elements for a manufacturing business:
→ Supply chain
→ Manufacturing operations and assets
→ Markets
→ Labour and other human resources
→ Energy and resources
Key elements for a public sector service provider
→ Service delivery
→ Related services and service providers
→ Personnel
→ General public
→ Systems & equipment
→ Administration & support

4.7 Briefing note

The output of the context stage is a briefing document summarising the context and the process to be used in the workshop for the initial assessment. A typical contents list for the briefing note is provided in Table 14.

Prior to a workshop the briefing note should be distributed to workshop participants, allowing sufficient lead time for it to be read carefully. If there are objections or errors to be addressed, it is more efficient to resolve them before the workshop than in an open meeting.

This and other organisational matters relevant to planning the workshop are discussed further in section 8.1.

Table 14: Briefing note contents

Section	Contents
Introduction	Purpose of the exercise Time, date and location of the workshop(s) Identity of the facilitator and, if different, the administrator of the exercise List of workshop participants Outline of the process with reference to AS/NZS 4360 and this guide
Context	Climate scenarios to be considered Scope, stakeholders, evaluation framework and key elements
Workshop	Procedural description of workshop Agenda with intended timetable

5. At the workshop
—identify, analyse & evaluate the risks

5.1 Introduction

The set of tasks referred to here collectively as a risk assessment, consists of three central steps in the risk management process:

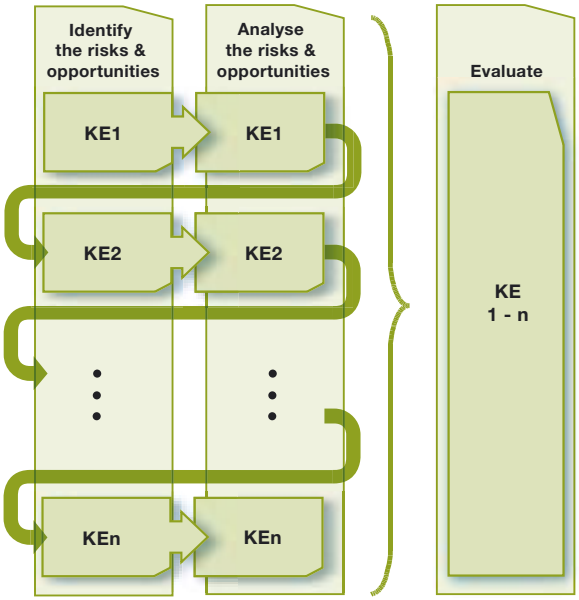
- identify the risks;
- analyse the risks; and
- evaluate the risks.

These steps are best undertaken as a single exercise in a workshop setting. The three steps must generate a list of risks associated with climate change that is as comprehensive as possible, not overlooking any major area of exposure, and do so as efficiently as possible. At the conclusion of these steps you will have a list of risks and existing controls that tend to mitigate them, with consequence and likelihood ratings in each scenario you have decided to consider and an agreed overall priority rating for each risk to your organisation.

The workshop will generally be most effective if it is led by an experienced facilitator, possibly an independent risk assessment specialist. Smooth running of the workshop may also benefit from having an additional person, either independent of the organisation or drawn from junior or administrative personnel, to assist with recording workshop outputs. Considerable attention will need to be given to ensuring that consensus outputs from the identification, analysis and evaluation steps are fully and systematically recorded during the course of the workshop. Workshops participants should be fully aware of what is being recorded. In practice, this probably means recording the information on a whiteboard, a computer spreadsheet projected on to a screen or a similar mechanism that provides visibility of proceedings to the participants.

At the workshop, the identification and analysis steps will require different modes of thought: creative open thinking to identify risks, and closed methodical thinking to analyse them. By interspersing them as indicated in Figure 8, the pace of the workshop can be maintained without the participants becoming stale and the focus that the key element structure brings to the exercise can be maintained.

Figure 8: Risk assessment steps for Key elements



KE=key element

In practice, the key elements are considered in conjunction with the climate change scenarios being examined, as shown in Figure 9.

Figure 9: Key elements and climate scenarios for risk identification

	Climate Scenario	
Key element	Scenario 1	Scenario 2
Element 1	KE 1.1	KE 1.2
Element 2	KE 2.1	KE 2.2
...	...	...

B
5.2

5.2 Risk workshop process overview

In a workshop setting, the recommended risk identification, analysis and evaluation process is to take each key element and each climate change scenario in turn and:

1. Brainstorm risks associated with the element until the main issues are felt to have been exposed.
2. Taking each risk in turn:
   - → identify any existing controls (features of the environment, natural and man made structures and mechanisms, procedures and other factors) that are already in place and tend to mitigate the risk;
   - → describe the consequences the risk would have if it was to arise, given the controls, and in each of the scenarios under consideration;
   - → describe the likelihood of suffering that level of consequence, again given the controls, in each of the scenarios under consideration;
   - → assign an initial priority in each scenario based on the likelihood and consequence of the risk; and
   - → where two or more scenarios are being considered, consider adjusting the priority in recognition that some scenarios are less likely to occur than others.
3. Return to step (1) for the next key element.

Apart from the need to consider two or more climate change scenarios, this process is a routine risk workshop exercise. Expert facilitation can be very valuable in producing a sound outcome and making cost-effective use of the effort invested in the workshop. Comprehensive advice on the operation of the process can be found in the Standards Australia Handbook HB 436, a companion to the Standard AS/NZS 4360.

5.3 Identify risks

A risk is the chance of something happening that will have an impact on the organisation's objectives. A brainstorming approach to risk identification encourages all participants to raise issues and provide opportunities for the contributions of one person to spark ideas for others.

The usual rules of brainstorming, that is allowing practically any input and suspending judgement during the brainstorming activity, should be applied. All issues raised in the workshop should be included, even if they prove later to be trivial or duplicates of other risks. The analysis step will screen out the trivial issues and duplicates can be drawn together in later rationalisation of the risk register if necessary.

There are a few recommendations for a successful risk identification exercise:

- → ensure that every risk statement includes a verb, saying "Road access may be cut" rather than just "Road access";
- → aim for a cause effect statement (X, the cause, may happen leading to Y, the effect) or equivalent;
- → apply a common sense test to check whether the statement will be understood by anyone who was not present in the workshop and clarifying it if not.

It can be difficult to disentangle risks from separate sources when long timescales and complex issues are concerned. The inclusion of a few non-climate change risks in the process will do no harm apart from absorbing a little time. If a risk is partly related to climate change, it should be included Any risks that are nothing to do with climate change that do slip into the process can easily be excised later and referred to other risk management activities in the organisation.

Recommendations

When running the risk identification activity

23. Adopt the conventional rules of brainstorming that allow almost any input and suspend judgement.

24. Do not allow the workshop to be diverted into debating whether a risk is a climate change risk or not. If in doubt let it remain in the process and consider the matter later, after the workshop.

5.4 Analyse risks

The analysis stage assigns each risk a priority assuming that each of the climate change scenarios being considered arises. It takes account of any existing factors that will operate to control the risk, which may be features of the environment, existing practices by which people can adapt as the climate changes or other trends that will happen at the same time and modify the effects of the risk (Table 15).

Table 15: Examples of risk controls

Only measures that are already in place or committed and require no further action to be implemented can be claimed as controls. Measures that might be taken to treat risks in the future cannot be assumed to be in place.
Controls on degradation of infrastructure: → Routine monitoring and repair systems → Inherent robustness in the design and construction → The existence of alternatives that can be used if the main infrastructure system fails
Controls on flooding due to storms and high tides: → The existing elevation of homes and other buildings above sea level → The design and construction of assets that may be affected by flooding → Existing barrages, levees and other flood control mechanisms
Controls on outbreaks of plant, animal or human diseases: → Early warning monitoring systems → Prophylactic treatments already in place → Naturally occurring mechanisms that compete with or counter the disease and will develop at the same time as the conditions that promote the disease
Controls on movements of population → Economic barriers to relocation → Existing distribution of health, transport and other infrastructure → Established government programs that provide incentives to remain in place → Growth of business opportunities associated with climate change that offer fresh employment in existing centres of population

Priorities are assigned in two stages:

- first, each risk is assigned a qualitative consequence and likelihood rating in each climate scenario being considered; and
- second, a priority is then assigned in each scenario, based on the combination of the consequence and likelihood ratings.

Consequences, likelihoods and risk priorities are assessed using the scales developed in the context step and described in Section 4.5.

If more than one climate change scenario has been used in risk identification then the priority rating of risks may need to be adjusted in recognition of the fact that some scenarios are less likely to occur than others. This can be addressed in two relatively simple ways according to the wishes of the participants.

The simplest approach is to examine the most severe risks and consider whether the relative likelihood of the alternative scenarios mean that some risks should be given more or less priority than has been assigned using Table 12 based on the initial assessment of consequences and likelihood. A risk that only rates a high priority in an unlikely scenario might be downgraded compared to one that rates a high priority in all scenarios or in the most likely scenario. This approach relies on direct examination and judgement, which is the basis of the entire process.

A slightly more mechanistic alternative is to reduce the priority rating of risks in the least likely scenarios systematically, while leaving those in the most likely scenario as they are. This is illustrated in Table 16.

Another alternative is not to adjust the priority ratings. This course may be prudent when there is little information about the likelihood of different scenarios. Better information about the likelihood of the alternative scenarios is expected to become available in the next 1-2 years.

Table 16: Adjusting priority ratings

More likely scenario		Less likely scenarios	
Initial	Adjusted	Initial	Adjusted
Extreme	Extreme	Extreme	High
High	High	High	Medium
Medium	Medium	Medium	Low
Low	Low	Low	Low

Using this approach, each risk is assigned an overall priority equal to the highest priority it received in any of the climate scenarios being considered. This ensures that any risks that may be significant, in at least one of the possible sets of future climatic conditions, are given appropriate attention in later stages of the analysis.

No matter which approach to adjusting priorities is adopted, the final priority rating assigned to a risk must be a realistic reflection of the workshop team's opinion of how important the risk is. This is considered explicitly in the next step of the workshop, after all key elements have been addressed with risk identification and risk analysis.

5.5 Evaluate risks

The objective of the evaluation step is to ensure the priority ratings are consistent with one another and match the participants' general view of the context within which they are operating.

When all key elements have been considered, assemble all the risks into a single set in priority order and review them as a whole. Manually adjust any risks found to have been over- or under-rated to show the agreed priority the participants feel is appropriate.

The outcome will be a list of risks with all the information recorded in the identification and analysis as well as the agreed priority allocated in the evaluation review.

5.6 Review the initial assessment

The initial assessment review is an extension of the risk evaluation stage. The aim of the review is to place risks into the following categories:

- risks that should be treated immediately without further analysis and for which the appropriate treatment is clear;
- risks that can be set aside without further action for the time being; and
- risks that will require more detailed analysis before determining whether to treat them or not or to select the most appropriate form of treatment.

In determining how to categorise risks it is useful to consider the following general principles:

- **Extreme** priority risks demand urgent attention at the most senior level and can not be simply accepted as a part of routine operations without executive sanction.
- **High** priority risks are the most severe that can be accepted as a part of routine operations without executive sanction but they will be the responsibility of the most senior operational management.
- **Medium** priority risks can be expected to form part of routine operations but they will be explicitly assigned to relevant managers for action and maintained under review.
- **Low** priority risks will be maintained under review but it is expected that existing controls will be sufficient.

In general, extreme and high priority risks will need to be treated immediately or subjected to more detailed analysis.

Low priority risks, on the other hand, will generally be set aside with no further action required to treat them apart from routine reviews to ensure that there has been no change that would make them more severe.

Starting with the most severe risks and working down to lower priority ratings as time and resources permit, you need to determine whether:

- the action required to address a risk is obvious, requires no further justification and can be implemented immediately;
- further analysis is required to determine the detailed nature of the risk or identify the most appropriate action to take; or
- it must simply be borne, either because it is insignificant or because there is no cost-effective treatment and this is clear without further analysis.

6. After the workshop
—treat the risks

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6.1

6.1 Risk treatment

6.1.1 Overview

Risk treatment consists of determining the most cost-effective actions to be undertaken in response to the identified risks and implementation of those actions. This will usually result in the modification of existing strategies and plans, the development of new plans, allocation of resources and responsibilities for the plans and their implementation. The formulation and implementation of actions is a matter for the routine operating practices of the organisation.

It is often the case that one treatment action will have an effect on several risks and one risk will be affected by more than one treatment. Some consideration of natural groupings among the risks and strategic combinations of treatments will be beneficial in completing this stage of the process.

6.1.2 Climate change risk treatment

Literature dealing with response by human or natural systems to the impacts of climate change generally refers to the concept of 'adaptation', adjustments in response to climate change that lead to a reduction in risks or a realisation of benefits (see for example: McCarthy et al. 2001; Willows & Connell 2003). Risk treatments developed and implemented by an organisation in response to climate change can be regarded as one type of adaptation.

Because of the long time scales, climate change risk treatments will usually involve strategic planning and the allocation of new resources. They are thus often distinguished from short term, reactive adjustments.

Climate change risk treatments can include technological and infrastructure measures, planning, research and education or a combination of actions. Table 17 provides an overview of different types of possible measures that can be adopted as risk treatments.

Table 17: Examples - Climate change risk treatments

Treatment type	Description and examples
Spread risk	**Insurance and diversification strategies:** → Use of financial products that off-lay the risk → Geographical diversification
Structural and technological	**Prevent effects through engineering solutions and changed practices:** → Increase reservoir capacity → Implement energy demand management measures → Scale up coastal protection measures → Change design of storm-water systems → Build more resilient housing → Install more efficient irrigation systems → Create wildlife corridors
Regulatory and institutional	**Prevent or mitigate effects through revised regulations and planning:** → Adopt integrated planning approaches → Amend local planning schemes to give greater weight to flood risk → Revise guidance notes for urban planners → Amend building design standards → Increase resources for coastal planning → Factor climate change into criteria for designation of species or ecosystems requiring increased protection → Improved contingency and disaster planning → Lengthen strategic planning horizons (from say 5-10 years to 20-30 years)
Avoidance	**Avoid or exploit changes in risk:** → Grow new crops → Migration of people way from high risk areas → Change location of new housing developments → Improve forecasting systems to give advance warning of extreme climate events
Research	**Research to improve understanding of relationship between climate change and risk:** → Improve knowledge of relationship between past and present variations in climate and performance of economic, social and environmental systems → Improve modelling of regionally-based climate change impacts → Improve knowledge of the probability of frequency and magnitude of changes to extreme climate events and other climate variables under climate change → Improve understanding of the relationship between changes to frequency and magnitude of extreme events and critical thresholds for individual risks
Education, behavioural	**Educate and inform stakeholders about the risks of climate change:** → Increase public awareness about the potential impacts of climate change and about climate change adaptation measures → Educate and inform management and personnel about climate change risks and adaptation measures

Source: adapted and revised from Burton 1996

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6.1

6.1.3 Principles for treating risks from climate change

There is a growing body of literature on climate change adaptation processes (see for example Willows & Connell 2005). A synopsis of generic principles of 'good climate risk treatment' drawn from that literature, which users of this Guide may find relevant and useful when developing risk treatments for their organisation is set out below:

1. **Achieve balance between climate and non-climate risks.**
   Implementing a climate change risk treatment is itself not risk free. An organisation may under-estimate the risks associated with climate change relative to other non-climate risks to the organisation, leading to insufficient actions taken to treat the climate change risks (referred to as 'under-adaptation'). Alternatively, the risks of climate change may have been over-estimated relative to other risks, resulting in too much attention and resources being devoted to treating the climate change risks (referred to as 'over-adaptation').

   One means of avoiding under- or over-adaptation is for organisations to take a balanced approach to managing climate and non-climate risks. This is best achieved by integrating climate change risk management with the broader risk management processes of the organisation (see Chapter 8). Ideally, all forms of risk management operating within an organisation will be integrated with one another and with all general management processes.

2. **Manage priority climate change risks.**
   The initial assessment detailed earlier provides organisations with a process for identifying and prioritising their climate change risks. As discussed in section 5.6, the risk treatment process of organisations should focus on their high priority risks (i.e. extreme and high risks). This is simply a statement of the general rule that it is necessary to set priorities for the allocation of management attention and resources.

3. **Use adaptive management.**
   Adaptive management is an important strategy for dealing with climate change uncertainties. It is the process of putting in place small, flexible, incremental changes based on regular monitoring and revision of plans using information available at the time, rather than relying on one-off, large-scale treatments. Adaptive management leaves scope for decisions about treatments to be reviewed in the future as improved information becomes available about the nature of climate change risks. An advantage of this approach is that it reduces the potential for over-adaptation (discussed above), while providing scope for an organisation to strengthen its risk treatment should it become apparent in the future that the organisation is under-adapting to one or more climate change risks.

4. **Look for win-win or no-regrets treatment options.**
   Organisations should look for and give priority to implementing 'win-win' or 'no-regrets' treatment options.

   Win–win treatments refer to measures that address the targeted climate change risk while also having other environmental, social or economic benefits.

   No-regrets treatments are measures that should be undertaken anyway, regardless of whether climate change is an issue.

   Examples of no-regrets and win-win treatments are provided in Table 18.

5. **Avoid adaptation constraining decisions.**
   Organisations should avoid taking decisions that will make it more difficult for them or others to manage climate change risks in the future. These decisions are sometimes referred to as 'adaptation constraining decisions'. An example of an adaptation constraining decision is a local council permitting a residential development in a flood-prone area.

6. **Review your treatment strategy.**
   An organisation should regularly review its climate change risk treatment strategy as part of the monitoring and review step discussed in section 3.3.

Table 18: Examples of win-win and no-regrets treatments

Win-win treatments:
→ changed cropping in response to climate change leads to reduced soil erosion
→ climate change risk treatment by an electricity distribution company increases reliability of customer supply
→ strategic response to climate change by a local government helps to build community networks
No-regrets treatments:
→ treatment measures that are cost neutral—maybe involving an initial capital investment but reducing overall costs in the longer term
→ improved management practices by an organisation (e.g. strategic planning)

PART C

Other Considerations

7. If detailed analysis is needed

C 7.1

7.1 Purpose and major aspects of detailed analysis

Some climate change risks are complex matters, with impacts affecting several components of an organisation and interactions with other trends and changes during the same time frame. In many cases the initial assessment process will prove sufficient for an organisation to identify and prioritise the risks that it faces from climate change and to develop and implement treatments.

Some risks may need more detailed analysis before the need for treatment or the nature of appropriate treatment measures can be determined. Detailed analysis may be needed to:

- address uncertainty in the likelihood, projected level or rate of change to climate variables – i.e. understand the climate change itself;
- analyse the sensitivity of particular risks to changes in climate variables – i.e. understand the way your operations will be affected by climate change; or
- assess treatment options.

This chapter provides a brief overview of each of these aspects of detailed analysis. The process of implementing the detailed analysis will, in most cases, be particular to your organisation and to the different risks faced by your organisation. For this reason, it is not feasible or appropriate to offer specific guidance on the detailed analysis.

Throughout the remainder of this chapter, while dealing with detailed analytical issues, it is important to bear in mind the purpose of the exercise. It is to provide a sound basis for deciding whether to act on an identified risk or not and, if action is to be taken, to select the most appropriate form of treatment.

7.2 Addressing uncertainty associated with climate change

Uncertainties exist about the magnitude, rate and direction of changes to specific climate variables, especially at the regional and local levels. Some organisations may decide that, in order to assess a risk, more detailed analysis is required on one or more climate variables to reduce the uncertainty in projections.

7.2.1 Reducing uncertainty about the likelihood of changes

The IPCC (2001) has provided estimates of confidence in projected changes to extreme events and other climate variables (Table 19).

Table 19: Estimates of confidence in projected changes in extreme events and other climate variables

Climate variable	Confidence in projected changes[1]
Higher maximum temperatures and more hot days over nearly all land areas	Very likely
Higher minimum temperatures, fewer cold days and frost days over nearly all land areas	Very likely
Reduced diurnal[2] temperature range over most land areas	Very likely
Increase of heat index[3] over land areas	Very likely, over most areas
More intense precipitation events	Very likely, over most areas
Increase summer continental drying and associated risk of drying	Likely, over most mid-latitude continental interiors
Increase in tropical cyclone peak wind intensities	Likely, over some areas
Increase in tropical cyclone mean and peak precipitation intensities	Likely, over some areas

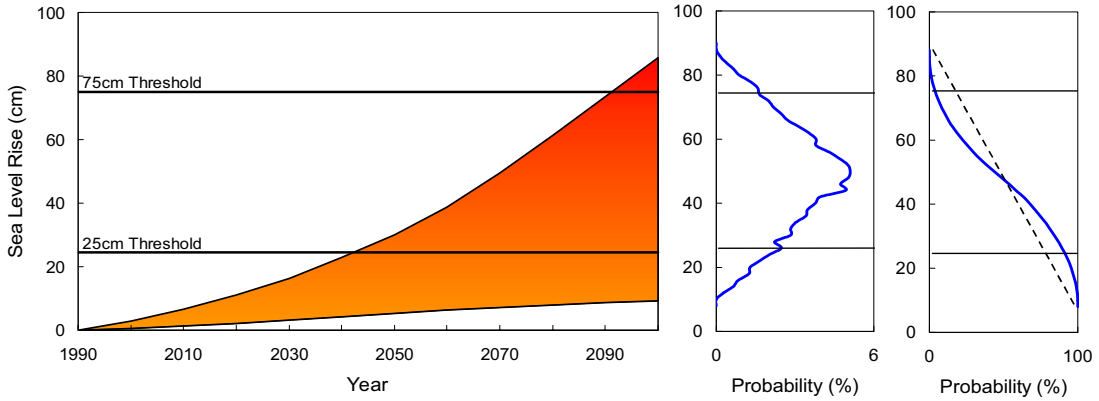
1. The IPCC uses the following definitions of confidence:: very likely - 90-99% confidence; likely - 66-90% confidence .
2. Diurnal temperature range is the range experienced within a 24-hour period.
3. Heat index is a combination of temperature and humidity that measures effect on human comfort.

Source: IPCC 2001

These estimates are fairly coarse, particularly for local application, and organisations may decide that they require more specific understanding of the changes. One way to gain this understanding is to produce probability distributions of changes to specific climate variables such as temperature, rainfall or sea level using statistical methods such as Monte Carlo analysis.

The CSIRO, for example, has undertaken an analysis of the probability of exceeding sea level thresholds (Figure 10). It has also produced probability distributions (single variable) and probability density plots (multiple variables) for temperature and rainfall changes in specific regions. Probability distributions such as these do not remove uncertainty but they do provide an assessment of the realistically likely ranges of outcomes and the likelihood of particular outcomes within each range.

Figure 10: Probability of Exceeding Sea Level Thresholds



Source: Hennessey et al. 2004

Probability distributions such as that outlined in Figure 10, rely heavily on assumptions about global and regional climate changes. Therefore organisations seeking to improve their understanding of the probability of changes to specific climate variables are likely to require assistance from climate change specialists.

7.2.2 Reducing uncertainty about regional and local changes

The climate change scenarios accompanying this Guide provide an indication of the sort of changes in climate that business and communities may have to prepare for in a number of regions in Australia. The CSIRO and other researchers in Australia have also undertaken studies which address projections of climate changes at the state and regional levels. A number of state climate change reports provide regional and even site-specific information on projected changes to the frequency of:

- very hot and very cold days and spells;
- droughts;
- extreme rainfall;
- extreme winds; and
- storm surges.

Many of these studies are available publicly.

Some organisations may decide that the level of detail provided in existing reports is insufficient for their needs. For example, they may want to know the implications of projected rainfall changes for streamflow in a specific catchment, or the impacts of sea level rise and storm surge on a specific stretch of coast. If this is the case for your organisation, it is likely that you will need to engage specialist support.

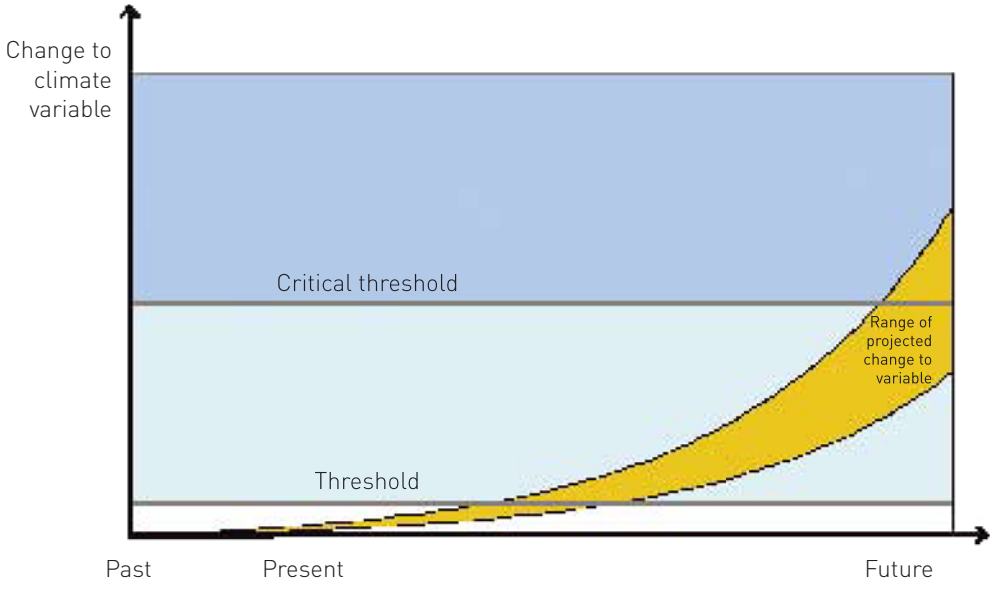
7.3 Understanding sensitivity to climate change

'Sensitivity' refers to the degree to which an area or activity of interest will be affected, either adversely or beneficially, by a particular change in climate or a climate-related variable. For the activities or assets of some organisations, relatively minor changes in the climate may pass unnoticed up to a certain point, and even significant changes may be manageable without the need for treatment. For example, there may be some civil engineering and building constructions that would be unaffected by a 5°C temperature rise. Other structures however, perhaps due to being built on moisture sensitive soil, might be affected badly if the mean temperature were to rise even 1-2°C.

The concept of sensitivity was raised briefly in section 2.3.3, noting that for most organisations when undertaking an initial assessment, it is only necessary to have a qualitative understanding of the sensitivity to climate change in order to assess and prioritise risks. For instance, in a region where a large proportion of the housing stock is ageing, in poor repair and perhaps built to less stringent standards than those in force today, it may be clear that the community is already struggling to cope when severe storms strike; in this case, they might evaluate the effect of any increase in the frequency or severity of such storms quite easily by comparison with their existing situation. Where the existing climate conditions are at or close to an obvious threshold and change can only make it worse, it might not be necessary to engage in very much more analysis to identify the fact that action is required.

Many sensitivities may be less obvious, and organisations will need to assess each risk on its merits. Some may decide that more detailed analysis is required to increase their understanding of the sensitivity of a particular risk or risks to potential changes in climate. In particular, they may wish to understand the point at which changes to a climate variable begins to matter (threshold) as well as the point at which a change to a climate variable will have a catastrophic effect on the organisation's activities or assets if the risk remains untreated (critical threshold). This is illustrated schematically in Figure 11.

Figure 11: Schematic diagram of relationship between change to a climate variable and risk thresholds for an organisation



Once a change to a climate variable (e.g. temperature or rainfall) passes an initial threshold, problems could arise that require treatment, but it may be unclear where the threshold lies. This may require an analysis in itself, drawing on expertise in the operations relevant to the organisation rather than climate science. Even when the threshold at which change starts to matter is clearly defined, it may still be a challenge to determine whether and how far into the future that point is likely to be reached. This is another matter for climate science.

Expertise in the organisation's operations and in climate science will generally both be required for a detailed analysis of climate sensitivity. Such studies may be a significant undertaking and it is important to use the initial assessment to set priorities to ensure that they are not devoted to risks that are insignificant or for which it is clear, without further study, that action is required.

7.4 Assessing treatment options

Once a risk is well understood and it is clear that some treatment will be required, detailed analysis of treatment options may be required. There will usually be several options, each entailing different costs and benefits and each offering a different level of risk mitigation.

7.4.1 Adaptive capacity

The range of treatment options that are available to an organisation will often depend on its capacity to respond to climate change. Much of the literature dealing with climate change response makes reference to the 'vulnerability' of organisations or systems, defined as 'the extent to which a system or organisation can cope with climate change' (see for example McCarthy et al. 2001). It is a function of risk and 'adaptive capacity', defined as 'the ability of a system or an organisation to adjust or respond to climate change or moderate the potential risks of climate change to its assets or activities'.

Adaptive capacity can be an inherent property of the organisation or it could have been developed as a result of previous policy, planning or design decisions. There are a range of factors which can influence adaptive capacity:

→ **Information increases adaptive capacity**

Is good information available to the organisation on climate change and variability and is the information available to the right people within the organisation and to relevant stakeholders? Are effective monitoring or other programs in place to detect changes that are occurring?

→ **Flexibility and resources increase adaptive capacity**

How flexible is the asset or activity at risk – i.e. can changes be made relatively easily and quickly or are long lead times required? Are appropriate resources for treating a risk – human, financial or other – in place already?

→ **Other risks reduce adaptive capacity**

Will other (non-climate) risks to the organisation influence its ability to respond to the climate-related risk(s)?

Adaptive capacity factors such as these could determine the range of treatment options that are available to an organisation or the treatments that are required to deal with a climate-related risk, and ultimately the cost of implementing treatments. Organisations or systems with strong adaptive capacity can generally be expected to have lower costs and a wider range of treatment options to select from than organisations with weak adaptive capacity.

7.4.2 Costs and benefits of treatment options

Where an organisation has a number of options for treating the risks of climate change, detailed analysis may be required to assess the costs and benefits of the alternatives. A range of tools or techniques are available for assessing the costs and benefits of risk treatment options including those associated with climate change. Some of these involve a full quantitative analysis of the costs and benefits of options; others are semi-quantitative or qualitative. The choice of technique employed will depend on judgements about:

- the significance of the risk to be treated;
- the range of options that are available for treating the risk;
- the range of criteria – economic, social and environmental – that need to be considered when assessing each option;
- data and information requirements in relation to each of these criteria; and
- the capacity of the decision makers to assimilate the available information and form a judgement without formal modelling.

Table 20 (over page) provides a brief overview of some of the major techniques available for assessing risk treatment options. Further discussion of these techniques is beyond the scope of this Guide. There are numerous guides however, which discuss in depth general application of the techniques. In addition, reports discussing the application of assessment techniques specifically to the impacts of climate change are available through the Australian Greenhouse Office website: www.greenhouse.gov.au (for example Metroeconomica 2003; MJA 2004).

Regardless of the technique used to assess climate change risk treatment options, care is needed to ensure that the technique is correctly designed and implemented. If it is not, it may yield incorrect or misleading conclusions. With this in mind, organisations may consider seeking external advice when undertaking detailed assessment of treatment options.

Table 20: Tools and techniques for assessing risk treatment options

Tool/technique	Type	Description and purpose	Comments
Cost-Benefit Analysis	Quantitative, economic	Determine whether the total benefits to society of a treatment option out-weighs the costs of the option or which option (from a group of options) will produce the greatest net benefit.	→ Focus is on costs and benefits to society. → Relies on pricing major benefit and cost streams. → Pricing of non-market costs and benefits can be resource intensive.
Cost-Effectiveness Analysis	Quantitative, economic	Determine the least-cost way of achieving a predetermined physical or environmental goal.	→ Only costs of treatment options need to be monetised. → Each option should achieve the same or similar level of benefit.
Financial Analysis	Quantitative, financial	Determine whether the total benefits to an individual entity of a treatment option out-weighs the costs of the option or which option (from a group of options) will produce the greatest net benefits.	→ Focus is on costs and benefits to the individual entity.
General equilibrium analysis	Quantitative, economic	Determine the flow-on effects throughout the economy of a treatment option or options.	→ Usually undertaken using computable general equilibrium models. → Data and resource intensive.
Multi-Criteria Decision Analysis	Qualitative/ semi-quantitative	Determine overall preferences among alternative treatment options, where the options accomplish several objectives. Options assessed against a range of weighted criteria using qualitative or semi-quantitative scoring and then ranked based on scores and weights.	→ Often relies on expert judgement. → Methods are not yet universally agreed → Can be combined with economic or financial techniques.

8. Preparation, planning and integration

8.1 Preparation and planning

Planning is critical to the success of any risk management exercise. It must:

- → engage the people required to sanction, execute and act upon the outcomes of the analysis;
- → obtain relevant information;
- → specify the timing of activities; and
- → obtain the resources required for the administration, facilitation and data recording components of each task.

The following list sets out the major steps for initiating a climate change risk management process.

1. Review any existing risk management processes or earlier examination of climate change, if any, within your organisation.
2. Determine how climate change risk management will be integrated with other processes (unless it is decided to treat it as a stand alone exercise, which is not recommended).
3. Identify the sponsor and the audience for the output of the process, generally the directors and senior executive management of the organisation.
4. Determine how any actions flowing from this process will be inserted into routine operational activity with appropriate resources and controls.
5. Build around the entire exercise a simple communication plan setting out what will be said by whom and to whom about climate change risk management and the actions flowing from it.
6. Identify the participants in the process, including any external advisers and collaborators you may wish to use.
7. Prepare a simple project plan for the process, with dates for the completion of each step.

Key tasks in the project plan for the initial assessment are:

1. Check that you have the latest climate change scenarios relevant to your organisation, as explained in section 4.2.1.
2. Establish the context of the initial assessment.
3. Identify who will plan and manage the work and, if it is a different person, who will facilitate the workshop(s) and analyse the results.
4. Identify the participants in the workshop(s).
5. Determine whether all participants can be included in a single workshop or if more than one workshop will be required.
6. Estimate how long it will take to prepare and document the context definition.
7. Pick a workshop date or dates allowing sufficient time to prepare a briefing note for all participants and issue it a clear week, or more, before the first workshop.
8. Document the plan for:
   - → establishing the context;
   - → preparing a briefing note;
   - → holding the workshop(s); and
   - → conducting the initial assessment review.

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Recommendations

When planning the initial risk assessment:

25. Work on an initial estimate of one to three months elapsed time to complete the stage and adjust it as necessary to suit your circumstances, but try to avoid extended delays.
26. Take account of the timing of significant information inputs that might become available around the time of the analysis and try to plan workshops to take advantage of them.
27. Try to ensure the initial assessment output is available in time to be used in budgeting and target setting, towards the end of a planning year rather than just after the start of a year.
28. Plan workshops for a half or a full day, erring on the high side if in doubt, with a target of seven to fifteen people in each.
29. Engage workshop participants who have understanding and ownership of the issues and responsibility for taking action to treat risks.
30. Consider whether you need a specialist facilitator, in-house or external, to help with the rest of the process.

8.2 Integration with existing risk management practices

Many organisations have risk management practices in place. These may range from fully integrated enterprise wide risk management systems to piecemeal applications of safety and hazard assessments or individual project risk assessments.

This Guide is intended for any organisation, no matter how much or how little their risk management activity has been formalised to date. Two extremes, in terms of the current state of risk management, are discussed in the following sub-sections. From these, most organisations will be able to select guidance to suit their circumstances.

8.2.1 Building on a fully integrated risk management system

An organisation that has a fully integrated risk management system will have skilled resources that can be applied to climate change risk management and many personnel will be familiar with the general working of the process. The organisation is likely to have an agreed strategic context definition, processes for defining the context of separate parts of their operation, and mechanisms for evaluating risks. The organisation may also have in-house resources for facilitating the risk management process or access to such expertise elsewhere.

In all these respects, such an organisation should find it relatively easy to initiate climate change risk management as a relatively straightforward extension of existing practices.

Recommendations

If you have existing risk management processes:

31. Use the established process as the foundation for climate change risk management.
32. If it is necessary to adjust or extend existing processes to meet the needs of climate change risk management, integrate the two processes into a single framework.
33. Make climate change risk management an integral part of risk management in the organisation, not a separate risk management activity operating on a different basis from that used for other risk management tasks.

8.2.2 Starting 'from scratch'

Organisations that have no existing risk management systems will find all the basic information required to establish a climate change risk management process in this Guide. If it is put together well, this could be the first step towards establishing a sound general risk management system. Related resources that will be useful in such circumstances are the Standard AS/NZS 4360:2004 and the associated handbook HB 436, both of which are available from Standards Australia.

Whether the intention is to generalise risk management across the organisation or merely to implement climate change risk management, those who have never engaged in formal risk management activity, or who are unfamiliar with implementing the Standard, may find it useful to seek external risk management support. Risk management practitioners with adequate experience and expertise should have no difficulty taking the process laid out here and implementing climate change risk management.

Recommendations

If you have no formal risk management processes at the moment:

34. Consider whether this will be an isolated risk management exercise or part of a wider risk management development.
35. If there is an intention to develop a general risk management process as well as implement climate change risk management, seek additional advice as this Guide does not extend to the establishment of a full organisational risk management process.
36. Even if there is no intention to go beyond climate change risk management, consider using specialist risk management guidance, even though it may not be required by everyone to implement the process laid out here.

8.3 Integration with other activities

8.3.1 The annual planning cycle

Climate change is taking place on a similar timescale and in some cases with similar consequences to other long terms trends and changes. These include:

- population growth;
- ageing of the population;
- changes in land use;
- general aspiration towards higher living standards; and
- pressure to reduce greenhouse gas emissions and adopt sustainable development practices.

C
8.3

A consideration of climate change risk can raise issues that are driven by both climate change and other factors as well, such as pressure on water supplies or growing susceptibility to pests and diseases. It makes a lot of sense to combine climate change risk assessment with the organisation's strategic planning process, as this can help to resolve the causes and consequences of risks and allow similar issues with long-term impacts to be considered together.

Given the timescale of climate change and related developments, it is likely that major reviews will take place about once a year. If the analysis takes place as part of the formulation of the next year's plans and budget setting, those plans and budgets can take account of climate change risk and be used to underpin the actions chosen to address the risks.

Planning and budgeting are usually conducted to a well defined timetable, but investigations that might feed into a risk analysis may be less predictable. Where possible, arrange for relevant information to be available before risks are identified or reviewed.

Recommendations

The annual planning cycle

37. Consider integrating climate change risk assessment with strategic planning.
38. Use all strategic planning and related information to identify changes that will take place at the same time as climate change.
39. Plan to have the conclusions of the risk management process available in time to be included in the annual objective setting and budget allocation exercises.
40. Use the communication and consultation activity in the risk management process to gather relevant information from other planning and investigation activities and disseminate climate change risk management information to these other activities.
41. As far as possible, try to make the outcome of other investigations and reports available before the risk analysis takes place.

8.3.2 Climate science and risk management expertise

Few organisations have in-house expertise in climate science. Somewhat more have in-house risk management process expertise. A simple initial implementation of the process set out in this Guide can be carried out with no more information than is included here, but some organisations will prefer to seek external support.

Whether you intend to take advice on climate change or risk management or on neither, it is important to check that you have the most recent climate science information. Climate science is a dynamic field and new insights are being gained every year. This Guide has been prepared using information available at the end of 2005. The risk management process described here should remain valid for many years but the climate change information used within it is expected to change. As noted previously, scenarios for use in initial climate change risk assessments will be updated as new information becomes available and included on the Australian Greenhouse Office web site.

Exhaustive interpretation of climate science information and quantitative analyses will usually only be required for the detailed analysis stage of the process. Support in these areas will generally have to come from external organisations. It is important that a member of the risk assessment facilitation team has a basic familiarity with current climate science to the level of, say, the 'summary for policy makers' in the IPCC Synthesis Report (IPCC 2001). If you do not believe this level of knowledge exists within your organisation or can be acquired readily, then additional third-party support should be sought.

Recommendations

Obtaining information and support

42. Check AGO website for the most up-to-date climate science information and scenarios.
43. Ensure that a member of the facilitation team involved in the initial assessment stage has a basic familiarity with current climate science to the level of, say, the 'summary for policy makers' in the IPCC Synthesis Report (IPCC 2001).
44. Consider using a specialist, whether in-house or externally sourced, to interpret climate science where it is necessary to go beyond the simplified scenarios accompanying this Guide.
45. Take account of the strategic nature of climate change risk management and the desirability of integrating the process with other management systems when selecting advisers for risk management support.

→ Checklist
of recommendations and hints

C

Using climate change scenarios

1. Apply climate change scenarios as the basis for assessing risks in the initial assessment stage of the risk assessment process. Standard scenarios accompany this Guide, and will be updated periodically as new information about climate projections becomes available.
2. When applying climate change scenarios to the risk assessment ensure that workshop participants are provided with both quantitative and descriptive information on the scenarios.
3. Limit the number of scenarios used to one or two.
4. More specific and detailed climate change information than is provided in the standard climate change scenarios may need to be used for detailed assessments.

When defining the scope

5. Try to address the entire scope of the organisation's operations in one assessment exercise if you can.
6. If it is necessary to split the scope into parts, look carefully for potential gaps between the parts and consider whether you need a separate, high level assessment to deal with issues that are not confined to one area.
7. Make sure the geographical area, organisational boundaries, operational boundaries and timeframe are specified explicitly.

When identifying the stakeholders

8. Start with broad groups of stakeholders rather than small groups or individuals.
9. Break groups down if they contain two or more distinctly separate sets of motivations and concerns.
10. Group together stakeholders with essentially the same motivations and concerns.
11. Think widely about anyone who is not directly involved but could have an effect on the success of your organisation.
12. List the stakeholders with a short summary of their motivations and concerns.

When developing consequence scales

13. If you have an existing risk management framework, stay as close to it as you can while satisfying the following recommendations.
14. Aim for four to six criteria.
15. Test the criteria before developing the scales to make sure they are a complete set and there are not too many of them.
16. Define the extremes of the consequences, Catastrophic and Insignificant, before specifying the Major, Moderate and Minor levels.

When developing likelihood scales

17. If you have an existing risk management framework, stay as close to it as you can while satisfying the following recommendation.
18. Use the default scale shown here unless there is a pressing reason not to, such as there being an established scale in use already or the range of likelihoods you face being very low.

When developing a priority matrix

19. If you have an existing risk management framework, stay as close to it as you can while satisfying the following recommendations.
20. If you need to start afresh, use the examples here as a foundation.
21. Create a few examples of risks to test the scales.
22. If in doubt, err on the side of making the Extreme and High regions of the matrix smaller rather than larger, as severe risks that are understated will usually be picked up in the review at the end whereas it is often more difficult to downgrade risks that are overstated and they can clog the process.

When running the risk identification activity

23. Adopt the conventional rules of brainstorming that allow almost any input and suspend judgement.
24. Do not allow the workshop to be diverted into debating whether a risk is a climate change risk or not. If in doubt let it remain in the process and consider the matter later, after the workshop.

When planning the initial risk assessment

25. Work on an initial estimate of one to three months elapsed time to complete the stage and adjust it as necessary to suit your circumstances, but try to avoid extended delays.
26. Take account of the timing of significant information inputs that might become available around the time of the analysis and try to plan workshops to take advantage of them.
27. Try to ensure the initial assessment output is available in time to be used in budgeting and target setting, towards the end of a planning year rather than just after the start of a year.
28. Plan workshops for a half or a full day, erring on the high side if in doubt with a target of seven to fifteen people in each.
29. Engage workshop participants who have understanding and ownership of the issues and responsibility for taking action to treat risks.
30. Consider whether you need a specialist facilitator, in-house or external, to help with the rest of the process.

If you have existing risk management processes

31. Use the established process as the foundation for climate change risk management
32. If it is necessary to adjust or extend existing processes to meet the needs of climate change risk management, integrate the two processes into a single framework
33. Make climate change risk management an integral part of risk management in the organisation, not a separate risk management activity operating on a different basis from that used for other risk management tasks

If you have no formal risk management processes at the moment

34. Consider whether this will be an isolated risk management exercise or part of a wider risk management development.
35. If there is an intention to develop a general risk management process as well as implement climate change risk management, seek additional advice as this Guide does not extend to the establishment of a full organisational risk management process.
36. Even if there is no intention to go beyond climate change risk management, consider using specialist risk management guidance, even though it may not be required by everyone to implement the process laid out here.

The annual planning cycle

37. Consider integrating climate change risk assessment with strategic planning.
38. Use all strategic planning and related information to identify changes that will take place at the same time as climate change.
39. Plan to have the conclusions of the risk management process available in time to be included in the annual objective setting and budget allocation exercises.

C

40. Use the communication and consultation activity in the risk management process to gather relevant information from other planning and investigation activities and disseminate climate change risk management information to these other activities.
41. As far as possible, try to make the outcome of other investigations and reports available before the risk analysis takes place.

Obtaining information and support

42. Check AGO website for the most up-to-date climate science information and scenarios.
43. Ensure that a member of the facilitation team involved in the initial assessment stage has a basic familiarity with current climate science to the level of, say, the 'summary for policy makers' in the IPCC Synthesis Report (IPCC 2001).
44. Consider using a specialist, whether in-house or externally sourced, to interpret climate science where it is necessary to go beyond the simplified scenarios accompanying this Guide.
45. Take account of the strategic nature of climate change risk management and the desirability of integrating the process with other management systems when selecting advisers for risk management support

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C

→ Glossary

C

Climate change

Adaptation

Actions in response to actual or projected climate change and impacts that lead to a reduction in risks or a realisation of benefits. A distinction can be made between a planned or anticipatory approach to adaptation (i.e. risk treatments) and an approach that relies on unplanned or reactive adjustments.

Adaptive capacity

The capacity of an organisation or system to moderate the risks of climate change, or to realise benefits, through changes in its characteristics or behaviour. Adaptive capacity can be an inherent property or it could have been developed as a result of previous policy, planning or design decisions of the organisation.

Climate

The composite of surface weather conditions such as temperature, rainfall, atmospheric pressure, humidity, sunshine and winds, averaged over a period of time ranging from months to thousands of years. The classical period for averaging, as defined by the World Meteorological Organisation, is 30 years.

Climate change

Any change in climate over time, whether due to natural variability or as a result of human activity.

Climate change mitigation

Response measures that reduce the emission of greenhouse gases into the atmosphere or enhance their sinks, aimed at reducing their atmospheric concentrations and therefore the probability of reaching a given level of climate change.

Climate scenario

A coherent, plausible but often simplified description of a possible future state of the climate. A climate scenario should not be viewed as a prediction of the future climate. Rather, it provides a means of understanding the potential impacts of climate change, and identifying the potential risks and opportunities to an organisation created by an uncertain future climate. A 'climate change scenario' can be defined as the difference between a climate scenario and the current climate.

Climate projection

A projection of the response of the climate system to scenarios of greenhouse gas emissions or atmospheric concentrations of greenhouse gases. Climate projections are often based upon simulations of the climate system by computer based mathematical models. Climate projections depend on assumptions about emission rates and concentrations and response of the climate system to changes in these variables and can therefore be distinguished from climate predictions.

Climate variability

Variations or deviations from the mean state of the climate. The climate system has natural, internal variability but variability could be affected by external factors driving climate change such as changes in the atmospheric concentration of greenhouse gases.

Enhanced greenhouse effect

Increases in the atmospheric concentration of greenhouse gases such as carbon dioxide, methane and nitrous oxide due to human activities, leading to an increase in the amount of thermal radiation near the Earth's surface. Most scientists agree that the enhanced greenhouse effect is leading to an increase in global average surface temperature (see global warming) and other changes in the atmospheric environment (see climate change). See also greenhouse effect.

Extreme event

Weather conditions that are rare for a particular place and/or time such as an intense storm or heat wave.

Global warming

An increase in the global average surface temperature due to natural or human caused factors.

Greenhouse effect

The process where gases in the lower atmosphere such as carbon dioxide and water vapour trap radiation released by the Earth's surface after it has been warmed by solar energy. These gases then radiate heat back towards the ground, adding to the heat the ground receives from the Sun. The surface of the Earth would be about 33°C colder on average than it is without the natural greenhouse effect. See enhanced greenhouse effect.

Sensitivity

The degree to which a system is affected, either adversely or beneficially, by climate related variables including means, extremes and variability.

Vulnerability

The extent to which a system or organisation can cope with the negative impacts of climate change, variability and extremes. It is a function of risk and adaptive capacity.

Risk management

Following the Standard AS/NZS 4360, the definitions below apply to this guide.

Consequence

Outcome or impact of an event

1. There can be more than one consequence from one event.
2. Consequences can range from positive to negative.
3. Consequences can be expressed qualitatively or quantitatively.
4. Consequences are considered in relation to the achievement of objectives.

Control

An existing process, policy, device, practice or other action that acts to minimise negative risk or enhance positive opportunities.
The word control may also be applied to a process designed to provide reasonable assurance regarding the achievement of objectives.

Event

Occurrence of a particular set of circumstances.

1. The event can be certain or uncertain.
2. The event can be a single occurrence or a series of occurrences.

Frequency

A measure of the number of occurrences per unit of time.

Hazard

A source of potential harm

Likelihood

Used as a general description of probability or frequency

Can be expressed qualitatively or quantitatively.

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Monitor

To check, supervise, observe critically or measure the progress of an activity, action or system on a regular basis in order to identify change from the performance level required or expected

Organisation

Group of people and facilities with an arrangement of responsibilities, authorities and relationships - eg. company, corporation, firm, enterprise, institution, charity, sole trader, association, or parts or combination thereof.

1. The arrangement is generally orderly.
2. An organisation can be public or private.

Probability

A measure of the chance of occurrence expressed as a number between zero and one.

1. 'Frequency' or 'likelihood' rather than 'probability' may be used in describing risk.

Risk

The chance of something happening that will have an impact on objectives.

1. A risk is often specified in terms of an event or circumstance and the consequences that may flow from it.
2. Risk is measured in terms of a combination of the consequences of an event and their likelihoods.
3. Risk may have a positive or negative impact.

Risk analysis

Systematic process to understand the nature of and to deduce the level of risk.

1. Provides the basis for risk evaluation and decisions about risk treatment.

Risk assessment

The overall process of risk identification, risk analysis and risk evaluation.

Risk evaluation

Process of comparing the level of risk against risk criteria.

1. Risk evaluation assists in decisions about risk treatment.

Risk identification

The process of determining what, where, when, why and how something could happen.

Risk management

The culture, processes and structures that are directed towards realising potential opportunities whilst managing adverse effects.

Risk management process

The systematic application of management policies, procedures and practices to the tasks of communicating, establishing the context, identifying, analysing, evaluating, treating, monitoring and reviewing risk.

Risk treatment

Process of selection and implementation of measures to modify risk.

1. The term 'risk treatment' is sometimes used for the measures themselves, in addition to the process of generating the measures to deal with a risk.
2. Risk treatment measures can include avoiding, modifying, sharing or retaining risk.

Stakeholders

Those people and organizations who may affect, be affected by, or perceive themselves to be affected by a decision, activity or risk.

1. The term 'stakeholder' may also include 'interested parties' as defined in AS/NZS ISO 14050 and AS/NZS ISO 14004.

Australian Government
Department of the Environment and Water Resources
Australian Greenhouse Office

CLIMATE CHANGE ADAPTATION ACTIONS FOR LOCAL GOVERNMENT

Report by SMEC Australia to the Australian Greenhouse Office
Department of the Environment and Water Resources

Published by the Australian Greenhouse Office, Department of the Environment and Water Resources.

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www.greenhouse.gov.au

Questions or comments about the content of this document should be addressed to:

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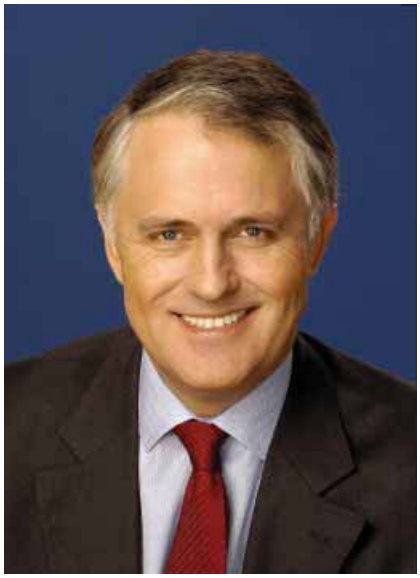
CANBERRA ACT 2601

Foreword



Climate change is one of the greatest economic and environmental challenges of our times. Not only does local government have an important role in reducing greenhouse gas emissions to reduce the magnitude of global warming, local government will also be at the forefront of managing the impacts of climate change.

The projected impacts of climate change cut across all elements of local government responsibility. More severe weather events will damage infrastructure, and impact on water and sewerage services and human health. Sea level rise will impact on coastal settlements and recreation facilities; and hotter and drier conditions in eastern Australia could lead to more bushfires and impacts on local biodiversity values.

While effective action to manage these impacts needs to be tailored to local conditions, there are real benefits from increasing awareness of adaptation options and from sharing experience gained in the implementation of different approaches.

This guide on climate change adaptation actions outlines the potential impacts of climate change on local government functions, and provides a valuable toolkit of responses including information on their benefits and costs. It complements the report Climate Change Impacts & Risk Management – A guide for Business and Government, released by the Australian Government last year.

Adaptation is an important element of the Australian Government's $3.4 billion climate change strategy. As part of this strategy we have taken world-leading action to improve the efficiency of the appliances that we use in our homes and buildings, including the phase-out of inefficient incandescent lighting. We are also supporting the generation of low emissions energy, domestically and in our region through the Asia-Pacific Partnership, and we have launched a global initiative to reduce deforestation and promote sustainable forestry.

The recently announced Australian Centre for Climate Change Adaptation will support all decision-makers, including local government, understand the likely risks from climate change impacts and identify and put in place effective adaptation strategies.

Malcolm Turnbull
Australian Minister for the Environment and Water Resources

Table of Contents

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

AGO	Australian Greenhouse Office
BCA	Building Codes of Australia
BoM	Bureau of Meteorology
CCP	Cities for Climate Protection
NCCAP	National Climate Change Adaptation Programme
WAPC	Western Australian Planning Commission
UKCIP	UK Climate Impacts Programme
UNFCCC	United Nations Framework Convention on Climate Change

1 Introduction

1.1 CLIMATE CHANGE CONTEXT

Preparing Australia for the unavoidable impacts of climate change is imperative. Australia's climate is clearly changing and increasing temperatures, sea level rise, changing rainfall patterns and more frequent and intense extreme climatic events are likely. Many Australian sectors and systems are highly vulnerable to climate change, including the functions and responsibilities of Australian local governments.

This report was developed as part of the Australian Government's *National Climate Change Adaptation Programme*, which is helping to address the need to prepare Australian governments, vulnerable industries, communities and ecosystems to manage the unavoidable consequences of climate change. This report forms part of a suite of tools being developed to assist local governments in identifying and implementing climate change adaptation actions. In particular, this report complements *Climate Change Impacts & Risk Management - A Guide for Business and Government*, released in May 2006.

This report has evolved from the understanding that the level of uncertainty of climate change projections makes it difficult for local governments to prioritise their commitment to adaptation. The most effective adaptation to a changing climate appears to require knowledge of both how the climate will change and how the changes will affect the environment, society and the economy. In addition, changes in other key variables, such as technology, personal preferences and social values, will also influence the rate of climate change, our ability to adapt to it and an increased focus on adaptation planning.

The most easily implemented adaptation actions for local governments are those that, regardless of what changes are occurring to Australia's climate, will provide a net benefit to the environment, society and/or the economy. The fact that some degree of benefit or co-benefits will occur irrespective of the scale of climate change, will help lessen the difficulties associated with scientific uncertainty when implementing adaptation actions.

1.2 REPORT OUTLINE

The primary objective of this report is to identify climate change adaptation actions that are applicable to Australia's climatic conditions and climate impact risks as currently predicted (using CSIRO 2001 scenarios) and that can be implemented by Australian local governments. In developing these actions, the following six local functions were considered:

- infrastructure and property services
- provision of recreation facilities
- health services
- planning and development approvals
- natural resource management
- water and sewerage services.

The adaptation actions that have been identified during this study are those that provide a net economic, social or environmental benefit no matter what level of climate change occurs. The actions that are identified in this report have been developed through:

a) Literature Review

A review was undertaken of the existing literature and information on climate change adaptation actions available at both the international and domestic level that are relevant to the key responsibilities of local government. A full list of all references is provided at Section 6.

b) Key Informant Interviews

To support the review of relevant information addressing climate change adaptation strategies and the development of possible new strategies, informal discussions were held with a number of relevant stakeholders. During these discussions, stakeholder views were obtained on the possible types of adaptation strategies, existing local government initiatives that were of relevance to climate change adaptation, and recommendations of possible mechanisms for implementation. Consulted organisations are identified at Appendix A.

2 Climate Change Projections

2.1 GLOBAL CLIMATE CHANGE

Over the twentieth century, average air temperatures at the earth's surface increased by approximately 0.74 °C (IPCC, 2007). It is very likely that greenhouse gas emissions generated by human activities caused most of the observed increase in globally averaged temperatures since mid-20th century (IPCC, 2007). These temperature increases have also influenced the global hydrological cycle. Precipitation in some regions of the world has increased significantly while more intense and longer droughts have been observed since the 1970s in other regions (IPCC, 2007).

Since 1990, the Intergovernmental Panel on Climate Change (IPCC) has provided regular comprehensive scientific assessments of past, present and future climate change with four scientific assessments having being undertaken to date – in 1990, 1996, 2001 and 2007.

The most recent assessment by the IPCC in 2007 made the following conclusions and projections about global climate change:

- an increase in the strength of evidence suggesting that most of the global warming that has been observed over the last 50 years can be attributed to human activities
- an average warming of 1.1 to 6.4 °C by 2090-99 relative to 1980-1999 temperatures
- an average sea level rise between 0.18 and 0.59 metres by 2090-99 (these figures do not include the full effects of recent accelerated changes in ice sheet flow)
- increases in the amount of precipitation is very likely in high-latitudes, while decreases are likely in most subtropical land regions and
- extreme climate events – hot extremes, heat waves and heavy rainfall – are very likely to become more frequent.

2.2 CLIMATE CHANGE PROJECTIONS FOR AUSTRALIA

Historical global changes have been mirrored in Australia where average temperatures have increased by about 0.7 °C since 1910 (Pittock, 2003). Precipitation in Western Australia and along Australia's east coast has declined steadily since the mid-20th century, while precipitation has increased in the northwest (IPCC, 2001b). There has also been an increase in extreme rainfall events throughout Australia, particularly during winter. In summary, projections suggest that:

- the majority of Australia may warm 0.4 to 2.0 °C by 2030 and up to 6 °C by 2070 with slightly less warming near the coast - this may result in more evaporation and hot days and fewer cold nights
- annual rainfall will generally decrease in the south and east (mainly in winter and spring)
- wetter summers may be experienced by some inland and eastern coastal areas
- more frequent extreme rainfall.

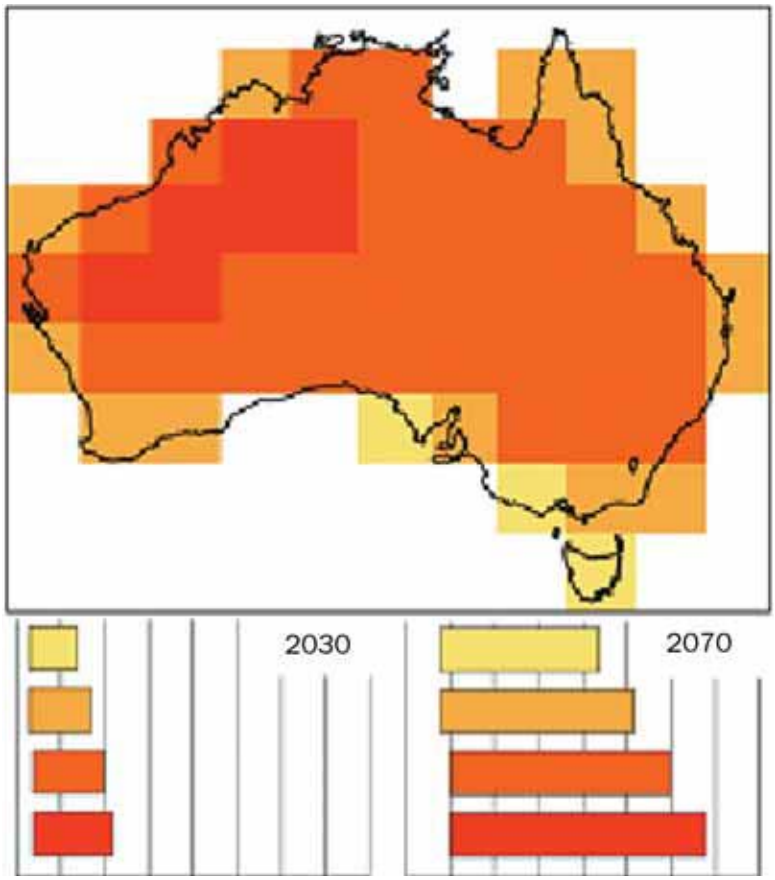
More specifically:

TEMPERATURE

It is predicted that by 2030, annual average temperatures will be 0.4 to 2.0 °C higher over most of the Australian continent with the greatest potential for warming to occur in north-west Australia. By 2070

annual average temperatures are projected to have increased by 1.0 to 6.0 °C over most of Australia (Pittock, 2003). See *Figure 1 - Projected changes in Australian temperature* for an illustration of projected changes in Australian temperatures and Table 2 for a summary of temperature changes.

Figure 1 - Projected changes in Australian temperature



Source – Pittock (2003), *Climate Change: An Australian Guide to the Science and Potential Impacts.*

Increases in average temperature can lead to large changes in the occurrence of extremely hot or cold days with the average number of hot days to increase across most of Australia.

Future changes in variability in daily temperature extremes are relatively small, with the increases in average minimum and maximum temperature determining the change in the extremes.

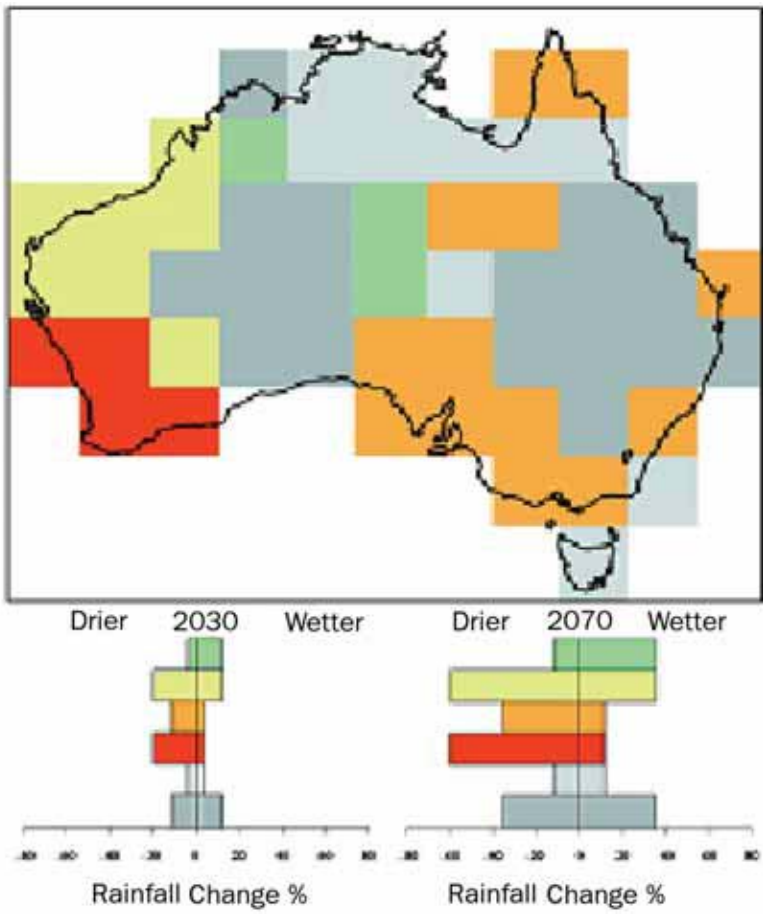
Table 1 - Summary of Temperature Changes

YEAR	PROJECTED CHANGE	REGIONAL VARIATION
2030	0.4 - 2.0 ºC increase	• Slightly less warming in Tasmania and some coastal areas. • Potential for greater warming in the north-west with maximum warming occurring in summer. • Range of warming greatest in spring and least in winter.
2070	1.0 - 6.0 ºC increase	

RAINFALL

Average annual rainfall is expected to change across Australia, with a tendency to decreased rainfall across much of southern and eastern Australia. In combination with increased evaporation (see below), changed rainfall patterns are expected to result in reduced stream flow across most of the country. Most models simulate an increase in extreme daily rainfall leading to more frequent heavy rainfall events. The extent of average projected seasonal and annual changes in Australian rainfall for 2030 and 2070 relative to 1990 are represented in *Figure 2*.

Figure 2 - Projected changes in Australian rainfall



Source – Pittock (2003), *Climate Change: An Australian Guide to the Science and Potential Impacts.*

EVAPORATION

Evaporation is likely to increase due to higher temperatures with increases expected in all seasons and ranging from 0% to 8% per °C of global warming over the majority of Australia and up to 12% in Tasmania and eastern Australian highlands.

The overall pattern shows a decrease in moisture balance nationally and therefore greater moisture stress across much of Australia with average decreases in moisture balance expected to range from 15 to 160mm by 2030 and 40 to 500mm by 2070.

SEA LEVEL RISE

Mean sea level rise is expected to increase with local and regional variations due to land-sea movements and changes to ocean currents. The anticipated extent of sea level rise is estimated between 18 to 59cm by 2099. Shoreline retreat can be 50 - 200 times the vertical sea level rise, depending on coastal geomorphology.

WEATHER EXTREMES

Projections of future weather extremes associated with climate change are difficult to make, however there are indications of changes to the intensity of extreme weather events including tropical cyclones, droughts and severe storms. CSIRO (2001) reports that regions of cyclone origin are likely to remain unchanged, although the paths and poleward extent may alter. There is also the potential for increases in the intensity of these events, which may lead to an increase in the frequency of associated phenomena such as storm surges, gales and flooding rains in northern Australia (CSIRO, 2001).

For example, the intensity of the 1-in-20 year daily rainfall event may increase by up to 10% in parts of South Australia by the year 2030, by 5 to 50% in some NSW regions by the year 2050, 5 to 70% by the year 2050 in Victoria and up to 30% by the year 2040 in south-east Queensland and northern NSW (Hennessy et. al., 2005).

FIRE

In a study based in south-east Australia, an area projected to become hotter and drier under climate change, CSIRO found that at most sites an increase in fire-weather risk is likely in 2020 and 2050. Changes in the frequencies of extreme Forest Fire Danger Index days are generally largest inland and vary from an increase of 10-40 % in 2020, to an increase between 20 – 120 % in 2050. (Hennessy et. al. 2006).

Projections presented in *Climate Change Projections to Australia* (CSIRO, 2001) (www.cmar.csiro.au/e-print/open/projections2001.pdf) and *Climate Change - An Australian Guide to the Science and Potential Impacts* (Pittock, 2003) (www.greenhouse.gov.au/science/guide/index.html) have been used as a basis for the expected levels of climate change in Australia for this study. The fire weather projections are from Climate change impacts on fire-weather in south-east Australia (Hennessy et. al. 2006).

CSIRO has undertaken a number of regional and local level assessments of climate change predictions (www.dar.csiro.au/impacts/future.html). These are under continual development. In May 2006 the Australian Government released *Climate Change Scenarios for Initial Assessment of Risk in Accordance with Risk Management Guidance*, which contains regional scenarios developed by CSIRO.

2.3 CLIMATE CHANGE IMPACTS AND REGIONAL VULNERABILITY

A summary of the predicted direct impacts of climate change and any anticipated regional vulnerability to these particular impacts is presented at *Table 3*. This summary is based on the information in *Climate Change - An Australian Guide to the Science and Potential Impacts* (Pittock, 2003). A more detailed discussion of all impacts on Australia associated with climate change is available at www.greenhouse.gov.au/science/guide/index.html. The anticipated flow-on impacts associated with climate change that are specifically relevant to the operations and responsibilities of local government are addressed in Section 3 of this Report.

Table 2 - Summary of Climate Change Impacts on Australia

CLIMATE VARIABLE	POTENTIAL IMPACT	VULNERABLE COMMUNITIES
Temperature	• Increased risk and incidence of bushfires – the number of days of very high and extreme fire danger increasing across the country. • Increase in extreme weather events such as floods and drought. • Impacts on ecosystems.	• Generally an increase in fire danger throughout Australia. • Settlements, industry and infrastructure vulnerable to adverse effects of weather. • Changes in biodiversity across Australia. • Loss of coastal wetlands.
Changes to rainfall patterns and evaporation rates	• Increase in the likelihood and severity of drought and increased evaporation from water storages. • Decrease in annual surface water run-off. • Possible reductions in mean flows of rivers. • Heavy rainfall events may be more extreme and frequent possibly leading to riverine flooding and erosion of river banks. • Increased risk, incidence and severity of bushfires.	• Adelaide and south-west Western Australia considered the most vulnerable metropolitan areas. • Drier inland areas more vulnerable to water shortages during the annual dry season. • A decrease of up to 20% is anticipated in south-east Australia. • A -10% to +10% change possible in Tasmania. • Stream flow in northern Australia may increase if summer rainfall increases. • Northern Territory particularly susceptible to inland flooding. • Generally an increase in fire danger throughout Australia.
Sea level rise	• Increased vulnerability to coastal erosion. • Inundation of coastal lowlands. • Impacts on coastal habitats due to changes in tidal inundation. • Increased risk of damage to coastal infrastructure. • Reductions in water quality in coastal rivers. • Saltwater intrusion of estuaries and aquifers.	• Coastal settlements of Queensland. • Low islands of the Torres Strait. • New South Wales coasts. • Especially under storm tides in Port Philip, Western Port and Gippsland Lakes. • Floodplains of northern Australia. • Riverine environments.
Extreme Weather Events	• Increased frequency of tropical cyclones associated with the occurrence of oceanic storm surges, gales and flooding rains. • Projected rises in average sea level contributing to more extreme storm surges. • Increased risk, incidence and severity of bushfires.	• Increased intensity of tropical cyclones affecting northern Western Australia and Northern Territory. • More intense precipitation events very likely over many areas. • Flooding of coastal wetlands. • Increased potential for freshwater wetlands to turn saline. • Loss of infrastructure in northern Australia. • Generally an increase in fire danger throughout Australia.

Source - Adapted from Pittock (2003)

3 Local Government and Climate Change

3.1 INTRODUCTION

Local government's response to climate change requires a dual approach:

- management and reduction of greenhouse gas emissions (mitigation)
- making adjustments to existing activities and practices so that vulnerability to potential impacts associated with climate change can be reduced or opportunities realised (adaptation).

These two activities are complementary rather than exclusive and should be considered simultaneously.

Local governments are undertaking a high number of greenhouse gas management and reduction activities. Investment in greenhouse gas management initiatives since the inception of the Cities for Climate Protection programme in 1998/99 is reported at over $100 million, with more than 5 million tonnes of CO_2e emissions being abated during the same period (CCP, 2005).

Some of the activities currently undertaken by local governments also have the additional benefit of assisting local communities to cope with, or adapt to, the impacts of climate change through the management of natural hazards and regulation of activities with environmental effects. Some existing examples of these adaptation activities include the encouragement of water sensitive urban design, flood plain mapping activities, increasing the availability of shade provision and protection, and mosquito control programmes.

This section provides an overview of how the functions of local government in Australia may be affected by a changing climate unless there is a continued focus on the implementation of adaptation measures. Potential adaptation measures for local government are identified at Section 4.

3.2 CLIMATE CHANGE IMPACTS ON LOCAL GOVERNMENT FUNCTIONS

The effects of climate change will have direct and indirect implications for local governments. Aside from any regional variations in impacts across parts of Australia, there will also be differences in the extent to which these impacts are specifically felt by the communities of a local government area. For example, the demographic make up of a local government area could increase vulnerability to health impacts with older people, low-income groups, and remote and Aboriginal communities potentially more sensitive to impacts such as heat stress and disease. To set the context for identification of relevant adaptation strategies, anticipated climate change impacts on, and implications for, the responsibilities and services of local government have been summarised in *Table 4*.

Table 3 - Potential Impacts of Climate Change on Local Government Functions

ASSETS/SERVICE DELIVERY	POSSIBLE CLIMATE CHANGE IMPACTS
Infrastructure and property services	
Road/pavement construction and maintenance	• Changes in rates of deterioration - faster deterioration in wetter areas but potentially slower deterioration in areas where rainfall decreases. Deterioration may also result from higher temperatures and increased solar radiation. • Inundation of surface and/or underground roads in coastal areas, potentially resulting in destruction. • Changes in frequency of interruption of road traffic from extreme weather events and emergency transport routes disrupted.
Stormwater/drainage	• More intense rainfall resulting in inflow and infiltration into wastewater networks. • Exceedance of existing flood defences. • Exceedance of drainage capacity. • Reduction in drainage capacity due to sea level rise and storm surge. • Changes in mean and peak stream and river flows. • Lower levels of rainfall, reducing pressure on stormwater systems.
Buildings	• Changes in building heating/cooling costs (can be either negative or positive). • Increased risk of damage from bushfires. • Changes in frequency of wind, rain, hail, flood, storm events and damage, potentially resulting in destruction. • Cyclone damage and destruction due to changes in wind intensity. • Higher rates of building deterioration and associated maintenance costs.
Coastal infrastructure	• Increased coastal erosion and inundation. • Increased frequency, or permanent inundation of, coastal infrastructure and utilities, e.g. water, sewerage, gas, telecommunications, electricity, transportation. • Destruction, damage and disturbance to council-managed marinas and boat ramps. • Increased erosion and/or exceedance of seawalls, jetties and other coastal defences.
Recreational facilities	
Provision and use of recreational facilities	• Impacts on coastal recreational infrastructure. • Loss of existing public space in coastal areas. • Impacts on tourism/recreation activities along the coast. • Increased costs associated with operation and maintenance costs of public amenities/recreational sites due to storm damage.
Maintenance of recreational facilities	• Reduced water quality and quantity resulting in less watering/irrigation of open space and sports grounds and closure of ovals. • Limited water for swimming pools, etc. • Beach closures, e.g. due to E.coli levels after storms.

ASSETS/SERVICE DELIVERY	POSSIBLE CLIMATE CHANGE IMPACTS
Health services	
Community/workplace health	• Milder winters improving communities' comfort levels. • Increase in geographical range and seasonality of vector-borne diseases and the possibility for an expansion of receptive zones. • High temperatures increasing incidence of food and water-borne diseases. • Risk of increased cryptosporidium infections during open water swimming in summer. • Health impacts due to exposure to extreme weather, e.g. heatwaves. • Excessive rainfall events transporting contaminants into waterways and drinking water supplies. • Increased pressure on drinking water supplies. • An increase in injuries due to increased intensity of extreme events, e.g. storm surge and coastal flooding in coastal regions of Australia due to changes in sea level rise and human settlement expansion into coastal catchments.
Emergency/bushfire management	• Increased emergency response and recovery operations. • Risks to public safety and tourism and longer term impacts on regional economies.
Planning and development approvals	
Planning policy and developments	• Inappropriate location of urban expansion areas. • Increased uncertainty in long-term land-use planning and infrastructure design, i.e. location of future developments, suitability of infrastructure designs to cope with changing climate, etc. • Cost of retrofitting of systems. • Loss of private property and community assets. • Increase in insurance costs. • Increased pressure on disaster management and response resources. • Early retirement of capital infrastructure.
Natural resource management	
Coastal management	• Increased coastal erosion and inundation. • Loss of private property/community assets. • Loss of beach width. • Changes to wetlands due to sea level rise, shoreline erosion and saltwater intrusion.
Weed/pest management	• Changes in distribution of invasive species due to changes in climate and associated loss of biodiversity and changes to bushfire intensity.
Biodiversity	• Shifts in distributions of plant and animal species. • Increased risk of population and species extinctions. • Reduced ecosystem resilience to stress. • Increased ecosystem and species heat stress. • Increased pressure on dunal systems. • Changes to mangrove habitats due to salt water intrusion. • Increases in ecological disturbances.

ASSETS/SERVICE DELIVERY	POSSIBLE CLIMATE CHANGE IMPACTS
Water and sewerage services	
Stormwater/sewerage	• Inundation of storm water and sewerage systems. • Increased peak flows. • Changes in groundwater levels. • Changes in flood plains. • Reduced dry weather sewerage flows. • Reduced/unreliability of power supply for sewage pumping and treatment if existing electricity suppliers cannot maintain pace with long term changes in climate.
Wastewater	• Changes in intensity of rainfall events impacting inflow and infiltration to wastewater network. • Potential for blockages and dry weather overflows during dry spells.
Water supply	• Changes in mean and peak stream and river flows. • Uncertain water availability. • Insufficient water supply in some areas. • Increased potential for water contamination. • Salination of surface and groundwater supplies. • Changes in availability of groundwater available for irrigation.

3.3 REGULATORY FRAMEWORK FOR CLIMATE CHANGE ADAPTATION

REGULATORY FRAMEWORK APPLYING TO LOCAL GOVERNMENT

The role of local government to protect the community has been described as:

> *"Local government provides for the health, safety and welfare of its community and if a council cannot show that it has taken preventative action against any threat to the health, safety and welfare of its community, it faces the possibility of liability costs - costs which can be reduced if a council identifies the threats to its community and implements appropriate strategies to prevent these threats"* (Local Government Association of Tasmania, 2004).

It has been documented that the two areas where liability related to climate change may arise are compensation or common law negligence due to a breach of the duty of care (Planning Institute of Australia, 2004).

Reduced risk of costs associated with possible liability could be considered an additional economic benefit of the implementation of adaptation measures. Also, if climate change was included as part of local government's overall risk management regime to mainstream its management, then this would see adaptation actions undertaken during day to day operations and inclusion in local emergency or risk management plans.

The nature of the relationship between each local government and their community means that local government has the ability to play a role of educator and encourage awareness within their communities, and to promote sustainable development.

REGULATORY POWERS OF LOCAL GOVERNMENT

Within each Australian state and territory, the Local Government Act is the principal statute governing councils in each jurisdiction. With respect to the regulatory powers that are available at the local government level to influence the uptake of adaptation to climate change within their jurisdiction, over the years, legislative reforms have resulted in an expansion of the general competence powers, increasing the flexibility of councils to respond more comprehensively to local needs.

Local government bodies in Australian jurisdictions have now been given the authority to "provide generally for the good government of their local government area" with local government now having roles in governance, advocacy, service delivery, planning and community development, and regulation. This has been viewed as conferring on local government the powers of general competence, or the power to take action in any area not expressly precluded by other legislation (National Office of Local Government, 2004).

Councils typically have the power to make and enforce by-laws in certain circumstances and to enforce compliance with the requirements of their Local Government Act and other relevant Acts. For example, Section 3 of the Western Australian *Local Government Act 1995* states that:

> *"A local government may make local laws under this Act prescribing all matters that are required or permitted to be prescribed by a local law, or are necessary or convenient to be so prescribed, for it to perform any of its functions under this Act."*

Of the local government regulatory powers which govern additional statutory responsibilities, planning systems provide particularly comprehensive regulatory powers as they typically comprise legislation, regulation, policies, guidelines and initiatives related to planning, natural resource management and environmental protection (Hullick, 2002).

MUTUAL AND SHARED OBLIGATIONS

Stakeholder consultation during the preparation of this report highlighted that local government's climate change obligations may be shared, implemented or defined by other agencies and authorities in other levels of government. These relationships can be complex and differ depending on both the state or territory where the local government is located and the particular local government function being considered. For example, the types of health services undertaken by local government and their relationship with state health agencies vary between jurisdictions. Understanding these relationships is essential to adaptation planning and may require investigation at a regional level.

4 Adaptation Options

The purpose of this report is to identify climate change adaptation actions for local government that produce benefits other than those that are strictly tied to climate change and in particular provide a net economic, social or environmental benefit no matter what level of climate change occurs.

The climate change adaptation actions can be categorised under the general themes presented at Section 4.1. Section 4.2 provides a framework for how local governments can identify the appropriate adaptation responses for their potential level of risk. Sections 4.3 to 4.9 identify potential climate change adaptation options for each local government sector.

4.1 GENERAL THEMES OF ADAPTATION ACTIONS

POLICY

- Undertake a risk assessment for the local government area to identify the most significant areas of risk and to establish priorities
- Incorporate potential climate change adaptation actions into strategic planning where appropriate.

NEW BUILDINGS AND INFRASTRUCTURE

- Where practicable, adopt climate sensitive building design that considers local cooling and heating requirements
  e.g. inclusion of natural ventilation cooling, consideration of building orientation and low energy consumption
- Design buildings to allow for consideration of future climate change impacts and incorporation of future adaptation (noting that the Building Code of Australia sets minimum standards, and it can be difficult for local governments to justify setting more stringent requirements).

EXISTING BUILDINGS AND INFRASTRUCTURE

- Monitor any changes to the condition in structures so that any modifications/retrofitting occurs on time and prior to failure
- Identify alternative options should the existing buildings and infrastructure be impacted upon in order to maintain services and connections, e.g. to minimise isolation of communities during an adverse storm event that puts the infrastructure at higher risk
- Design retrofitting to a higher standard than the minimum set where possible and practical
- Progressively incorporate higher design standards into asset management plans and rolling capital works programmes.

COMMUNITY HEALTH AND RECREATION

- Establish the level of risk to the community of climate change impacts to assist in prioritising potential adaptation actions
- Control planning and activities in areas of high risk

- Encourage building design and public spaces that provide improved levels of thermal comfort and security, e.g. protection during floods or extreme wind.

NATURAL ENVIRONMENT

- Analyse the risks from the initial risk assessment, such as flood liability, storm surge, species extinction, security of water supply
- Reduce other external stresses e.g. pollution or development.

4.2 SELECTING THE APPROPRIATE ADAPTATION RESPONSE

There are a number of different frameworks to provide guidance on conducting assessments of climate change impacts and/or adaptation responses. Increasingly, a risk management approach to addressing the potential consequences of climate change is advocated as a means of evaluating decision alternatives in the context of various uncertainties (CSIRO, 2006a).

It has been acknowledged that to identify the appropriate adaptation response, a careful assessment of the risks facing a particular area due to climate change is required. As such the AGO has recently released a guide to assist in the integration of climate change impacts into risk management and other strategic planning activities within Australian public and private sector organisations - *Climate Change Impacts and Risk Management - A Guide for Business and Government*. This guide and associated climate change scenarios prepared by CSIRO, support users in the:

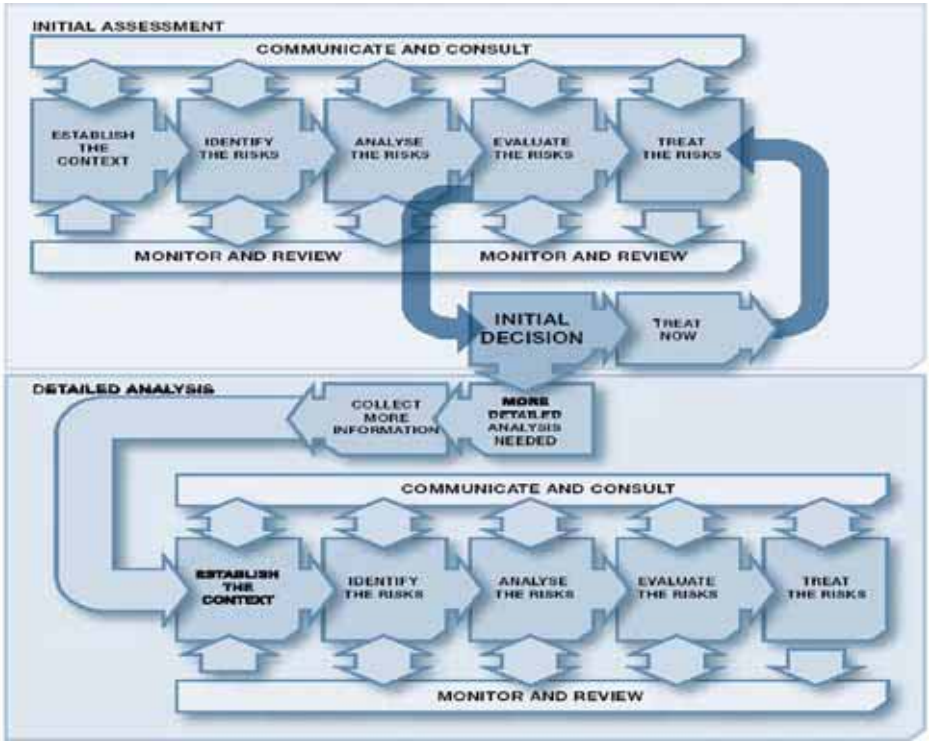
- enumeration of climate change impact related risks
- prioritisation of risks requiring further attention
- establishment of processes to ensure higher priority risks are managed effectively (AGO, 2006).

This framework for the assessment of the risks associated with climate change is based on the *Australian and New Zealand Standard AS/NZS 4360 Risk Management* which prescribes the following steps in the climate change risk management process:

- *Establishment of the context* - through identifying the business to be assessed, its objectives, responsibilities and stakeholders, and the relevant climate scenarios
- *Risk Identification* - by identifying how climate change will impact on each of the above
- *Risk Analysis* - by identifying existing management strategies, the likelihood of each risk, the consequence should this likelihood be realised and the level of resulting risk for each of the above climate change impacts
- *Risk Evaluation* - by ranking risks by severity and identifying those that require additional analysis
- *Risk Treatment* - through the identification and selection of the relevant risk management and/or adaptation options.

Figure 3 below provides an overview of the process that should be followed in the initial assessment and detailed analysis of risks associated with climate change. Further information is available in *Climate Change Impacts and Risk Management - A Guide for Business and Government* available at www.greenhouse.gov.au/impacts/publications/risk-management.html. The accompanying CSIRO climate change scenarios are also available online at www.greenhouse.gov.au/impacts/publications/risk-scenarios.html.

Figure 3 - Initial risk assessment and detailed analysis



Source - AGO (2006), *Climate Change Impacts and Risk Management - A Guide for Business and Government*.

Consideration of climate change scenarios and the utilisation of a risk assessment and management framework ensures that climate change is considered as early as possible in the decision making process and that the appropriate actions are taken when it is most feasible and sensible to do so rather than being forced into action by a climate change related event.

While the choice of suitable adaptation action will vary depending on the nature of the climate change threat, the sensitivity of the region and its capacity to respond (Engineers Australia, 2004), it is important to remember that the consideration of climate change effects in local government risk assessment and decision-making activities will not always result in an increase in costs or the need for changes to existing operations, particularly where decision-making already considers holistic consequences of actions. It is possible that existing infrastructure and policies will be sufficient to cope with predicted climate change scenarios and related impacts in a particular area (New Zealand Climate Change Office, 2004b).

The following sections identify potential climate change adaptation options for each local government sector. The relevance of the actions identified to the Australian context has been noted as has the anticipated benefits at a broad economic, social and/or environmental level, and a qualitative assessment of potential costs. A qualitative rather than quantitative assessment of adaptation options has been provided as the adaptation option chosen will normally depend on the objectives of the decision-maker and normally involves a trade-off between social, economic and environmental ideals (Kerr and McLeod, 2001), with the associated benefits typically varying substantially between decision-making parties.

4.3 INFRASTRUCTURE AND PROPERTY SERVICES

Table 6 lists the potential adaptation actions relevant to infrastructure and property services. Adaptation for this local government function should exploit the fact that infrastructure is not static and will require refurbishment and replacement on time scales of 25 to 30 years, providing many opportunities to adapt structurally (Engineers Australia, 2004). The costs of adaptation measures can be substantially reduced if these measures are implemented at the stage of upgrade or replacement of existing infrastructure. This is because the costs of designing new buildings to incorporate climate change is in some cases very small whereas the costs of adapting existing infrastructure in the future is potentially large. The implementation of early adaptation strategies in the infrastructure and property services responsibility of local government will ultimately decrease the risk of asset damage and failure in the future which would represent an economic and social cost to councils (UKCIP, 2001).

In the event of new infrastructure, property and building services, adaptation strategies should include the consideration of those elements which are difficult and/or expensive to change during the design life of the building such as location, orientation, thermal mass and structural materials. This is because the costs of retrofitting due to the realisation of anticipated climate impacts in the future can be prohibitive if the appropriate elements are not included in the design phase (Cavan, 2004).

Local governments may have a role in encouraging adaptation in new buildings and in retrofitting actions through motivating and educating the community, setting an example, providing incentives and regulation through approval functions.

The City of Melville has developed sustainable design guidelines which provide a case study showing how planning functions can be used for improving the adaptive capacity of infrastructure and property (Case Study 1). Port Adelaide-Enfield Council has also undertaken a flood risk study, which will be used to better manage the flood vulnerability of infrastructure and property (Case Study 2).

Case Study 1 - Sustainable Design Guidelines

In recognition of its role as an educator and demonstrator, the City of Melville has engaged in a number of initiatives that target the local community and assist them to adapt to the impacts of climate change. These include:

Sustainable Residential Design Guidelines - These guidelines and associated design checklist and manual have been designed to provide illustrated examples of how to design a dwelling to achieve maximum energy efficiency and water savings for those designing a new dwelling or planning additions. To help make sustainable residential design common practice across the City of Melville, these guidelines have been incorporated in council policy and apply to any significant residential extensions or new home development. All City of Melville facilities are also subject to the *Sustainable Building Checklist* before their development can proceed.

Greywater Reuse Package - Information resources for the selection and installation of greywater reuse systems that
take household wastewater and reuse this to irrigate garden areas have been developed and made freely available to
the local community to assist householders looking for alternative ways to conserve water.

Additional information on these initiatives is available at www.melville.wa.gov.au or on (08) 9364 0666.

Table 4 - Adaptation Actions for Property and Infrastructure Services

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
Infrastructure development, provision and maintenance				
• All climate change impacts	• Showcase best practice in climate sensitive building design in public buildings.	• Triple bottom line benefit of encouraging sustainable development within the community more generally.	• Economic cost of demonstration technologies and building design.	• Relevant action for construction works managed or approved by local government. • A number of councils already have demonstration sustainable homes. These form an existing mechanism for demonstration of potential measures.
• All climate change impacts	• For infrastructure developments with a lifetime greater than 50 years, design for staged construction to allow future climate change impacts to be taken into account.	• Opportunities to take into account other (non-climate related) improvements to the infrastructure.	• Likely to be a more expensive option, or not technically feasible in some construction projects.	• Relevant for infrastructure design and construction works approved or undertaken by local government. • Relevant guidelines could be included in council specific design manuals, noting that these are often referenced to Australian Design Standards.
• Temperature increases	• Design council buildings to allow for ease of future adaptation, e.g. have the ability for significant amounts of shade to be added or removed from a facade.	• Decreased incidence of heat stress. • Reduced cooling requirements, meaning reduced use of air conditioning.	• Building design costs.	• Relevant for building design and construction works approved or undertaken by local government. • Relevant guidelines could be included in council specific design manuals.

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
• Temperature/rainfall changes - seasonal changes in soil wetting and drying and risk of ground subsidence.	• Consider potential for subsidence/heave in the design of infrastructure foundations.	• Economic and social benefits of infrastructure more resistant to existing risks of heave and subsidence.	• Potential for greater expense in developing resistance in infrastructure foundations.	• Scenarios show changes in rainfall and temperature across Australia. Particularly relevant for local government areas located on clayey soils, or with infrastructure built in water. • Relevant guidelines could be included in council specific design manuals.
• Increased rainfall/severe weather events - potential for increased risk of flood disruption and higher risk of flooding for roads located in flood plains or in coastal areas.	• Flood-proof or re-site infrastructure and plan transport routes and roads to avoid disruption by flooding activities. • Increase monitoring and maintenance activities at embankments and bridge piers, and gully emptying activities.	• Social and economic benefits associated with better coping with existing flood events. • Economic benefits of infrastructure maintenance and avoiding rapid degradation.	• Economic costs of flood-proofing and potential economic, environmental and social costs of re-locating infrastructure. • Economic costs of more rigorous monitoring and maintenance programme.	• Scenarios show that some local government areas are vulnerable to increased flooding events. Local governments play a role in land-use planning. • Relevant to municipalities with scenarios of increased storm activity, and with infrastructure in water environments. • Relevant guidelines could be included in council specific design manuals and asset management plans.
• Increased temperatures - increased risk of bushfires.	• Risk assessment to ensure new infrastructure is not placed in fire-prone areas. • For those where location is not flexible, investigate standards of construction that reduce their sensitivity to bushfire.	• Improved protection of human health and safety and property during bushfires. • Reduced potential for buildings/infrastructure loss and/or damage due to bushfire.	• Potential for unnecessary lock up of available land. • Increased costs associated with use of fire-retardant materials.	• Local governments play a role in land-use, infrastructure development and planning. • The ACT Planning and Land Authority's *Firewise Home Design and Construction Guide* provides examples of fire safe construction methods.

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
Building design				
• Increased temperatures/hot spells - increased demand for comfort cooling in buildings, affecting energy consumption.	• Increase use of insulation in new buildings. • Retrofitting existing buildings with addition of insulation materials and effective and efficient cooling systems. • Reduce lighting and equipment loads to reduce overheating. • Optimise design of cooling systems to provide the best energy efficiency under higher temperature operating loads, i.e. use of passive cooling systems, improved use of thermal properties of building materials, reduce solar heating using recessed windows, roof overhangs and shades. • Promote micropower initiatives.	• Social benefits - comfort affects the health, productivity and general wellbeing of occupants. • Economic and environmental benefits - decreased energy consumption and greenhouse gas emissions.	• Cost of insulation and appropriate building materials. • Capital costs may not be recouped by improved efficiency.	• Scenarios show widespread temperature rise, affecting thermal comfort levels, across Australia. • Local government may have an influence on building research agendas. • Local government may assess cooling systems as part of building approval role. • Local government may encourage retrofitting actions though marketing and incentives and by setting an example with public buildings. • Local government may encourage adaptation in new building design actions through marketing and incentives and by setting an example with public buildings.

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
• Higher rainfall intensity - creating drainage problems in urban environments.	• Provide education of preventative practices prior to and during extreme events, e.g. clearing gutters and drains. • Minimise hard surfaces, such as pavements. • Include development controls, such as those that promote soft surfaces external to the building footprint.	• Environmental and social benefits of managing runoff from current storm events. • Possibility for use of rainwater for alternative purposes such as garden watering.	• Economic cost of roofing redesign and retrofitting.	• Many local government areas will be susceptible to urban flooding. • Local government may influence roofing design within the community more generally through their role of building approver and setting examples with demonstration houses to demonstrate potential adaptation measures. • Councils could distribute community educative information through rates notices.
Waste Management				
• Increased rainfall intensity - increased risk of pollution from open site waste disposal.	• Increase community education to reduce waste generation through both sustainable consumption and reducing overall consumption. • Maximise kerbside diversion of material from landfill through provision of high performance collection systems. • Encourage sorting of waste at source for household, commercial and construction wastes and promote composting.	• Environmental and economic benefits associated with less waste production, and increased recycling and resource recovery.	• Economic costs of increased waste reduction and education strategies.	• Hotter temperatures and potential for increased severity of rainfall events predicted for most of Australia. • Local government has responsibility for municipal waste management. • Although not necessarily required by legislation, local government also plays a role in environmental and waste management/recycling education.

Case Study 2 – Port Adelaide-Enfield Council – Flood Risk Study

The City of Port Adelaide–Enfield, and in particular, the Lefevre Peninsula and its environs, has been identified as a key precinct potentially 'at risk' of being impacted by a natural event due to its coastal nature and its history as an 'unnaturally' engineered area.

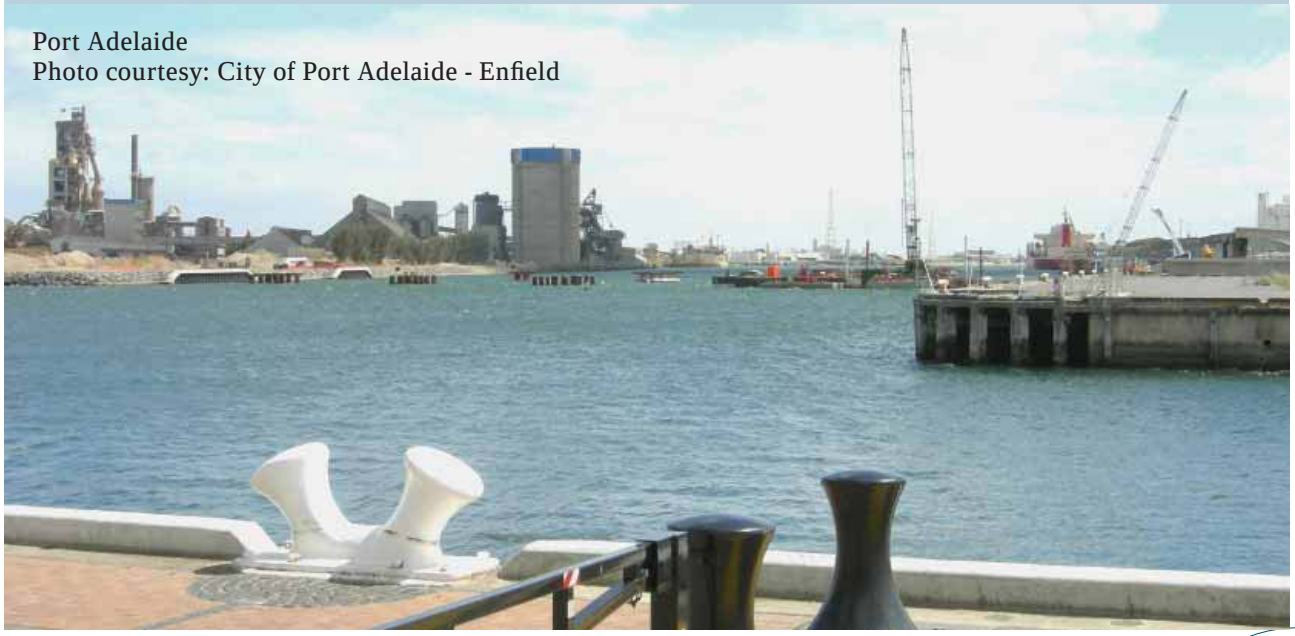
The Peninsula has a residential population of approximately 28,000 and accommodates key national, state and local infrastructure, proposed major industrial and residential developments, power generation facilities, harbour facilities and a proposed naval precinct. The area also contains key marine and coastal ecosystems, and related environmental and community assets, including the Barker Inlet and Port River Estuary.

Its position subjects the area to a great deal of risk from storm surge and sea level rise which in turn threatens the local coastal ecosystem. As a result, the Council has initiated and is project-managing a three stage study, the *Lefevre Peninsula and Gillman Flood Risk Study*. The study includes a risk assessment to identify current and predicted risks and threats to the environment and the community, and the potential long term impacts on vulnerable coastal areas of a range of flood-related issues, including the predicted effects of sea level rise due to climate change. Based on the resulting data, the project will propose appropriate adaptation strategies that will be socially, economically, and environmentally affordable and sustainable.

The project is being funded via contributions from the three levels of government – council, the state government via the Department of Premier and Cabinet's Security and Emergency Management Office, and the Commonwealth Department of Transport and Regional Services Natural Disaster Mitigation Programme.

The first stage (collection of coastal hydrology data) has been completed with scenarios developed for the next 10, 50 and 100 years. The second stage of the project is currently underway, and will identify a mix of engineering, urban planning, and education strategies required to ensure adequate adaptive management is in place. This project is managed by the Council's Technical Services Department, with reference to an inter-agency and multi-disciplinary steering group, and is the first programme to incorporate management of sea level rise and climate change related projections in urban coastal areas.

For additional information on this study, please contact the Customer Service Team on (08) 8405 6600 or custserv@portenf.sa.gov.au.



Port Adelaide
Photo courtesy: City of Port Adelaide - Enfield

4.4 PROVISION OF RECREATIONAL FACILITIES

There are a number of adaptation action strategies listed in *Table 7* that will provide benefits with respect to local government provision of recreational facilities and services. These also cross over a number of other areas of responsibility including infrastructure, planning, health, and natural resource management.

Case Study 3 shows how Ku-ring-gai Council is adapting the management of its recreational facilities to save water.

Case Study 3 - Stormwater harvesting for management of recreational facilities

Stormwater harvesting at Barra Brui
Photo courtesy: Ku-ring-gai Council

Ku-ring-gai Council has begun a seven year programme to secure a more sustainable source of water to irrigate its playing fields and public gardens. The first site, completed in January 2006 saves five million litres of water per year. A 250,000 litre galvanized tank has been buried underneath the St Ives Oval, connecting to the upstream stormwater network. The harvested stormwater is treated prior to entering the tank through a small detention basin and gross pollution trap with excess flow being discharged into the adjacent bushland, just upstream of Garigal National Park.

This initiative brings a number of benefits to both the Council and the local community. These include:

- greater public amenity and safety at local sporting fields
- reduction in number and intensity of peak flow events
- movement to a more natural or pre-development flow regime
- improvements to local water quality
- more sustainable use of water resources and provision of greater resource security.

This project has cost around $500,000 which has included the reconstruction of the oval, installation of irrigation, construction of a playground (on top of the fill from the tank) and the stormwater harvesting elements (including swales, tank, wetland/detention area). This has been funded by the Council through its capital works programmes.

The Council also has plans in place to apply the same harvesting techniques to an additional ten sports ovals and two public gardens as part of a $4 million water recycling initiative. These new projects will be funded within a special Environmental Levy charged to all ratepayers over the next seven years. In addition, Council is also looking to meet all the non-potable water needs at its two public golf courses through a combination of stormwater harvesting and treated effluent (sewer mining) in the coming years.

Another aspect of Ku-ring-gai Council's overall commitment to reducing water consumption is the launch of the *Water Smart Challenge* which commits the Council to reducing consumption by 10% over two years. The Challenge is a community education campaign designed to encourage residents to conserve water through a number of initiatives, the first of which has been the Water-Smart Garden. The Water-Smart Garden is a community space available for both recreation and education that aims to demonstrate how to reduce water usage in the garden and lessen impacts on the environment. Some of the specific aims include reduction of stormwater impacts, use of drought-tolerant native plant species and creating habitats within vegetation to encourage population of native fauna. The Council's community nursery also encourages the use of native plants that require less watering.

The Water-Smart Garden has been developed via support from the NSW Department of Infrastructure Planning and Natural Resources, Ku-ring-gai Council and the local community.

Additional information on Ku-ring-gai Council's stormwater harvesting project and other water saving initiatives is available from Council's website (www.kmc.nsw.gov.au) or phone (02) 9424 0745.

Table 5 - Adaptation Actions for Provision of Recreational Facilities

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
Shade provision and protection				
• Increased temperatures - heat stress.	• Review/prepare design guidelines for street furniture, shelters and awnings, and infrastructure to provide protection, e.g. development of a shade and sun protection policy. • Conduct shade audits to determine the adequacy of existing shade, whether there is a need for more, if appropriately located and of appropriate size. • Include provision of shade structures in design of new council recreational facilities. • Ensure sufficient shade, either natural or built, is available or planned for when developing new recreational facilities or centres and in any development plans for picnic areas, playgrounds etc.	• Decreased exposure of the community to the sun. • Decreased incidence of heat stress. • Reduced cooling requirements.	• Potential for increased design costs/utilising appropriately qualified staff. • Economic costs of conducting an audit and providing shade material.	• Relevant for the design and construction of works approved by or undertaken by local government. • Local government may develop shade provision policies. These could potentially be amended at a later stage to address climate change. Examples: • Alice Springs Town Council – *Shade and Sun Protection Policy.* • *UnderCover - Guidelines for Shade Planning and Design* (prepared by the SA Cancer Council). • *Shade for Everyone - A Practical Guide for Shade Development* (SunSmart Victoria).

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
Water requirements for recreational facilities/areas				
• Decreased overall rainfall - impacts on watering requirements for turf sports ovals, open spaces, golf courses etc.	• Four main options to consider in reducing irrigation mains water use - i. choosing areas to receive less irrigation ii. efficient irrigation iii. water efficient landscaping iv. using alternative supplies of water such as rainwater tanks, aquifer storage and recovery, greywater and blackwater, reclaimed effluent and groundwater. • Train staff on irrigation system auditing and scheduling. • Develop an irrigation plan to identify and reduce existing irrigation levels where possible. • Water controls and management be tailored for specific council areas.	• More qualified staff. • Decreased water consumption and associated costs. • More aesthetically attractive and hardy recreational areas. • Decreased potential for and risk of injuries, and potential for litigation, on poorly managed turf surfaces.	• Costs associated with assessing feasibility and most appropriate options. • Consultancy costs. • Implementation costs. • Staff training costs.	• Climate change scenarios show hotter and drier weather across Australia. While national parks are generally managed at a state government level, many municipalities provide and maintain natural areas as places of recreation. • In light of decreased overall rainfall and increased water restrictions, the need for greater water efficiency is an area that is already being addressed in a number of Australian councils with general recognition that the use of water in parks and reserves needs to be carefully managed. • Water requirements can be linked with existing local and state government water conservation and efficiency initiatives, e.g. *South Australian Local Government Water Conservation Handbook*.
• Decreased overall rainfall - impacts on watering requirements for open spaces, parks, gardens, etc.	• Use of plants in parks and open spaces that are indigenous to the local council area. • Set aside areas for community gardens to trial plants local to the respective council and their ability to adapt to use in gardens. • Increase mowing heights of lawns to decrease lawn water use and stress. • Increase application of mulches.	• Garden trials provide an opportunity for the local community to inspect and assess various plant types for their own gardens.	• Costs of establishing trials - although these can be offset through the use of existing community volunteer programmes.	• Potential linkages to the existing ICLEI Water Campaign.

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
• Increased temperatures - deterioration of value of existing parks and forests and private gardens for recreational purposes.	• Dedicate additional resources to the provision and maintenance of parks, forests and other green areas. • Provide for increased regular maintenance of park/green space in council management plans and council budgets.	• Environmental benefits associated with preservation of existing natural resources. • Social benefits of provision of high-value recreational areas.	• Economic costs of maintaining natural areas and loss of land for other development purposes.	• While national parks are generally managed at a state government level, many municipalities provide and maintain natural areas as places of recreation. • Local government already allocates land for green space, parks and forests and many have streetscape/tree plans for their area. These activities may require dedicated and specific planning to be undertaken in the future to account for potential decline in existing park areas.
Recreational/sporting events				
• Increased temperatures - potential to initiate emergency/health impacts at recreational, tourism and sporting events.	• Adopt heat-emergency contingency plans for recreational/tourism events held within local council area (these plans are generally developed by state/territory governments). • Encourage scheduling recreational and sporting events and activities to avoid the hottest part of the day and at shady locations where possible.	• Social and economic benefits of better preparedness for hot weather-triggered emergencies. • Social and economic benefits of avoiding heat exposure.	• Economic costs of developing emergency contingency plans. • Economic costs of disrupting existing schedules.	• State governments are responsible for emergency services but local governments are usually first in line for provision of services. • Local governments approve applications for tourism events and can be involved in emergency contingency planning. Many Australian councils already have *Events and Festivals Information Kits* for prospective event organisers and associated risk assessment guides for such events. • Education for recreational park users such as schools may be provided by local government.

4.5 HEALTH SERVICES

There is evidence to suggest that humans have a capacity for coping with thermal stress, particularly in parts of Australia where the population has experienced natural acclimatisation due to protracted periods of time living in a hot environment (Australian Medical Association 2004). However, without adaptation there is the potential for an increase in temperature-related deaths in some regions, particularly given Australia's ageing population.

For example in 2004, south-east Queensland experienced extreme temperatures that led to 12 deaths and 221 heat-related hospitalisations due to extreme heat conditions (Queensland Ambulance Service - www.ambulance.qld.gov.au). Flood-related deaths and those associated with extreme weather events are also a possibility in a changing climate.

There are a number of climate change impacts that may affect local government provision of health care services. The implementation of adaptation actions must balance the risks of disease against the risk of upsetting people unnecessarily and causing 'warning fatigue' by the time the disease or scenario has eventuated.

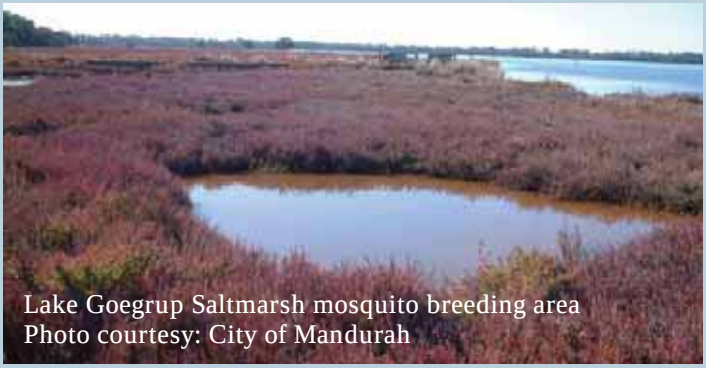
Surveillance programmes, such as mosquito trapping, may be required and local government capacity to undertake similar eradication programmes may also be needed (e.g. the surveillance programme that identified the *Aedes aegypti* mosquito at Tennant Creek Northern Territory in February 2004).

In areas currently susceptible to Dengue, there are existing initiatives to eradicate breeding sites and awareness campaigns on such actions as staying inside during the times of days when mosquitoes are biting. These types of actions may be introduced in areas that will become vulnerable to Dengue and other vector-borne diseases as a result of climate change. The City of Mandurah's mosquito control programme is presented as Case Study 4.

Any local government adaptation actions relating to health and climate change health risks should be developed in consultation with higher levels of government and with the assistance of existing health programmes.

Potential adaptation actions for local government provision of health services are listed in *Table 8*.

Case Study 4 - Mosquito control in the City of Mandurah



Lake Goegrup Saltmarsh mosquito breeding area
Photo courtesy: City of Mandurah

The City of Mandurah, 74 kilometres south of Perth, Western Australia, is part of the Peel Region. High numbers of mosquitoes can cause a serious nuisance problem in this region and a number of mosquito species present are also able to transmit Ross River and Barmah Forest virus diseases. These are debilitating illnesses that have symptoms including painful and swollen joints, sore muscles, aching tendons, skin rashes, fever, tiredness, headaches and swollen lymph nodes.

Mosquitoes breed in the saltmarshes that fringe the Peel-Harvey Estuary and its tributaries and it is not uncommon to find over 1000 mosquito larvae per square metre at some sites. To reduce disease, mosquito control is undertaken during the peak disease period (August - April). Because there is approximately six million square metres of saltmarsh, mosquito control is an immense task. The programme is undertaken collaboratively by the municipalities of Mandurah, Murray, Rockingham and Waroona and also the WA Department of Health. Currently the programme is based on *larviciding*. Aerial larvicide operations attempt to reduce the mosquito population before they emerge as adults. The mosquito-specific larvicide is spread via a helicopter at regular periods (usually fortnightly) throughout the breeding season.

Both the number of mosquitoes and the efficacy of the control programme are highly climate sensitive, and the programme takes into account that climatic conditions in the region have the potential to increase the risk of mosquito-borne disease and nuisance.

It is known that warmer weather benefits mosquito breeding. Mosquito activity in the salt marshes is also heavily influenced by tidal activity with high tides providing more expansive breeding sites. The effectiveness of the control programme is also affected by tides. If the tides are higher than predicted or increase unexpectedly, then the chemical larvicide used can be diluted and its contact time with larvae shortened. This drastically reduces its effectiveness.

The following climate conditions have been identified as most likely to produce higher than expected tidal levels in the Peel Region:

- local low-pressure systems and the effect of wind
- progression of cyclones down the coast of Western Australia
- the La Niña cycle with associated higher than expected rainfall and tides.

A La Niña cycle was present during the 1999/2000 mosquito season which caused tidal levels to be approximately 300 millimetres higher than expected and brought warmer temperatures. This resulted in a massive increase in mosquito breeding and control was unsuccessful.

As a result of the control programmes, climate vulnerability, and lessons learnt during the 1999/2000 La Niña event, there is ongoing work to develop new techniques for mosquito control. These include runnelling (where small channels are installed in the salt marshes to facilitate tidal movement) and developing new forms of larvicide that will be effective during high-tide events (by requiring shorter contact times with larvae). Both these control techniques are still under development and undergoing trials.

Further information on the Mosquito Control Programme can be obtained from the Environmental Health Services division of the City of Mandurah Council on (08) 9550 3746.

Table 6 - Adaptation Actions for Provision of Health Services

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
All climate change related health impacts.	• Utilise demographic profile and social analysis of council area to assess health vulnerability. • Identify affected communities and needs. • Develop a Public Health Plan that looks at the current health and wellbeing of the communities within the council area and develop Wellbeing Indicators so that the programme can be assessed over future years.	• Greater awareness of local constituency and their requirements allowing for more effective targeting of programmes and educational campaigns.	Costs of social analysis.	• Councils already provide a number of health programmes designed to protect and promote public health and a number have prepared Public Health Plans as a strategic tool to provide direction and guidance for identified public health issues within their area.
Thermal stress				
• Increased temperatures - possibility for increased sunburn/rise in heat stress to older people, economically disadvantaged groups and vulnerable communities.	• Increase community education on awareness of dangers of sun exposure/symptoms of heat stress. • Shade audits/provision of more shade in public recreational areas. • Reduce the impact of thermal stress via advice on how to stay cool including the use of portable fans, improved ventilation of homes, public buildings, and other residential institutions and workplaces. • Development of community heat emergency management plans. • Raising awareness of heat-related illness.	• Economic and social benefits of reducing incidents of heat stress, sunburn and skin disease. • Decreased community health costs. • Economic benefits of using ventilation as a cooling strategy (rather than alternative strategies that require electricity).	• Cost of education campaigns. • Shade provision costs. • Economic costs of development of emergency-response plans.	• Many local government areas have ageing and vulnerable communities that are particularly susceptible to heat stress. • Local government could have a role in awareness campaigns, and also encourage or require provision of shade in public areas. For example existing Cancer Council SunSmart Programmes with local government. • Advice should be sought from state and Commonwealth agencies.

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
• Increased temperatures - heat stress likely to increase, and mortality and morbidity rise in hot weather.	• Provide accessible air-conditioned public facilities. • Waive/reduce user fees for swimming pools. • Provision of outdoor drinking facilities.	• Social benefits of improving access to cooling facilities, reducing user fees for facilities, and encouraging use of public areas.	• Economic costs of reducing fees and economic and environmental costs of air-conditioning and installation of drinking fountains.	• Heat stress likely to rise in all regions. Local government able to promote or implement initiatives.
Disease				
• Increased temperatures and changes in rainfall patterns - may affect prevalence of vector-borne diseases.	• Improve alert systems for the possibility of vector-borne disease outbreaks to be developed with advice from state and Commonwealth health agencies.	• Economic, social and environmental benefits of controlling vector-borne disease outbreaks.	• Economic costs of implementing alert systems and community education programmes (could be minimised by integrating into existing systems and programmes).	• Benefits far more likely from cooperative arrangements on a state and/or national basis.
• Increased temperatures and changes in rainfall patterns - changes in disease patterns.	• Educate residents about disease risks, precautions and symptoms. • Increase council-run immunisation programmes to address any increased threats where possible (should be undertaken in liaison with state health programmes/ agencies).	• Economic, environmental and social benefits for reducing spread of disease.	• Economic costs of education initiatives and increased immunisation services.	• Risks of Ross River Fever, Dengue Fever and diarrhoeal disease are likely to increase in some parts of Australia. While education campaigns might be primarily coordinated through Commonwealth and state governments, local government could play a role in disseminating information within local communities.

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
• Increased temperatures and changes in rainfall patterns - worsen risk of some vector-borne diseases.	• Surveillance of vector populations, monitoring and reporting of disease incidence. • Control of disease vectors, including elimination of disease vector breeding sites.	• Economic, environmental and social benefits for monitoring and controlling current vector populations.	• Economic costs of monitoring and reporting systems, and elimination of breeding sites.	• The distribution of some vector populations (e.g. mosquitoes and ticks) will be altered by climate change. Local government may have a surveillance role. • National and state government leadership will be required to develop local government capacity to undertake eradication programmes, e.g. municipalities in the Peel Region of WA have a current mosquito control programme (see Case Study 4).
• Increased temperatures and changes in rainfall patterns - worsen risk of some water-borne diseases.	• Increased monitoring for water-borne diseases (such as E. coli, toxic algae, and viruses).	• Social and economic benefits of improving health impacts of current water-borne disease.	• Economic costs of increased monitoring activities.	• Water quality standards are set at Commonwealth level, but water treatment and monitoring is typically a local government function. • National and state government leadership is required.
• Increased temperatures and changes in rainfall patterns - worsen risk of some water and food-borne diseases particularly at temporary stalls and events.	• Engage in public health education activities (information addressing safer food production and storage processes for local business and communities, food handling guidelines).	• Social and economic benefits of improving health impacts of water-borne and food-borne disease.	• Economic costs of additional education activities.	• Councils already have a legislative duty of care to promote proper standards of public health to ensure that food premises are operated and maintained in a clean and sanitary condition and that food for sale is fit to eat. Advice and guidance on food safety matters generally already available from councils' environmental health departments. • Leadership required from a state and national level.
Extreme events				
• Extreme weather events	• Review local disaster management plans. • Evaluate bushfire risks. • Improve community disaster preparedness and response systems.	• Social and economic benefits of improved planning and reduced incidents of extreme weather event-related accidents.	• Economic costs of implementation of appropriate systems and associated education activities.	• The Local Grants Scheme under Emergency Management Australia provides grants for local government emergency management and community preparedness activities, protective measures for critical infrastructure and emergency management awareness training.

4.6 PLANNING AND DEVELOPMENT APPROVALS

Potential adaptation actions for local government planning and development approval functions are listed in *Table 9*.

Local government decision-making with regards to planning and development is generally steered by policy and legislation at the state government level. For example, the Queensland Government's *State Planning Policy 1/03 - Mitigating the adverse impacts of flood, bushfire and landslide* guides local government decision-making about development applications in areas subject to natural hazards and requires local government planning schemes to:

- identify hazard-prone areas
- develop appropriate desired environmental outcomes and performance criteria for these areas
- apply appropriate development policies and standards to hazard-prone areas
- identify and manage risks associated with natural disasters.

While planning and development are governed by statutory frameworks established at a state and territory government level, local governments in all Australian jurisdictions prepare a range of legally binding statutory planning instruments such as planning schemes, codes and regulations. There is however substantial variation in the level of authority given to local government to regulate.

Individual local council planning schemes generally place an obligation on councils to consider certain matters when dealing with applications for planning consent. This obligation provides an opportunity for councils to incorporate actions that may serve as a mechanism for local community adaptation to climate change. This includes zoning that restricts development in certain areas and development controls such as building setback, height, design and landscaping requirements.

The Western Australian policy requiring that coastal setback distances are calculated by taking into account sea level rise scenarios demonstrates these principles (see Case Study 5). Other examples relate to property infrastructure such as the types of fencing, or building materials that can be used to minimise the risk of damage from bushfire. The ACT Planning and Land Authority's bushfire management guideline provides a case study on this type of adaptation action (see Case Study 6).

Case Study 5 - Coastal planning in Western Australia to allow for sea level rise. – *State Coastal Planning Policy No 2.6*

The Western Australian Planning Commission (WAPC) is a statutory authority that undertakes a major coordinating role across all aspects of Western Australia's planning processes. Of relevance to typical local government planning functions, the WAPC has control of subdivision across the state and supports local government in regional strategic planning, especially along the coast.

WAPC's Coastal Planning Program (www.wapc.wa.gov.au/Publications/658.aspx) addresses the need to support the capacity of local governments in Western Australia to plan for and manage their public foreshore areas. The Program facilitates partnership between the WAPC and local government with supporting funds, advice from officers and guidance through material such as the WAPC's *Coastal Planning and Management Manual* (www.wapc.wa.gov.au/Publications/312.aspx).

WAPC recognises the importance of taking into account sea level rise scenarios when setting development setback distances to ensure that coastal processes do not affect development, and vice versa. Requirements for setback distances are included in the *State Coastal Planning Policy No 2.6*, which addresses land use planning and development issues specifically as they relate to the protection and management of the coast.

Schedule One, Section D of the Policy - "Factors to be Considered in Calculating Coastal Processes Setback" - requires a range of factors to be considered when calculating a setback to protect development from physical processes on the coast. The values for these factors are "based upon the best available data, a conservative estimate of that factor and includes allowance for uncertainty". The third factor D.3 (S3) Distance to Allow for Sea Level Change is explained in the policy as provided below:

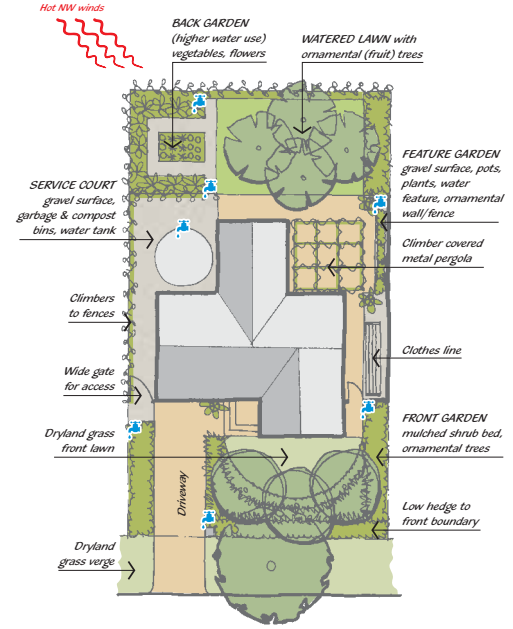
> *The setback to allow for sea level rise is based on the mean of the median model of the latest Assessment Report of the IPCC Working Group (currently, the Third Assessment Report of the Intergovernmental Panel on Climate Change Working Group, January 2001). The vertical change predicted by the current model between the years of 2000 and 2100 is 0.38 metres. A multiplier of 100, based on the Bruun Rule shall be used and gives a value for S3 = 38 metres for sandy shores. For other shore types, S3 shall be assessed in regard to local geography.*

The policy makes a particular reference that the value for sea level change is based upon an imperfect knowledge of the underlying physical processes. As knowledge improves, the WAPC will update the values in consultation with, and agreement of, the Department for Planning and Infrastructure.

More detail and/or advice on the factors and the models used to calculate the value given for each factor can be obtained from the Senior Coastal Engineer, Asset Management Directorate of the Department for Planning and Infrastructure on (08) 9264 7777. Website www.dpi.wa.gov.au.

Port Beach, Fremantle, May 2003
Source: Dept. of Planning and Infrastructure, Western Australia

Case Study 6 - Planning for Bushfire Mitigation in the ACT



FIREWISE Garden Layout design
Courtesy: ACT Planning and Land Authority

In 2005, as a result of the 2003 bushfires that devastated Canberra, the ACT Planning and Land Authority (ACTPLA) adopted under the Territory Plan the *Guideline Planning for Bushfire Risk Mitigation in the ACT*. This Guideline was formally adopted in January 2006. As such, it must be taken into consideration in all planning processes including development applications. The Guideline seeks to ensure that bushfire risk is appropriately assessed and considered during planning, development and construction in the ACT.

Although the planning of the city has always taken bushfire risk into account, the Guideline responds to the need to overtly:

- take site specific conditions into account
- use risk assessment in the opportunities and constraints analysis
- identify any required bushfire mitigation measure
- integrate the findings of the latest bushfire research

All new suburban estates and rural residences within the declared Bushfire Prone Area are required to undertake bushfire risk assessments and any required higher construction standards for dwellings must comply with the *Building Code of Australia*.

Risk mitigation measures that have been identified as a result of the bushfire risk assessment include:

- higher residential design and construction standards to be applied through lease and development conditions to buildings to mitigate against ember attack (Level 1 construction)
- Outer, Inner and House Asset Protection Zones
- water supply infrastructure to agreed capacity levels
- provision of emergency access in the form of an outer ring road or fire trail and access points - an additional clearance of 0.5 metre on both sides of the road is required to be kept clear of all street furniture including signs
- increased verge width to residential blocks on the urban edge with dryland grass surface
- street trees species selected for low bark flammability characteristics.

Whilst no existing urban area within Canberra is declared a Bushfire Prone Area, it is encouraged that the threat posed by bushfires be considered by the building owner in any redevelopment of an existing property or extension to an existing house. To assist with this, two *FIREWISE* information brochures (*Home Design & Construction and Home Gardens*) have been prepared outlining techniques to reduce the risk to homes and gardens.

Importantly, the Guideline is complementary to the ACT Emergency Services Authority's Strategic Bushfire Management Plan Version 1. This Plan is a strategic document outlining measures for the prevention, preparedness, response and recovery from bushfires in the ACT.

For additional information on the *Guideline Planning for Bushfire Risk Mitigation* in the ACT or the *FIREWISE* series please refer to www.actpla.act.gov.au/TPlan/planning_register/register_docs/bushfireguidefeb06.pdf or phone (02) 6207 1923.

Table 7 - Adaptation Actions for Planning and Development Approval

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
Increased temperatures, flooding and shoreline erosion				
• Increased temperatures - increased risk of bushfire.	• Identify which areas will be more vulnerable to bushfire. • Encourage new developments, or changes to existing developments, to include improved protection and adaptations to increased bushfire risk (bushfire management strategies are largely available).	• Environmental, social and economic benefits associated with better coping with bushfires and associated damage to public and private infrastructure.	• Development of educational materials.	• Some regions of Australia will be subject to increased intensity of bushfires and some jurisdictions have already prepared relevant planning advice and requirements for bushfire risk assessments based on historical events, e.g. *ACT Interim Guideline Planning for Bushfire Risk Mitigation* (see Case Study 6).
• Increased temperatures and reduced rainfall - water a more valuable resource.	• Incorporate polices which ensure that the water resource implications of new developments are assessed. • Promote water sensitive urban design at the plan-making and development assessment stages of the planning process.	• Improved conservation of water. • Decreased water costs.	• Cost of policy development and implementation. • Costs associated with development of educational materials.	• Water sensitive urban design planning is already taking place within a number of local councils. This can be implemented into development assessment criteria.
• Sea level rise, increased storm surge and more intense rainfall - higher risk of flooding/erosion in flood plains or water margins.	• Ensure emergency procedures and equipment are in line with currently available information on local flooding risks.	• Economic and social benefits associated with better preparedness for current flooding regimes.	• Economic costs of updating emergency procedures.	• While state agencies generally have responsibility for emergency services, local government is a stakeholder in emergency preparedness planning.

4.7 NATURAL RESOURCE MANAGEMENT

Potential adaptation actions that local governments could undertake in the natural resource management sector are listed in *Table 10*.

All natural ecosystems are vulnerable to climate change and as identified above, coastal management is one area of natural resource management at a local government level in which climate change impacts have already been integrated into some decision-making. A range of potential adaptation options available for protection of these resources commonly documented includes:

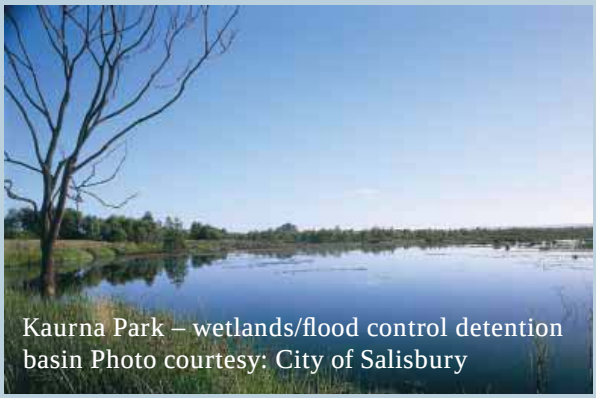
- abandon - allow natural processes to continue unabated
- protect - shield areas from relevant climate change impacts and identified hazards
- adapt - formulate measures that allow continued or extended use of vulnerable land and resources
- retreat - instigate measures to minimise the costs of changing land-use once threatened by coastal hazards and climate change impacts
- do nothing (Rigby and Haward, 2005).

Impacts on the coast are not just restricted to changes in landforms. Changes to wetlands due to sea level rise, shoreline erosion and saltwater intrusion are also important impacts associated with climate change.

Other aspects on which climate change could potentially impact include natural coastal habitats, biodiversity and other land resources and these are already vulnerable to risk due to stress from other man-made activities such as pollution and land clearing. The loss of natural habitats and changing land use activities to accommodate continued population growth and urban expansion will continue to place pressure on the natural environment and the specific processes that sustain their ecosystems (Planning Institute of Australia, 2004). The City of Salisbury's development of a large wetland area, as part of a stormwater management strategy, is a good example of where the provision and maintenance of a natural resource area is an adaptation action itself (see Case Study 7).

Parafield Stormwater Harvesting Facility – harvest and treatment of stormwater for reuse. Photo courtesy: City of Salisbury

Case Study 7 - City of Salisbury - Stormwater Recycling Through Wetlands



Kaurna Park – wetlands/flood control detention basin Photo courtesy: City of Salisbury

In 1984, the City of Salisbury prepared and approved the initial concept of developing 42 hectares of low-lying, saline land into a stormwater detention basin and wetlands habitat. The result, the Greenfields Wetlands, had its first stage completed in 1990 and was one of the first large constructed urban wetlands in Australia.

Since then wetlands have been incorporated as an integral part of stormwater drainage systems in the City of Salisbury and are being developed as part of the Council's drainage infrastructure wherever opportunity permits, with all new residential subdivisions in the last ten years required to install wetlands to contain stormwater on site as much as possible. Large industrial developments have also been actively encouraged to develop wetlands. As a result, the City now has more than 30 wetlands that cover approximately 250 hectares.

Urban stormwater run off is harvested and purified in wetlands which is in turn made available for irrigation and industrial use, or is stored in underground aquifers for later use (aquifer storage and recovery).

The City's alternative strategy for managing urban stormwater was driven by a combination of a number of factors:

- the flood prone nature of the local area
- recognition that stormwater is a resource that can be used to improve the amenity of the urban landscape and enhance the existing environment
- the significant environmental impacts of stormwater if it is left to be discharged untreated.

Aside from the reduced need for underground pipes, concrete drains and channels, and therefore reductions in infrastructure costs, there have been a number of associated benefits to the local environment and the community resulting from the use of wetlands as a stormwater management option including:

- greater flood control and reduction in peak flow rates by up to 80%
- water quality improvements with reduced flows of polluted surface water
- creation of natural habitats and biodiversity for flora and fauna
- opportunities for recreation and environmental education
- harvesting of water for reuse and aquifer recharge
- general enhancement of the local landscape.

While not specifically driven as a means of adapting to climate change, the City's initiatives will also have the associated benefit of assisting the local environment and community adapt to the impacts associated with a changing climate.

The City is continuing to build on this good base into the future by adopting an Integrated Water Cycle Management Plan (IWCMP). This plan will integrate the management of rainwater, stormwater, groundwater, wastewater and potable water. The primary objective of this plan is to replace up to 20 GL/annum of mains water by utilising 'smart' rainwater tanks, recycled stormwater, sustainable groundwater (extracted under licence with credits obtained with aquifer storage and recovery injection) and a mix of recycled stormwater/recycled effluent.

Further information on the use of wetlands for stormwater management or other water management initiatives undertaken by the Council can be obtained from the Water Systems Division, City of Salisbury. Ph. (08) 8406 8574 or www.salisbury.sa.gov.au.

Table 8 - Adaptation Actions for Natural Resource Management

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
Biodiversity management and protection				
• Changed climatic conditions in general - adversely affecting ecological succession.	• Develop a Local Biodiversity Plan as a component of the Local Planning Strategy and Town Planning Scheme. • Implement conservation management plans for local reserves and other local government lands. • Encourage private land conservation, e.g. through incentives.	• Environmental and social benefits of increased amenity, areas of recreation, air pollution control and habitat for wildlife (provided these uses are compatible, some types of recreation may adversely impact on wildlife habitat). • Potential for increased availability of areas for recreation/tourism. • Decreased risk of loss of private and public property and infrastructure.	• Costs associated with mapping and associated staff resources. • Costs associated with additional level of detail in planning/ planting costs.	• Local government is responsible for strategic spatial planning, and management of urban vegetation and local government may require reafforestation as a requirement of local government development approvals. • Local government may also undertake reafforestation activities under their own initiative. • Darwin City Council is currently developing an Environmental Management Plan (EMP) to protect the values of the coastal, urban and rural environments in Darwin. It is also developing the City Atlas of Values that presents known environmental, recreational, cultural and land-use values and issues.
• Reduced rainfall and runoff - decreased water supply and associated impacts on urban vegetation.	• During strategic spatial planning, take into account impact of potential reduced water supply on urban vegetation. Trees can result in subsidence risks and location of water bodies relative to urban vegetation may help sustain the vegetation.	• Economic, environmental and social benefits of increased sustainability of urban vegetation and prevention of existing subsidence risks.	• Costs associated with additional level of detail in planning/ planting.	• Climate change scenarios show decreased water supply levels across most of Australia. • Local government is responsible for strategic spatial planning, and management of urban vegetation.

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
• Reduced rainfall and runoff - decreased water supply and associated impacts on urban vegetation.	• Continue to develop roadsides/utility corridors as native vegetation corridors, in consultation with relevant road authorities to ensure road use safety is protected.	• Environmental and social benefits of increased amenity, areas of recreation, air pollution control and habitat for wildlife. • Potential for increased availability of areas for recreation/tourism.	• Costs associated with policy development and/or amendment.	
Coastal management/protection				
• Sea level rise - inundation and erosion of inland areas.	• Implement dune restoration programmes as appropriate.	• Environmental and social benefits of restoring the beneficial natural and human use values associated with coastal dunes.	• Economic cost of implementing dune restoration programmes.	• Sea level rise is a potential risk to all Australian coastal zones. • Dune restoration programmes are an existing feature of many coastal local government areas.
• Sea level rise and increased flooding - potential for erosion in shore zones and impact on vegetation worsening impacts of inundation.	• Protect buffer vegetation in shore zones.	• Environmental benefits of protecting productive ecological zone. Social benefits of maintaining amenity and potential areas of recreation e.g. fishing.	• Economic costs of protecting vegetation in shore zones.	• Scenarios indicate that many regions of Australia will be vulnerable to shoreline erosion. Maintenance of shoreline vegetation can be a local government activity.

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
Land/park management				
• Increased risk of bushfires.	• Take into account the areas at increased risk of bushfire from climate change in the use of prescribed fire as a tool for managing fuel accumulation (recognising that inappropriate fire regimes can potentially threaten the conservation of biodiversity). • Use of fire adapted vegetation (much of Australian vegetation is fire adapted). • Ensure that 'fire management zones' have been identified. • Ensure that clear objectives and the most suitable forms of fire management and mitigation for each zone have been developed, e.g. identification of assets and collation of information on how fire, and fire mitigation, might affect these assets. (Note - many local governments have already done this)	• Improved bushfire risk management – planning, preparedness, response and recovery. • Decreased potential for risk to human life. • Decreased potential for loss of private and public property. • Decreased costs associated with recovery.	• Increased potential for air pollution and fire related smog, particularly in the Northern Territory where this can already be a problem due to local savannah burning and fire related smog from Indonesia and Malaysia.	• *FIREWISE* Home Gardens - ACT Planning and Land Authority has developed guides that provide strategies for reducing the susceptibility of residential gardens such as - the appropriate selection of materials, plants, lawn, pebbles and pavements and arrangement of garden spaces to ensure a *FIREWISE* garden. (Case Study 6)

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
Pest/weed management				
• Changed climatic conditions - adverse impacts on ecological succession and creating worsened and new pest and weed problems.	• Develop and implement a pest, weed and invasive species management policy/strategy that takes into account changed climatic conditions (many local government areas have management policies/ strategies in place). • Promote awareness to local communities of potential weed risks resulting from climate change in the local area (incorporate into existing awareness programmes if appropriate). • Revisions to mowing and weed control schedules to take into account changed climatic conditions that affect growth and dispersion.	• Economic and environmental benefits of managing existing weed and pest problems and mitigating against future problems (whether these arise from climate change or not).	• Economic costs of management strategies.	• Pest and weed problems are an existing issue for many local government areas. Local governments may require management strategies as part of development approval, and may also undertake management strategies. • Many Australian councils already have weed management strategies that provide co-ordinated weed control programmes and address issues such as: – increasing community awareness of weed issues – encouraging community support for weed management programmes – weed hygiene – spread of weeds along road reserves.

Case Study 8 - Darwin City Council Environmental Management Plan and Atlas

Where you live in Darwin is special

Did you know that where you live is special and so are 24 other areas in Darwin? Each area has its own unique environmental, recreational, social, cultural and land use characteristics and issues. Darwin City Council is developing an Environmental Management Plan to protect Darwin's environment and your quality of life into the future.

Did you know that environmental issues and concerns differ greatly across Darwin? For example, some pollution moves with stormwater. Stormwater flows into drains and mainly discharges into the harbour. Therefore, the things that we do can have a big impact on the quality of stormwater and its impact on the harbour.

Did you know that for us to protect what is important to you we have to know what we have in the first place? Our first step has been to create a 'map' of each area, which we call an Environmental Management Unit and these are then combined in an Atlas. To ensure that this Atlas covers all the bases we have started with what information we already know about each area and have identified what some of the issues are. Most importantly we need to be sure that:

- It represents the views of Darwin residents.
- Council is aware of what you would like to see protected now and into the future.
- Important environmental concerns, problems and issues in your neighbourhood are recorded so that Council's Action Plan reflects the wishes and expectations of the community as a whole.

Help us to protect your environment and have your say
Please take the time to complete and return the enclosed survey

To find out more – **Come and talk to your Aldermen and EMP Advisory Committee members at the Parap Markets on Saturday 25 March 2006, from 9:00 am**

Your Aldermen are Alderman Joanne Sangster phone: 0408 746 487 (Chairman, Environment Management Plan Advisory Committee) Alderman Rodger Dee phone: 0439 751 954, Alderman Helen Galton phone: 0400 659 661 and Alderman Heather Sjoberg phone: 8981 0714 (A/H)

An Atlas extract for your local area is provided below. The full Atlas and all related strategies can be viewed at Darwin City Council Libraries at Casuarina, Karama, Nightcliff and City (Civic Centre) and on the Council website: www.darwin.nt.gov.au

EMP Atlas Extract for Dinah Beach/Stuart Park Environmental Management Unit (EMU)

Description:

The DINAH BEACH/ STUART PARK ENVIRONMENTAL MANAGEMENT UNIT (EMU) includes the suburbs of Stuart Park and Tipperary Waters, the Dinah Beach Cruising Yacht Club, the Chinese Cemetery and One Mile Dam.

The Natural Environment:

- 8 maintained recreation parks including Anne Park, Beatrice Park, Dinah Beach Park, Bill Sullivan Park, Gothenburg Park, Meigs Parks and Duke Street Park (2).
- 1 urban bushland – Duke Street Rainforest.
- 8 registered Trees of Significance

The Social and Built Environment:

- The Dinah Beach/Stuart Park EMU is home to approximately 1484 people from diverse and multicultural backgrounds
- Architecture of the EMUs suburb consists of single occupancy low or elevated homes, with some high-density townhouse and apartment building.
- 1 oval – Dinah Beach Oval
- Dinah Beach Boat Ramp
- 1 Chinese Cemetery
- The Register of the National Estate includes the Darwin Chinese Cemetery, Water Tower No 3 and Sidney William Hut
- Marina

Land Ownership:

Land ownership rests with a variety of stakeholders including the Dinah Beach Cruising Yacht Club, Darwin City Council, NT Government, private and commercial community (freehold)

Courtesy: Darwin City Council

Darwin City Council has recognised that effective environmental management depends on having knowledge of local environmental values and issues. The City has also recognised the need for appropriate policies and procedures to be in place to ensure environmental concerns, including climate change, can be effectively addressed in a timely and sustainable manner. To facilitate the appropriate management of environmental issues, the City has made a commitment to the development and implementation of:

- a community focused Environmental Management Plan (EMP) for Darwin
- an organisationally focused Environmental Management Strategy (EMS).

Together these tools provide the mechanism for the City to allocate resources, assign responsibilities and continually evaluate practices, procedures and processes to address environmental risks.

The process for the development of the City's adopted EMP model includes the following activities:

- development of an EMP strategy paper
- preparation of a City Atlas of Values - this divides Darwin City into separate Environmental Management Units (EMUs) based on the City's 24 identified hydrological subcatchment boundaries and for each of these identifies known environmental, recreational, cultural and land-use values and issues
- community and stakeholder consultation
- Action Plans - management options for the top ten issues in each of the 24 EMUs will be selected and costed to enable the development of four-yearly works programmes for these issues and costing of these included in Budget submissions.

This information will be consolidated into an overarching EMP with a yearly review. Reporting will be undertaken on completed actions and programmes and community response, to allow for changes in priorities and issues.

Funding for current and future EMP action is facilitated through the council-approved budget for the EMP 10-year Capital Works Program for the areas of water quality, biodiversity, air quality and land management.

Further information on the City of Darwin's Environmental Management Strategy and associated Plan and Atlas can be obtained at www.darcity.nt.gov.au/aboutcouncil/city_planning/EMP_mgmt_plan.htm or from the Environment Manager on (08) 8930 0530.

4.8 WATER AND SEWERAGE SERVICES

A good deal of activity in the provision of water resources has already been undertaken at a local government level to identify and implement actions to serve the purpose of assisting community adaptation to climate change. The continued implementation by local government of water efficiency and demand management initiatives (e.g. rainwater harvesting, water-wise gardens, water efficiency ratings on equipment), will help communities adapt to decreased water availability as a result of climate change.

Commonly identified existing adaptation mechanisms include:

- use of water efficient appliances and hardware
- water efficient urban design and housing standards
- water efficient garden planting and watering
- supplementing supplies with recycled water
- watering restrictions
- appropriate pricing mechanisms
- detection and control of leaks including water pressure management (Brisbane Institute, 2005).

Enhanced community education and engagement will continue to play a role in the adaptation of local government water and sewerage services.

Table 11 identifies adaptation actions relevant to the provision of water and sewerage services by local government. Appropriate strategies have also been identified under other sections, namely recreational facilities, infrastructure and planning. Case Study 9 has also been provided to illustrate existing initiatives in water management that qualify as adaptation actions with additional benefits.

Case Study 9 - City of Melville Sustainable Water Management

Groundwater provides a major source of Western Australian water supply and in particular supplies about 60% of Perth's water. Local governments can also rely on groundwater for activities such as irrigation of parks and gardens and, although the relationship between groundwater and climate change is still uncertain, this resource is potentially threatened with groundwater being lost through increased evaporation rates.

The City of Melville has recognised that good management of groundwater is essential to ensure that growth (i.e. new developments) can still occur, whilst maintaining sustainable yields from the groundwater aquifers into the future. As such, it is a key performance indicator of the City's Strategic Plan to limit groundwater use to 90% of allocated quantity. The City has also been actively developing strategies and procedures that will enable it to practice sustainable water management within its area. One such strategy is that the City has adopted the rationale "if you can't measure it, you can't manage it" and, progressively over the last 10 to 15 years, has been adding meters to its groundwater bores to enable monitoring and sustainable management of groundwater extraction.

The City has recognised that volumetric-based groundwater monitoring is much more practical and monitoring of these resources is a form of process control, risk management and asset management. Over the coming year, the City of Melville will also concentrate on real-time water monitoring activities and has plans to trial wireless water meters internally before applying these more widely so that the local community can play a role in monitoring its own water budget. These initiatives have been funded as ongoing investments by the City with regular budget allocations made appropriately. The City of Melville is also investigating the ability to access funding through the National Water Initiative.

Further information on the above initiatives is available at www.melville.wa.gov.au or phone (08) 9364 0617.

Table 9 - Adaptation Actions for Water and Sewerage Services

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
Wastewater services				
• Increased rainfall intensity - potentially more frequent incidence of wastewater system overflow.	• Design wastewater systems to prevent overflow events from wetter than normal weather, based on climate change scenarios. If costs are prohibitive, plan for regular system reviews to consider climate change effects.	• Economic, environmental and social benefits of reducing pollution caused by wastewater overflows. Economic benefits of improving efficiency of wastewater system.	• Economic costs associated with upgrading wastewater systems, designing systems to more frequent and heavy rain events and undertaking more regular system reviews in light of changing climatic conditions.	• Wastewater overflow events are an existing problem, and pollute Australian waters. Climate change scenarios show increased incidence of high intensity rain events, which may cause wastewater overflows in many local government areas. Wastewater systems are managed by local governments in some jurisdictions, particularly rural areas.
Water provision and water conservation activities				
• Increased temperatures and reduced rainfall - water a more valuable resource.	• Develop water strategies that incorporate greywater reuse. • Supplement existing supplies with recycled water where possible. • Community education on water efficient garden planting and watering.	• Environmental benefits from more efficient water use. • Economic benefits from decreased levels of potable and non-potable water consumption. • Economic benefits from decreased levels of community water consumption.	• Economic cost of greywater recycling infrastructure. • Greywater reuse may pose health risk if not managed appropriately (social/economic costs).	• Dry weather and drainage issues from intense rain events are existing problems for Australia and climate change scenarios show that these problems may worsen in many areas of Australia. • Local government could require greywater recycling as part of development approval, and may incorporate greywater recycling in public infrastructure, e.g. Queensland Government has recently introduced legislation to allow people to use greywater on gardens and lawns in sewered areas. The legislation took effect on 1 March 2006. • Local governments are eligible to apply for a community water grant from the Commonwealth Government to encourage wise water use (www.communitywatergrants.gov.au/index.html). • Coomera in Queensland has taken steps towards supplementing their water supply with water recycling.

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
• Increased temperatures and reduced rainfall - water a more valuable resource.	• Promotion of use of Sustainable Urban Design Systems (SUDS) and water efficient installations into new developments. • Identification of opportunities to include Sustainable Urban Design Systems in existing developments/ infrastructure. • Prepare or review policies to incorporate demand management strategies such as roof water harvesting in residential areas. • Identify potential water conservation incentives.	• Environmental benefits from more efficient water use. • Increased water availability for other activities including recreation, land management, etc.	• Community education and promotion costs.	• Some councils are already using techniques such as stormwater harvesting as means for meeting irrigation requirements within their local area. • Local government has a role as a community educator, e.g. development and distribution of the Water Sensitive Planning Guide for the Sydney Region. • Relevant for developments initiated and/or approved at a local government level.
Stormwater services				
• Increased rainfall intensity and changes to rainfall patterns will impact on drainage and water management in urban areas.	• Develop urban drainage management plans that optimise active storage capacity to alleviate flood peaks. • Urban based drainage system should be linked to catchment based flood management to avoid impacting on other areas in the catchment.	• Environmental and social benefits of better managing water, and linking to catchment scaled plans. • Economic benefits of optimising existing active storage capacity. • Social benefits from better management of drainage from existing intense rainfall events (health and safety).	• Development of plans. • Engineering/consultancy costs.	• Rainfall patterns are expected to change across Australia, affecting drainage management. Local governments typically have responsibility for drainage.

IMPACT	ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS	TRANSFERABILITY IN AUSTRALIA/ EXAMPLES OF EXISTING INITIATIVES
• Increased rainfall intensity and changes to rainfall patterns will impact on drainage and water management in urban areas.	• Development of a stormwater management plan that addresses potential locally-appropriate alternative uses of stormwater and includes measures to reduce peak flows during wet weather, e.g. increased use of stormwater by capturing (such as developing wetlands and aquifer storage and recovery). • Ongoing and periodic review of sewerage system strategies and operations to address hydraulic constraints and overflow risks, and sewer rehabilitation and cleaning regimes. • Limit growth expansion and/or connections to parts of the system where there are potential capacity constraints.	• Reduced pollutant loads due to cleansing of incoming storm water via sedimentation processes. • Reduced amount of stormwater discharged into sensitive ecosystems. • Increased availability of water for reuse for other purposes such as irrigation of ovals, golf courses, etc.	• Development of plans. • Engineering/consultant costs.	• Rainfall patterns are expected to change across Australia, affecting drainage management. Local governments typically have responsibility for drainage and run-off. • There are examples of aquifer recharge projects in South Australia (see http://www.dwlbc.sa.gov.au/water/projects/frac_rock_aquifer.html).

4.9 GENERAL ADAPTATION MEASURES

There are a number of adaptation measures that can apply across all responsibilities, roles and jurisdictions of local government. These are identified in *Table 12*.

Table 10 - Adaptation Actions that Apply Across Sectors

ADAPTATION ACTION	BENEFITS (ECO/ENVIRO/SOCIAL)	COSTS
• Strengthen profile of climate change within local government, and combine with the sustainability agenda.	• Incorporate climate change scenarios into policy and decision-making processes. • Environmental and social benefits of improving awareness of integrated planning principles and the sustainability agenda. • Increased staff capacity.	• Economic costs of education programmes and staff time dedicated to these.
• Raise local community awareness of climate change and adaptation actions that can be implemented at home and that have ancillary benefits in addition to those associated with climate change, e.g. water and energy conservation measures, etc.	• Environmental and social benefits of improving awareness of environmental topics.	• Economic costs of awareness campaigns.
• Establish communication channels between scientists and local government officers.	• Economic benefits of having access to communication channels between scientists and local government.	• Economic costs of establishing and maintaining communication channels.
• Improve public sector capabilities through capacity building activities for local government staff.	• Economic, social and environmental benefits of having access to improved environmental services.	• Economic costs of providing capabilities, and potential cost of underutilising capabilities.
• Complete climate change risk assessments.	• Improved understanding of existing climate vulnerabilities of local government functions, potentially leading to improvements in these functions.	• Cost of undertaking risk assessment, and updating the assessment to maintain its validity.

4.10 REGIONAL AND PARTNERSHIP APPROACHES

Adaptation to climate change does not necessarily require a fundamental change to actions that are already being undertaken by local government. Many actions that could be considered to be adaptation actions and programmes are already in place within some proactive councils (i.e. green building, water and energy efficiency initiatives) and while perhaps these have been initially established for reasons other than the risk of climate change, they nevertheless represent an adaptation action. An adaptation action may be simply to increase the frequency or magnitude of existing programme implementation and monitoring.

The following are approaches that may assist local government in the implementation of actions:

- using a risk management framework to identify risks, set priorities, decide on strategies to manage risks, assign responsibilities for action and monitor progress
- adopting a regional approach in driving adaptation
- partnerships with state and federal government and/or private industry.

REGIONAL APPROACHES

A regional approach is an efficient mechanism for local governments to engage in the implementation of adaptation actions because it allows for the sharing of resources and knowledge. Given that many of the climate change adaptation issues that face councils are similar, particularly for neighbouring councils, cooperation can provide substantial benefits.

Collaboration on a regional scale is not a new concept to local government, with regional organisations of councils already operating in most states of Australia. A number of organisations of councils are focused specifically on issues related to climate change and environmental management with examples of these including:

- *Greenhouse Alliances* - these regional alliances in Victoria are funded by the state government but provide local government with the opportunity to network and share resources (see Case Study 10)
- *Regional Councils* - in Western Australia, as within other states, amalgamations of councils into regional groups such as the Eastern Metropolitan Regional Council and the Southern Metropolitan Regional Council has proven to be an efficient mechanism for the implementation of environmental management programmes
- *Sydney Coastal Councils Group* - promotes coordination between member councils on environmental issues.

Solar hot water panel – Bass Coast Shire Civic Centre
Photo Courtesy: Western Port Greenhouse Alliance

Case Study 10 - Western Port Greenhouse Alliance

Bass Coast Windfarm, Wonthaggi. Photo Courtesy: Western Port Greenhouse Alliance

The Western Port Greenhouse Alliance (WPGA) is a regional partnership that was established in July 2004 to provide a regional framework for local stakeholders to respond to climate change and work together on greenhouse gas abatement projects.

The establishment of the WPGA was made possible through the provision of funds by the Victorian Department of Sustainability and Environment (DSE) under the Victorian Greenhouse Strategy's *Regional Partnerships Program* and has been formed under a Memorandum of Understanding between:

- City of Casey (Alliance host)
- Bass Coast Shire
- Cardinia Shire
- Frankston City Council
- Mornington Peninsula Shire.

A Management Committee has been formed with representatives from each of the above organisations along with the International Council for Local Environmental Initiatives (ICLEI) and the Victorian DSE. A Regional Coordinator to coordinate its activities has also been employed.

The *Victorian Greenhouse Strategy* was released in June 2002 and commits the Victorian Government to supporting greenhouse abatement activities by local communities and includes a number of specific programmes to facilitate greater participation in greenhouse abatement activities across regional and rural Victoria. The Regional Partnerships Program was established under Action 5.5 of the Strategy with the Western Port region being identified for a Regional Partnership due to its combined regional and rural focus.

One of the WPGA's current projects is an assessment of climate change needs, potential impacts and adaptation options for key stakeholders in the Western Port region, one of three regional climate impacts studies in Victoria being funded by the AGO and the DSE. The WPGA has engaged Marsden Jacob Associates, the Regional Development Company and the CSIRO Climate Impacts Group to undertake this project which aims to:

- raise awareness of the potential impacts of climate change in the region
- assess natural and human vulnerabilities to climate change impacts in the region
- explore possible adaptation opportunities.

The outcome will be the *Climate Change Impacts and Adaptation Scoping Report* which will determine strategic directions in assisting stakeholders within the Western Port region to prepare for and adapt to the impacts of climate change.

Further information on either the WPGA or its work can be obtained at www.casey.vic.gov.au/wpga/.

PARTNERSHIPS WITH GOVERNMENT/PRIVATE INDUSTRY

Partnerships with different levels of government and/or business are a useful (and sometimes essential) mechanism for increased implementation of adaptation actions. Partnerships enable the sharing of resources, existing knowledge and avoid the "reinvention of the wheel" by local government. In some cases relationships with private organisations will be needed for particular local government functions (such as the building industry). State government agencies may also be able to provide guidance or assistance.

Existing joint initiatives between local and state governments which could potentially be broadened to include climate change as an issue are:

- The Queensland Disaster Management Alliance, a collaborative approach to disaster management planning that is a joint initiative between the Local Government Association of Queensland and the State Department of Emergency Services. This alliance has been driven by the recognition that local governments play a critical role in planning for and managing disasters that impact on their communities.
- Regional Alliance Groups are made up of individual local governments who may choose to align themselves with other local governments based on shared risks or other common social, environmental or economic criteria. These groups are established to, among other activities, "raise issues and provide collective solutions to disaster management problems" and "promote and facilitate the integration of comprehensive disaster management planning into local government corporate, operational and financial planning processes".
- In Victoria, a partnership between the Department of Sustainability and the Environment, the Municipal Association of Victoria and the Country Fire Authority is another example of where a partnership approach is being adopted (see Case Study 11). While this example is not specifically referring to climate change as an issue, it provides a useful example of how different levels of government are working together to achieve an outcome. It also shows how the framework adopted by this project is equally applicable to the development and implementation of adaptation actions at a local government level.

Case Study 11 - Integrated Municipal Fire Management Planning Project

IMFMP
INTEGRATED MUNICIPAL FIRE MANAGEMENT PLANNING

The Victorian Department of Sustainability and the Environment is working with the Municipal Association of Victoria and the Country Fire Authority on a project of fire prevention, preparedness, response and recovery (PPRR). This project has been initiated in recognition of the fact that there is a need for more consistency in planning and broader cooperation between fire and other emergency agencies, local government and communities. Its objective is to provide assistance to municipalities to help them to include the fire management planning framework in their current emergency management arrangements.

Further information can be obtained at http://www.mav.asn.au/imfmp

An example of a partnership approach between business and government is illustrated by the Insurance Australia Group (IAG). In 2004, IAG developed a partnership with local government planners in New Zealand to determine the most appropriate flood planning levels for the future. IAG provided the scientific modelling results which showed changes in extreme rainfall which the local government then used to determine the likely changes to future flood levels. This was then incorporated into their flood mitigation programmes (Stagnitta et al., 2005).

Another example of how partnerships with local government may support uptake of adaptation actions is the voluntary and incentive-based building labelling standard which has been developed by the Urban Development Institute of Australia (see Case Study 12).

Case Study 12 - Development of an environmental labelling scheme "EnviroDevelopment"

As an industry policy organisation, the Urban Development Institute of Australia (Qld) has recognised the need for both public and private organisations to take greater steps towards both adaptation and mitigation of climate change and its impacts. To assist this, the Institute is currently working on the implementation of an environmental labelling scheme called *EnviroDevelopment*. The purpose of the initiative is to encourage the rapid adoption of sustainable development principles in Queensland's urban sector. The strategies promoted by *EnviroDevelopment* will offer benefits in regards to both climate change adaptation and climate change mitigation. Indeed, an awareness of climate change issues was a major driver for the Institute's commitment to the project.

EnviroDevelopment will help raise the awareness of climate change issues within governments (particularly local governments), the development industry, and the community. The standard supports both climate sensitive and water sensitive urban and building design and has elements dedicated to community, ecosystems, energy, materials, waste and water.

As a voluntary, incentive-based framework, *EnviroDevelopment* demonstrates how partnerships with local government can support climate adaptation and achieve development outcomes for mutual benefit.

For further information on the development of this project please contact the Urban Development Institute of Australia on (07) 3229 1589 or visit www.envirodevelopment.com.au

The AGO is currently supporting another practical example of initiating local government adaptation action. ICLEI – Local Governments for Sustainability have been contracted to manage a process in which six Local Councils pilot the use of the AGO climate change risk management guide for integrating climate change considerations into council operations. This project will result in a set of useful technical and guidance materials that all local governments in Australia will be able to access from the Australian Centre for Climate Change Adaptation website.

Five integrated assessment projects have also been initiated by the AGO in partnership with state, territory and local governments, research institutions and local communities. They foster collaboration and recognition of the need for differentiated approaches when integrating adaptation considerations in real life council operations. The projects will provide cost efficient and environmentally effective information and adaptation options for decision makers in the study areas that will be transferable to other similar settlements across Australia.

5 Examples of Climate Change Adaptation Initiatives in Australia

There are many initiatives in Australia that may provide useful examples or sources of information to assist local governments in the development of climate change adaptation actions relevant to their own jurisdictions. This list is not exhaustive and there are many other initiatives being undertaken at all levels of government. Identifying best practice adaptation examples is an ongoing process that requires an integrated approach and interaction between disciplines, consequently many of these examples fall across a number of sectors or areas of responsibility.

INFRASTRUCTURE AND PROPERTY SERVICES

- *BASIX* - the Building Sustainability Index is a NSW web-based planning tool designed to assess the potential performance of residential buildings against a range of sustainability indices. Features required to be incorporated in sustainable building design include recycled water, rainwater tanks, AAA-rated showerheads and taps, native landscaping, heat pump or solar water heaters, roof eaves/awnings and wall/ceiling insulation. Many developments in NSW now require a BASIX Certificate prior to their approval (www.basix.nsw.gov.au).
- *Enviro-Development* - a performance-based tool developed by the Urban Development Institute of Australia (Qld) to encourage developments incorporating efficient energy use, water conservation, biodiversity protection and use of environmentally responsible materials (refer to Case Study 12, p55).
- *Flood plain mapping activities* - a number of local councils are identifying risks within their local area and participating in the distribution of flooding awareness material to the general public with regard to the impacts on their housing and property.
- *Cyclone Testing Station and Hail Gun* - given the relevance of the impacts of climate change to the insurance industry, the Insurance Australia Group (IAG) have been sponsoring adaptation research activities. Examples of these activities include the Cyclone Testing Station which aims to understand the susceptibility and vulnerability of different building types to damage from tropical cyclones and, the 'Hail Gun' project, which is testing the susceptibility of various roofing materials to hail damage.

HEALTH/RECREATION

- Partnership programmes such as *SunSmart Local Government* (www.sunsmart.com.au) in Victoria and *Cancer Council Community Partners* (www.cancercouncil.com.au) in NSW have been developed recognising that local government is uniquely positioned to help reduce the incidence and impact of skin cancer in the community through community education activities.

PLANNING

- *Sustainable Regional and Urban Communities Adapting to Climate Change project* - instigated by the Planning Institute of Australia (Qld Branch) and the AGO, this four stage project provides guidance on how the planning system in Queensland can assist local and regional communities to adapt to climate change. This project's outputs are relevant to other Australian states (www.planning.org.au).
- *Guidelines for Responding to the Effects of Climate Change in Coastal and Ocean Engineering* - prepared by the Australian Institute of Engineers to provide assistance to coastal and ocean engineers in assessing climate change significance for particular situations or projects. This includes possible adaptation options for climate change threats (www.engineersaustralia.org.au).

- *Indicative Mapping of Tasmanian Coastal Vulnerability to Climate Change and Sea Level Rise* - identification of Tasmanian coastal areas potentially vulnerable to increased storm surge flooding and sandy shoreline erosion and recession as a result of global climate change and sea level rise.

Some specific examples of how adaptation has been included in coastal planning policy at a state level are included in *Table 5*.

Table 11 - Examples of Climate Change Adaptation Requirements in State Coastal Planning Policies

LOCATION	ADAPTATION MEASURE
South Australia	The Coast Development Board has adopted the median sea level predictions of the IPCC as part of its policy which allows new developments to be reasonably protected from a 1 metre sea level rise by 2100. The Board also recommends that building and site levels should be 0.3 metres above the 100-year average return interval water level.
Western Australia	The Western Australian *State Coastal Planning Policy* includes consideration of climate change with the preferred management option of the application of an adequate total setback, and where there is defined public-benefit, the possibility of setback exemptions that either accept the eventual loss of infrastructure or the need for capital protection works (Refer to Case Study 5).
Queensland	The *State Coastal Management Policy* provides for "planning to adapt to climate change and sea level rise" so that the coast is managed to allow for the occurrence of these changes while providing protection for life and property.

NATURAL RESOURCE MANAGEMENT

- *National Biodiversity and Climate Change Action Plan 2004 – 2007* - the plan is a result of recognition in the National Greenhouse Strategy that biodiversity is one of the key sectors sensitive to the effects of climate change and for which adaptation planning is needed. This Plan sets out a series of adaptation strategies and actions to minimise negative impacts of climate change on biodiversity and maximise the capacity of species and ecosystems to adapt in the future (www.deh.gov.au/biodiversity/publications/nbccap/).
- *Guidelines for Regional Natural Resource Management (NRM) Planning in Queensland* - include a module and guideline, *Adaptation to Climate Change in Regional NRM Plans*, that address climate change adaptation in regional natural resource management plans, target setting and investment strategies (www.regionalnrm.qld.gov.au/policies_plans_legislation).

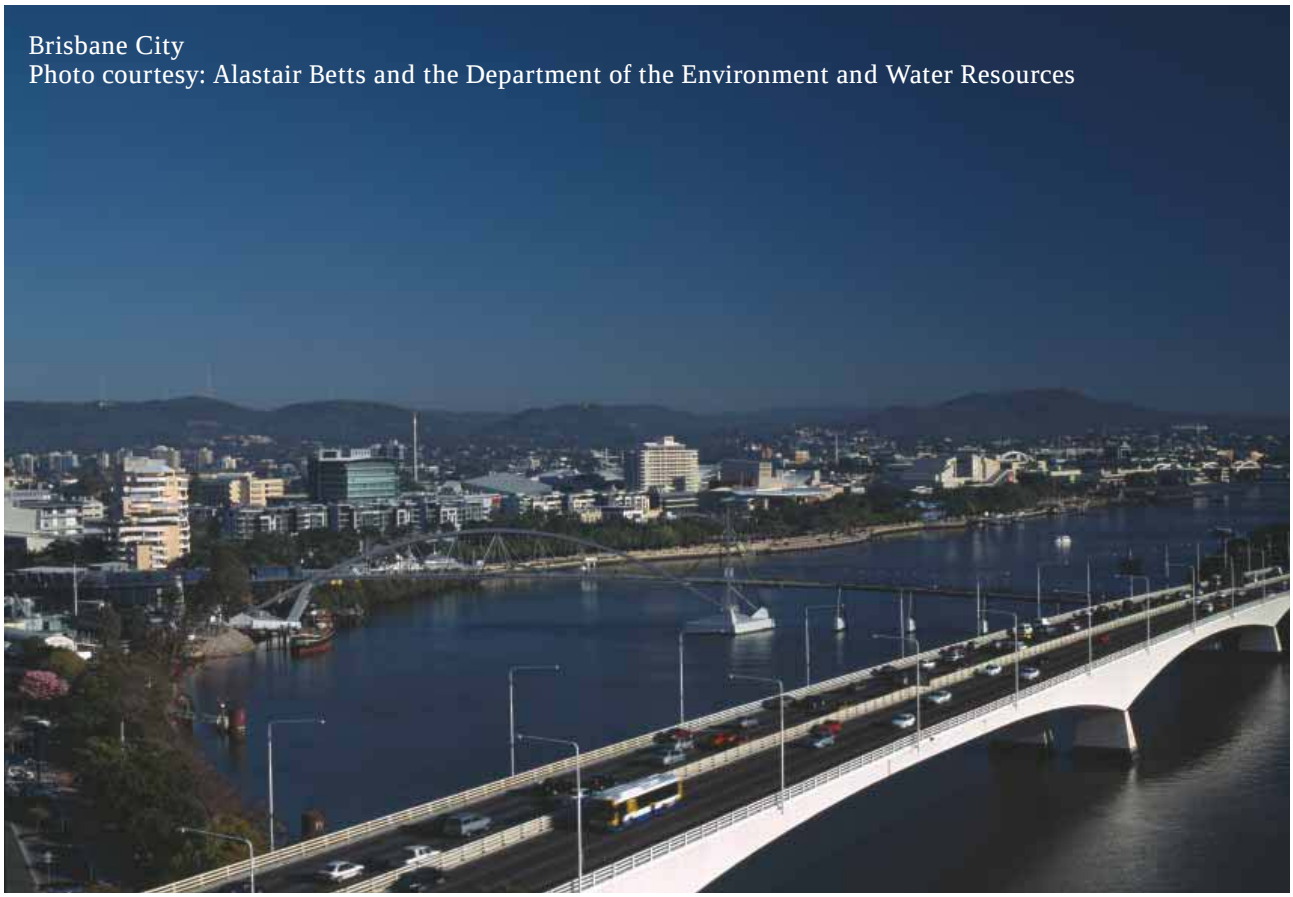
WATER AND SEWERAGE SERVICES

- *State-based water efficiency and demand management initiatives* - e.g. Waterproofing Adelaide (www.waterproofingadelaide.sa.gov.au) which requires councils to develop stormwater management plans on a whole-of-catchment basis and the *SA Water Conservation Handbook for Local Government* (www.environment.sa.gov.au/sustainability/water_resources).
- *Local government stormwater management* - strategies and plans designed to assist councils and other stakeholders to manage the environmental quality of urban stormwater run-off and provide a framework for integrating stormwater management into existing management and planning activities.
- *ICLEI Water Campaign* - a voluntary capacity-building programme to assist local governments to conserve

water. The programme is based on the achievement of milestones including - preparation of an inventory of water consumption and water quality management data; establishment of goals for water conservation and water quality; and development, implementation, measurement and reporting of a *Local Water Action Plan* (www.iclei.org/water/).

- *Water Sensitive Urban Design (WSUD) in the Sydney Region* - a collaborative project to enhance the ability of council staff to promote and implement sustainable water management practices in council operations and development projects. Tools include the *Water Sensitive Planning Guide for Sydney Region and Technical Guidelines* to provide guidance on best management practice design (www.wsud.org).
- *Water Sensitive Urban Design principles* - these have been adopted at a local government level at varying degrees across Australia via activities such as encouraging the increased use of water tanks for domestic supplies and landscaping that reduces overall water use.
- *Community Water Grants* - local governments are eligible to apply for a community water grant from the Commonwealth Government to encourage wise water use (www.communitywatergrants.gov.au). Recent local government projects receiving grants provide useful examples of potential adaptation actions such as subsidising the installation of rainwater tanks on residences, retrofitting dual flush toilets and water efficient shower roses to houses and businesses, and installing underground tanks to collect rain water to be used to supply shower and toilet water requirements at local recreational clubs.

Specific examples of potential adaptation options available to local government that will have a net benefit regardless of the ultimate degree of climate change are provided in Section 5.



Brisbane City
Photo courtesy: Alastair Betts and the Department of the Environment and Water Resources

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Appendix A: Consulted Stakeholders

Organisations consulted during the preparation of this report are listed below.

ACT Office of Sustainability (part of the Chief Minister's Department)
ACT Planning and Land Authority (ACTPLA)
Association of Bayside Municipalities (Vic.)
Australian Building Codes Board (ABCB)
Australian Local Government Association (ALGA)
Brisbane City Council (Qld)
Central Victorian Greenhouse Alliance
City of Marion (SA)
City of Melville (WA)
City of Port Adelaide-Enfield (SA)
Conservation Council of the South East Region and Canberra (CCSERAC)
Darwin City Council (NT)
Department of Agriculture, Fisheries and Forestry (Cwlth)
Department of Conservation and Land Management (WA)
Department of Energy and Infrastructure (SA)
Department of Environment (WA)
Department of Environment and Conservation (NSW)
Department of Health and Ageing (Cwlth)
Department of Local Government and Planning (Qld)
Department of Local Government and Regional Development (WA)
Department of Natural Resources (NSW)
Department of Natural Resources, Environment and the Arts (NT)
Department of Natural Resources and Mines (Qld)
Department of Planning and Infrastructure (WA)
Department of Premier and Cabinet (Greenhouse Unit) (WA)
Department of Primary Industries, Water and Environment (Tas.)
Department of Sustainability and Environment (Vic.)
Department of Transport (SA)
Eastern Metropolitan Regional Council (WA)
Engineers Australia
Environment Protection Authority (Vic.)
Gold Coast City Council (Qld)
ICLEI (Cities for Climate Protection)
Insurance Australia Group
Indian Ocean Climate Change Initiative (IOCI)
Ku-ring-gai Council (NSW)
Municipal Association of Victoria

Northern Alliance for Greenhouse Action (NAGA)
NSW Greenhouse Office
Northern Territory Local Government Association
Northern Territory Power and Water
Office of Local Government (SA)
Parramatta City Council (NSW)
Planning Institute of Australia (Qld Division)
Property Council (SA Branch)
Queensland Health
South Australia Local Government Association
South Australian Office of Sustainability
State Emergency Service (Tas.)
Sydney Coastal Councils (NSW)
Tasmania Local Government Association
Urban Development Institute of Australia (Qld)
Western Australia Agriculture
Western Australia Local Government Association
WaterCorp (WA)
Western Port Greenhouse Alliance (Vic.)

Appendix B: Local Government Functions

Six key local government functions and responsibilities have been identified for the development of climate change adaptation strategies. The size, structure and activities of local councils are diverse. This makes it difficult to make broad generalisations when identifying appropriate adaptation actions. State and territory legislation provides the framework for the role of local government across Australia and therefore the roles and responsibilities of local government, and their level of control over these, varies between each state and territory. A summary of the broad functions considered during the preparation of this report is provided at *Table B1*.

Table B1 - Description of Local Government Functions

INFRASTRUCTURE AND PROPERTY SERVICES
• Management and maintenance of essential 'hard' infrastructure networks such as provision, replacement and maintenance of local roads, drainage systems, recreational facilities, parks, gardens and open space, and in some states, water and sewerage infrastructure within council areas. • Planning responsibilities affecting the provision of infrastructure, such as town planning, rezoning of land, subdivision approval, development assessment and building regulation. Note: local government in the Northern Territory does not have the functions of planning, such as development assessment, nor building regulation. (Planning powers reside within the Northern Territory Department of Planning and Infrastructure, with most development proposals being considered by the relevant Development Consent Authority - a committee which includes members of the local council). • Management and maintenance of 'soft' infrastructure services such as cultural, civic and library facilities. • Collection and management of municipal waste.
PROVISION OF RECREATIONAL FACILITIES
• Construction, management and maintenance of council-owned community and recreational facilities including parks, sports fields and stadiums, public golf courses, swimming pools, sport centres, halls and camping grounds. • Hosting of community, sporting and recreational events and issuance of permits for events to third parties. • Provision of a range of services and programmes such as festivals, sporting programmes and leisure programmes.
HEALTH SERVICES
• Environmental health activities - such as environmental protection, sanitation services and waste management. • Public health activities - development, implementation and enforcement of public health policies and regulations. • Health promotion and preventative health programmes and services. • Health inspections and enforcement of food quality standards. • Recreation and leisure facilities and services - such as provision and maintenance of parks and sporting centres. • Typically provides first management response to emergencies such as bushfires and floods. • Special services to deal with the social consequences during and after natural disasters.

PLANNING AND DEVELOPMENT APPROVALS

- Translation of state planning and management policies and legislation into local actions.
- Strategic planning - through land use zoning and statutory controls on freehold land and locally managed public open space.
- Administration of building regulations in accordance with the Building Code of Australia (BCA) and other planning and building by-laws, e.g. council building standards to "bushfire proof" and "cyclone proof" buildings in vulnerable areas.
- With the exception of the Northern Territory, development control of nearly all activities and works on freehold land and crown land (except national parks and state forests) through development consent powers e.g. setbacks, density restrictions, clearing controls, erosion and sediment management, waste disposal (including pollution control).
- Enforcement powers for development consent conditions, waste management and unauthorised land uses, e.g. land clearing, drainage, filling, unauthorised construction and some pollutant (including sediment) discharges.
- Development and administration of other incorporated plans and strategies adopted at a council level, e.g. foreshore management plans, local sustainability plans, and asset management plans.

NATURAL RESOURCE MANAGEMENT

- Vegetation management including roadside vegetation, noxious weeds, and pests.
- Bushfire management and prevention in land vested under local government control.
- Influence over land clearance patterns through incentive programmes, such as planning amendments, rate differentials, levies and developer contributions.
- Management of local open space to restore remnant vegetation and recreate habitat.
- Local tourism developments.
- Community engagement/provision of resources to volunteer groups under NRM and conservation works.
- Closure of parks and nature reserves to enable natural systems to recover after extended droughts, storms and fires.

WATER AND SEWERAGE SERVICES

- Provision of domestic water supplies, stormwater management control, treatment of household waste, provision of adequate sewerage and drainage works and flood mitigation and flood plain management (although there are some differences across the jurisdictions).
- Queensland - statewide provision of water and sewerage service to Queensland communities. The state government's role in water planning management is only a regulatory one.
- NSW - councils are only responsible for providing water and sewerage services in urban communities outside the Sydney, Newcastle and Wollongong metropolitan areas.
- Tasmania - local government joint authorities own and operate water services via water authorities such as Hobart Water, Cradle Coast Water and Esk Water that are established under the *Local Government Act 1993*.
- Western Australia - a number of councils are licensed providers of sewerage services and non-potable water supply that hold operating licences under the *Water Services Licensing Act 1995*. Under these licences, councils are required to undertake asset management and maintenance activities, and observe the Sewerage Code of Australia in the design and construction of sewerage systems.
- Northern Territory - water infrastructure (with the exception of stormwater infrastructure) is typically delivered and maintained by the Northern Territory Government in both regional and rural areas.

Appendix C: Climate Change Terminology

Table 1 defines key climate change terminology used. Definitions of climate change terminology are sourced from two scientific reports - *Climate Change 2001 - Impacts, Adaptation and Vulnerability* (IPCC, 2001a) and *Climate Change - An Australian Guide to the Science and Potential Impacts* (Pittock, 2003).

Table C1 - Glossary of Climate Change Terms

TERM	DEFINITION
Climate change	Any change in climate over time, whether due to natural variability or as a result of human activity.
Climate prediction	An attempt to produce the most likely description or estimate of the actual evolution of climate into the future.
Climate projection	Projection of the response of the climate system typically based upon climate model simulations. These differ from climate predictions in that projections are based on assumptions that may or may not occur (e.g. technological and socio-economic developments) and are therefore subject to substantial uncertainty.
Climate scenarios	Simplified representations of the future climate, based on a set of assumptions. These can be derived from projections, but are usually based on additional information sources. A "climate change scenario" is the difference between a climate scenario and the current climate.
Mitigation	Response strategies that reduce the sources of greenhouse gases or enhance their sinks, to reduce the probability of reaching a given level of climate change. Mitigation reduces the likelihood of exceeding the adaptive capacity of natural systems and human societies.
Adaptation	Adjustment in natural or human systems in response to actual or expected climatic changes or their effects, which moderates harm or exploits beneficial opportunities. This is the primary means for maximising the gains and minimising the losses associated with climate change. The adaptation actions that are the subject of this report are those that provide a net economic, social or environmental benefit no matter what level of climate change occurs.
Vulnerability	The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change. Vulnerability is a function of the character, magnitude and rate of climatic variation to which a system is exposed (exposure), its sensitivity to those changes and its adaptive capacity.
Exposure	Relates to the influences or stimuli that impact on a system. Broadly it is the changes to the climate conditions that a system will be exposed to.
Sensitivity	Reflects the responsiveness of a system to climate and the degree to which changes in climate might affect a system in its current form (meaning without adaptation). Sensitive systems are highly responsive to climate and can be significantly affected by climate change.
Adaptive capacity	Reflects the ability of a system to change in a way that makes it better equipped to cope with external influences.

Sources - IPCC (2001a), Pittock (2003).

Potential Impacts of Climate Change on Local Government Functions
(Source: Climate Change Adaptation Actions for Local Government, Australian Greenhouse Office, 2007)

Assets/ service delivery	Possible Climate Change Impacts
Infrastructure and Property Services	
Road/ pavement construction and maintenance	▪ Changes in rates of deterioration – faster deterioration in wetter areas but potentially slower deterioration in areas where rainfall decreases. Deterioration may also result from higher temperatures and increased solar radiation. ▪ Inundation of surface and/or underground roads in coastal areas, potentially resulting in destruction. ▪ Changes in frequency of interruption of road traffic from extreme weather events and emergency transport routes disrupted.
Stormwater/ drainage	▪ More intense rainfall resulting in inflow and infiltration into wastewater networks ▪ Exceeding existing flood defences ▪ Exceeding drainage capacity ▪ Reduction in drainage capacity due to sea level rise and storm surge ▪ Changes in mean and peak stream and river flows ▪ Lower levels of rainfall, reducing pressure on stormwater systems
Buildings	▪ Chanees in building heating/ cooling costs (can be either negative or positive) ▪ Increased risk of damage from bushfires ▪ Changes in frequency of wind, rain, hail, flood, storm events and damage, potentially resulting in destruction ▪ Cyclone damage and destruction due to changes in wind density ▪ Higher rates of building deterioration and associated maintenance costs
Coastal Infrastructure	▪ Increased coastal erosion and inundation ▪ Increased frequency, or permanent inundation of, coastal infrastructure and utilities e.g. water, sewerage, gas, telecommunications, electricity, transportation ▪ Destruction, damage and disturbance to council-managed marinas and boat ramps ▪ Increased erosion and/or exceedance of seawalls, jetties and other coastal defences
Recreational Facilities	
Provision and use of recreational facilities	▪ Impacts on coastal recreational infrastructure. ▪ Loss of existing public space in coastal areas. ▪ Impacts on tourism/recreation activities along the coast. ▪ Increased costs associated with operation and maintenance costs of public amenities/recreational sites due to storm damage.
Maintenance of recreational facilities	▪ Reduced water quality and quantity resulting in less watering/irrigation of open space and sports grounds and closure of ovals. ▪ Limited water for swimming pools, etc. ▪ Beach closures, e.g. due to E.coli levels after storms.
Health Services	
Community/ Workplace health	▪ Milder winters improving communities' comfort levels. ▪ Increase in geographical range and seasonality of vector-borne diseases and the possibility for an expansion of receptive zones. ▪ High temperatures increasing incidence of food and water-borne diseases. ▪ Risk of increased cryptosporidium infections during open water swimming in summer. ▪ Health impacts due to exposure to extreme weather, e.g. heatwaves. ▪ Excessive rainfall events transporting contaminants into waterways and

	drinking water supplies. ▪ Increased pressure on drinking water supplies. ▪ An increase in injuries due to increased intensity of extreme events, e.g. storm surge and coastal flooding in coastal regions of Australia
Emergency/ bushfire management	▪ Increased emergency response and recovery operations. ▪ Risks to public safety and tourism and longer term impacts on regional economies.
Planning and development approvals	
Planning policy and developments	▪ Inappropriate location of urban expansion areas. ▪ Increased uncertainty in long-term land-use planning and infrastructure design, i.e. location of future developments, suitability of infrastructure designs to cope with changing climate, etc. ▪ Cost of retrofitting of systems. ▪ Loss of private property and community assets. ▪ Increase in insurance costs. ▪ Increased pressure on disaster management and response resources. ▪ Early retirement of capital infrastructure.
Natural Resource Management	
Coastal management	▪ Increased coastal erosion and inundation. ▪ Loss of private property/community assets. ▪ Loss of beach width. ▪ Changes to wetlands due to sea level rise, shoreline erosion and saltwater intrusion.
Weed/ pest management	▪ Changes in distribution of invasive species due to changes in climate and associated loss of biodiversity and changes to bushfire intensity.
Biodiversity	▪ Shifts in distributions of plant and animal species. ▪ Increased risk of population and species extinctions. ▪ Reduced ecosystem resilience to stress. ▪ Increased ecosystem and species heat stress. ▪ Increased pressure on dunal systems. ▪ Changes to mangrove habitats due to salt water intrusion. ▪ Increases in ecological disturbances.
Water and Sewerage services	
Stormwater/ sewerage	▪ Inundation of storm water and sewerage systems. ▪ Increased peak flows. ▪ Changes in groundwater levels. ▪ Changes in flood plains. ▪ Reduced dry weather sewerage flows. ▪ Reduced/unreliability of power supply for sewage pumping and treatment if existing electricity suppliers cannot maintain pace with long-term changes in climate.
Wastewater	▪ Changes in intensity of rainfall events impacting inflow and infiltration to wastewater network. ▪ Potential for blockages and dry weather overflows during dry spells.
Water supply	▪ Changes in mean and peak stream and river flows. ▪ Uncertain water availability. ▪ Insufficient water supply in some areas. ▪ Increased potential for water contamination. ▪ Salinisation of surface and groundwater supplies. ▪ Changes in availability of groundwater available for irrigation.

(REVISED)

Community Emergency Management Arrangements

August 2006

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FESA Emergency Management Services	
FESA SES Belmont	
FESA SES Wanneroo	
FESA Fire Rescue Services (Joondalup)	
Joondalup Health Campus	
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Note: Distribution by hard copy & CD-Rom

AMENDMENT LIST

NO	DATE	AMENDMENT DETAILS	AMENDED BY *(Initials & Date)*	
1	Nov 2002	Draft Plan		
2	Nov 2003	Emergency Contact Numbers	JC	11/2003
3	Feb 2006	Review and restructure	JC	03/2006
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Amendments or suggested amendments/additions to the contents of this Plan are to be forwarded in writing to: -

Director
Infrastructure Services
City of Joondalup
PO Box 21
Joondalup WA 6919

PREFACE

The City of Joondalup Community Emergency Management Plan has been compiled to address those areas where the City provides support to Hazard Management Agencies and other agencies, and the Cities responsibility for recovery operations.

This Plan should be read in conjunction with the COW/COJ LEMC Local Community Emergency Management Arrangements, State Emergency Management Plans (Westplans), State Emergency Management Committee Policy Statement No. 7 "WA Emergency Management Arrangements", Emergency Management Act 2005 and the Standing Operating Procedures of participating organisations.

In a joint initiative the COJ and the COW completed an undertaking of the emergency risk management process based on the Australian and New Zealand Risk Management Standards AS/NZS 4360:2004 in December 2005. Relevant information from the process has been incorporated into these arrangements. In alignment to the Emergency Management Act 2005, this plan, including relevant support and special plans, will be reviewed as required by the SEMC to accommodate the needs and changes to the COJ community.

GLOSSARY

Combat Agency
An organisation which, because of its experience and resources, is responsible for performing a task or activity such as fire fighting, rescue, temporary building restoration, evacuation, containment of oil spills, monitoring of radioactive materials. An emergency operation may involve a number of combat agencies.

District Emergency Management Committee (DEMC)
Based on emergency management districts and chaired by police district officers, as District Emergency Coordinator, (except for the Metropolitan Emergency Management Coordination Group which is chaired by the Assistant Commissioner Metropolitan) with a Regional Director of the Fire and Emergency Services Authority as the Deputy Chair. Executive Officer support is provided by FESA Managers nominated by FESA Chief Executive Officer.

Emergency
An event actual, or imminent, which endangers or threatens to endanger life, property or the environment, and which is beyond the single resources of a single organisation to manage or which requires the coordination of a number of significant emergency management activities.
Note: The term “emergency” is used on the understanding that it also includes any meaning of the word “disaster”.

Emergency Risk Management (ERM)
A systematic process that produces a range of measures which, on being implemented contributes to the well being of communities and the environment.
Hazard - a situation or condition with the potential for loss or harm to the community or the environment.
Risk - a concept used to describe the likelihood of harmful consequences, arising from the interaction of hazards, communities and the environment.

Hazard Management Agency (HMA)
That organisation which, because of its legislative responsibility or specialised knowledge, expertise and resources is responsible for ensuring that all emergency management activities pertaining to the prevention of, preparedness for, response to and recovery from a specific hazard are undertaken. Such organisations are either designated by legislation or detailed in State level emergency management plans. The list of hazards and the responsible hazard management agency are detailed in SEMC Policy Statement No 7 is attached.

Incident Manager
The person designated by the relevant Hazard Management Agency, responsible for the overall management and control of an incident and the tasking of agencies in accordance with the needs of the situation.

Local Emergency Management Committee (LEMC)
Based on either local government boundaries or emergency management sub-districts. Chaired by the Shire President (or a delegated person) with the Local Emergency Coordinator, whose jurisdiction covers the local government area concerned as the Deputy Chair. Executive support should be provided by the local government.

Prevention, Preparedness, Response and Recovery (PPRR)
Prevention activities eliminate or reduce the probability of occurrence of a specific hazard. They also reduce the degree of damage likely to be incurred.
Preparedness activities focus on essential emergency response capabilities through the development of plans, procedures, organisation and management of resources, training and public education.
Response activities combat the effects of the event, provide emergency assistance for casualties, and help reduce further damage and help speed recovery operations.
Recovery activities that support emergency affected communities in reconstruction of the physical infrastructure and restoration of emotional, social economic and physical wellbeing. During recovery operations, actions are taken to minimise the recurrence of the hazard and/or lessen its effects on the community.

State Emergency Management Committee (SEMC)
Chaired by the Commissioner of Police, as State Emergency Coordinator, with Chief Executive Officer of the Fire and Emergency Services Authority as the Deputy Chair. The Executive Director, FESA Emergency Management Services, is the SEMC Executive Officer. The SEMC is comprised of an executive and four functional groups whose membership includes those organisations essential to the State's emergency management arrangements. The chair of each of the functional groups is also a member of the SEMC Executive Group. The functional groups are:
1) Emergency Services Group
2) Public Information Group
3) Lifelines Services Group
4) Recovery Services Group

Support Agency
An organisation whose response in an emergency is to restore essential services (i.e. Western Power, Water Corporation, Main Roads WA, etc) or to provide such support functions as welfare, medical and health, transport, communications, engineering, etc.

ACRONYMS

AIIMS - Australasian Interagency Incident Management System

CALM - Department of Conservation And Land Management

CCERM - Community Centred Emergency Risk Management

COJ - City of Joondalup

COW - City of Wanneroo

DCD - Department of Community Development

DEMC - District Emergency Management Committee

DOH - Department of Health

ERM - Emergency Risk Management

FESA - Fire & Emergency Services Authority of Western Australia

- FRS - Fire & Rescue Service
- SES - State Emergency Service
- BFS - Bush Fire Service

HMA - Hazard Management Agency

LEMC - Local Emergency Management Committee

LG - Local Government

PPRR - Prevention, Preparedness, Response & Recovery

SEMC - State Emergency Management Committee

SOP - Standard Operating Procedures

WA - Western Australia

WAP - Western Australian Police

WVBFB - Wanneroo Volunteer Bush Fire Brigade

PART 1: MANAGEMENT

1.1 AUTHORITY

The City of Joondalup Community Emergency Management Plan has been produced under the authority of the:

a) City of Joondalup Council

b) Chief Executive Officer City of Joondalup

c) The City of Wanneroo / City of Joondalup Local Emergency Management Committee

1.2 DATE

The date (March 2006) displayed on the cover of the City of Joondalup Community Emergency Management Plan represents the date this document was formally endorsed.

1.3 AREA COVERED

The *City of Joondalup* lies within the Perth's northwest metropolitan area and has a population of approximately 160,888 with over 50,000 dwellings. The City covers an area of 98 sq. km and is located approximately 27 km from Perth CBD.

Administration Centre
90 Boas Avenue
Joondalup
Telephone (08) 9400 4000
Fax (08) 9300 1383
After Hrs Emergency 1300 655 860
http://www.joondalup.wa.gov.au

Surrounding Local Authorities
City of Wanneroo to the north and east
City of Stirling to the South

Major Transport Arteries
Mitchell Freeway, Wanneroo Rd, Marmion Ave.

Primary Roads
Beach Rd, Warwick Rd, Hepburn Ave, Whitfords Ave, Ocean Reef Rd, Hodges Dr, Moore Dr, Burns Beach Rd, West Coast Dr.

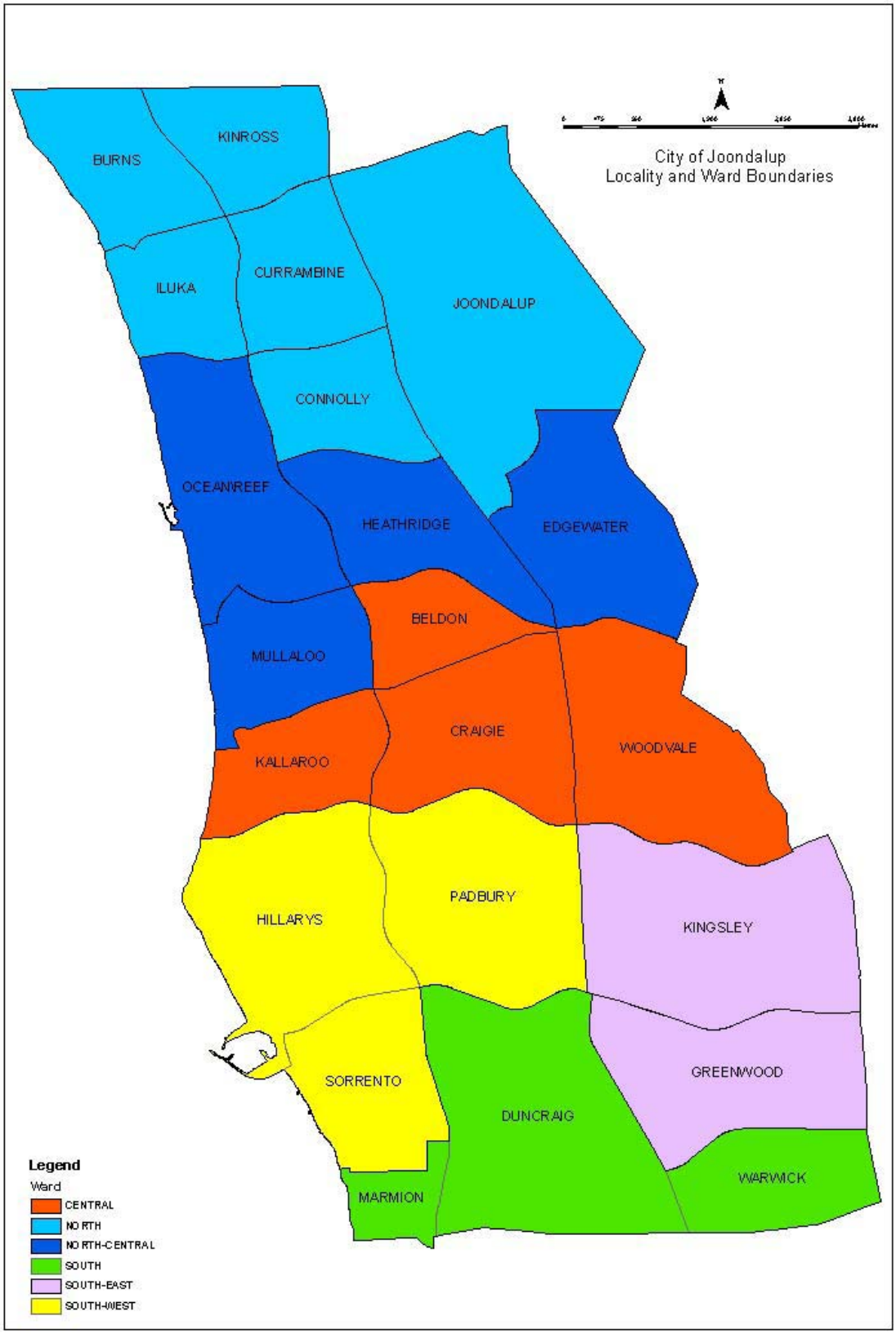
Rail Link
An electric passenger rail link connects to Perth Central station. Currambine, Joondalup, Edgewater, Greenwood and Warwick Station are located on the rail link to Perth.

Ferry Service
A regular boat ferry service runs between Hillary's Boat Harbour and Rottnest Island.

Physical Attributes
The City of Joondalup has 16 km of coastline extending from Marmion in the south to Burns Beach in the north. There are areas of bush land including national parks regional parks and public reserves. The majority of the City is largely urban, commercial and small isolated areas of light industry.

Wetlands/Lakes
Lake Joondalup, Lake Goollelal

Regional Reserves
Yellagonga Regional Park


City of Joondalup
Locality and Ward Boundaries
BURNS
KINROSS
ILUKA
CURRAMBINE
JOONDALUP
CONNOLLY
OCEAN REEF
HEATHRIDGE
EDGEWATER
BELDON
MULLALOO
KALLAROO
CRAIGIE
WOODVALE
HILLARYS
PADBURY
KINGSLEY
SORRENTO
DUNCRAIG
GREENWOOD
MARMION
WARWICK
Legend
Ward
CENTRAL
NORTH
NORTH-CENTRAL
SOUTH
SOUTH-EAST
SOUTH-WEST

1.4 PURPOSE

The purpose of this community emergency management plan is to document the management of identified risks and provide specific detail on planning, response and recovery activities of the City of Joondalup, hazard management agencies and other agencies.

1.5 OBJECTIVES OF THIS COMMUNITY EMERGENCY MANAGEMENT PLAN

a) Enable the COJ to meet its emergency management role and responsibilities, in relation to community safety.

b) Provide information and a framework to facilitate the effective management of emergencies with the potential to impact the COJ community.

c) Establish contemporary guidelines for effective emergency management strategies, which enhance the community's response and recovery capabilities.

d) Incorporate relevant information on CCERM and the undertaking of the ERM process in relation to the COJ community.

e) A document which provides sufficient detail in community emergency management, formatted in a manner that facilitates regular review to effectively accommodate change to the community.

f) A document that is aligned to the Emergency Management Act 2005 and recommended guidelines in relation to local community emergency management arrangements.

1.6 SCOPE

a) This document applies to all areas encompassed within the established boundaries of the local government authority known as the City of Joondalup.

b) These arrangements cover areas where the COJ provides support to Hazard Management Agencies and other agencies in the event of an emergency event.

c) This document comprises details on the capacity of the COJ in relation to the provision of resources to support the effective management of emergencies.

d) The Cities responsibility in recovery operations and the restoration and reconstruction of services and facilities within the community are detailed in this document.

e) These arrangements serve as a guide to emergency management at the local level. An emergency situation may graduate and require to be managed at a regional or state level.

This document is structured as below:

Part 1: Management
Part 2: Planning
Part 3: Response
Part 4: Recovery
Part 5: Emergency Contacts Directory
Part 6: Testing, Exercising and Review
Part 7: Support Plans
Part 8: Emergency Assets Register
Part 9: Emergency Risk Management
Appendices

This plan has been compiled in alignment with the;

- Local Community Emergency Management Arrangements Guide for Western Australia;
- State Emergency Management Committee, Policy Statement No 7 – Western Australian Emergency Management Arrangements (pending the development of the Western Australian Emergency Management Regulations); and the
- Western Australian Emergency Management Act 2005.

This document interfaces and should be read in conjunction with the;

- Standing Operating Procedures (SOP's) of participating agencies.
- COW / COJ LEMC Local Community Emergency Management Arrangements (which overarches both cities organisational arrangements)
- State Hazard Management Plans (Westplans)

1.7 EXISTING PLANS AND ARRANGEMENTS

The table below contains the suite of existing plans and arrangements held by the COJ that may be actioned / utilised in the event of an emergency event and where and who they are located with.

Plan / Arrangements	Dated	Location
COJ Risk Register	Nov 2005	Refer to Table of Contents.
COJ Risk Treatment Plan	Dec 2005	Refer to Table of Contents.
COW / COJ LEMC Community Emergency Mgmt Arrangements	2006	Chairman COW/COJ LEMC Mark Harrison (WA Police) Ph: 9246-8372 Mob: 0434 600 208 Derrick Briggs (WA Police) Ph: 9246-8379 Mob: 0434 600 208
State Hazard Management Plans (Westplans): - Bushfire - Cyclone - Earthquake - Flood - Isolation - Storm - Tsunami - Recovery - Welfare	 Nov 2005 Nov 1999 Nov 1999 Nov 1999 Nov 1999 Nov 1999 Nov 1999 Mar 2003 Jul 2003	COJ Admin Centre Mgr Operations Services Dennis Cluning Ph: 9400 4341 Mob: 0419 908 479
COJ Recovery Plan	2004	Refer to Table of Contents.
Support Plans: COJ Operations Services Support Plan (Works Division) COJ Community Services Support Plan (Welfare) COJ Environmental Health Support Plan	 Nov 2002 Nov 2002 Nov 2002	Refer to table of contents.
Emergency Contacts Directory	2006	Refer to Table of Contents.
Emergency Evacuation Centres	2006	Refer to Table of Contents.
COJ Asset Register	2006	Refer to Table of Contents.
Special plans: City of Bayswater – Community EM Arrangements City of Stirling – Local EM Plan City of Wanneroo – Local EM Plan COJ Beach Closure Strategy COJ Beach Lifeguard Patrol Service Risk Mgmt Plan COJ Depot Emergency Procedures COJ Libraries Emergency Management Plan COJ Shark Sighting Strategy COJ Surf Life Saving Emergency Procedures Craigie L/C BMX & Skate Risk Management Plan Craigie Leisure Centre Emergency Action Plan Joondalup Festival Risk Management Plan Little Feet Festival Risk Management Plan	 Aug 2005 Jun 2005 Nov 2004 Mar 2001 Sep 2002 Sep 2003 Jul 2001 Mar 2005 Feb 2005	COJ Admin Centre Mgr Operations Services Dennis Cluning Ph: 9400 4341 Mob: 0419 908 479 COJ Admin Centre Team Leader Ranger Services Paul Hrovatin Ph: 9400 4906 Mob: 0417 177 019

Mawson Park Concert Risk Management Plan Valentines Day Concert Risk Management Plan Yellagonga Regional Park – Fire Response Plan Yellagonga Regional Park – Pollution Response Plan	2005 2005 2004/2005 Feb 1999	

1.8 AGREEMENTS, UNDERSTANDINGS AND COMMITMENTS

1.8.1 Agreement: Shared Local Recovery Coordination Centre (LRCC) Facility

Parties of the agreement:
City of Wanneroo
City of Joondalup

Purpose:
Enable the shared use of the LRCC facility to coordinate and administrate recovery operations in the event of an emergency occurring in the COW and/or COJ.

Location:
COW Ashby Depot, Building 1, 1204 Wanneroo Road, Ashby 6065

Description:
The agreement attracts an annual fee paid by the COJ to the COW for the shared use of the LRCC throughout a COJ emergency. In the event of a large-scale emergency affecting both cities, staff from both cities may be effectively utilised to form a larger resource pool and rotated to participate in recovery activities.

Note:
The Twin Cities FM broadcast facility is also located in the same building.

Refer to Appendix 2: Joint City Of Wanneroo/City Of Joondalup Local Emergency Management Activities – Council Report

1.8.2 Partnering Agreement: The Provision of Mutual Aid For Recovery During Emergencies

Parties to the Agreement:
- City of Joondalup
- City of Wanneroo
- City of Stirling
- City of Bayswater
- City of Swan
- Town of Bassendean
- Shire of Mundaring

Purpose:
Undertake the provision of mutual aid between parties to the Agreement for recovery management during emergencies.

Description:
The above partnering agreement was developed by the Metropolitan North & East Recovery Group to enable effective pooling and utilisation of local resources. The

participating local government authorities formally endorsed the Agreement in October 2004.

Refer to Appendix C: Partnering Agreement: The Provision of Mutual Aid For Recovery During Emergencies.

1.9 ADDITIONAL SUPPORT

In the event of an emergency, additional support may be sort from neighbouring or other local governments that may be able to offer assistance through providing additional resources.

Refer to Section 1.8: "Agreements, Understandings and Commitments (the section above).

1.10 SPECIAL CONSIDERATIONS

1.10.1 Severe Weather Conditions

During periods where severe wind or flash flooding is impacting the community, the COJ's resources may be depleted due to additional deployment requirements. This would include resources such as manpower, vehicles and equipment.

This circumstance is most likely to occur during the winter, however severe thunderstorms and the effect of cyclonic weather conditions from the northern Western Australia are not uncommon during the summer months.

1.10.2 After Hours, Weekends and Public Holidays

It should be duly noted that the business hours of the COJ, are from Monday to Friday 08:30 to 17:00 hours, however the Depots in Ashby and Winton Road Joondalup are manned from 07:00 hours (O6:30 hours during summer).

In order to access the COJ's services and resources after hours, on weekends and public holidays, the utilisation of relevant emergency contact phone numbers will be required. These numbers are located and clearly outlined in the COJ Emergency Contacts Directories.

Refer to Part 5: Emergency Contacts Directories

1.10.3 Joondalup Festival

The Joondalup Festival is an annual event usually held in the central business district of Joondalup. An expected 70 000 (approx) visitors frequent the event which is usually held over one weekend in March, commencing on Saturday morning and concluding on the Sunday evening.

The event comprises various forms of family entertainment including a street parade, main stage area, various bands, children activities, food and beverages, street theatre and a community dance stage.

To prevent vehicle access to the festival area numerous road closures are implemented throughout the duration of the festival.

1.11 AUSTRALIAN INTERSERVICE INCIDENT MANAGEMENT SYSTEM (AIIMS)

The AIIMS, also known as the Incident Control System (ICS), provides for the joint combat of emergency incidents. AIIMS may be used to manage any event where coordination & integration of services is essential.

AIIMS is a universal incident control system proven to be effective worldwide because of its compatibility and use of common terminology. Awareness of AIIMS comes highly recommended for Recovery Coordination in the field. The training would provide greater confidence in managing the integration of services of other recovery/welfare agencies/stakeholders. AIIMS is highly recommended for persons in liaison roles in any emergency incident.

The implementation of the AIIMS as a management structure for multi-agency emergency operations is achieved through the following process.

- Recognition and qualification of members of organisations to fill the AIIMS roles and functions.
- Training members of organisations to achieve accreditation in AIIMS roles.
- Adoption of the key functions, role statements, structures, terminology and documentation as defined by AIIMS to suit Western Australian operations.
- Maintaining the integrity of the Chains of Command and Information Systems within participating agencies and preserving other agencies industrial agreements and standard operational agreements when involved in multi-agency incidents.
- Participation in regular multi-agency training exercises incorporating AIIMS.
- Facilitation and/or attendance at post incident debriefs following multi-agency emergency activities.

The City is committed to pursuing the feasibility of adopting an AIIMS approach to administration and co-ordination of emergency and recovery arrangements. As developments occur in this regard, relevant information on AIIMS will be inserted into this section.

1.12 RESOURCES

The HMA is responsible for the determination of resources required for their specific hazards. The COJ's resources have been identified and appropriately listed to facilitate their availability upon request.

The COJ's resources are located in the Emergency Contacts Directories and Emergency Assets Register. Both documents require to be annually reviewed. They include information pertaining to;

a) HMA, combat and support agencies;
b) specialised services;
c) LG staff & volunteers;
d) Emergency Evacuation Centres;
e) COJ facilities (buildings etc.);
f) operational plant machinery;

g) transport vehicles; and
h) various plant equipment.

Refer to Part 5: Emergency Contacts Directories

Refer to Part 8: Emergency Assets Register

1.13 FINANCIAL ARRANGEMENTS

Whilst recognising the provisions of the State Emergency Management Committee's Policy Statement Number 13 – Funding For Multi Agency Emergencies (SEMC PS 13), local governments are committed to spending such necessary funds as required to ensure the safety of its residents and visitors.

SEMC PS 13 Section 4c states, "Where costs are incurred in delivering services or resources at the request of the HMA concerned, which are not part of the agency's core functions and there are not prior agreements as to funding responsibilities, then such costs shall be met by the HMA".

1.14 RESPONSIBILITIES

As stated in the SEMC Policy Statement 7 – Western Australian Emergency Management Arrangements, the following outlines descriptions and responsibilities of key positions or groups in relation to local community emergency management.

1.14.1 Emergency Coordinator

Under the Western Australian Emergency Management Arrangements the District or Local Emergency Coordinator is designated by the Commissioner of Police and is based on the WA Police districts or sub-districts, which are aligned to LG boundaries.

The District or Local Emergency Coordinator has a responsibility for ensuring that the roles and functions of their respective District or Local Emergency Management Committees are performed, and assisting the HMA in the provision of a coordinated multi agency response during emergency incidents and operations.

At the local level the Senior Police Officer responsible for the Police sub-district is the Local Emergency Coordinator.

The Local Emergency Coordinator (LEC) for the COJ is the;

WA Police, North West Metropolitan, Emergency Management Coordinator (located at the Warwick Police Complex).

1.14.2 Local Emergency Management Committee (LEMC)

LEMC's are based on either local government boundaries or emergency management sub-districts and are chaired by the Mayor/Shire President (or delegated person) with the Local Emergency Coordinator as the Deputy Chair.

The Local Government provides executive support to the LEMC and its membership should include representatives from the LG, Government Agencies, Statutory Authorities, Industry and Community Groups.

1.15 EMERGENCY COORDINATION CENTRE (ECC) MANAGEMENT

An ECC is a facility for the central management of resources for an emergency. It is the focus of the community's emergency management arrangements in supporting an effective multi-agency response and recovery. Operational procedures for the ECC lay down prescribed actions to be followed by staff. They cover such procedures as indicated in the following table.

Activation	Operating Procedures	Stand Down
Opening the ECC Calling out staff Opening communication systems Preparing of display boards and maps Preparing a staff roster	Message flow Information display Information processing Resource deployment Situation reports (Sitreps) Preparing media bulletins Decision making Information briefings	Filing messages / records Cleaning displays boards and maps Standing down staff Closing communication systems Closing the ECC Initial and follow up debrief

Note: COJ Emergency Coordination Centre - Operational Procedures are yet to be developed.

Refer to Section 5.5: Emergency Coordination Centres.

PART 2: PLANNING

2.1 LOCAL EMERGENCY MANAGEMENT COMMITTEE (LEMC)

LG and the Local Emergency Coordinator ensure the LEMC functions to overview, plan and test local emergency management arrangements. Membership of the LEMC is representative of agencies, organisations, community groups and expertise relevant to the identified community hazards and risks and emergency management arrangements.

Since the COJ was formed in 1999 emerging from the former COW, the two cities have remained aligned in various emergency management matters. Together both local government authorities make up the City of Wanneroo / City of Joondalup LEMC. They also form the North-West Metropolitan District Emergency Management District (DEMC). The COW/COJ LEMC convenes bi-monthly with the two Cities alternating as host.

The North-West Metropolitan DEMC is responsible to oversee and provide strategic direction to the COW/COJ LEMC, which is formalised by an annual LEMC Business Plan. Emergency management activities conducted by the LEMC are reported to the DEMC on an annual basis.

2.1.1 COW/COJ LEMC Composition

Chair:	WA Police, North West Metro, Emergency Management Coordinator
Deputy Chair:	Senior Police Officer, North West Metro
Executive Officer:	Senior Local Government Officer
Secretary:	Local Government Officer
Members:	WAPS – OIC all Police Stations FESA – FRS, VFRS, BFS, SES. DCD - Regional Manager CALM – Fire Control Officer DPI – Regional Officer Dept of Health – Regional Officer Dept of Education – Regional Officer Red Cross – Regional Officer LG – Senior Ranger x 2 LG – Councillor x 2 (optional) LG – EM Officer
Sub-committees:	Local Plan & Business Plan Welfare & Recovery Training & Exercises Emergency Services (Note: Sub-committee members consist of LEMC members)

Role:
Assist the Local Emergency Coordinator (Officer in Charge of Police sub-district) to develop and maintain effective emergency management arrangements for the local area.

Functions:
a. Liaise with participating agencies in the development, review and testing of emergency management arrangements.
b. Assist with the preparation of emergency management operating procedures for application in the local area.
c. Prepare an annual report on Committee activities for submission to the District Emergency Management Committee.
d. Participate in the emergency risk management process.
e. Carry out other emergency management functions as directed by the District Emergency Management Committee.

Refer to Section 5.2 City of Wanneroo / City of Joondalup LEMC Contacts.

2.2 EMERGENCY RISK MANAGEMENT

Refer to Part 9: Emergency Risk Management

2.3 EMERGENCY MANAGEMENT STRUCTURE

Within the context of this plan, depending on the nature of the risk, the following components form the emergency management structure in the event of a local incident.

2.3.1 Hazard Management Agency (HMA)

The HMA is an organisation which, because of its legislative responsibility or specialised knowledge, expertise and resources, is responsible for ensuring all emergency management activities pertaining to the prevention of, preparedness for, response to and recovery from a specific hazard are undertaken.

The HMA are also responsible for;
a) Appointing an Incident Manager;
b) Ensuring the safety of all participants.
c) Providing situation reports to the Emergency Coordinator.
d) Providing progress reports to higher levels; and
e) Submitting a post operations report.

It is vitally important that the designated controller and the Emergency Co-ordinator work in close co-operation.

For a list of HMAs as detailed in SEMC Policy Statement No. 7 -

Refer to Section 5.1: Hazard Management Agencies

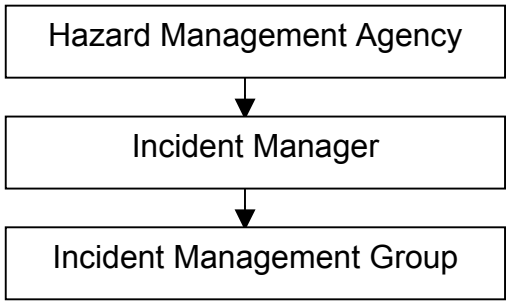
2.3.2 Incident Manager

The person designated by the relevant 'Hazard Management Agency' responsible for the overall management and control of the incident and the tasking of agencies in accordance with the needs of the situation.

2.3.3 Incident Management Group (IMG)

The IMG may be convened by the "Incident Manager" in consultation with the relevant Local Emergency Coordinator to assist in the overall management of an incident. The IMG includes representation from key agencies involved in the response.

Fig. 1 Operations Management Structure for a localised incident.



2.3.4 Local Emergency Coordinator

The Western Australian Police Service (Police Service) is the designated Emergency Coordinator for all emergencies. The Senior Police Officer attending any incident automatically becomes the Emergency Co-ordinator at that incident.

The Local Emergency Co-ordinator for the City of Joondalup is the:
WA Police, North West Metro, Emergency Management Coordinator.

2.3.5 Local Recovery Coordinator

The recovery coordinator has two broad areas of responsibility.

a) In conjunction with the Local Recovery Committee the Local Recovery Coordinator is responsible for the development and implementation of recovery management arrangements for the City of Joondalup.

b) Coordinate and report on local recovery activities for a particular emergency event, in accordance with plans, strategies and policies determined by the Local Recovery Coordinating Committee.

The designated Local Recovery Coordinator is the:
City of Joondalup: Manager Operations Services.

Refer to Appendix A: COJ Recovery Plan

2.3.6 Combat Agency

A Combat Agency is an organisation with expertise and resources. It is responsible for performing a task or activity such as fire fighting, rescue, temporary building restoration, evacuation, containment of oil spills, monitoring of radioactive materials etc.

Combat Agencies are responsible for;

a) Executing combative action in accordance with their statutory responsibilities;
b) Executing tasks as allocated in the tactical response plan;
c) Managing their own resources;
d) Providing progress reports to the designated Incident Manager;
e) Providing progress reports to the higher levels of their parent organisation; and
f) Contributing to a post operations report.

The following examples are well known:

- Fire fighting – Fire & Rescue Service
- Traffic and Crowd Control – Police Service
- First Aid – Ambulance Service WA & Medical Services.

2.3.7 Support Organisation

A Support Organisation is an organisation whose response in an emergency is to provide support functions such as welfare, medical and health, transport, communications, engineering, essential services, etc. Support organisations report to either the designated Incident Manager or the Emergency Co-ordinator as appropriate to the situation.

Support organisations are responsible for;

a) Restoring essential services affected by the emergency;
b) Providing "function" support as part of the tactical plan; eg. Family and Children's Services to provide welfare services.
c) Providing progress reports to either the designated Incident Manager or the Emergency Co-ordinator as appropriate to the situation;
d) Providing progress reports to the higher levels of their parent organisation; and
e) Contributing to a post operations report.

The following examples are well known:

- Welfare – Department Community Development
- Health & Medical Services – Department of Health

2.3.8 Testing During the Planning process

Exercising and testing during the planning process is essential to ensure that the arrangements are workable and effective. Exercising during the planning process will allow the LEMC to:

a) Test the effectiveness of local arrangements;
b) Bring together all members of emergency management agencies and give them knowledge of, and confidence in, each other;
c) Help educate the community about local arrangements and programs;
d) Allow participating agencies an opportunity of testing their operational procedures and skills in simulated emergency conditions; and
e) Test the abilities of separate agencies to work together on common tasks, and to assess effectiveness and coordination between them.

Refer to Section 6: Testing, Exercising and Reviewing the Arrangements

2.3 TRAINING PROGRAMS - PLANNING

The following training programs may assist local community emergency management practitioners to plan more effectively.

- Introduction to ERM
- Introduction to Evacuation Management WA
- Contribute to ERM
- Facilitate ERM
- Determine Treatment Options
- Undertake Emergency Planning
- Emergency Management for LG
- Risk Based Land Use Planning
- Community Engagement

PART 3: RESPONSE

3.1 RISKS

Through a Community Centred Emergency Risk Management Process (CCERM) emergency risks with the most potential to impact the joint COW/COJ community have been identified. The following table indicates hazards (or source of risk), the responsible HMA, whether the HMA is located locally or within the district, any local plans and the relevant Westplan (State Emergency Management Plan).

Hazard	HMA	Local HMA	District HMA	Local Plan	Westplan
Bushfire (Primarily within the COW)	FESA Fire & Rescue Services & Bush Fire Services	Yes			Bushfire (2005)
	Dept of Conservation and Land Management		Yes (COW)	Yellagonga Regional Park	
	Local Government Authority	Yes			
Structural Fire	FESA Fire & Rescue Services	Yes			Urban Fire (2000)
Severe Storm	FESA State Emergency Services	Yes			Storm (2004)
Chemical Incident	FESA Fire & Rescue Services	Yes			Hazmat (2005)
Marine Transport Emergency	Dept of Planning & Infrastructure	Yes			Marine Transport Emergency (2004)
Rail Transport Emergency	Public Transport Authority – Trans Perth Train Operations	Yes			PTA – Joondalup SOP
Human Epidemic	Dept of Health		Yes (Shenton Park)		Human Epidemic (2001)

Consistent with SEMC PS 7, these arrangements are based on the premise that the HMA responsible for the above threats will develop, test and review appropriate emergency management plans.

To ensure a timely response to any of the identified threats, Part 5 of these arrangements details key contacts for each HMA.

It is recognised that HMAs and Combat Agencies may require local government resources and assistance/support where possible.

3.2 EVACUATION

3.2.1 Evacuation Planning Principles

The following principles should be observed in evacuation planning.
a) Determination of legal or other authority to evacuate;
b) Establishment of a management structure;
c) Clear definition of roles and responsibilities;
d) Development of appropriate and flexible plans;
e) Effective warning and information system;
f) Assurance of movement capabilities;
g) Establishment and maintenance of confidence and cooperation of the affected community;
f) Appropriate welfare provision throughout all stages; and
g) Exercise of developed plans.

3.2.2 Emergency Evacuation Centres

Dependant on the risk, in the event of an emergency, the need for long or short term evacuation, and immediate or evacuation with warning may be necessary.

It is useful to:
a) Identify the venues available for evacuees;
b) Assess availability (e.g. in case maintenance is in progress);
c) Determine who is responsible for opening and managing the venues;
d) Note how many people the venues can cope with;
e) Note what facilities are available in the venues; and
f) Identify and list which venues are suitable.

Refer to Section 5.8: COJ Emergency Evacuation Centres

Note:
- It is important to also consider evacuation "into" your community should an emergency occur in a neighbouring community that requires evacuation out of their area.
- Consideration should also be given to the necessary evacuation from the COJ Community to another.

Refer to Appendix C: Partnering Agreement – The Provision of Mutual Aid in Recovery During Emergencies.

3.3 DEMOGRAPHICS

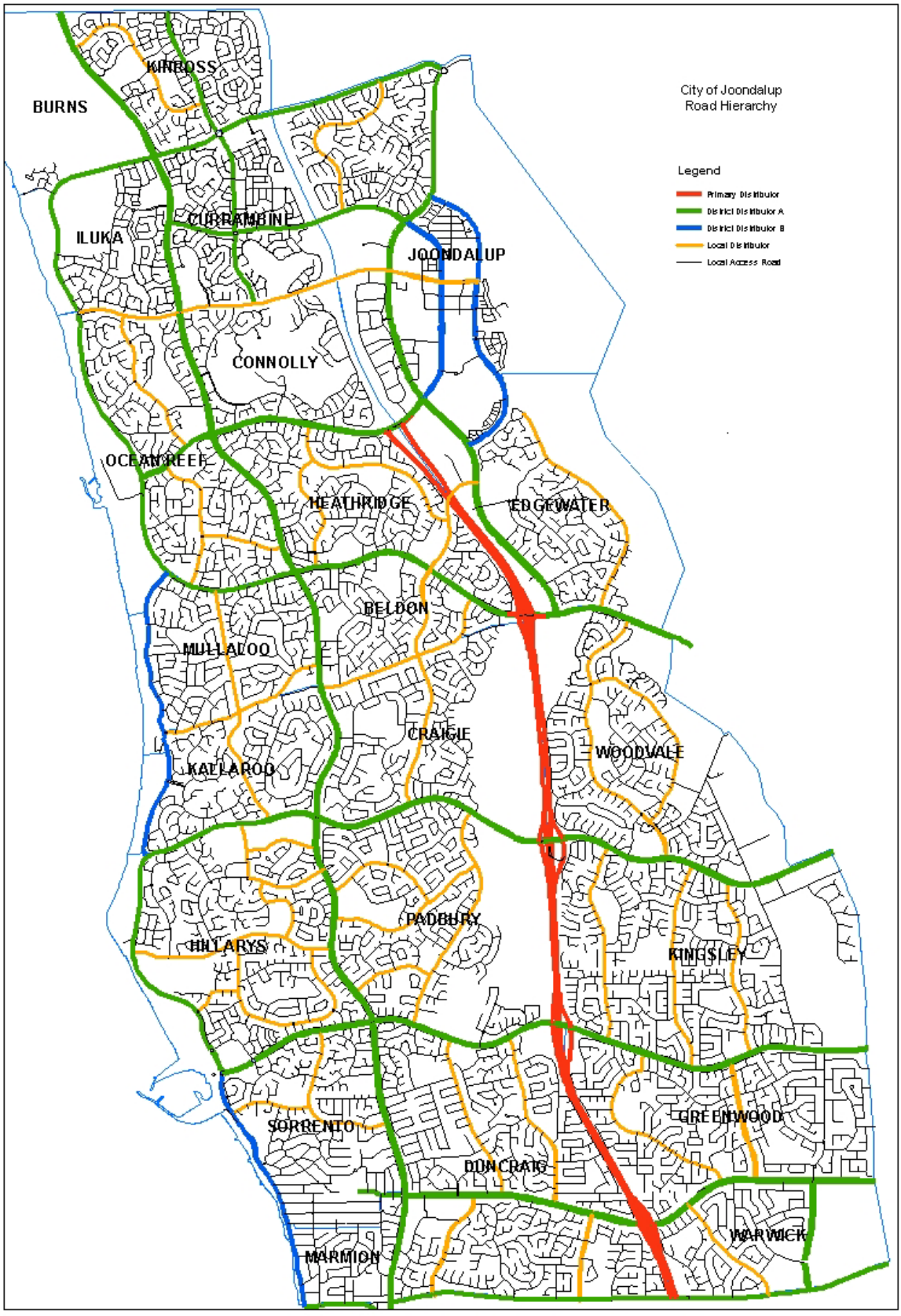
Australian Bureau of Statistics
Estimated Resident Population as at 30 June 2004
Selected Suburbs in Joondalup (C)
Cat. No. 9941.0

Suburb	0-4 years	5-9 years	10-14 years	15-19 years	20-85 years	TOTAL
Beldon	304	279	344	390	3124	4441
Burns	13	12	15	6	207	253
Connolly	202	318	403	365	2588	3876
Craigie	418	370	391	468	4566	6213
Currambine	553	692	594	507	4378	6724
Duncraig	802	861	1218	1638	11850	16369
Edgewater	258	357	448	502	3650	5215
Greenwood	571	519	674	869	7882	10515
Heathridge	483	583	643	690	5216	7615
Hillarys	593	684	781	778	7344	10180
Iluka	232	288	350	273	2435	3578
Joondalup	524	612	695	780	5698	8309
Kallaroo	252	329	426	483	4073	5563
Kingsley	696	871	1175	1394	9907	14043
Kinross	661	741	611	498	4588	7099
Marmion	85	116	162	212	1664	2239
Mullaloo	301	402	516	581	4435	6235
Ocean Reef	426	664	848	916	5870	8724
Padbury	522	517	605	775	6614	9033
Sorrento	348	438	601	712	5663	7762
Warwick	157	164	239	306	3096	3962
Woodvale	579	835	1113	1033	6708	10268
TOTAL	**8980**	**10652**	**12852**	**14176**	**111556**	**158216**

3.4 EVACUATION MATRIX

Refer to Section 7.2: Community Services (Welfare) Support Plan

3.5 EVACUATION ROUTES AND MAPS



Note: A COJ Evacuation Support Plan is yet to be developed.

3.6 TRAINING PROGRAMS - RESPONSE

- Emergency Coordination Centre Management
- Chemical, Biological, Radiological Incidents and Emergencies
- Undertake Emergency Planning
- Australian Interservice Incident Management System (AIIMS) introductory and subsequent programs.

PART 4: RECOVERY

The Recovery Process is detailed in the State "Westplan – Recovery" documentation.

The COJ recognises and accepts their role within the Recovery Process. In the event of an emergency a Recovery Committee with the appropriate membership will be established.

Refer to Appendix 1: COJ Local Recovery Plan

Also, refer to Part 7 (Support Plans relevant to this community).
- *Section 7.1 Operations Services Support Plan*
- *Section 7.2 Community Services (Welfare) Support Plan*
- *Section 7.3 Environmental Health Support Plan*

4.1 RECOVERY MANAGEMENT PRINCIPLES AND CONCEPTS

(Extracted from the Australian Emergency Management Manual – Disaster Recovery)

4.1.1 Principles

a) Recover from disaster is an enabling and supportive process, which allows individuals, families and communities to attain a proper level of functioning through the provision of information, specialist services and resources.

b) Effective recovery requires the establishment of planning and management arrangements, which are accepted and understood by recovery agencies, combat agencies and the community.

c) Recovery Management arrangements are most effective when they recognise the complex, dynamic and protracted nature of recovery processes and the changing needs of affected individuals, families and groups within the community over time.

d) The management of disaster recovery is best approached from a community development perspective and is most effective when conducted at a local level, with the active participation of the affected community and a maximum reliance on local capacities and expertise.

e) Recovery management is most effective when human service agencies play a major role in all levels of key decision making which may influence the well being and recovery of the affected community.

f) Recovery from disaster is best achieved where the recovery process begins from the moment of disaster impact.

g) Recovery planning and management arrangements are most effective when they are supported by training programs and exercises, that ensures recovery agencies and personnel are properly prepared for their role.

h) Recovery from disaster is most effective where recovery management arrangements provide a comprehensive and integrated framework for managing all potential emergencies and disasters and where the assistance measures are

provided in a timely, fair, equitable manner and are sufficiently flexible to respond to a diversity of community needs.

4.1.2 Concepts

a) Community involvement,
b) Management at a local level,
c) Affected area/community approach,
d) Differing effects/needs to different communities/individuals,
e) Empowering individuals and communities,
f) Minimum intervention,
g) Recognition of resourcefulness,
i) Planned/timely withdrawal,
j) Accountability, flexibility, adaptability and responsiveness,
k) Integration of services; and
l) Coordination.

4.2 RECOVERY ACTIVITIES AND STRATEGIES

4.2.1 Recovery Activities

Recovery Activities include the following
a) Short term accommodation.
b) Counselling emotionally affected people.
c) Establishing and managing emergency relief schemes.
d) Surveying and assessing damage to public and private property.
e) Repairing or replacing public utilities, services and assets.
f) Assisting with the repair or replacement of private property.
g) Initiating programs to stimulate community morale and economic growth.
h) Managing environmental rehabilitation programs.
i) Coordinating recovery and research agencies.
j) Revision of Land use/Town Planning Schemes.

4.2.2 Recovery Strategies

The following are some suggested strategies to assist Hazard Management Agencies and Recovery Committees in recovery management responsibilities.

Community Involvement Strategies:
a) Maximum use of local resources, groups and individuals.
b) Promote prior community awareness and education.
c) Involve people in their own and their community' recovery.
d) Maintain continuous liaison between emergency teams, volunteer groups and community organisations.
e) Create opportunities for local decision-making.
f) Ensure self-determination in restoration planning.
g) Maintain a cooperative relationship between volunteers and imported "specialists".
h) Use local suppliers
i) Empower the community as quickly as possible.

4.2.3 Recovery Information Strategies

a) Provide regular updates on: -
   Current state and extent of disaster.
   Actual and proposed official response.
   Desired community response.
   Advice to isolated families.
b) Ensure everybody has an understanding of the situation and the opportunity for personal counselling/discussion.
c) Provide for advocacy by agencies and organisations.

4.2.4 Recovery Assistance Strategies

a) Provide for special needs of aged, ethnic, children etc.
b) Make food, shelter, clothing, health and emergency finance available immediately.
c) Deliver services in a simple and caring manner with minimal disruption to existing processes.
d) Ensure welfare centres cater for privacy and individual care.
e) Ensure emergency workers receive ongoing support, debriefing and rest.
f) Maximise financial aid and minimise material aid.

4.2.5 Accountability Strategies

a) Ensure the affected community is involved in the allocation and distribution of material and financial resources.
b) Assist the community in ensuring there is accountability in the use of resources

4.2.6 Strategies for Grants, Loans and Gifts

a) Ensure there is community involvement in determining criteria.
b) Communicate entitlement criteria for financial support and grants immediately.
c) Alterations to criteria must be communicated clearly to the community.
d) Consider non-English speaking groups.
e) Maintain confidentiality.
f) Use the Lord Mayors Appeal Process to receive donations.

4.2.7 Strategies to maintain Family Cohesion

a) Keep families together during evacuation and resettlement.
b) Ensure all policies and processes support the family's ability to recover.
c) Provide for advocacy by agencies and organisations.

4.2.8 Recovery Committee Strategies

a) Survey and Assess damage-all levels of Government want immediate information.
b) Use Lord Mayors Appeal Process to receive donations.
c) Recovery Committee members to be seen in the community talking to affected people.
d) Sat a time limit on donations and claims.
e) Donations of goods should be through the Lord Mayor's Appeal and not direct to affected persons because of taxation implications.
f) If the criteria for distribution of funds doesn't fit the Lord Mayors official guidelines, suggest a different approach, and seek the Lord Mayors Appeal Committee

approval. Resource information is available from the www.appealswa.org.au website.

g) Broker bulk purchase of goods with suppliers on behalf of the people receiving appeal donations.
h) Do not get involved in litigation but give advice on where to seek help. Allow use of Council facilities for public information seminars.
i) Don't tell the community what to do.
j) Designate responsibility to Recovery Committee members and publicise.
k) Inform the public from who and how to get information.
l) Church services to be coordinated.
m) All information, minutes of the Recovery Committee meetings, discussions and records of distribution of donations are to be archived.
n) Have Councils media/marketing section to play a major role in informing the Community.
o) Set up a phone system for priority in and out use.
p) Emergency Power is essential in Local Emergency/ Recovery Coordination Centre.
q) Arrange community events and recovery activities in the recovery phase are key initiatives within the emergency/disaster-affected community that help the community re-bond.
r) Consider who is to arrange and supply meals to what quality and variation of menu.
s) Arrange Trauma Counselling-peer support as well as professional for affected members of community and response/recovery staff.
t) Assign Manager Economic Development the lead role to identify economic development recovery strategies for the short, medium and long term in consultation with local business associations.
u) Create fast track assistance availability to people with disabilities reinforced with regular updated website information and community service announcements on Twin Cities FM and community newspapers.

4.3 TRAINING PROGRAMS – RECOVERY

- Introduction to Recovery Management WA
- Context of Recovery Management
- Community Based Recovery Management
- Planning & Managing Recovery
- Recovery Services
- Evacuation & Recovery Centre Management

PART 5: EMERGENCY CONTACTS DIRECTORY

5.1 HAZARD MANAGEMENT AGENCIES

The following list of hazards/emergencies identifies the HMA responsible for that hazard/ emergency. The hazards/emergencies identified are by no means exhaustive and will be added to as required.

	HAZARD/EMERGENCY	HAZARD MANAGEMENT AGENCY	CONTACT PHONE NUMBERS
1	Air Transport Emergencies	WA Police	000 - emergency 131 444 - enquires
2	Dam Break (inc. major hydraulic structures)	Water Corporation	13 13 75
3	Earthquake	FESA (WA State Emergency Service)	1300 1300 39 – emergency ass. 1300 657 209 – hotline
4	Exotic Animal Disease	Agriculture WA	9368 3333 – head office 1800 675 888 - hotline 0417 910 082 – mobile contact
5	Fire (CALM-managed land)	Gazetted Fire Districts: FESA (Fire & Rescue Service) Other – CALM	000 – emergency 9323 9300 – general enquires 1300 657 209 – hotline 9334 0333 - general enquiries 9334 0375 - fire mgmt services
6	Fire (Urban & Rural)	Gazetted Fire Districts: FESA (Fire & Rescue Service) Other: Local Govt. Authorities	000 – emergency 9323 9300 – general enquires 1300 657 209 – hotline City of Wanneroo 9405 5000 or 1300 138 393 (AH)
7	Flood	FESA (WA State Emergency Service)	1300 1300 39 – emergency ass. 1300 657 209 – hotline
8	Fuel Shortage Emergencies	Dept. of Consumer & Employment Protection – Energy Safety Directorate	9422 5200 or 1800 678 198 (AH)
9	Hazardous Materials Emergencies (inc. radioactive materials)	FESA (FRS)	000 – emergency 9323 9300 – general enquires 1300 657 209 – hotline
10	Human Epidemic	Department of Health	9388 4999 – infectious diseases

11	Land Search and Rescue	WA Police	000 - emergency 131 444 - enquires
12	Landslide	FESA (FRS)	000 – emergency 9323 9300 – general enquires 1300 657 209 – hotline
13	Marine Oil Pollution	Department Planning & Infrastructure	9216 8902 - office 0417 938 157 – after hours
14	Marine Transport Emergencies	Department Planning & Infrastructure WA Police	9841 1000 - operations 9442 8600 - Water Police (after hours)
15	Nuclear Powered Warships	WA Police	000 - emergency 131 444 - enquires
16	Offshore Petroleum Operations Emergencies	Department of Industry & Resources	9222 3333 – general enquires 1300 665 500 – emergencies & after hours
17	Rail Transport Emergencies	Urban Passenger: Public Transport Authority Freight Network: Westnet Rail	9326 2111 Emergency 24hrs 9212 2501
18	Road Transport Emergencies	WA Police	000 - emergency 131 444 - enquires
19	Sea Search and Rescue	WA Police	000 - emergency 131 444 - enquires
20	Space Debris Re-entry	WA Police	000 - emergency 131 444 - enquires
21	Storm/Tempest	FESA (State Emergency Service)	1300 1300 39 – emergency ass. 1300 657 209 – hotline
22	Structural Collapse	FESA (Fire & Rescue Service)	000 – emergency 9323 9300 – general enquires 1300 657 209 – hotline
23	Tropical Cyclone	FESA (State Emergency Service)	1300 1300 39 – emergency ass. 1300 657 209 – hotline
24	Tsunami	FESA (State Emergency Service)	1300 1300 39 – emergency ass. 1300 657 209 – hotline

NOTES:
HMA responsibilities are limited to those hydraulic structures for which the Water Corporation is the managing agency.

(Emergency contact directory – updated May 2006)

CITY OF JOONDALUP
EMERGENCY CONTACTS DIRECTORY

5.2 CITY OF WANNEROO / CITY OF JOONDALUP - LOCAL EMERGENCY MANAGEMENT COMMITTEE CONTACTS

AGENCY	NAME	POSITION	EMAIL	WK PHONE	MOBILE	ADDRESS
CALM	Brian Inglis	District Fire Protection Officer	briani@calm.wa.gov.au	94050709	0419 194 922	Dundebar Rd, Wanneroo
COJ	Paul Hrovatin	Senior Ranger	paul.hrovatin@joondalup.wa.gov.au	9400 4906	0417 177 019	90 Boas Ave, Joondalup
COW/COJ	John Clark	Aware Project Coordinator	john.clark@joondalup.wa.gov.au	9400 4507	0417 179 026	90 Boas Ave, Joondalup
COW	Michael Barry	Manager Ranger Safety Services	michael.barry@wanneroo.wa.gov.au	9405 5265	0429 001 589	1204 Wanneroo Rd, Ashby
COW	Tony McTaggart	Team Leader	tony.mctaggart@wanneroo.wa.gov.au	9405 5253	0429 001 364	1204 Wanneroo Rd, Ashby
Dept of Education and Training	Megan Rimes	A/Student Services Manager	megan.rimes@det.wa.edu.au	9301 3000		L2, 52 Davidson Tce, Joondalup. WA 6027
DCD	Graeme Symons	DCD-LEMC Welfare Coordinator	graeme.symons@dcd.wa.gov.au	9301 3668	0407 192 606	8 Davidson Tce, Joondalup
DCD	Jo-Anne Bennett	District Emergency Services Officer	joanne.bennett@dcd.wa.gov.au	9301 3632	0429 683 948	8 Davidson Tce, Joondalup
DPI	Don Froome	Manager Hillarys Boat Harbour	don.froome@dpi.wa.gov.au	9448 7544	0418 912 036	Hillarys Boat Harbour PO Box 410, Hillarys

FESA	Brad Stringer	A/FSM	bstringer@fesa.wa.gov.au	9300 9222	0418 952 037	Unit 1/108 Winton Road, Joondalup
FESA	Eddy Brooks	DM Stirling	ebrooks@fesa.wa.gov.au	9300 9222	0417 097 760	Unit 1/108 Winton Road, Joondalup
FESA	Geoff Watson	Manager Wanneroo/Joondalup SES	geoff@couplers.com.au	9300 1666	0438 004 673	Winton Road, Joondalup
FESA/COW	Mike Teraci	CFM/CBFLO Wanneroo	mteraci@fesa.wa.gov.au	9300 9222	0428 101 132	Unit1/108 Winton Road, Joondalup
JHC	Michael Bowran	JHC EM Dept.	michael.bowran@affinityhealth.com.au			Shenton Ave, Joondalup
JHC	Steve Nation	JHC EM Dept.	steve.nation@affinityhealth.com.au			Shenton Ave, Joondalup
Red Cross	Bob Kelly	National Services Manager	rkelly@redcross.org.au		0408 930 811	110 Godrich St, East Perth
Red Cross	Simone Krynski	Disaster Services Coordinator	skrynski@redcross.org.au	9225 8812	0407 772 147	110 Godrich St, East Perth
St John Ambulance	Chris Oakes	Team Leader	tlred@ambulance.net.au		0415 428 642	209 Great Eastern Highway, Belmont
WAP	Anthony Jarret	Inspector	anthony.jarret@police.wa.gov.au	9400 0888		9 Reid Promenade, Joondalup
WAP	Derrick Briggs	Senior constable	derrick.briggs@police.wa.gov.au	9246 8378	0416 077 237	37 Eddington Rd, Warwick, WA 6024
WAP	Eric Smith	OIC Hillarys Police Station	eric.smith@police.wa.gov.au	9403 1010		114 Flinders Ave, Hillarys 6025

WAP	Kevin Dale	OIC Warwick Police Station	kevin.dale@police.wa.gov.au	9246 8315		37 Eddington Road, Warwick 2024
WAP	Lillian Cvijic	OIC Wanneroo Police Station	lillian.cvijic@police.wa.gov.au	9405 1313		942 Wanneroo Road, Wanneroo 6065
WAP	Mark Harrison	Senior Constable LEMC Chairprerson	mark.harrison@police.wa.gov.au	9246 8372	0434 600 208	37 Eddington Rd, Warwick, WA 6024
WAP	Phil Birch	OIC Joondalup Police Station	phil.birch@police.wa.gov.au	9400 0934		9 Reid Promenade, Joondalup 6027
WAP	Steve Principe	OIC Clarkson police Station	steve.principe@police.wa.gov.au	9407 1000		14 Ocean Keys Boulevard 6030
WAP	Steve Szokolai	OIC Two Rocks Police Station	steve.szokolai@police.wa.gov.au	9561 2323		Shop 15 Enterprise Ave, Two Rocks 6037

(COW/COJ LEMC Contacts - updated May 2006)

5.3 CITY OF JOONDALUP – MASTER RESOURCE SCHEDULE

SERVICE / ORGANISATION	COMMUNICATIONS	FIRE FIGHTING EQUIPMENT	AMBULANCE & FIRST AID	REFRESHMENTS	ACCOMMODATION	REGISTRATION OF PERSO	TRAFFIC CONT - TRAFFIC SIGNS	RESCUE TEAMS	SEARCH TEAMS	CLIFF - CAVE RESCUES	ANIMAL CARE	BUSES	VEHICLES 4WD	WATER CARRIERS - TANK	POWER & LIGHT PORT GENERAT	CHAINSAWS	BULLDOZERS	FRONT END LOADERS	GRADERS	LOW LOADERS	CUTTING - LIFTING EQUIPMENT	MECHANICS	PLANT OPERATOR - MAN POWER	ROAD REPAIRS - CLEANUP	PETROL - OIL - LUBRICANTS	ELECTRICIANS	PLUMBERS	LIQUID WASTE DISPOSA.	TARPS - PLASTIC SHEETS - SANDBAGS
POLICE	X						X		X																			
SES LOCAL/REGIONAL	X			X				X	X	X			X		X	X												X
CITY OF JOONDALUP	X			X			X					X	X	X	X	X		X			X		X	X	X	X	X	
FESA – Fire	X	X		X				X				X	X	X							X							
WA WATER COMM	X						X						X															
TELSTRA	X																											
WESTERN POWER	X																							X	X	X		
ALINTA GAS																												
AGRICULTURAL DEPT	X										X																	
COMMUNITY SERVICES				X	X	X																						
EVAC/WELFARE CENTRES HALLS/SCHOOLS)					X							X																
DOCTORS/AMBULANCE/ HOSPITAL			X					X																				
WELFARE & RELIGIOUS ORGANISATION			X	X	X																							
VET PRACTITIONERS											X																	
CALM	X	X		X							X		X	X		X												

CITY OF JOONDALUP
EMERGENCY CONTACTS DIRECTORY

5.5 EMERGENCY COORDINATION CENTRES

LOCATION	CATEGORY	PHONE
City of Joondalup Works Depot Building 1 1204 Wanneroo Road ASHBY 6065	Primary Location (First preference)	9400 4114 9400 4152 (fax)
Police Joondalup District 9 Reid Promenade JOONDALUP	Alternative Location (Second preference)	9400 0888 9400 0831 (fax)
Joondalup SES Unit Winton Road JOONDALUP 6027	Alternative Location (Third preference)	9345 1499 9345 5186 (fax)
Police Warwick Police Complex 37 Eddington Road WARWICK	Alternative Location (Forth preference)	9246 8333 9246 8303 (fax)

CITY OF JOONDALUP
EMERGENCY CONTACTS DIRECTORY

5.6 SENIOR OFFICERS CONTACT DETAILS

POSITION	NAME	OFFICE #	MOBILE #
Chief Executive Officer	Garry Hunt	9400 4456	---- --- ---
Executive Assistant to C E O	Helen Hill	9400 4433	0417 927 774
Manager Marketing Communications & Council Support Services	Mike Smith	9400 4509	0419 962 804
Manager Human Resources	Vacant	9400 4326	0418 939 446
Manager Information Management	Kevin Syme	9400 4508	0417 981 867
Director Infrastructure Services	David Djulbic	9400 4464	0409 377 259
Manager Infrastructure Services	Murray Ralph	9400 4401	0408 653 754
Manager Operations Services	Dennis Cluning	9400 4341	0419 908 479
Manager Community Development Services	Graeme Hall	9400 4915	0417 919 224
Manager Library & Information Services	Rebecca Moore	9400 4735	0418902110
Director Planning & Community Development	Clayton Higham	9400 4445	0409 881 793
Manager Craigie Leisure Centre	Gavin Taylor	9400 4614	0409 376 532
Manager Approvals Planning & Environmental Services	Chris Terelinck	9400 4393	0418 947 853
Director Corporate Services	Mike Tidy	9400 4344	0409 908 314
Manager Financial Services	Said Hafez	9400 4384	0419 934 255
Manager Strategic & Sustainable Development	Rhonda Hardy	9400 4523	0417 985 973
Senior Ranger	Paul Hrovatin	9400 4906	0417 177 019
After Hours Emergencies			1300 655 899

CITY OF JOONDALUP
EMERGENCY CONTACTS DIRECTORY

5.7 TRANSPORT, ENGINEERING & OPERATIONS PLANT & EQUIPMENT

Location	Contact Person	Contact Phone #
City of Joondalup Administration Centre Boas Avenue Joondalup	Manager Operations Services Dennis Cluning	9400 4341 work 0419 908479 mobile 9561 1696 home
City of Joondalup Works Depot 1204 Wanneroo Road Ashby	Coordinator Operations Services Jonathon Wesley	9400 4128 work 0417 982 693 mobile 9414 7645 home
City of Joondalup Works Depot Winton Road Joondalup	Supervisor Operations Services Dave Latham	9300 1359 work 0409 958 206 mobile 9409 7006 home

Note: For detailed information refer to Part 5: COJ Emergency Assets Register

CITY OF JOONDALUP
EMERGENCY CONTACTS DIRECTORY

5.8 COJ EMERGENCY EVACUATION CENTRES

Facility	**Sorrento Duncraig Leisure Centre**				
Physical Address	40 Warwick Road, Duncraig 6023				
	Office: 9246 4722	Fax: 9246 5411	Email: sorrento@joondalup.wa.gov.au		
Postal Address	PO Box 21, Joondalup, WA 6919				
Manager	Name: Gavin Taylor	Office: 0409 376 532	Fax: 9307 8047	Email: gavin.taylor@joondalup.wa.gov.au	
Supervisor	As above				
Emergency Contact	Citywatch 1300 655 860 or Manager				
Security	Electronic Security: Yes	Contracted Firm: Chubb	Fire Extinguishers: Yes	Marked Exits: Yes	
Construction	Brick with metal roof sheeting				
Exterior Lighting	Yes				
Toilets	Interior Access: Yes	Male: X 2	Female: X 2	Child: X 1	Exterior: Nil
Showers	Interior Access: Yes	Male: Yes	Female: Yes	Baby Bath: Nil	
Hot Water System	Gas: nil		Electric: yes		
Beds	Dormitory: nil	Units: nil	Other Style: nil	Mattresses: nil	
	Sheets: nil	Pillows: nil	Blankets: nil	Sleeping Bags: nil	
Kitchen	Commercial: nil	Other: nil	Cool Room: nil	Stoves (gas): nil	
	Fridges: X 1	Microwave: X 1	Urn: X 1	Pie Warmer: nil	
	Kettles: yes	Toaster: no	Sandwich Maker: nil		
Dining	Dining Area: nil	Tables: yes	Chairs: yes		
	Cutlery: nil	Plates: minimal	Cups: nil		
Laundry	Laundry Area: nil	Washing M/Cs: nil	Clothes Dryer: nil	Hanging Space: nil	
Air Conditioning	Cooling: yes in most rooms		Heating: office, crèche, craft room		
Sewerage	Deep Sewerage: yes		Septic: no		
Garbage Disposal	Council pick up				
Amenities Areas	Recreation Room: sports hall	BBQs: nil	Conference Room: Yes		
	Meeting Rooms: yes	Courts: X 1	Swimming Pool: nil		

	Oval: yes	Outdoor Seating: nil		
Telephone	Connections: office requirement only		Public: Nil	
Parking	Cars: yes	Bus: yes	Articulated vehicles: nil	Caravans: nil
Generator	Size: nil		Capability: nil	
Other Comments				

Facility	**Ocean Ridge Leisure Centre**				
Physical Address	Sail Terrace Heathridge				
	Office: 9401 0500	Fax: 9307 9088	Email: oceanridge@joondalup.wa.gov.au		
Postal Address	PO Box 21, Joondalup, WA 6919				
Manager	Name: Gavin Taylor	Office: 0409 376 532	Fax: 9307 8047	Email: gavin.taylor@joondalup.wa.gov.au	
Supervisor	As above				
Emergency Contact	Citywatch 1300 655 860 or Manager				
Security	Electronic Security: Yes	Contracted Firm: Chubb	Fire Extinguishers: Yes	Marked Exits: Yes	
Construction	Brick with metal roof sheeting				
Exterior Lighting	Yes				
Toilets	Interior Access: Yes	Male: X 2	Female: X 2	Child: X 2	Exterior: Nil
Showers	Interior Access: Yes	Male: X 1	Female: X 1	Baby Bath: Nil	
Hot Water System	Gas: nil		Electric: yes		
Beds	Dormitory: nil	Units: nil	Other Style: nil	Mattresses: nil	
	Sheets: nil	Pillows: nil	Blankets: nil	Sleeping Bags: nil	
Kitchen	Commercial: x 1	Other: kiosk	Cool Room: nil	Stoves (gas): nil	
	Fridges: X 2	Microwave: X 1	Urn: X 1	Pie Warmer: nil	
	Kettles: X 1	Toaster: X 1	Sandwich Maker: nil		
Dining	Dining Area: function room	Tables: X 50	Chairs: X 150		
	Cutlery: nil	Plates: nil	Cups: nil		
Laundry	Laundry Area: nil	Washing M/Cs: nil	Clothes Dryer: nil	Hanging Space: nil	
Air Conditioning	Cooling: partial – fans in rooms		Heating: partial		
Sewerage	Deep Sewerage: yes		Septic: no		
Garbage Disposal	Council pick up				

Amenities Areas	Recreation Room: sports hall		BBQs: X 1	Conference Room: function room
	Meeting Rooms: X 5		Courts:	Swimming Pool: nil
	Oval: yes		Outdoor Seating: yes	
Telephone	Connections: office X 2		Public: Nil	
Parking	Cars: yes (2 carparks)	Bus: yes	Articulated vehicles: nil	Caravans: nil
Generator	Size: nil		Capability: nil	
Other Comments				

CITY OF JOONDALUP
EMERGENCY CONTACTS DIRECTORY

5.9 COMMUNITY SERVICE CENTRES

DESCRIPTION	LOCATION	CONTACT	PHONE
Leisure Centres			
Craigie Leisure Centre	Whitfords Avenue, Craigie	Gavin Taylor	9307 4566 0409 376 532
Ocean Ridge Leisure Centre	Sail Terrace, Heathridge	Adrian Fischer or Gavin Taylor	9401 0500 0409 376 532
Sorrento/Duncraig Leisure Centre	40 Warwick Road, Duncraig	Adrian Fischer or Gavin Taylor	9246 4722 0409 376 532
Warwick Leisure Centre	Cnr Warwick & Wanneroo Roads, Warwick	Jim Longbottom	9247 2266 0407 441 588
Libraries			
Joondalup Public Library	Cnr Lakeside Drive & Boas Avenue JOONDALUP, 6027		9400-4707
Sorrento/Duncraig Public Library	Cnr Warwick Road & Marmion Avenue DUNCRAIG, 6020		9447-9533
Whitford Public Library	Cnr Banks & Marmion Avenues, HILLARYS, 6025		9401-8222
Woodvale Public Library	Trappers Drive WOODVALE, 6026		9309-4717
Halls & Clubrooms			
Burns Beach Jack Kikeros Community Hall	Cnr Burns Beach Rd & Ocean Parade, Burns Beach	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Craigie Warrandyte Reserve Clubrooms	Warrandyte Drive	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Connolly Connolly Community Centre	5 Glenelg Place Connolly	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Duncraig Percy Doyle Reserve Buildings - Duncraig Community Hall Sorrento Soccer Clubrooms	Warwick Road Warwick Road	Community Facility Officer – Allison Gentry Kerry Slater Secretary	9400 4268 0403 126 405 9448 5908H 9326 2108W

Teeball and Junior Football Clubrooms) Undercroft Bridge Club	40 Warwick Road Duncraig Percy Doyle Reserve Beddi Road	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Edgewater Emerald Park Clubrooms	Emerald Park, Emerald Way	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Greenwood Calectasia Community Hall Greenwood Community Scout and Guide Hall Penistone Reserve Clubrooms	Calectasia Street Calectasia Street Penistone Street	Community Facility Officer – Allison Gentry Community Facility Officer – Allison Gentry Community Facility Officer – Allison Gentry	9400 4268 0403 126 405 9400 4268 0403 126 405 9400 4268 0403 126 405
Heathridge Guy Daniel Building Ocean Ridge Community Centre Heathridge Park Clubrooms	16 Sail Terrace Sail Terrace Sail Terrace	Community Facility Officer – Allison Gentry Community Facility Officer – Allison Gentry Community Facility Officer – Allison Gentry	9400 4268 0403 126 405 9400 4268 0403 126 405 9400 4268 0403 126 405
Hillarys Flinders Park Community Hall	Broadbeach Boulevard	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Kallaroo Rob Baddock Community Hall	Cnr Mullalloo Drive & Dampier Avenue	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Kingsley Kingsley Community Facility Kingsley Childcare Care Centre Kingsley Park Clubrooms (Kingsley Playgroup also operates from this building)	Kingsley Reserve Kingsley Drive Goolellal Drive Kingsley Drive	Community Facility Officer – Allison Gentry Community Facility Officer – Allison Gentry	9400 4268 0403 126 405 9309 2300 9400 4268 0403 126 405
Kinross MacNaughton Way Clubrooms	MacNaughton Crescent	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405

Mullaloo			
Surf Lifesaving Club Hall	Oceanside Promenade	At Clubhouse Steve Dargie President	9307 7666 0417177908
Mullaloo Community Centre	Koorana Road		9401 4540
Ocean Reef			
Beaumaris Community Hall	Constellation Drive	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Beaumaris Sports Complex	Beaumaris Boulevard		9400 4268
Padbury			
Padbury Community Hall	Caley Road	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Fleur Fream Pavillion	MacDonald Park	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
MacDonald Sports Complex	Forrest Road	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Sorrento			
Sorrento Surf Lifesaving Club	West Coast Drive	At Clubhouse Neil Rowse President	9448 1431 0419048860
Sorrento Community Hall	Padbury Circle	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Sorrento/Duncraig Bowling Club	40 Warwick Road		9447 0696
Warwick			
Dorchester Community Hall	Cnr Dorchester Avenue & Dugdale Street	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Warwick Community Centre	Dugdale Road	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Ellersdale Clubrooms	Ellersdale Road	Community Facility Officer – Allison Gentry	9400 4268 0403 126 405
Warwick Open Space Clubrooms	Warwick Road	Richard Oliver	0404894258 9448 4704
Whitfords			
Whitfords Community Centre	Flinders Park Broadbeach Boulevard		9307 2243
Whitford Family Centre	21 Endeavour Road Hillarys		

Woodvale Timberlane Community Hall Chichester Clubrooms	 Timberlane Drive Trappers Drive	 Community Facility Officer – Allison Gentry Community Facility Officer – Allison Gentry	 9400 4268 0403 126 405 9400 4268 0403 126 405
Child Health Centres			
Carine Child Health Clinic	Off Davallia Road Duncraig		9447 9372
Craigie Child Health Clinic	Camberwarra Drive Craigie		9401 2619
Duncraig Child Health Clinic	Marri Road Duncraig		9447 9568
Greenwood Infant Health Clinic	Calectasia Way Greenwood		9447 9482
Heathridge Infant Health Clinic	Off Sail Terrace Heathridge		9401 9690
Joondalup Infant Health Clinic	Jolstra Crescent Joondalup		9300 2202
Kingsley Child Health Clinic	Cnr Moolanda Blvd. & Bargate Way Kingsley		9309 1517
Mullalloo Child Health Clinic	Koorana Road Mullaloo		9401 4540
Padbury Child Health Clinic	Cnr Alexander & Caley Road Padbury		9401 2631
Senior Citizens Centres - All Hired Facilities			
Greenwood/Warwick Community Care Facility	Dorchester Avenue	Community Facility Officer – Allison Gentry Group at Warwick Community Centre	9400 4268 0403 126 405 9448 0856
Wanjoo RSL Community Group	Woodvale/Kingsley Trappers Drive Woodvale	Community Facility Officer – Allison Gentry President	9400 4268 0403 126 405 9309 2414
Mildenhall/Duncraig Senior Citizens Centre	Beddi Road Duncraig	Community Facility Officer – Allison Gentry At Mildenhall Community Centre	9400 4268 0403 126 405 9447 2682
Whitford Senior Citizens Centre	Whitfords Avenue Hillarys	Community Facility Officer – Allison Gentry At Whitfords Community Centre	9400 4268 0403 126 405 9401 9650
Sports Stadiums			
Joondalup Basketball Stadium	380 Joondalup Drive (entrance Collier Pass turn right into Wise St)		9300 1325

Pre Schools			
Duncraig Pre School	57 Marri Road Duncraig		9447 5218
Hillarys Pre School	137 Broadbeach Boulevard		9401 3296
Davallia Pre School	487 Beach Road Duncraig		9447 6633

(Community Service Centres – Reviewed March 2006)

5.10 WA POLICE REGIONAL STATIONS

LOCATION	PHONE
JOONDALUP	9400 0888
HILLARYS	9403 1000
WARWICK	9246 8333
CLARKSON	9305 8300
TWO ROCKS	9561 2322
WANNEROO	9306 1111

CITY OF JOONDALUP
EMERGENCY CONTACT DIRECTORY

5.11 HOSPITALS / AMBULANCE / DOCTORS

RESOURCE	LOCATION	PHONE
HOSPITALS		
Sir Charles Gardner	Verdun Street, Nedlands	9346 3333
Royal Perth	Wellington Street, Perth	9224 2244
Joondalup Health Campus	Shenton Avenue, Joondalup	9405 2211
Osborne Park Public	Osborne Place, Stirling	9346 8000
PRIVATE HOSPITALS		
Joondalup Private	Shenton Avenue, Joondalup	9400 9400
Mt Lawley Private	14 Alvan Street, Mt Lawley	9370 2500
St John of God	175 Cambridge Street, Subiaco	9382 6111
AMBULANCE		
Communications Centre		000
Non Emergency	St John Ambulance	9334 1234
DOCTORS		
Department of Health	1800 022 222	
Dr		

CITY OF JOONDALUP
EMERGENCY CONTACT DIRECTORY

5.12 WANNEROO / JOONDALUP SES UNIT KEY CONTACTS

CONTACT	PHONE
City of Wanneroo & City of Joondalup SES Co-ordinator Andrew Stanbury	0419 976 666 (mobile)
City of Wanneroo & City of Joondalup SES Unit 15 Winton Road Joondalup	9300 1666 (24 hours) 9300 1663 (fax)
SES Northshore Emergency Centre Metro Regional Headquarters 7 Lynton Street MT HAWTHORN	9444 9440 9443 2808 (fax)
Emergency Assistance	1300 130 039
Administration & General Enquiries	9277 0555 (24 hours) 9277 8320 (fax)

5.13 ADJOINING LOCAL AUTHORITIES

LOCAL AUTHORITIES	ADDRESS	PHONE
City of Wanneroo	1204 Wanneroo Road Ashby (Depot address)	9400 5000
City of Stirling	Civic Place Stirling	9345 8555

PART 6: TESTING, EXERCISING & REVIEWING THE ARRANGEMENTS

6.1 TESTING

Testing the emergency management arrangements is at least as important as writing them. The arrangements are intended to be a blueprint for the COJ's response and recovery from a major occurrence and they must be verified for accuracy and functionality. The benefits of the testing include:

- Determining the effectiveness of your arrangements;
- Bringing together all relevant people and giving them knowledge of and confidence in each other;
- Providing the opportunity to promote the arrangements and educate the community;
- Providing an opportunity for testing participating agencies' operational procedures and skills in simulated emergency conditions while testing the ability of the agencies to work together on common tasks;
- Improving the arrangements in accordance with results found from debriefing the testing.

6.2 EXERCISING

The ongoing testing of the COJ's emergency management arrangements will require appropriate exercise styles. The aim and outcomes of each exercise will assist in determining the most appropriate style. Using more than one style of exercise and building progressive exercise programs is recommended.

The following are three commonly used exercise styles:

- *Discussion Exercises* include orientation exercise, agency presentations, hypothetical and syndicate progressive exercises. Discussion exercises are low cost and usually involve few players.
- *Functional Exercises* are closely related to discussion exercises, but normally take place in an operational environment and require participants to actually perform the functions of their roles. They are commonly known as tabletop exercises.
- *Field Exercises* involve the deployment of personnel to a simulated incident or emergency. Field exercises can often follow a series of discussion or functional exercises.

6.3 LOCAL ARRANGEMENTS

The COW/COJ LEMC on behalf of both the Cities has established the following testing, exercising and reviewing mechanisms.

- Two emergency management exercises aligned to priority local emergency risks shall be targeted annually (one per City). The exercise shall be planned, directed and conducted by an appropriate sub-committee of the COW/COJ LEMC.
- The LEMC Executive Officer (appointed local government officer) shall retain the details of emergency exercises undertaken, which shall be incorporated into the LEMC annual report to the North-West Metropolitan DEMC.
- A COJ local government officer in cooperation with the COW/COJ LEMC shall undertake the review of these emergency management arrangements in order to update relevant information and accommodate changing circumstances.

6.4 TRAINING PROGRAMS – TESTING, EXERCISING & REVIEWING THE ARRANGEMENTS

- Exercise Management

PART 7: SUPPORT PLANS

7.1 OPERATIONAL SERVICES SUPPORT PLAN

7.1.1 General

a) This plan is formulated to provide for the coordination of response from the City of Joondalup Operational Services in support of the combat authority in an emergency. Staff and plant from Operational Services may be called on through the City of Joondalup Operation Services Manager or his Deputy.

b) This plan must be read in conjunction with the entire City of Joondalup Local Emergency Management Plan.

7.1.2 Aim

To detail arrangements necessary for the mobilisation and deployment of City of Joondalup to support an emergency operation.

7.1.3 Emergency Alert

A community member of the City of Joondalup, Hazard Management Agency or emergency services (e.g. Police, Fire, Ambulance or SES and services including Water and Electricity) may request council resources according to the LEMP. The alert will usually occur by telephone to the switchboard or to the after hours service. In both cases an Operations Manager or duty Ranger is to be telephoned
The Manager Operations Services may also call in other Sections of the City of Joondalup to assist with the emergency.

7.1.4 Principal Works Division Functions

The City of Joondalup Operation Services Manager or Deputy will coordinate the deployment of Council resources from the Depot office.

a) Provide operational support to combat authorities.

b) Carry out clean-up and specific operations such as removal of storm damaged trees and emergency construction work.

c) Provide technical information on location and destination of local drainage system.

d) Undertake traffic direction support duties and assist with any available traffic signs or barriers.

e) Provide fuel, vehicles and personnel.

f) Provide communication equipment and information.

g) Familiarise staff with the Local Emergency Management Plan and its requirements.

h) Assist Hazard Management Agencies to carry out damage assessment.

7.1.5 City of Joondalup Operational Services

Emergency Management:

The Operation Services Manager assesses the scope of the emergency and classifies it as:

- *Level 1* – able to be managed by a Supervisor and one crew.
- *Level 2* – an emergency requiring more than one crew and a person to monitor the two way radio system.
- *Level 3* – an emergency involving Hazard Management Agencies or Wanneroo State Emergency Services Unit and more than two City of Joondalup crews.

Level 1 – The supervisor calls in the employees required, arranges the equipment necessary and proceeds to the scene of emergency and carries out the necessary control actions. The Operation Services Manager may be contacted if necessary.

Level 2 – The supervisor contacts the Operation Services Manager and confirms proposed emergency control actions. The Operation Services Clerical Officer is called in to operate the two-way radio system.

Level 3 – The Supervisor immediately contacts the Operation Services Manager who takes control of the emergency management process. This will usually require coming to the Engineering office or the Local Co-ordination Centre.

7.1.6 Operational Services

a) Operational Services Coordination is carried out by the Operation Services Manager, who will form a small working group of staff to prepare an Action Plan to deal with the incident.

b) The Operational Services Coordinating team will operate from the City of Joondalup Depot Office, Wanneroo.

   The action committee will maintain an Emergency Resource File with current listings of relevant emergency equipment available:
   - From the City of Joondalup Depot.
   - From major hire operators and contractors in strategic locations in the City.

   This file will contain a current directory of after hour numbers for relevant staff needed to operate machinery.

c) Unless specifically authorised no Council equipment is to be operated by outside personnel.

d) Identification Vests - Liaison officers to Emergency Co-ordination Centre and command posts must wear identification vests.

7.1.7 Communications

The COJ's Operations Services communicates via mobile phone as well as being a user of Telstra's Push-To-Talk (PTT) Service. Communication can be obtained and/or coordinated by utilising the;

a) Designated land-line numbers;

b) Mobile phone service;

c) PTT Service - person to person function; and

d) PTT Service - group talk function.

7.1.8 Procedures

Stage 1 - Warning

a) This will come from the Local Emergency Coordinator.

b) Immediately following the warning the City of Joondalup Operational Services will alert members of the section.

c) Key personnel will be contacted with information on the emergency.

d) The Chief Executive Officer (and through him the Mayor) is advised by the Director of Infrastructure and Management Services.

Stage 2 - Activate Action Plan

a) Staff are called and resources deployed as required.
b) Necessary records are maintained in a logbook under established procedure.

7.1.9 Activation

The Operational Services Support Plan will be activated by the City after advice from the Hazard Management Agency or WASES or Local Emergency Coordinator. Alternatively Council Staff are at an incident or emergency and is considered to require the resources available the supervisor will immediately contact the Manager Operations who will alert the appropriate Hazard Management

7.2 COMMUNITY SERVICES SUPPORT PLAN

7.2.1 General

This operational Support Plan outlines a range of welfare services aimed at providing care, assistance and rehabilitation for the victims of a disaster and counselling and support for rescuers. The Department of Community Development, Joondalup Branch coordinates these programs

This Support Plan to be read in conjunction with the City of Joondalup Local Emergency Plan.

7.2.2 Aim

To provide detailed arrangements for the provision of welfare support to those affected by an emergency.

7.2.3 Introduction

Welfare services include all or some of the following functions:
a) Feeding of evacuees.
b) Temporary shelter.
c) Short/medium term accommodation.
d) Registration
e) Personal services such as:
   - Care of children/aged persons
   - Counselling
   - Spiritual services

The above services are provided by a wide range of Government, local government, church and voluntary agencies coordinated by the Manager, Community Services, at the City of Joondalup. These services are coordinated by the Department of Community Development.

7.2.4 Basic Community Services Functions

a) Emergency Catering
The Manager Community Services in conjunction with Principal Environmental Health Officer will coordinate this activity. The administrator Meals on Wheels will organise the preparation and distribution of meals to evacuees and staff at Community Centres. Commercial food outlets will be used as required.

b) Community Services Centre and Emergency Accommodation
In conjunction with the Department of Community Development welfare centres will be set up as required and temporary emergency shelter arranged.

c) Emergency Clothing
The City of Joondalup Community Services Officers will liaise with Community Groups, Government and Government support agencies.

d) Personal Services
These include the reception and care of victims, their direction to welfare centres, basic first aid, counselling advice, spiritual services and escort duties.

e) Registration and Enquiry

Achieved in liaison with the Regional Welfare Support Plan.

f) Provision of Financial Assistance
Ensure access to financial assistance is liaison with the Department of Community Services and Non-Government support groups.

7.2.5 Evacuation Matrix

The Evacuation Matrix of the Community Services Support Plan is used to establish the level of welfare support. It will be noted from the matrix that the level of welfare support is dependent upon the number of evacuees and the duration of the evacuation. In view of the considerable cost involved, the Department for Department of Community Services is activated at divisional, regional or state level for all significant evacuations.

The provision of welfare services is therefore a coordinated operation between Manager, Community Services (City of Joondalup) and the appropriate Department for Community Development. Activation of the Dept of Community Development district officer is achieved through the Manager Local Emergency Co-ordinator.

Duration People	0-8 hours	8 hrs to 1 day	1-3 days	3-7 days	1 week +
1-10	Local	Local/Division	Local/Region	Region	Region
10-100	Local/Division	Local/Region	Region	Region	Region/Stage
100-500	Local/Division	Local/Region	Region/State	State	State
500 +	Local/Region	Region	Region/State	State	State

The above evacuation matrix is a *guide* to the Hazard Management Agency and/or Emergency Coordinator during emergency operations.

The Hazard Management Agency should be in a position to advise the Local Emergency Co-ordinator of the area and estimated duration of evacuations.

Welfare support for evacuees can be obtained through local planning or Department of Community Services arrangements. “Local” in the above indicates the Local Plan requires activation. Where Division, Region or State are indicated, Department of Community Services arrangements at Divisional, Regional or State level may be activated.

The appropriate agency to arrange activation of Local or Department of Community Services Emergency Management Support Plans in the Metropolitan area should be the head of the Hazard Management Agency or the emergency Coordinator by conferring with the appropriate Welfare Coordinator from the organisation.

Should a short-term evacuation include persons who have been involved in or witnessed a traumatic event, unless the Local Plan has provision for trauma counselling, contact the nearest Department of Community Services office.

7.2.6 Registration

The registration of evacuees is discharged by Department of Community Services under the provisions of the State Registration and Inquiry Plan. Registration is conducted at welfare centres by appropriately training personnel.
Registration is not required in all cases. The decision to perform this function will be made by the State Welfare Co-ordinator.

7.2.7 Welfare Centres

The primary facility for the provision of welfare services is the Welfare Centre. These facilities are suitable for welfare support from City of Joondalup resources. During large scale evacuations welfare resources will be concentrated at the major centres. Welfare Centres and contact details are detailed in Part Three (Resources) and Five (Contacts), of the City of Joondalup Local Emergency Management Plan.

7.2.8 Welfare Resources

The contact details of various church, club and philanthropic organisations is contained in the community directory. Major resource requirements such as transport, bedding communications will be coordinated through the District and State Emergency Coordination Centre.

7.2.9 Activation

The decision to activate this plan will be determined by the Hazard Management Agency.

Communication of the decision to participating organisations is the responsibility of the Local Emergency Coordinator.

7.3 ENVIRONMENTAL HEALTH SUPPORT PLAN

7.3.1 General

This operational support plan outlines a range of public health and environmental measures necessary to protect the health of the community and evacuees at the time of the emergency.

The plan calls for close liaison with the other agencies dealing with the emergency and particularly with the Principal Environmental Health Officer and Manager Community Services.

7.3.2 Aim

To detail the principal, public health and environmental functions to be addressed during an emergency or within a disaster affected area by the City of Joondalup.

To ensure adequate public health conditions are maintained and that the potential for the occurrence of disease is minimised.

7.3.3 Principal Environmental Health Functions

The fundamental public health protection required at the time of a disaster are directed from the Local Emergency Co-ordination Centre and an officer from the Health Department of WA (appointed for major disasters). City of Joondalup Environmental Health support functions are coordinated by the City of Joondalup Principal Environmental Health Officer. Close liaison is maintained with the SES Local Manager. The City of Joondalup Principal Environmental Health Officer will initially act on behalf of the Health Department.

a) Survey and Assessment:

- Conduct an initial survey of the disaster to assess the priority of the environmental health response measures necessary and for the identification of immediate potential hazards.

- Identify safe temporary facility sites and disposal sites in conjunction with other authorities involved.

b) Food (Human Consumption):

- Food surveillance and possible rejection for human consumption.

- Monitoring of health provisions for food preparation, storage and distribution.

- Arrange seizure and disposal of damaged/perished foodstuff.

c) Water:

- Selection and maintenance of a portable water supply for use in an emergency.

- Develop guidelines for water transportation and distribution.

d) Disease Prevention:

- Determine the need for action and supervise the destruction of insect vectors and vermin where necessary.
- Liaise with Agriculture Western Australia as required.

e) Water Disposal (Including Site of Ablution, etc):

- Arrange for disposal of sullage water from emergency ablutions, sanitary conveniences and laundries.
- Sitting of emergency facilities (ie ablutions, sanitary conveniences, laundries and refuse disposal.
- Arrange for disposal of solid wastes.
- Arrange disposal method for dead animals and supervise subsequent disposal.

f) Hygiene and Cleaning Details:

- Detail the procedures and schedules for:
  (i) Cleaning of accommodation areas and public places.
  (ii) Servicing of liquid waste holding tanks and drainage systems.

- Supervise activities as detailed above.

g) Accommodation:

In conjunction with the Family and Children's Services, identify and supervise the provision of suitable accommodation for evacuees and relief workers.

7.3.4 Environmental Health Organisation - City of Joondalup

a) Environmental Health Co-ordination, City of Joondalup

The Principal Environmental Health Officer coordinates environmental Health Services.

b) Principal Environmental Health Officer

The Principal Environmental Health Officer of the City of Joondalup will develop a team of trained officers to act as backup in an emergency. An environmental health resource file will be developed and maintained in the City of Joondalup Environmental Health Department.

c) Role of the Environmental Health Officer

- To develop specific emergency contingency plans to ensure the Health Act is upheld in relation to environmental health and to arrange for appropriate staff training.

- In the event of an emergency to liaise with the Health Department of WA Medical Officer and the Local Emergency Co-ordinator. To provide status reports regarding environmental health as requested.

- To survey and access the environmental and public health impact of the emergency and to initiate appropriate measures.

- To co-ordinate the various environmental and public health response activities and monitor conditions throughout the emergency period.

- To re-assess and direct appropriate environmental health measures to be undertaken and followed through during the recovery phase.

7.3.5 Activation

The Environmental Health Support Plan will be activated, after request made by Police or the Health Department of WA.

PART 8: COJ EMERGENCY ASSETS REGISTER

SUB CATEGORY	CATEGORY DESCRIPTION	PLANT No	PLANT DESCRIPTION	SUPERVISOR	PURCHASE DATE	REGISTRATION #
ATV	ALL TERRAIN VEHICLE	95071	KAWASAKI KVF650 ALL TERRAIN VEHICLE - 1AZY549	GRAEME HALL	14/09/2001	1AZY549
	ALL TERRAIN VEHICLE	95070	KAWASAKI KVF650 ALL TERRAIN VEHICLE (RANGERS) - 1AZY548	PAUL HROVATIN	14/09/2001	1AZY548
BLOWER	VACUUM BLOWER HAND HELD	97057	STIHL BG85 VAC/BLOWER	ALAN DOUST	6/03/2003	
	VACUUM BLOWER HAND HELD	97058	STIHL BG85 VAC/BLOWER	ALAN DOUST	6/03/2003	
	VACUUM BLOWER HAND HELD	97059	STIHL BG85 VAC/BLOWER	ALAN DOUST	6/03/2003	
	VACUUM BLOWER HAND HELD	97086	STIHL BG85 BLOWER	ALAN DOUST	25/11/2003	
	VACUUM BLOWER HAND HELD	97087	STIHL BG85 BLOWER	ALAN DOUST	25/11/2003	
	VACUUM BLOWER HAND HELD	97088	STIHL BG85 BLOWER	ALAN DOUST	25/11/2003	
	VACUUM BLOWER HAND HELD	97089	STIHL BG85 BLOWER	ALAN DOUST	25/11/2003	
	VACUUM BLOWER HAND HELD	97090	STIHL BG85 BLOWER	ALAN DOUST	25/11/2003	
	VACUUM BLOWER HAND HELD	97091	STIHL BG85 BLOWER	ALAN DOUST	25/11/2003	
	VACUUM BLOWER HAND HELD	97092	STIHL BG85 BLOWER	SAM DUINA	25/11/2003	
	VACUUM BLOWER HAND HELD	97093	STIHL BG85 BLOWER	DAVE LATHAM	25/11/2003	
	VACUUM BLOWER HAND HELD	97094	STIHL BG85 BLOWER	BILL EARNSHAW	25/11/2003	
	VACUUM BLOWER HAND HELD	97095	STIHL BG85 BLOWER	BILL EARNSHAW	25/11/2003	
	VACUUM BLOWER HAND HELD	97096	STIHL BG85 BLOWER	DAVE LATHAM	25/11/2003	
	VACUUM BLOWER HAND HELD	97097	STIHL BG85 BLOWER	DAVE LATHAM	25/11/2003	
	VACUUM BLOWER HAND HELD	97098	STIHL BG85 BLOWER	DAVE LATHAM	25/11/2003	
	VACUUM BLOWER HAND HELD	97109	STIHL BG85 BLOWER	DAVE LATHAM	3/12/2004	
	VACUUM BLOWER HAND HELD	97142	STIHL BG85 BLOWER	MARK SKROZA	12/12/2005	
	VACUUM BLOWER HAND HELD	97037	STIHL BG85 VAC/BLOWER	ALAN DOUST	31/10/2002	
	VACUUM BLOWER HAND HELD	97040	STIHL LEAF BLOWER MODEL BG85	ALAN DOUST	21/11/2002	
	VACUUM BLOWER HAND HELD	97047	STIHL LEAF BLOWER MODEL BG85	BILL EARNSHAW	29/04/2003	
	VACUUM BLOWER HAND HELD	97048	STIHL LEAF BLOWER MODEL BG85	BILL EARNSHAW	29/04/2003	
	VACUUM BLOWER HAND HELD	97049	STIHL LEAF BLOWER MODEL BG85	BILL EARNSHAW	29/04/2003	
	VACUUM BLOWER HAND HELD	97131	STIHL SH85 SHREDDER/VACUUM	SAM DUINA	9/07/2004	
BRUSHCUTTER	BRUSHCUTTER <35CM3	98567	STIHL BRUSHCUTTER	DAVE LATHAM	21/05/1999	
	BRUSHCUTTER <35CM3	97100	STIHL FS120 BRUSHCUTTER	DAVE LATHAM	28/11/2003	

	BRUSHCUTTER <35CM3	97126	STIHL FS120 LOOP HANDLE BRUSHCUTTER	ALAN DOUST	9/07/2004	
	BRUSHCUTTER LARGE	97039	FS200 STIHL BRUSHCUTTER	ALAN DOUST	21/11/2002	
	BRUSHCUTTER LARGE	97046	STIHL FS200 BRUSHCUTTER	ALAN DOUST	21/03/2003	
	BRUSHCUTTER LARGE	97052	STIHL FS200 BRUSHCUTTER	ALAN DOUST	6/03/2003	
	BRUSHCUTTER LARGE	97053	STIHL FS200 BRUSHCUTTER	ALAN DOUST	6/03/2003	
	BRUSHCUTTER LARGE	97054	STIHL FS200 BRUSHCUTTER	ALAN DOUST	6/03/2003	
	BRUSHCUTTER LARGE	97055	STIHL FS200 BRUSHCUTTER	ALAN DOUST	6/03/2003	
	BRUSHCUTTER LARGE	97056	STIHL FS200 BRUSHCUTTER	ALAN DOUST	6/03/2003	
	BRUSHCUTTER LARGE	97064	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	ALAN DOUST	25/11/2003	
	BRUSHCUTTER LARGE	97065	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	DAVE LATHAM	25/11/2003	
	BRUSHCUTTER LARGE	97066	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	ALAN DOUST	25/11/2003	
	BRUSHCUTTER LARGE	97067	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	ALAN DOUST	25/11/2003	
	BRUSHCUTTER LARGE	97068	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	ALAN DOUST	25/11/2003	
	BRUSHCUTTER LARGE	97069	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	ALAN DOUST	25/11/2003	
	BRUSHCUTTER LARGE	97070	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	ALAN DOUST	25/11/2003	
	BRUSHCUTTER LARGE	97072	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	BILL EARNSHAW	25/11/2003	
	BRUSHCUTTER LARGE	97073	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	ALAN DOUST	25/11/2003	
	BRUSHCUTTER LARGE	97074	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	ALAN DOUST	25/11/2003	
	BRUSHCUTTER LARGE	97075	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	SAM DUINA	25/11/2003	
	BRUSHCUTTER LARGE	97076	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	ALAN DOUST	25/11/2003	
	BRUSHCUTTER LARGE	97077	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	ALAN DOUST	25/11/2003	
	BRUSHCUTTER LARGE	97078	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	ALAN DOUST	25/11/2003	
	BRUSHCUTTER LARGE	97079	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	ALAN DOUST	25/11/2003	

	BRUSHCUTTER LARGE	97140	STIHL FS200 BRUSHCUTTER WITH BULL HORN HANDLE	ALAN DOUST	13/09/2005	
	BRUSHCUTTER LARGE	97127	STIHL FS200 BULL BAR BRUSHCUTTER	ALAN DOUST	9/07/2004	
	BRUSHCUTTER LARGE	97128	STIHL FS200 BULL BAR BRUSHCUTTER	BILL EARNSHAW	9/07/2004	
	BRUSHCUTTER LARGE	97038	STIHL FS200B BRUSHCUTTER	ALAN DOUST	31/10/2002	
BUS	BUS <15 SEATS	95001	TOYOTA COASTER BUS - 9DI166	GRAEME HALL	15/08/1995	9DI166
	BUS <15 SEATS	95075	TOYOTA COMMUTER 3.0 LITRE DIESEL 14 SEATER BUS - 1BAG968	BILL BETTS	22/10/2001	1BAG968
	BUS >15 <25 SEATS	95093	MITSUBISHI ROSA BUS WITHOUT HOIST - TC4296	GRAEME HALL	24/09/2002	TC4296
	BUS >15 HOIST <25 SEATS	95096	MITSUBISHI ROSA WITH WHEEL CHAIR HOIST - TC4297	GRAEME HALL	14/11/2002	TC4297
CEMENTMIXER	CONCRETE MIXER < 75LT	98020	CEMENT MIXER EP35 WITH 4 HP HONDA PETROL ENGINE	SAM DUINA	29/10/1999	
	CONCRETE MIXER < 75LT	97104	CONCRETE MIXER 75 LITRE HONDA GX120 MOTOR	BILL BETTS	22/12/2003	
	CONCRETE MIXER < 75LT	97123	EASYMIX 65 LITRE CEMENT MIXER	MARK SKROZA	18/08/2004	
	CONCRETE MIXER < 75LT	97124	EASYMIX 65 LITRE CEMENT MIXER	ANDREW O'FARRELL	18/08/2004	
	CONCRETE MIXER < 75LT	98035	EASYMIX CEMENT MIXER 65 LITRE	BILL EARNSHAW	18/11/1999	
	CONCRETE MIXER >75LT <110LT	98039	EASYMIX CEMENT MIXER 100 LITRE	SAM DUINA	18/11/1999	
CHAINSAW	CHAINSAW <40CM3	97044	STIHL MODEL MS200T CHAINSAW 16"BAR	BILL EARNSHAW	2/11/2003	
	CHAINSAW <40CM3	97062	STIHL MS360 16" CHAINSAW	BILL EARNSHAW	30/06/2003	
	CHAINSAW <40CM3	98196	STIHL 12" 200T CHAIN SAW	BILL EARNSHAW	20/06/2002	
	CHAINSAW <40CM3	97115	STIHL MS 200 CHAINSAW	BILL EARNSHAW	8/12/2004	
	CHAINSAW <40CM3	97116	STIHL MS 200 CHAINSAW	BILL EARNSHAW	8/12/2004	
	CHAINSAW <40CM3	97117	STIHL MS 260 CHAINSAW	BILL EARNSHAW	13/08/2004	
	CHAINSAW <40CM3	97108	STIHL MS200T LOPPING CHAINSAW	BILL EARNSHAW	20/02/2004	
	CHAINSAW >40CM3	97113	CHAINSAW STIHL MS361 WITH 16" BAR	DAVE LATHAM	25/06/2004	
	CHAINSAW >40CM3	98152	STIHL MODEL 036 CHAINSAW 16"BAR	BILL EARNSHAW	17/10/2000	
	CHAINSAW >40CM3	98154	STIHL MODEL 036 CHAINSAW 16"BAR	DAVE LATHAM	17/10/2000	
	CHAINSAW >40CM3	98179	STIHL MODEL 036 CHAINSAW	BILL EARNSHAW	25/01/2002	

			16"BAR			
	CHAINSAW >40CM3	97099	STIHL CHAINSAW MS260C WITH 16" BAR	SAM DUINA	25/11/2003	
	CHAINSAW >40CM3	97106	STIHL CHAINSAW MS260C WITH 16" BAR	SAM DUINA	30/01/2004	
	CHAINSAW >40CM3	97102	STIHL EXTENDABLE CHAINSAW POLE PRUNER WITH 12" BAR	BILL EARNSHAW	12/02/2003	
	CHAINSAW >40CM3	97103	STIHL EXTENDABLE CHAINSAW POLE PRUNER WITH 12" BAR	DAVE LATHAM	12/02/2003	
	CHAINSAW >40CM3	97121	STIHL MS 361 CHAINSAW 18" BAR	BILL EARNSHAW	18/08/2004	
	CHAINSAW >40CM3	97122	STIHL MS 361 CHAINSAW 18" BAR	BILL EARNSHAW	18/08/2004	
	CHAINSAW >40CM3	97051	STIHL MS360 CHAIN SAW	BILL EARNSHAW	27/05/2003	
	CHAINSAW >40CM3	97135	STIHL MS361, RAPID SUPER CHAIN, 40CM BAR	BILL BETTS	1/10/2005	
	CHAINSAW >40CM3	97137	STIHL MS660 CHAINSAW WITH 20" BAR	KAREN CALLAGHAN	4/06/2005	
COMPACTOR	COMPACTOR DUAL DRUM RIDE ON	98329	VIBROMAX TURF WICKET ROLLER - WN26260	BILL EARNSHAW	10/12/1989	WN26260
	COMPACTOR PLATE COMPACTOR	97061	WACKER PLATE COMPACTOR VPH	SAM DUINA	13/10/2003	
	COMPACTOR PLATE COMPACTOR	97134	WACKER VIBRATING PLATE COMPACTOR	SAM DUINA	14/01/2005	
	COMPACTOR PLATE COMPACTOR	97060	WACKER VPH70 PLATE COMPACTOR	SAM DUINA	6/10/2003	
	COMPACTOR PLATE COMPACTOR	97111	WACKER VPH70 PLATE COMPACTOR	MARK SKROZA	4/02/2004	
	COMPACTOR SINGLE DRUM PEDESTRIAN	98219	WACKER SINGLE DRUM VIBRATING ROLLER	MARK SKROZA	3/03/2003	
	COMPACTOR VERTICAL RAMMER	98157	WACKER VIBRO RAMMER COMPACTOR	SAM DUINA	11/01/2000	
CUTTER SAW	CONCRETE SAW	98088	BR-SP8H SURFACE PREP MACHINE HONDA GX160	SAM DUINA	12/07/2004	
	CONCRETE SAW	98220	COMPAC CSS-COM09-H FLOOR SAW	SAM DUINA	20/03/2003	
	CONCRETE SAW	98148	DEMBICON COMPAC FLOORSAW 14"	SAM DUINA	11/01/2000	
	CONCRETE SAW	98155	DEMBICON COMPAC FLOORSAW 14"	SAM DUINA	11/01/2000	
	CONCRETE SAW	98119	DEMBICON COMPACT CONCRETE SAW (9HP)	MARK SKROZA	27/06/2000	
	CONCRETE SAW	97133	HONDA K-PACT FOLDING HANDLE FLOOR SAW WITH 6.75KW MOTOR, 35CM BLADE	SAM DUINA	15/10/2004	
	CONCRETE SAW	98086	K PACT CONCRETE FLOOR SAW,	MARK SKROZA	12/01/2004	

			40CM , 8.2KW HONDA MOTOR, FOLDING HANDLE			
	CONCRETE SAW	97114	PARTNER K700 14" ACTIVE III POWER CUTTER	MARK SKROZA	8/04/2004	
	CONCRETE SAW	98077	PARTNER K700 PIPE CUTTER	MARK SKROZA	4/07/2000	
	CONCRETE SAW	98050	STIHL CUT QUICK TS 400 CUTTER	ANDREW O'FARRELL	29/10/2003	
EDGER	LAWN EDGER PETROL POWERED	98063	3 WHEELED EDGER	BILL EARNSHAW	4/05/2002	
	LAWN EDGER PETROL POWERED	98074	3 WHEELED HEAVY DUTY EDGER	SAM DUINA	4/12/2000	
	LAWN EDGER PETROL POWERED	98075	3 WHEELED HEAVY DUTY EDGER	ALAN DOUST	4/12/2000	
	LAWN EDGER PETROL POWERED	97119	DWYER & FELTON 3 WHEEL EDGEMASTER WITH HONDA GX120 MOTOR, MODEL E12 STD	ALAN DOUST	16/08/2004	
	LAWN EDGER PETROL POWERED	97118	DWYER & FELTON 3 WHEEL EDGEMASTER WITH HONDA GX120 MOTOR, MODEL E12 STD	SAM DUINA	16/08/2004	
	LAWN EDGER PETROL POWERED	97027	DWYER & FELTON LAWN EDGER, 3 WHEELER	ALAN DOUST	15/11/2000	
	LAWN EDGER PETROL POWERED	97028	DWYER & FELTON LAWN EDGER, 3 WHEELER	DAVE LATHAM	15/11/2000	
	LAWN EDGER PETROL POWERED	97004	MOW MASTER 3 WHEELED EDGER	DAVE LATHAM	16/06/2000	
GENERATOR	GENERATOR PETROL POWERED <5KVA	98161	DUNLITE GENERATOR 8KVA	BILL EARNSHAW	13/02/2001	
	GENERATOR PETROL POWERED <5KVA	98226	GENERATOR EP5900HSRE WITH HONDA ENGINE	ANDREW O'FARRELL	23/09/2003	
	GENERATOR PETROL POWERED <5KVA	97101	HONDA GENERATOR EU20	WAYNE EVANGELISTA	12/02/2003	
	GENERATOR PETROL POWERED <5KVA	97132	ROBIN 3KVA GENERATOR	DAVE LATHAM	10/12/2004	
	GENERATOR PETROL POWERED <5KVA	97110	ROBIN RGX3500L GENERATOR SET	SAM DUINA	19/03/2004	
	GENERATOR PETROL POWERED <5KVA	98878	ROBIN/MARKON GENERATOR 3.75KVA	SAM DUINA	23/04/1997	
HEDGECUTTER	HEDGE CUTTER PETROL	97081	STIHL HEDGE CUTTER HS80 WITH 70CM BAR	BILL EARNSHAW	25/11/2003	
	HEDGE CUTTER PETROL	97082	STIHL HEDGE CUTTER HS80 WITH 70CM BAR	BILL EARNSHAW	25/11/2003	
	HEDGE CUTTER PETROL	97083	STIHL HEDGE CUTTER HS80 WITH 70CM BAR	DAVE LATHAM	25/11/2003	

	HEDGE CUTTER PETROL	97084	STIHL HEDGE CUTTER HS80 WITH 70CM BAR	DAVE LATHAM	25/11/2003	
	HEDGE CUTTER PETROL	97041	STIHL HEDGE TRIMMER MODEL HS45	SAM DUINA	12/09/2002	
	HEDGE CUTTER PETROL	97139	STIHL HS45 HEDGECUTTER	BILL EARNSHAW	8/10/2005	
	HEDGE CUTTER PETROL	97129	STIHL HS80 HEDGECUTTER	DAVE LATHAM	9/07/2004	
	HEDGE CUTTER PETROL	97130	STIHL HS80 HEDGECUTTER	DAVE LATHAM	9/07/2004	
	HEDGE CUTTER PETROL	97136	STIHL HS80 HEDGECUTTER	BILL BETTS	23/02/2005	
LOADER	SKID STEER LOADER <50kW	98224	MUSTANG 2064 SKID STEER LOADER - 1BIP457	SAM DUINA	4/08/2003	1BIP457
	SKID STEER LOADER >50kW < 100kW	98230	VOLVO L60E LOADER- 1BYI160	MARK SKROZA	20/04/2005	1BYI160
	SKID STEER LOADER >50kW <75kW	98186	MUSTANG 2070 SKID STEER LOADER - 1BCL241	MARK SKROZA	19/03/2002	1BCL241
	SKID STEER LOADER >50kW <75kW	98185	MUSTANG 2070 SKID STEER LOADER - 1BCL242	SAM DUINA	19/03/2002	1BCL242
MISC ITEMS	BEACH CLEANER 1500MM WIDE	98198	BOSS BBC 2000 BEACH CLEANER - WN28850	ALAN DOUST	11/04/2002	WN28850
	BRICKSAW PETROL POWERED	98206	TMP PETROL BRICK SAW 14" BLADE (MNT ON 98124)	SAM DUINA	2/10/2003	
	COMPACTOR SINGLE DRUM PEDESTRIAN	98085	BOMAG BW55E VIBRATING PEDESTRIAN ROLLER	SAM DUINA	29/11/2004	
	COMPACTOR VERTICAL RAMMER	98084	VERTICAL RAMMER, LT6000, 4 STROKE WITH GX100 HONDA ENGINE	MARK SKROZA	9/09/2004	
	COMPRESSOR PETROL POWERED	98024	INGERSOL RAND 3P151C AIR COMPRESSOR	SAM DUINA	29/10/1999	
	COMPRESSOR PETROL POWERED	97063	SCORPION COMPRESSOR	SAM DUINA	17/10/2003	
	ELEVATING WORK PLATFORM TOWED SELF PROPELLED <6M HGT	98197	GUNDOO GT 5/7 WORK PLATFORM - 1TDS227	BILL EARNSHAW	26/06/2002	1TDS227
	FORKLIFT	98497	CROWN 20MT FORKLIFT	KAREN CALLAGHAN	20/12/1994	
	GRADER < 75kW	98881	MITSUBISHI MG130 GRADER - WN31099	MARK SKROZA	10/08/1997	WN31099
	JACK HAMMER ELECTRIC	98061	JACK HAMMER (KANGO ELECTRIC)	SAM DUINA	11/01/2002	
	JACK HAMMER ELECTRIC	97143	MILWAUKEE ELECTRIC JACK HAMMER WITH CHISEL, POINT & CUTTER ATTACHMENTS	SAM DUINA	18/01/2006	
	LAWN CORER 3 POINT LINKAGE	98178	BOSS INDUSTRIAL 3 POINT LINKAGE	ALAN DOUST	22/01/2002	

			CORER			
	MISC PLANT ITEMS	98071	CONCRETE SCREED WITH HONDA GX31 MOTOR	MARK SKROZA	4/02/2004	
	MISC PLANT ITEMS	97120	INGERSOLL RAND COMPRESSOR	DAVE LATHAM	17/08/2004	
	MISC PLANT ITEMS	97063	SCORPION COMPRESSOR	SAM DUINA	17/10/2003	
	POST HOLE DIGGER HAND HELD	97033	TANAKA JEA50 POST HOLE BORER	DAVE LATHAM	9/12/2001	
	POST HOLE DIGGER TRACTOR MOUNTED	98221	SUPERIOR HEAVY DUTY POST HOLE DIGGER	BILL EARNSHAW	21/03/2003	
	SPRAYER ELECTRIC	97043	HARDY HYDROGEN PEROXIDE ELECTRIC SPRAYER ON TRAILER 98103	DAVE LATHAM	2/01/2002	
	SPRAYER PETROL POWERED	98099	KARCHER HDS 1000 DE HIGH PRESSURE CLEANER WITH 9HP YAMAHA ENGINE	DAVE LATHAM	4/06/2005	
	SPRAYER PETROL POWERED	98011	SPITWATER HP201SAE PRESSURE BLASTER	SAM DUINA	12/10/2003	
	SPRAYER PETROL POWERED	98040	SPITWATER HP201SAE PRESSURE BLASTER	SAM DUINA	12/10/2003	
	SPREADER FERTILISER MANUAL OPERATION	98083	VICON PS303 FERTILISER SPREADER	DAVE LATHAM	24/08/2004	
	SPREADER SAND 3 POINT LINKAGE	98089	HEAVY DUTY SMUDGE BOARD AND SCREED	ALAN DOUST	25/02/2000	
	TURF CUTTER PETROL POWERED	98043	INGS TURFCUTTER WITH 9HP HONDA MOTOR	BILL EARNSHAW	13/10/2003	
MOWER	MOWER PEDESTRIAN ROTARY	97085	HONDA HRU195 ROTARY MOWER WITH 19" CUT	ALAN DOUST	25/11/2003	
	MOWER PEDESTRIAN ROTARY	97105	HONDA HRU195 ROTARY MOWER WITH 19" CUT	BILL EARNSHAW	22/12/2003	
	MOWER PEDESTRIAN ROTARY	98068	LAWNMOWER HONDA HRV195 19" CUT	BILL EARNSHAW	22/03/2000	
	MOWER RIDE ON 2WD	98092	RIDE-ON TORO GROUNDSMASTER 328D ROTARY 2WD MOWER - 1BWR368	ALAN DOUST	4/06/2005	1BWR368
	MOWER RIDE ON 2WD	98093	RIDE-ON TORO GROUNDSMASTER 328D ROTARY 2WD MOWER - 1BWR369	ALAN DOUST	4/06/2005	1BWR369
	MOWER RIDE ON 2WD	98094	RIDE-ON TORO GROUNDSMASTER 328D ROTARY 2WD MOWER - 1BWR370	ALAN DOUST	4/06/2005	1BWR370

	MOWER RIDE ON 2WD	98095	RIDE-ON TORO GROUNDSMASTER 328D ROTARY 2WD MOWER - 1BWR371	ALAN DOUST	4/06/2005	1BWR371
	MOWER RIDE ON 2WD	98096	RIDE-ON TORO GROUNDSMASTER 328D ROTARY 2WD MOWER - 1BWR372	ALAN DOUST	4/06/2005	1BWR372
	MOWER RIDE ON 2WD	98098	RIDE-ON TORO GROUNDSMASTER 328D ROTARY 2WD MOWER - 1BWR373	ALAN DOUST	4/06/2005	1BWR373
	MOWER RIDE ON 2WD	98187	TORO 223-D RIDE ON MOWER INCLUDING CATCHER - 1AZE763	ALAN DOUST	30/04/2002	1AZE763
	MOWER RIDE ON 2WD	98701	TORO 325-D RIDE ON MOWER 4WD - 1BBU019	ALAN DOUST	24/12/2001	1BBU019
	MOWER RIDE ON 2WD	98207	TORO 328 -D RIDE ON MOWER - 1BDM842	ALAN DOUST	21/02/2003	1BDM842
	MOWER RIDE ON 2WD	98070	TORO GROUNDMASTER 328-D 2WD MOWER-1BOP077	ALAN DOUST	25/02/2004	1BOP077
	MOWER RIDE ON 2WD	98200	TORO GROUNDMASTER 328-D RIDE ON MOWER - 1BDM841	ALAN DOUST	2/12/2003	1BDM841
	MOWER RIDE ON 2WD	98188	TORO GROUNDSMASTER MOWER ROTARY RIDE 2WD - 1BAA446	ALAN DOUST	30/05/2002	1BAA446
	MOWER RIDE ON 2WD	98189	TORO GROUNDSMASTER MOWER ROTARY RIDE 2WD - 1BAA447	ALAN DOUST	30/05/2002	1BAA447
	MOWER RIDE ON 4WD	98181	TORO GM325D RIDE-ON 4WD - 1AZE734	ALAN DOUST	2/07/2002	1AZE734
	MOWER RIDE ON 4WD	98195	TORO GROUNDSMASTER MOWER ROTARY RIDE 4WD - 1BAA445	ALAN DOUST	30/05/2002	1BAA445
	MOWER SELF PROPELLED ROTARY	98078	13 HP DEUTSCHER MOWER	ALAN DOUST	26/05/2000	
	MOWER SELF PROPELLED ROTARY	98080	13 HP DEUTSCHER MOWER	ALAN DOUST	26/05/2000	
	MOWER SELF PROPELLED ROTARY	98065	26" CUT LAWN MOWER WITH HONDA GX270 ENGINE	ALAN DOUST	4/05/2000	
	MOWER SELF PROPELLED ROTARY	98064	26" CUT WICKET MOWER WITH HONDA GX270 ENGINE	BILL EARNSHAW	4/05/2000	
	MOWER SELF PROPELLED ROTARY	98201	DEUTSCHER FIXED WHEEL MOWER	ALAN DOUST	30/11/2000	
	MOWER SELF PROPELLED ROTARY	98202	DEUTSCHER FIXED WHEEL MOWER	ALAN DOUST	30/11/2000	
	MOWER SELF PROPELLED	98203	DEUTSCHER FIXED WHEEL MOWER	ALAN DOUST	30/11/2000	

	ROTARY					
	MOWER SELF PROPELLED ROTARY	98204	DEUTSCHER FIXED WHEEL MOWER	ALAN DOUST	30/11/2000	
	MOWER SELF PROPELLED ROTARY	98214	DEUTSCHER FIXED WHEEL MOWER	ALAN DOUST	17/01/2001	
	MOWER SELF PROPELLED ROTARY	98215	DEUTSCHER FIXED WHEEL MOWER	ALAN DOUST	17/01/2001	
	MOWER SELF PROPELLED ROTARY	98170	DEUTSCHER H26 ROTARY MOWER	ALAN DOUST	11/12/2001	
	MOWER SELF PROPELLED ROTARY	98171	DEUTSCHER H26 ROTARY MOWER	ALAN DOUST	11/12/2001	
	MOWER SELF PROPELLED ROTARY	98172	DEUTSCHER H26 ROTARY MOWER	ALAN DOUST	11/12/2001	
	MOWER SELF PROPELLED ROTARY	98173	DEUTSCHER H26 ROTARY MOWER	ALAN DOUST	11/12/2001	
	MOWER SELF PROPELLED ROTARY	98174	DEUTSCHER H26 ROTARY MOWER	ALAN DOUST	11/12/2001	
	MOWER SELF PROPELLED ROTARY	98003	DEUTSCHER H660 18HP MOWER	SAM DUINA	30/10/2003	
	MOWER SELF PROPELLED ROTARY	98222	DEUTSCHER ROTARY MOWER 36058	ALAN DOUST	4/03/2003	
	MOWER SELF PROPELLED ROTARY	98223	DEUTSCHER ROTARY MOWER 36058	ALAN DOUST	4/03/2003	
	MOWER SELF PROPELLED ROTARY	98563	DEUTSCHER ROTARY MOWER 650MM	ALAN DOUST	28/05/1999	
	REEL MOWER RIDE ON	98036	TORO REELMASTER 3100-D3WD RIDE ON MOWER - WN31552	ALAN DOUST	23/12/1999	WN31552
	REEL MOWER TOWABLE <= 7 GANG	98162	BEAVER TM739, 7 GANG MOWER - 1TCO932	ALAN DOUST	4/02/2001	1TCO932
	REEL MOWER TOWABLE <= 7 GANG	98049	HAYTER TM 749 SEVEN GANG TRAILING MOWER - 1TEO817	ALAN DOUST	14/10/2003	1TEO817
	REEL MOWER TOWABLE <= 7 GANG	98067	HAYTER TM 749 SEVEN GANG TRAILING MOWER - 1TEU824	ALAN DOUST	1/12/2004	1TEU824
	REEL MOWER TOWABLE <= 7 GANG	98091	HAYTER TM749 SEVEN GANG MOWER - 1TFP523	ALAN DOUST	1/07/2005	1TFP523
	VERTIMOWER	98057	DWYER FELTON VERTIMOWER	BILL EARNSHAW	25/02/2000	
	VERTIMOWER	98056	FLAIL VERTI MOWER WITH 1800MM WIDE CUT	ALAN DOUST	1/09/2004	
PASSENGER	SEDAN 4 CYLINDER	99015	MITSUBISHI LANCER, AUTOMATIC,	KAREN	3/09/2005	93COJ

			SILVER STATION WAGON - 93COJ	CALLAGHAN		
	SEDAN 4 CYLINDER	99071	NISSAN PULSAR LX SEDAN - 102COJ	VIC ETHERINGTON	22/11/2002	102COJ
	SEDAN 4 CYLINDER	99065	NISSAN PULSAR LX SEDAN, SILVER- 1BEM498	STEVE SULLIVAN	23/09/2002	1BEM498
	SEDAN 4 CYLINDER	99001	NISSAN PULSAR ST 1.8LT AUTO WHITE SEDAN- 33COJ	PETER PIKOR	11/12/2003	33COJ
	SEDAN 4 CYLINDER	99002	NISSAN PULSAR ST AUTOMATIC TWILIGHT- 85COJ	PETER PIKOR	12/04/2003	85COJ
	SEDAN 4 CYLINDER	99006	NISSAN ST PULSAR SEDAN, AUTOMATIC, BURGUNDY- 92COJ	CHRIS TERELINCK	5/03/2004	92COJ
	SEDAN 4 CYLINDER	99017	NISSAN ST PULSAR, BLUE, AUTOMATIC - 40COJ	STEVE SULLIVAN	14/03/2005	40COJ
	SEDAN 4 CYLINDER	99005	NISSAN ST PULSAR, BLUE, AUTOMATIC - 89COJ	GRAEME CATCHPOLE	28/09/2004	89COJ
	SEDAN 4 CYLINDER	99016	NISSAN ST PULSAR, BLUE, AUTOMATIC - 91COJ	GRAEME HALL	14/03/2005	91COJ
	SEDAN 4 CYLINDER	99086	TOYOTA COROLLA HATCHBACK 1.8LTR - SILVER - 109COJ	KEVIN SYME	15/05/2003	109COJ
	SEDAN 4 CYLINDER	99085	TOYOTA COROLLA HATCHBACK 1.8LTR - SILVER - 1BIT745	CHRIS TERELINCK	15/05/2003	1BIT745
	SEDAN 4 CYLINDER	99087	TOYOTA COROLLA HATCHBACK 1.8LTR - WHITE - 46COJ	RHONDA HARDY	15/05/2003	46COJ
	SEDAN 4 CYLINDER	99084	TOYOTA COROLLA HATCHBACK 1.8LTR - WHITE - 86COJ	VIC ETHERINGTON	15/05/2003	86COJ
	SEDAN 6 CYLINDER	99007	HOLDEN COMMODORE VZ EXECUTIVE, BARBADOS - 1BTF733	CEO	11/11/2004	1BTF733
	SEDAN 6 CYLINDER	99014	HOLDEN COMMODORE VZ SEDAN, AUTOMATIC, SILVER- 1BWU390	CHRIS TERELINCK	21/01/2005	1BWU390
	SEDAN 6 CYLINDER	99008	HOLDEN COMMODORE VZ, WHITE - 1BTF732	DAVE DJULBIC	11/12/2004	1BTF732
	SEDAN LUXURY	99018	FORD FAIRMONT GHIA, AUTOMATIC, SILVER - 1BXR478	CEO	18/03/2005	1BXR478
	SEDAN LUXURY	99010	HOLDEN BERLINA VZ, MARTINI - 28COJ	DAVE DJULBIC	17/11/2004	28COJ
	SEDAN LUXURY	99083	HOLDEN CALAIS VY SEDAN - RED - 1BJG800	PETER SCHNEIDER	14/05/2003	1BJG800
	SEDAN LUXURY	99011	HOLDEN VZ CALAIS, AUTOMATIC, BLACK SEDAN - 1BUX728	CEO	12/06/2004	1BUX728

	SEDAN LUXURY	99012	HOLDEN VZ CALAIS, AUTOMATIC, BLUE - 1BUX734	CEO	15/12/2004	1BUX734
	SEDAN LUXURY	99013	HOLDEN VZ CALAIS, RED - 1BUY229	CEO	17/12/2004	1BUY229
	STATION WAGON 6 CYLINDER	99004	FORD XT FALCON BA SILVER GAS STATION WAGON - 1BPP316	CHRIS TERELINCK	2/09/2004	1BPP316
	STATION WAGON 6 CYLINDER	99082	HOLDEN COMMODORE VY STATION WAGON- SILVER - 100COJ	GRAEME HALL	5/08/2003	100COJ
	STATION WAGON 6 CYLINDER	99080	HOLDEN COMMODORE VY STATION WAGON- WHITE - 105COJ	KAREN CALLAGHAN	30/04/2003	105COJ
	STATION WAGON 6 CYLINDER	99088	HOLDEN COMMODORE VY STATIONWAGON - GREEN - 44COJ	GRAEME HALL	28/04/2003	44COJ
PUMP	PUMP PETROL POWERED	98055	DAVEY WATER PUMP	SAM DUINA	15/12/1999	
	PUMP PETROL POWERED	98108	DAVEY WATER PUMP MOUNTED ON 96001	MARK SKROZA	31/05/2000	
	PUMP PETROL POWERED	98159	HONDA TRASH PUMP	ANDREW O'FARRELL	14/11/2000	
	PUMP PETROL POWERED	98025	HONDA WATER PUMP	SAM DUINA	11/01/1999	
	PUMP PETROL POWERED	98158	HONDA WATER PUMP MOUNTED ON 1ATT447 (95051)	MARK SKROZA	11/10/2000	
	PUMP PETROL POWERED	98027	HONDA WT-30X TRASH PUMP	SAM DUINA	10/10/2003	
	PUMP PETROL POWERED	98042	HONDA WT-30X TRASH PUMP	ANDREW O'FARRELL	10/10/2003	
	PUMP PETROL POWERED	97045	HONDA WX10 WATER PUMP (MNT ON 95098)	SAM DUINA	3/04/2003	
	PUMP PETROL POWERED	98199	PETROL ENGINE MOUNTED ON REAR OF 96010	BILL EARNSHAW	30/12/2002	
	PUMP PETROL POWERED	98774	ROBIN EY20D PUMP AND MOTOR	SAM DUINA	12/01/2000	
	PUMP SUBMERSIBLE	97125	SUBMERSIBLE FLEXI DRIVE PUMP, 50MM WITH HONDA POWER HEAD	SAM DUINA	24/08/2004	
	PUMP SUBMERSIBLE	98111	SUBMERSIBLE FLEXI TOOL PUMP WITH HONDA MOTOR	ANDREW O'FARRELL	18/01/2006	
SLASHER	ROLLER SLASHER	98225	JARRETT ROLLER SLASHER 3 POINT LINKAGE	ALAN DOUST	23/05/2003	
	ROLLER SLASHER	98090	JARRETT TM232 FINISHING MOWER	ALAN DOUST	12/08/2004	
	ROLLER SLASHER	98082	MOOREHOUSE JUNGLE BASTER, 3 POINT LINKAGE SLASHER	ALAN DOUST	30/06/2004	
	ROLLER SLASHER	98184	MOOREHOUSE SLASHER	ALAN DOUST	15/03/2002	
SWEEPER	ROAD SWEEPER	98072	TENNANT ROAD SWEEPER- 1BNG190	DAVE LATHAM	4/02/2004	1BNG190

	SWEEPER PEDESTRAIN	98474	TENNANT 110 SWEEPER	SAM DUINA	28/03/1996	
TRACTOR	TRACTOR 2WD >50kW <60kW	98100	CASE CX70 2WD TRACTOR - 1ARP831	ALAN DOUST	25/05/2000	1ARP831
	TRACTOR 2WD >50kW <60kW	98229	CASE TRACTOR JX80U 2WD - 1BLI213	ALAN DOUST	9/12/2003	1BLI213
	TRACTOR 2WD >50kW <60kW	98227	CASE TRACTOR JX80U 2WD - 1BLI214	ALAN DOUST	9/12/2003	1BLI214
	TRACTOR 2WD >50kW <60kW	98104	MCCORMICK CX85 2WD TRACTOR - 1CAF848	ALAN DOUST	19/09/2005	1CAF848
	TRACTOR 4WD <40kW	98498	CASE IH 3230XL TRACTOR WITH BUCKET - WN30864	DAVE LATHAM	26/05/1997	WN30864
	TRACTOR 4WD <40kW	98160	KUBOTA L3010 4WD TRACTOR - 1AUM748	DAVE LATHAM	10/12/2000	1AUM748
	TRACTOR 4WD >50kW <60kW	98183	CASE CX 80 TRACTOR 4WD - 1BCU174	ALAN DOUST	3/12/2002	1BCU174
	TRACTOR 4WD >50kW <60kW	98017	CASE CX70 TRACTOR 2WD - 1AOA174	ALAN DOUST	12/10/1999	1AOA174
	TRACTOR 4WD >50kW <60kW	98102	MCCORMICK CX 4WD TRACTOR - 1BZS509	ALAN DOUST	7/11/2005	1BZS509
	TRACTOR 4WD >60kW <80kW	98013	CASE CX100 TRACTOR 4WD - 1AOA179	ALAN DOUST	12/10/1999	1AOA179
TRAILER	TRAILER BOX <750KG AGG	98194	NEIGHBOURHOOD WATCH BOX TRAILER (WAS 1TAE751) - NHW000	GRAEME HALL	7/01/1998	NHW000
	TRAILER BOX <750KG AGG	97112	TRAILER BOX WITH TOOL BOX - 1TFE078	BILL BETTS	25/06/2004	1TFE078
	TRAILER BOX <750KG AGG	98073	TRAILER BOX, 7X5, HYD BRAKES & TOOL BOX - 1TFD991	ANDREW O'FARRELL	18/06/2004	1TFD991
	TRAILER BOX >2000KG <3000KG AGG	98536	POLMAC LOW BED MOWER TRAILER - 1TAO067	ALAN DOUST	15/05/1998	1TAO067
	TRAILER BOX >750KG <2000KG AGG	98137	2 TONNE COLLECTION TRAILER - 1TCC592	ALAN DOUST	30/06/2000	1TCC592
	TRAILER BOX >750KG <2000KG AGG	98125	2 TONNE TANDEM TRAILER - MESH SIDES - 1TCE002	BILL EARNSHAW	30/06/2000	1TCE002
	TRAILER BOX >750KG <2000KG AGG	98124	2 TONNE TANDEM TRAILER - REAR MESH RAMP - 1TCE001	SAM DUINA	30/06/2000	1TCE001
	TRAILER BOX >750KG <2000KG AGG	98209	BOX TOP TRAILER - 1TCM066	DAVE LATHAM	15/01/2001	1TCM066
	TRAILER BOX >750KG <2000KG AGG	98210	BOX TOP TRAILER - 1TCM067	DAVE LATHAM	15/01/2001	1TCM067
	TRAILER BOX >750KG <2000KG AGG	98380	BOX TRAILER - WN28706	BILL EARNSHAW	28/05/1999	WN28706
	TRAILER BOX >750KG <2000KG AGG	98381	BOX TRAILER - WN28707	BILL EARNSHAW	28/05/1999	WN28707

	TRAILER BOX >750KG <2000KG AGG	98387	BOX TRAILER - WN28710	BILL EARNSHAW	28/05/1999	WN28710
	TRAILER BOX >750KG <2000KG AGG	98847	NWE TANDEM TRAILER - WN30834	SAM DUINA	28/06/1996	WN30834
	TRAILER BOX >750KG <2000KG AGG	98182	SINGLE AXLE BOX TRAILER - 1TDJ508	BILL EARNSHAW	2/07/2002	1TDJ508
	TRAILER BOX >750KG <2000KG AGG	98079	SINGLE AXLE BOX TRAILER (WORK FOR THE DOLE) - 1TCE278	BILL BETTS	28/07/2000	1TCE278
	TRAILER BOX >750KG <2000KG AGG	98103	SINGLE AXLE BOX TRAILER FOR SPRAY UNIT 98045 - 1TCE279	DAVE LATHAM	28/07/2000	1TCE279
	TRAILER BOX >750KG <2000KG AGG	98216	TANDEM AXLE BOX TRAILER - 1TCM088	SAM DUINA	19/01/2001	1TCM088
	TRAILER BOX >750KG <2000KG AGG	98566	TANDEM AXLE TRAILER - 1TBJ551	BILL BETTS	19/07/1999	1TBJ551
	TRAILER BOX >750KG <2000KG AGG	98133	TRAILER 2 TONNE TANDEM WITH SIDE RAMPS - 1TCC590	SAM DUINA	30/06/2000	1TCC590
	TRAILER BOX >750KG <2000KG AGG	98076	TRAILER GRAFFITI, LOCKABLE, BOX - 1TFE302	SAM DUINA	18/06/2004	1TFE302
	TRAILER BOX >750KG <2000KG AGG	98176	TRAILER- MESH SIDES & RAMP - 1TDH510	SAM DUINA	16/01/2002	1TDH510
	TRAILER BOX >750KG <2000KG AGG	98177	TRAILER- SIDE RAMP & PARTITION - 1TDH508	SAM DUINA	16/01/2002	1TDH508
	TRAILER BOX >750KG <2000KG AGG	97138	TRAILER, 7X5 HEAVY DUTY, MESH FRONT & SIDES - 1TXF956	BILL BETTS	17/05/2005	1TXF956
	TRAILER BOX >750KG <2000KG AGG	98175	TRAILER-TAIL RAMP & PARTITIONS - 1TDH509	MARK SKROZA	16/01/2002	1TDH509
	TRAILER GRAFFITI	98890	GRAFFITI TRAILER - WN28637	SAM DUINA	28/08/1998	WN28637
	TRAILER MOWER >2000KG <3000KG AGG	98228	LOW BED MOWING TRAILER - 1TEI469	ALAN DOUST	6/04/2003	1TEI469
	TRAILER MOWER >2000KG <3000KG AGG	98110	LOW BED TANDEM MOWER TRANSPORT TRAILER - 1TCC310	ALAN DOUST	22/06/2000	1TCC310
	TRAILER MOWER >2000KG <3000KG AGG	98112	LOW BED TANDEM MOWER TRANSPORT TRAILER - 1TCC311	ALAN DOUST	22/06/2000	1TCC311
	TRAILER MOWER >2000KG <3000KG AGG	98114	LOW BED TANDEM MOWER TRANSPORT TRAILER - 1TCC312	ALAN DOUST	22/06/2000	1TCC312
	TRAILER MOWER >2000KG <3000KG AGG	98116	LOW BED TANDEM MOWER TRANSPORT TRAILER - 1TCC313	ALAN DOUST	22/06/2000	1TCC313
	TRAILER MOWER >2000KG <3000KG AGG	98413	LOW BED TRANSPORT TRAILER - WN28570	ALAN DOUST	5/04/1994	WN28570

	TRAILER PLANT >2000KG <3000KG AGG	98887	SKID STEER PBB TRAILER TANDEM - WN28681	MARK SKROZA	22/05/1998	WN28681
	TRAILER PLANT >2000KG <3000KG AGG	98105	SKID STEER TRAILER - 1TCE245	SAM DUINA	25/08/2000	1TCE245
	TRAILER PLANT >2000KG <3000KG AGG	98107	SKID STEER TRAILER - 1TCE246	SAM DUINA	25/08/2000	1TCE246
	TRAILER PLANT >2000KG <3000KG AGG	98211	SKID STEER TRAILER - 1TCM050	MARK SKROZA	15/01/2001	1TCM050
	TRAILER PLANT >750KG <2000KG AGG	98047	TANDEM TRAILER - 1TBW867	DAVE LATHAM	2/11/2000	1TBW867
	TRAILER SPECIAL TRAFFIC	98106	SPEED INDICATOR TRAILER - 1TGM873	USHA PATEL	1/12/2006	1TGM873
	TRAILER SPECIAL TRAFFIC	98205	TRAILER WITH SP20 FLASHING ARROW BOARD - 1TCL135	ANDREW O'FARRELL	30/11/2000	1TCL135
	TRAILER TIPPING >2000KG <3000KG AGG	98138	3 TONNE TIPPING TRAILER - 1TCE003	BILL EARNSHAW	30/06/2000	1TCE003
	TRAILER VAN >1000KG	98213	SINGLE AXLE STORAGE TRAILER (CARPENTERS) - 1TCM051	WAYNE EVANGELISTA	1/10/2001	1TCM051
	TRAILER VAN >1000KG	98218	TRAILER-MOBILE BEACH PATROL	GRAEME HALL	16/01/2002	
TRUCK	TRUCK <4 TNNE	95098	ISUZU NPR300 CREW CAB WITH KEVREK CRANE 1000- 103COJ	SAM DUINA	18/12/2002	103COJ
	TRUCK <4 TNNE	95102	ISUZU NPR400 , 4 TONNE DUAL CAB - 106COJ	SAM DUINA	5/07/2003	106COJ
	TRUCK <4 TNNE	95191	ISUZU NPR400 MEDIUM TRAY WITH WATER TANK & PUMP - 1CBI298	SAM DUINA	21/09/2005	1CBI298
	TRUCK <4 TNNE	95085	MITSUBISHI CANTER TRUCK - 1BDI743	ANDREW O'FARRELL	5/03/2002	1BDI743
	TRUCK <4 TNNE EXTRA CAB	95073	MITSUBISHI CANTER 3.5 TONNE FE647EV LWB TRAY TOP - 1AZY493	SAM DUINA	10/03/2001	1AZY493
	TRUCK >4 TNNE <8 TNNE	95184	ISUZU NPR400 LWB TRAY TRUCK - 1CAA019	SAM DUINA	15/07/2005	1CAA019
	TRUCK >4 TNNE <8 TNNE	95186	ISUZU NPR400, EXTRA LONG TRAY, BORE TRUCK WITH KEVREK CRANE- 1CAH925	ANDREW O'FARRELL	18/07/2005	1CAH925
	TRUCK >4 TNNE <8 TNNE EVEVATING WORK PLATFORM	96010	MITSUBISHI FK618KJRFAC TRUCK & HYDRAULIC PLATFORM - 1BHJ122	BILL EARNSHAW	23/12/2002	1BHJ122
	TRUCK >4 TNNE <8 TNNE LOADING CRANE	96385	ISUZU FTS750 TRUCK TIP WITH HIAB - WN31078	BILL EARNSHAW	8/12/1997	WN31078
	TRUCK CREW CAB < 4 TNNE	95190	ISUZU NPR400 MEDIUM CREW CAB WITH TWO WAY TIPPER BODY &	DAVE LATHAM	29/08/2005	1CAX986

			CRANE - 1CAX986			
	TRUCK CREW CAB >4 TNNE <8 TNNE	95187	ISUZU NPR400 LWB DUAL CAB WITH HIAB CRANE & TANK - 1BZX664	MARK SKROZA	8/02/2005	1BZX664
	TRUCK CREW CAB LOADING CRANE <4 TNNE	95190	ISUZU NPR400 MEDIUM CREW CAB WITH TWO WAY TIPPER BODY & CRANE - 1CAX986	DAVE LATHAM	29/08/2005	1CAX986
	TRUCK CREW CAB LOADING CRANE <4 TNNE	95157	ISUZU NPR400 TRAY TOP WITH KEVREK CRANE, TRAY 4.5M X 2.3M-1BNU980	DAVE LATHAM	4/04/2004	1BNU980
	TRUCK CREW CAB LOADING CRANE <4 TNNE	95111	MITSUBISHI FE659 FWSRFAB CANTER DUAL CAB WITH NEW KEVREK 1500 CRANE - 1BJN931	SAM DUINA	6/05/2003	1BJN931
	TRUCK CREW CAB LOADING PLATFORM <4 TNNE	95194	ISUZU NPR400 CREWCAB WITH SIDELIFTER - 1CBX945	ALAN DOUST	11/04/2005	1CBX945
	TRUCK CREW CAB LOADING PLATFORM <4 TNNE	95193	ISUZU NPR400 CREWCAB WITH SIDELIFTER - 1CCB812	ALAN DOUST	26/10/2005	1CCB812
	TRUCK CREW CAB LOADING PLATFORM <4 TNNE	95195	ISUZU NPR400 CREWCAB WITH SIDELIFTER - 1CCK453	ALAN DOUST	16/11/2005	1CCK453
	TRUCK CREW CAB LOADING PLATFORM <4 TNNE	95197	ISUZU NPR400 CREWCAB WITH SIDELIFTER - 1CCY173	ALAN DOUST	28/11/2005	1CCY173
	TRUCK CREW CAB LOADING PLATFORM <4 TNNE	95196	ISUZU NPR400 CREWCAB WITH SIDELIFTER - 1CCY174	ALAN DOUST	28/11/2005	1CCY174
	TRUCK CREW CAB LOADING PLATFORM <4 TNNE	95192	ISUZU NPR400 CREWCAB WITH SIDELIFTER - 1CBO779	ALAN DOUST	10/12/2005	1CBO779
	TRUCK CREW CAB LOADING PLATFORM <4 TNNE	95183	ISUZU NPR400 MEDIUM STANDARD CAB WITH SIDELIFTER - 1BZG839	SAM DUINA	14/06/2005	1BZG839
	TRUCK CREW CAB LOADING PLATFORM <4 TNNE	95062	MITSUBISHI CANTER DUAL CAB TRAYTOP WITH SIDELIFTER - 1AYF605	ALAN DOUST	6/06/2001	1AYF605
	TRUCK REFUSE	96011	ISUZU FRR500 REFUSE TRUCK WITH MAC/JOHN 8CMTR REAR LOAD COMPACTOR - 1BYZ609	BILL EARNSHAW	7/01/2005	1BYZ609
	TRUCK ROAD PATCH >4 TNNE <8 TNNE	96009	MITSUBISHI CANTER FE659E6SRFAB FLOCON BODY 4 TONNE - 1BOI932	SAM DUINA	31/10/2003	1BOI932
	TRUCK TIPPER <4 TNNE	95090	ISUZU NPR400 4 MTR LONG TIPPER TRUCK - 1BZF720	DAVE LATHAM	2/05/2004	1BZF720
	TRUCK TIPPER <4 TNNE	95185	ISUZU NPR400 CREW CAB TIP TRUCK - 1BZZ176	DAVE LATHAM	7/08/2005	1BZZ176
	TRUCK TIPPER <4 TNNE	95120	ISUZU NPR400 DUAL CAB 4 TONNE TIPPER- 1BMN151	BILL EARNSHAW	20/02/2004	1BMN151

	TRUCK TIPPER <4 TNNE	95153	ISUZU NPR400 MEDIUM 4 TONNE TIP TRUCK- 1BMN582	BILL EARNSHAW	15/03/2004	1BMN582
	TRUCK TIPPER >4 TNNE <8 TNNE	95049	MITSUBISHI CANTER FE647EV TIP TRUCK - 1AUB211	BILL EARNSHAW	13/11/2000	1AUB211
	TRUCK TIPPER >4 TNNE <8 TNNE	96005	MITSUBISHI FM658HV TRUCK TIP - 1AXX820	MARK SKROZA	30/04/2001	1AXX820
	TRUCK TIPPER >4 TNNE <8 TNNE	96041	MITSUBISHI FV547K2W FULL FORWARD CONTROL TANDEM 6 WL TIP TRUCK - WN31577	MARK SKROZA	21/10/1999	WN31577
	TRUCK TIPPER >8 TNNE <12 TNNE	96004	ISUZU FTS750 4WD TRUCK - 1AUI933	BILL EARNSHAW	16/11/2000	1AUI933
	TRUCK TIPPER >8 TNNE <12 TNNE	96012	ISUZU FVD 950 HD, 8 TONNE, TRUCK, AUTOMATIC WITH DROPSIDE TIPPER BODY - 1BYF967	SAM DUINA	6/06/2005	1BYF967
	TRUCK TIPPER >8 TNNE <12 TNNE	96013	ISUZU FVD 950 HD, 8 TONNE, TRUCK, AUTOMATIC WITH DROPSIDE TIPPER BODY - 1BYF968	MARK SKROZA	6/06/2005	1BYF968
	TRUCK TIPPER >8 TNNE <12 TNNE	96003	MITSUBISHI 2000 FM658HV TIP TRUCK - 1ATC495	SAM DUINA	9/08/2000	1ATC495
	TRUCK WATER >8 TNNE <12 TNNE	96001	MITSUBISHI FIGHTER FM658HV WATER CART - 1ARD034	MARK SKROZA	4/11/2000	1ARD034
	TRUCK WATER >8 TNNE <12 TNNE	96008	MITSUBISHI FM658H RFAC WATER TRUCK - 1BED025	BILL EARNSHAW	18/06/2002	1BED025
	TRUCK WATER >8 TNNE <12 TNNE	96006	MITSUBISHI FM658HV 8 TONNE WATER TRUCK - 1AYF429	DAVE LATHAM	31/05/2001	1AYF429
	TRUCK WATER >8 TNNE <12 TNNE	96007	MITSUBISHI FM658HV TRAY TOP WATER TRUCK - 1AYF820	BILL EARNSHAW	6/12/2001	1AYF820
UTE	UITILITY 2WD EXTENDED CAB >750KG <1500KG	95107	TOTOTA HILUX 2WD EXTENDED CAB - 99COJ	DAVE LATHAM	20/05/2003	99COJ
	UITILITY 2WD EXTENDED CAB >750KG <1500KG	95108	TOTOTA HILUX 2WD EXTENDED CAB (RETICULATION) - 94COJ	ANDREW O'FARRELL	20/05/2003	94COJ
	UITILITY 2WD EXTENDED CAB >750KG <1500KG	95104	TOYOTA HILUX 2WD DUAL CAB, ALUMINIUM TRAY - 108COJ	DAVE LATHAM	5/07/2003	108COJ
	UITILITY 2WD EXTENDED CAB >750KG <1500KG	95103	TOYOTA HILUX 2WD DUAL CAB, ALUMINIUM TRAY - 25COJ	BILL EARNSHAW	5/07/2003	25COJ
	UITILITY 2WD EXTENDED CAB >750KG <1500KG	95105	TOYOTA HILUX 2WD DUAL CAB, ALUMINIUM TRAY - 29COJ	BILL EARNSHAW	5/07/2003	29COJ
	UITILITY 2WD EXTENDED CAB >750KG <1500KG	95106	TOYOTA HILUX 2WD DUAL CAB, ALUMINIUM TRAY - 83COJ	BILL EARNSHAW	5/07/2003	83COJ
	UTILITY 2WD <750KG	95172	FORD BA FALCON UTILITY - 198COJ	STEVE SULLIVAN	12/09/2004	198COJ

	UTILITY 2WD <750KG	95173	FORD BA FALCON UTILITY - 68COJ	VIC ETHERINGTON	12/09/2004	68COJ
	UTILITY 2WD <750KG	95176	FORD BA FALCON UTILITY, AUTOMATIC, GAS - 149COJ	PETER PIKOR	22/12/2004	149COJ
	UTILITY 2WD <750KG	95174	FORD BA FALCON UTILITY, AUTOMATIC, GAS - 65COJ	GRAEME CATCHPOLE	14/12/2004	65COJ
	UTILITY 2WD <750KG	95175	FORD BA FALCON UTILITY, AUTOMATIC, GAS (RANGERS) - 45COJ	PETER DUNN	23/12/2004	45COJ
	UTILITY 2WD <750KG	95122	FORD BA FALCON XL WELL BODY UTILITY, GAS- 54COJ	DENNIS CLUNING	3/08/2004	54COJ
	UTILITY 2WD <750KG	95160	FORD BA FALCON XT GAS UTILITY - 22COJ	WAYNE EVANGELISTA	26/05/2004	22COJ
	UTILITY 2WD <750KG	95121	FORD BA FALCON XT WELL BODY UTILITY, GAS- 1BMK526	DENNIS CLUNING	3/08/2004	1BMK526
	UTILITY 2WD <750KG	95170	FORD FALCON BA MKII GAS UTILITY - 61COJ	ALISON EDMUNDS	16/11/2004	61COJ
	UTILITY 2WD <750KG	95171	FORD FALCON BA MKII GAS UTILITY- 75COJ	DENNIS CLUNING	16/11/2004	75COJ
	UTILITY 2WD <750KG	95182	FORD FALCON GAS, AUTOMATIC, UTILITY - 64COJ	PETER PIKOR	5/11/2005	64COJ
	UTILITY 2WD <750KG	95091	FORD FALCON UTILITY WITH DEDICATED GAS - 84COJ	DENNIS CLUNING	9/04/2002	84COJ
	UTILITY 2WD <750KG	95082	FORD FALCON UTILITY WITH DEDICATED GAS - 95COJ	VIC ETHERINGTON	21/03/2002	95COJ
	UTILITY 2WD <750KG	95033	HOLDEN COMMODORE UTILITY VSII 3.8 LTR - 63COJ	DENNIS CLUNING	21/07/2000	63COJ
	UTILITY 2WD <750KG	95097	HOLDEN COMMODORE VY UTILITY - 36COJ	DENNIS CLUNING	13/12/2002	36COJ
	UTILITY 2WD <750KG	95100	HOLDEN COMMODORE VY UTILITY - 50COJ	DENNIS CLUNING	14/04/2003	50COJ
	UTILITY 2WD <750KG	95109	HOLDEN COMMODORE VY UTILITY - 77COJ	PETER PIKOR	23/05/2003	77COJ
	UTILITY 2WD >75KG <1500KG	95110	MITSUBISHI TRITON 2WD - MANUAL - 57COJ	ALAN DOUST	26/05/2003	57COJ
	UTILITY 2WD DUAL CAB >750KG <1500KG)	95163	HOLDEN CREWMAN VY WITH FIBREGLASS CANOPY (RANGERS) - 82COJ	PAUL HROVATIN	30/06/2004	82COJ
	UTILITY 2WD DUAL CAB >750KG <1500KG)	95164	HOLDEN CREWMAN VY WITH FIBREGLASS CANOPY, AUTOMATIC (RANGERS) - 1BRR559	PETER PIKOR	8/05/2004	1BRR559

	UTILITY 2WD DUAL CAB >750KG <1500KG)	95156	HOLDEN CREWMAN VY WITH FIBREGLASS CANOPY, AUTOMATIC (RANGERS) - 59COJ	PAUL HROVATIN	31/03/2004	59COJ
	UTILITY 2WD DUAL CAB >750KG <1500KG)	95155	HOLDEN CREWMAN WITH FIBREGLASS LID, AUTOMATIC - 20COJ	ALISON EDMUNDS	18/03/2004	20COJ
	UTILITY 2WD DUAL CAB >750KG <1500KG)	95198	HOLDEN CREWMAN, AUTOMATIC WITH FIBREGLASS CANOPY (RANGERS) - 1CDB601	PAUL HROVATIN	21/12/2005	1CDB601
	UTILITY 2WD DUAL CAB >750KG <1500KG)	95169	HOLDEN VZ CREWMAN WITH FIBREGLASS CANOPY (RANGERS) - 23COJ	PAUL HROVATIN	16/11/2004	23COJ
	UTILITY 2WD DUAL CAB >750KG <1500KG)	95101	MITSUBISHI TRITON 2WD DUAL CAB - 107COJ	DENNIS CLUNING	5/05/2003	107COJ
	UTILITY 2WD DUAL CAB >750KG <1500KG)	95117	MITSUBISHI TRITON HIGH RISE 2WD AUTOMATIC DUAL CAB- 1BOK578	PETER PIKOR	2/11/2004	1BOK578
	UTILITY 2WD DUAL CAB >750KG <1500KG)	95114	TOYOTA HILUX 2.7LT DUAL CAB 2WD - 1BJY948	DENNIS CLUNING	30/06/2003	1BJY948
	UTILITY 2WD DUAL CAB >750KG <1500KG)	95113	TOYOTA HILUX 2.7LT DUAL CAB 2WD - 1BKB530	PETER PIKOR	30/06/2003	1BKB530
	UTILITY 2WD DUAL CAB >750KG <1500KG	95155	HOLDEN CREWMAN WITH FIBREGLASS LID, AUTOMATIC - 20COJ	ALISON EDMUNDS	18/03/2004	20COJ
	UTILITY 2WD DUAL CAB >750KG <1500KG	95166	MITSUBISHI TRITON 4X2 WITH ALUMINIUM TRAY - 79COJ	BILL EARNSHAW	10/12/2004	79COJ
	UTILITY 2WD DUAL CAB >750KG <1500KG	95118	TOYOTA HILUX 2WD DUAL CAB, ALLOY TRAY- 1BPS387	BILL EARNSHAW	13/02/2004	1BPS387
	UTILITY 2WD DUAL CAB >750KG <1500KG	95112	TOYOTA HILUX 4X2 DUAL CAB UTILITY WITH WELL BODY - 41COJ	ANDREW O'FARRELL	6/10/2003	41COJ
	UTILITY 2WD DUAL CAB >750KG <1500KG	95119	TOYOTA HILUX 4X2 DUAL CAB WITH WELL BODY - 1BPS386	SAM DUINA	13/02/2004	1BPS386
	UTILITY 2WD DUAL CAB >750KG <1500KG	95057	TOYOTA HILUX 4X2 DUAL CAB WITH WELL BODY - 32COJ	BILL EARNSHAW	2/03/2004	32COJ
	UTILITY 2WD DUAL CAB >750KG <1500KG	95044	TOYOTA HILUX 4X2 DUAL CAB WITH WELL BODY - 48COJ	MARK SKROZA	2/03/2004	48COJ
	UTILITY 2WD DUAL CAB >750KG <1500KG	95161	TOYOTA HILUX 4X2 DUAL CAB, MANUAL UTILITY WITH EXTRA WIDE TRAY - 53COJ	DAVE LATHAM	15/06/2004	53COJ
	UTILITY 2WD DUAL CAB >750KG <1500KG	95167	TOYOTA HILUX DUAL CAB, 4X2, WELL BODY - 62COJ	DAVE LATHAM	21/10/2004	62COJ
	UTILITY 4WD >750KG <1500KG	95180	FORD COURIER, 4X4, DIESEL UTILITY - 90COJ	SAM DUINA	18/03/2005	90COJ

	UTILITY 4WD DUAL CAB >750KG <1500KG	95179	HOLDEN LT 4X4 CREWCAB RODEO, AUTOMATIC WITH FIBREGLASS CANOPY - 1BXD827	CEO	3/02/2005	1BXD827
	UTILITY 4WD DUAL CAB >750KG <1500KG	95154	HOLDEN RODEO 4X4 DUAL CAB AUTOMATIC WITH CANOPY- 60COJ	PETER PIKOR	16/03/2004	60COJ
	UTILITY 4WD DUAL CAB >750KG <1500KG	95123	HOLDEN RODEO RA 4X4 DUAL CAB WITH CANOPY, MANUAL- 78COJ	DENNIS CLUNING	3/10/2004	78COJ
	UTILITY 4WD DUAL CAB >750KG <1500KG	95159	TOYOTA HILUX 4WD DUAL CAB, WITH CANOPY- 67COJ	DENNIS CLUNING	5/11/2004	67COJ
	UTILITY 4WD DUAL CAB >750KG <1500KG	95178	TOYOTA HILUX 4X4 DUAL CAB, AUTOMATIC (RANGERS) - 66COJ	PAUL HROVATIN	2/01/2005	66COJ
	UTILITY 4WD DUAL CAB >750KG <1500KG	95177	TOYOTA HILUX 4X4 DUAL CAB, AUTOMATIC- 74COJ	PETER PIKOR	2/01/2005	74COJ
	UTILITY 4WD DUAL CAB >750KG <1500KG	95099	TOYOTA HILUX DUAL CAB 4X4 - 104COJ	PETER PIKOR	4/03/2003	104COJ
	UTILITY 4WD DUAL CAB >750KG <1500KG	95095	FORD COURIER UTILITY DUAL CAB 4X4 - 101COJ	SAM DUINA	10/01/2002	101COJ
	UTILITY 4WD DUAL CAB >750KG <1500KG	95094	FORD COURIER UTILITY DUAL CAB 4X4 - 98COJ	SAM DUINA	10/01/2002	98COJ
VAN	VAN <1 TNNE PAYLOAD	95081	MITSUBISHI EXPRESS VAN SWB - 1BDB684	NINA MEEHAN	4/04/2002	1BDB684
	VAN <1 TNNE PAYLOAD	95168	MITSUBISHI EXPRESS VAN, 2 SLIDING DOORS, BOOKS ON WHEELS - 21COJ	REBECCA MOORE	15/11/2004	21COJ
	VAN <1 TNNE PAYLOAD	95080	MITSUBISHI SJ SWB EXPRESS VAN (CLEANERS) - 1BDA319	NINA MEEHAN	26/03/2002	1BDA319
	VAN <1 TNNE PAYLOAD	95005	TOYOTA HIACE CLEANERS SWB VAN - 123COJ	NINA MEEHAN	9/09/2003	123COJ
	VAN <1 TNNE PAYLOAD	95012	TOYOTA HIACE CLEANERS SWB VAN - 27COJ	NINA MEEHAN	10/09/2003	27COJ
	VAN <1 TNNE PAYLOAD	95011	TOYOTA HIACE CLEANERS SWB VAN-26COJ	NINA MEEHAN	10/09/2003	26COJ
	VAN <1 TNNE PAYLOAD	95189	TOYOTA HIACE LWB AUTOMATIC VAN (PARKS JLP) - 1CAU142	DAVE LATHAM	26/08/2005	1CAU142
	VAN <1 TNNE PAYLOAD	95030	TOYOTA HIACE LWB CARPENTERS VAN- 39COJ	WAYNE EVANGELISTA	10/09/2003	39COJ
	VAN <1 TNNE PAYLOAD	95013	TOYOTA HIACE LWB CARPENTERS VAN-37COJ	WAYNE EVANGELISTA	10/09/2003	37COJ
	VAN <1 TNNE PAYLOAD	95188	TOYOTA HIACE LWB MANUAL VAN (CLEANERS) - 1CAU141	NINA MEEHAN	26/08/2005	1CAU141
	VAN <1 TNNE PAYLOAD	95010	TOYOTA HIACE LWB RETIC VAN -	ANDREW	9/09/2003	34COJ

			34COJ	O'FARRELL		
	VAN <1 TNNE PAYLOAD	95007	TOYOTA HIACE LWB RETIC VAN - 58COJ	ANDREW O'FARRELL	9/09/2003	58COJ
	VAN <1 TNNE PAYLOAD	95006	TOYOTA HIACE LWB RETIC VAN - 88COJ	ANDREW O'FARRELL	9/09/2003	88COJ
	VAN <1 TNNE PAYLOAD	95092	TOYOTA HIACE LWB RETIC VAN - 97COJ	ANDREW O'FARRELL	19/09/2002	97COJ
	VAN <1 TNNE PAYLOAD	95077	TOYOTA HIACE LWB RETICULATION VAN - 55COJ	ANDREW O'FARRELL	2/05/2004	55COJ
	VAN <1 TNNE PAYLOAD	95116	TOYOTA HIACE LWB RETICULATION VAN- 43COJ	ANDREW O'FARRELL	2/05/2004	43COJ
	VAN <1 TNNE PAYLOAD	95083	TOYOTA HIACE LWB RETICULATION VAN- 56COJ	ANDREW O'FARRELL	2/05/2004	56COJ
	VAN <1 TNNE PAYLOAD	95158	TOYOTA HIACE LWB RETICULATION VAN- 76COJ	ANDREW O'FARRELL	5/03/2004	76COJ
	VAN <1 TNNE PAYLOAD	95115	TOYOTA HIACE LWB RETICULATION VAN- 80COJ	ANDREW O'FARRELL	2/05/2004	80COJ
	VAN <1 TNNE PAYLOAD	95084	TOYOTA HIACE LWB VAN CARPENTERS - 1BCR118	WAYNE EVANGELISTA	21/03/2002	1BCR118
	VAN <1 TNNE PAYLOAD	95004	TOYOTA HIACE SWB CLEANERS VAN - 24COJ	NINA MEEHAN	9/09/2003	24COJ
	VAN <1 TNNE PAYLOAD	95015	TOYOTA HIACE SWB CLEANERS VAN- 31COJ	NINA MEEHAN	10/09/2003	31COJ
	VAN <1 TNNE PAYLOAD	95165	TOYOTA HIACE SWB VAN (CLEANERS) MANUAL 5 SPEED - 51COJ	NINA MEEHAN	28/09/2004	51COJ
	VAN <1 TNNE PAYLOAD	95009	TOYOYA HIACE LWB RETIC VAN - 87COJ	ANDREW O'FARRELL	9/09/2003	87COJ
	VAN >1 TNNE PAYLOAD	95181	FORD VJ TRANSIT, LWB, AUTOMATIC, HIGH ROOF VAN - 81COJ	REBECCA MOORE	21/04/2005	81COJ

(COJ Emergency Assets Register – updated May 2006)

PART 9: EMERGENCY RISK MANAGEMENT

Introduction

Western Australia is a diverse state that presents a variety of hazards and risks that differ from one local government area to another. As per the Emergency Management Act 2005 - Section 36(a), it is a function of Local Government to ensure that effective local emergency management arrangements are prepared and maintained to deal with hazards and risks that their communities face.

The ERM process forms the foundation of local emergency management arrangements. The ERM process supports the negotiation and development of shared responsibilities necessary for the establishment of effective arrangements.

In establishing and testing effective local emergency management arrangements and undertaking the ERM process the COW and COJ, in collaboration with their LEMC, have worked comprehensively in partnership with the community.

ERM Committee

The COW/COJ LEMC formed an ERM sub-committee and funding was accessed through FESA's AWARE (All West Australians Reducing Emergencies) Program. This resulted in a joint initiative known as the COW/COJ AWARE Project and the committee engaging a Project Coordinator for the undertaking of the ERM process.

The core members of the COW/COJ AWARE Project Committee are as follows.
- Manager Operations Services (Chairman) – COJ
- Senior Ranger, Ranger Services - COJ
- Manager Technical Services – COW
- Manager Ranger and Safety Services – COW
- Local Emergency Coordinator (& Chairman of the LEMC) – WA Police

Note: Temporary committee members are co-opted as required in alignment with the Project's objectives and tasks.

9.1 COW/COJ AWARE PROJECT

The aim of the COW/COJ AWARE Project is, "To communicate and consult with the local community in order to raise awareness and obtain hazard information with regard to the formulation of risk treatment strategies and incorporation into the Local Emergency Management Plans of the COW and COJ".

In creating a safer community and improving local ERM the objectives of the COW/COJ AWARE Project also include:
- Identify and develop current and future ERM leaders and ensure ongoing support within the community.
- Enhance ERM skills and understanding.
- Identify opportunities and implement ERM strategies.
- Increase community awareness, involvement and ownership in ERM arrangements.

- Encourage the integration of ERM as part of community culture.

The ERM Process

The ERM process, as undertaken in the COW/COJ AWARE Project, was jointly developed by FESA and WALGA (Western Australian Local Government Association). It is based on the Australian and New Zealand Risk Management Standards AS/NZS 4360:2004.

The model below has been taken from the Western Australian Emergency Risk Management Guide (July 2005).

Main Elements of the Emergency Risk Management (ERM) Process

There are five (5) main steps in the ERM process *(see Figure 1)*:

1. **Establish the context:** Identify strategic and community issues that may apply to the emergency risk management process. Develop the project management plan and initial risk evaluation criteria.
2. **Identify risks:** Identify and describe the nature of the hazards, community and environment. Examine vulnerabilities of the community and environment and identify the risks that the community is facing.
3. **Analyse risks:** Examine the risks for their likelihood and consequences and assign the levels of risk.
4. **Evaluate risks:** Compare the risks with the risk evaluation criteria (adjust where necessary), and rank the risks in order of priority for treatment.
5. **Treat risks:** Select and implement appropriate treatments for dealing with risks.

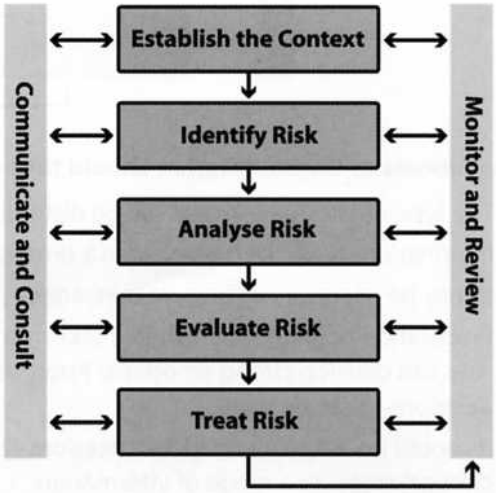


Figure 1—Main Elements of the Emergency Risk Management Process

The ERM process, under the direction of the COW/COJ AWARE Project Committee, has been undertaken in three stages and aligned to specific phases.

- Stage 1:
  January 2003 to December 2003 - Establish the Context & Identify Risk
- Stage 2:
  January 2004 to December 2004 – Analyse Risk & Evaluate Risk
- Stage 3:
  January 2005 to December 2005 – Treat Risk

Documentation

As part of the ERM process a number of key documents have been developed to assist in the identification of risks and hazards faced by the COW/COJ community. Documents that can be produced as a result of undertaking the ERM process include the following.

- Project Management Plans (for stages 1, 2 & 3)
- Risk Identification Matrix
- Risk Register (Refer to 9.2)
- Risk Treatment Schedules
- Risk Treatment Plans (Refer to 9.3)
- Emergency Risk Management Reports

Note: For information on the ERM process in application to the COW/COJ community or the COW/COJ AWARE Project please contact the City of Joondalup Administration Centre.

9.2 RISK REGISTER – NOVEMBER 2005

City of Wanneroo/City of Joondalup AWARE Project Risk Register – November 2005				
Risk Statement	Likelihood Rating	Consequence Rating	Level of Risk	Risk Priority
1. There is a risk that bush fire will cause loss of life and or injury to the general public.	C	4	E	1
2. There is a risk that structure fire will cause loss of life and or injury to the general public.	B	4	E	1
3. There is a risk that storms will cause injury or loss of life to the general public.	C	4	E	1
4. There is a risk that a chemical incident will cause injury and or loss of life to the general public.	C	4	E	1
5. There is a risk that a marine transport incident will cause injury and or loss of life to residents involved in a marine accident.	C	4	E	1
6. There is a risk that a train derailment will cause injury and loss of life to passengers and the public	C	5	E	1
7. There is a risk that a human epidemic will cause injury and or loss of life to the general public.	D	5	E	1

Legend			
Likelihood	Consequence	Level of risk	Risk Priority
A – almost certain	1 – insignificant	L - low	1 - people
B – likely	2 – minor	M – moderate	2 - lifelines
C – possible	3 – moderate	H – high	3 - infrastructure
D – unlikely	4 – major	E – extreme	4 - economy
E - rare	5 - catastrophic		5 - environment
			6 - social
			7 - heritage

A Joint City of Wanneroo/City of Joondalup Project

AWARE

All West Australians Reducing Emergencies

City of Wanneroo / City of Joondalup
AWARE Project – Stage 3

9.3 EMERGENCY RISK MANAGEMENT - TREATMENT PLANS
December 2005

City of Wanneroo

City of Joondalup

RISK TREATMENT – PLAN					
Hazard: Bushfire	**Risk Statement:** There is a risk that bushfire will cause loss of life and or injury to the general public.				**Reference No:** 001
	Likelihood: possible	**Consequence:** major	**Level of Risk:** extreme	**Risk Priority:** level 1	**Date Compiled:** 07/12/2005

Vulnerability Data:

The COW/COJ Community includes areas of rural-urban interface that are noticeably more vulnerable, comprising *aged care facilities, education facilities, caravan parks,* residences, market gardens, hobby farms and various businesses. Other vulnerable areas include natural bush land, pine plantations, state forests, national and regional parks. Also all households in developed areas adjacent to urban bushland.

Special needs groups include – the young (0-5 years), the aged (65 years & over), certain ethnic groups, cultural groups, disabled persons and persons with respiratory conditions (i.e. allergies, asthma).

COJ vulnerable locations include – Kinross, Burns Beach, Hepburn Heights/Padbury, residents adjacent to Pinaroo Memorial Park, Craigie Open Space and bush forever areas. Due to rapid development, there is only urban type bush land remaining within the COJ.

COW vulnerable locations include – Yanchep, Two Rocks, Carabooda, Carramar, Butler, Banksia Grove, Flynn Drive Industrial Area, Barbagallo Raceway, Club Capricorn, Neerabup, Gnangara, Koondoola, Alexanda Heights, Ridgewood, Merriwa, Nowergup, Edlington, Landsdale, Jandabup, Mariginup and bush forever areas.

Risk Treatment Strategies	**Action Priority**	**Responsible Agency(s)**	**Implementation Data**	**Implementation Timeframe**	**Budget Considerations**	**Monitor & Review**
1. Review formerly the existing community education programs on bushfire and report outcomes.	1*	COW, COJ	Undertaken by the Project Coordinator in liaison with relevant stakeholders (FESA, CALM). Report, including recommendations to be disseminated to all agencies involved and LEMC.	Approximately 2 months	Relatively minimal cost. Includes hours worked and administration.	Monthly reports & Committee Meetings. Utilise report for annual initiatives.

2. Conduct community surveys of areas at high risk to bushfire and obtain existing perception and expectations.	1*	COW, COJ	Coordinated by the Project Coordinator in consultation with relevant stakeholders. Report to be disseminated to all agencies involved and LEMC.	Approximately 3 months	Relatively low cost. Includes hours worked, administration, printing and copying etc.	Monthly reports & Committee Meetings. Refer to results for future consultation.
3. Conduct an emergency management exercise on bushfire to test existing arrangements.	2	COW, COJ LEMC	Undertaken by a working group of the COW/COJ LEMC. Discussion type. Report including recommendations to be disseminated to all agencies involved and LEMC.	Approximately 3 months (comprising periodic planning meetings)	Relatively low cost. Includes hours worked afforded by LEMC members and Project Coordinator.	Post exercise debrief and analysis. Identify gaps and initiate appropriate action.
4. Establish and monitor fuel loads (combustible vegetation) on government managed land subject to bushfire.	3	COW, FESA BFS, Wanneroo Volunteer BFB.	Coordinated by the Project Coordinator in cooperation with and undertaken by FESA BFS & WVBFB.	Approximately 6 months (plus annual maintenance)	TBA New methods currently being developed.	Monthly reports & Committee Meetings. Utilise information in risk analysis.

* Action simultaneously.

Implementation Approval					
Agency	**Item(s)**	**Approved By (Print)**	**Position**	**Signature**	**Date**
City of Wanneroo					
City of Joondalup					
COW/COJ LEMC					
FESA Bush Fire Service					
Wanneroo VBFB					

RISK TREATMENT – PLAN					
Hazard: Structural Fire	**Risk Statement:** There is a risk that structure fire will cause loss of life and or injury to the general public.				**Reference No:** **002**
	Likelihood: likely	**Consequence:** major	**Level of Risk:** extreme	**Risk Priority:** level 1	**Date Compiled:** **0**7/12/2005

Vulnerability Data:

Members of the general public in the COW/COJ Community that are noticeably more vulnerable to structural fire include special needs groups such as the young (0-5 years), the aged (65 years and over), sick, injured, disabled, certain cultural and ethnic groups.

Those who reside in or frequent shopping Centres, hospitals, older buildings and buildings of wooden construction including *aged care facilities, education facilities and caravan park* are also more vulnerable. Urban developments near to bushland are also noticeably more vulnerable,

Risk Treatment Strategies	Action Priority	Responsible Agency(s)	Implementation Data	Implementation Timeframe	Budget Considerations	Monitor & Review
1. Identify high-risk households within the community. Initiate the review of existing Emergency Management Plans in relation to fire and evacuation, where necessary.	1	COW, COJ	Undertaken by the Project Coordinator in liaison with FESA FRS. Will include the formulation of lists comprising households at high risk to structure fire and formal correspondence regarding EMPs.	Approximately 3 months	Relatively low cost. Includes hours worked and administration.	Monthly reports & Committee Meetings. Obtain copy of completed plans.
2. Coordinate the physical inspection and evaluation of households at high risk to structure fire, including in-house equipment.	2*	COW, COJ, FESA FRS	Coordinated by the Project Coordinator in collaboration with FESA FRS. Prior authorisation and an agreed schedule between the parties concerned may be required.	Approximately 4 months	Relatively low cost. Includes hours worked and administration.	Monthly reports & Committee Meetings. Record outcomes.
3. Coordinate an emergency management awareness education program on structural fire for local high-risk householders.	2*	COW, COJ	Undertaken by the Project Coordinator who will collate and communicate information on structure fire to the management of local high-risk householders.	Approximately 2 months	Relatively low cost. Includes hours worked, administration and copying.	Monthly reports & Committee Meetings. Record initiatives for future reference.

4. Review of fire emergency infrastructure and resources in relation to high risk and new development (especially in COW north).	3	COW, COJ, FESA FRS	Undertaken by the Project Coordinator in liaison with FESA as new facilities have been proposed. Copy of report to COW, COJ, COW/COJ LEMC.	Approximately 1 month	Relatively minimal cost. Includes hours worked and administration.	Monthly reports & Committee Meetings. Review progress annually.
5. Coordinate the development and implementation of an Emergency Management Plan & Recovery Plan Guide for households at high risk to structure fire.	4	COW, COJ	Coordinated by the Project Coordinator who may require external consultation to formulate an appropriate EMP guide for distribution to high-risk households.	Approximately 3 months	Relatively low to moderate cost. Includes hours worked, possible consultant fee and administration.	Monthly reports & Committee Meetings. Obtain copy of completed plans.
6. Coordinate and support the participation of local caravan parks with the Caravan Industry of Australia (WA) – national accreditation program in relation to fire safety.	5	COW, COJ	Initiated by the Project Coordinator directly with the management of local caravan parks, in consultation with the CIA.	Approximately 1 month	Relatively minimal cost. Hours worked and administration.	Monthly reports & Committee Meetings. Review membership annually.
7. Conduct an emergency management exercise on structural fire with a priority high-risk household(s).	6	COW, COJ, COW/COJ LEMC	Undertaken by a working group of the COW/COJ LEMC. Discussion type. Report including recommendations to be disseminated to all agencies involved and LEMC.	Approximately 3 months (comprising periodic planning meetings)	Relatively low cost. Hours worked afforded by LEMC members and Project Coordinator.	Post exercise debrief and analysis. Identify gaps and initiate appropriate action.

* Action simultaneously.

IMPLEMENTATION APPROVAL					
Agency	**Item(s)**	**Approved By (Print)**	**Position**	**Signature**	**Date**
City of Wanneroo					
City of Joondalup					
COW/COJ LEMC					
FESA FRS					

RISK TREATMENT – PLAN					
Hazard: Severe Storm	**Risk Statement:** There is a risk that storms will cause injury or loss of life to the general public.				**Reference No:** **003**
	Likelihood: possible	**Consequence:** **major**	**Level of Risk:** extreme	**Risk Priority:** level 1	**Date Compiled:** **0**7/12/2005

Vulnerability Data:

Vulnerable households include a*ged care facilities, education facilities and caravan parks.*
The COW/COJ Community comprises general public that are noticeably more vulnerable including special needs groups such as the young (0-5 years), the aged (65 years and over), certain ethnic groups, cultural groups, sick, injured and disabled persons.
Also general public residing in or frequenting areas located near to the coastline (i.e. housing, businesses, marina's,) are also more vulnerable.
Note: All residents of the COW/COJ community should be aware of this risk, as mini tornados have been known to cause devastation among inland areas as well.

Risk Treatment Strategies	Action Priority	Responsible Agency(s)	Implementation Data	Implementation Timeframe	Budget Considerations	Monitor & Review
1. Identify high-risk households within the community. Initiate the review of existing Emergency Management Plans in relation to severe storm and evacuation where necessary.	1	COW, COJ, FESA SES	Undertaken by the Project Coordinator in liaison with FESA SES. Will include the formulation of lists comprising households at high risk to severe storm and formal correspondence regarding EMPs.	Approximately 3 months	Relatively low cost. Includes hours worked and administration.	Monthly reports & Committee Meetings. Obtain copy of completed plans.
2. Review formerly the existing community education programs on severe storm and report outcomes.	2	COW, COJ	Undertaken by the Project Coordinator in collaboration with relevant stakeholders (i.e. FESA SES). Report, including recommendations to be disseminated accordingly.	Approximately 1 month	Relatively minimal cost. Includes hours worked and administration.	Monthly reports & Committee Meetings. Utilise report for annual initiatives.

3. Coordinate an emergency management awareness education program on severe storm for local high-risk householders.	3	COW, COJ	Undertaken by the Project Coordinator who will collate and communicate information on severe storms to of local high-risk householders.	Approximately 1 month	Relatively low cost. Includes hours worked afforded by LEMC members and Project Coordinator.	Monthly reports & Committee Meetings. Record initiatives for future reference.
4. Coordinate an MOU between aged care service providers in relation to severe storms, considering practical support and resource sharing.	4	COW, COJ, COW/COJ LEMC	Coordinated by the Project Coordinator in consultation with local stakeholders. Will comprise liaison with City of Bayswater / City of Stirling regarding their existing model and the comprehensive consultation process that was utilised.	Approximately 3 months	Relatively low cost. Includes hours worked and administration.	Monthly reports & Committee Meetings. Exercise the MOU to test capabilities.
5. Conduct an emergency management exercise on severe storm with a priority high-risk household(s).	5	COW, COJ, COW/COJ LEMC	Undertaken by a working group of the COW/COJ LEMC. Discussion type. Report including recommendations to be disseminated to all agencies involved and LEMC.	Approximately 3 months (comprising periodic planning meetings)	Relatively low cost. Hours worked afforded by LEMC members and Project Coordinator.	Post exercise debrief and analysis. Identify gaps and initiate appropriate action.

* Action simultaneously.

IMPLEMENTATION APPROVAL					
Agency	**Item(s)**	**Approved By (Print)**	**Position**	**Signature**	**Date**
City of Wanneroo					
City of Joondalup					
COW/COJ LEMC					
FESA SES					

RISK TREATMENT – PLAN					
Hazard: Hazardous Materials	**Risk Statement:** There is a risk that a chemical incident will cause injury and or loss of life to the general public.				**Reference No:** **004**
	Likelihood: possible	**Consequence:** major	**Level of Risk:** extreme	**Risk Priority:** level 1	**Date Compiled:** **0**7/12/2005

Vulnerability Data:

Vulnerable households include *shopping centres and retail outlets.*
The COW/COJ Community includes industrial and commercial sites where chemicals are stored and used. Chemicals are also transported via road. The general public that are noticeably more vulnerable includes special needs groups such as chemical hypersensitive persons, the young (0-5 years), the aged (65 years and over), sick, injured, disabled, certain cultural and ethnic groups. General public located in or adjacent to industrial and commercial sites.

Risk Treatment Strategies	Action Priority	Responsible Agency(s)	Implementation Data	Implementation Timeframe	Budget Considerations	Monitor & Review
1. Identify high-risk households within the community. Initiate the review of existing Emergency Management Plans in relation to chemical incident and evacuation, where necessary.	1	COW, COJ, FESA FRS	Undertaken by the Project Coordinator in liaison with FESA FRS. Will include the formulation of lists comprising households at high risk to chemical incident and formal correspondence regarding EMPs.	Approximately 3 months	Relatively low cost. Includes hours worked and administration.	Monthly reports & Committee Meetings. Obtain copy of completed plans.
2. Establish a requirement for a health and environmental assessment for developments at the application stage in relation to hazmat safety. (Incorporate into the Town Planning Scheme).	2	COW/COJ	Coordinated by the Project Coordinator in cooperation with the management of both cities and appropriate Council Planning Officers.	Approximately 3 months	Relatively low cost. Includes hours worked and administration.	Monthly reports & Committee Meetings. Review annual totals.

3. Review the capability to access drainage system plans in the event of a chemical incident. Consider the storage and dissemination of the information on CD.	3	COW, COJ	Undertaken by the Project Coordinator in liaison with FESA FRS who will develop and establish optimum accessibility, and determine the feasibility of the information being placed on CD.	Approximately 2 months	Relatively moderate cost to establish, low cost to maintain. Includes software, hardware, hours worked and administration.	Monthly reports & Committee Meetings. Review with organisational EM Plans.
4. Conduct a community awareness program on hazmat safety targeting the commercial sector.	4	COW, COJ	Undertaken by the Project Coordinator in liaison with FESA FRS, collate and communicate information on hazmat management.	Approximately 2 months	Relatively low cost. Includes hours worked, copying and administration.	Monthly reports & Committee Meetings.
5. Coordinate an emergency management awareness education program for local householders at high risk to chemical incident.	5	COW, COJ	Undertaken by the Project Coordinator in cooperation with FESA FRS, who will collate and communicate information on hazmat safety to the management of local householders at high risk.	Approximately 1 month	Relatively low cost. Includes hours worked, copying and administration.	Monthly reports & Committee Meetings. Record initiatives for future reference.
6. Conduct an emergency management exercise on chemical incident with a priority high-risk household(s).	6	COW, COJ, COW/COJ LEMC	Undertaken by a working group of the COW/COJ LEMC. Discussion type. Report including recommendations to be disseminated to all agencies involved and LEMC.	Approximately 3 months (comprising periodic planning meetings)	Relatively low cost. Hours worked afforded by LEMC members and Project Coordinator.	Post exercise debrief and analysis. Identify gaps and initiate appropriate action.

* Action simultaneously.

IMPLEMENTATION APPROVAL					
Agency	**Item(s)**	**Approved By (Print)**	**Position**	**Signature**	**Date**
City of Wanneroo					
City of Joondalup					
COW/COJ LEMC					
FESA FRS					

RISK TREATMENT – PLAN					
Hazard: Marine Transport Incident	**Risk Statement:** There is a risk that a marine transport incident will cause injury and or loss of life to residents involved in a marine accident. (i.e. Commercial or amateur vessels involved in emergencies including – collision, explosion or fire, sinking, grounding, persons lost at sea).				**Reference No:** **005**
	Likelihood: possible	**Consequence:** major	**Level of Risk:** extreme	**Risk Priority:** level 1	**Date Compiled:** **0**7/12/2005
Vulnerability Data: The population of the COW/COJ Community is noticeably more vulnerable, with approximately 48 kilometres of coastline along the western border and a high proportion of the population involved in boating, both commercially and recreationally.					

Risk Treatment Strategies	Action Priority	Responsible Agency(s)	Implementation Data	Implementation Timeframe	Budget Considerations	Monitor & Review
1. Review formerly the existing community education programs on marine transport safety and report outcomes. (Consider the utilisation of Twin cities FM for seasonal community education).	1	COW, COJ, DPI, FESA VMRS	Undertaken by the Project Coordinator in collaboration with relevant stakeholders (i.e. DPI, FESA VMRS) Report, including recommendations to be appropriately disseminated.	Approximately 1 month	Relatively minimal cost. Includes hours worked and administration.	Monthly reports & Committee Meetings. Utilise report for annual initiatives.
2. Conduct an emergency management exercise on a marine incident to test existing arrangements.	2	COW, COJ, COW/COJ LEMC	Undertaken by a working group of the COW/COJ LEMC. Discussion type. Report including recommendations to be disseminated to all agencies involved and LEMC.	Approximately 1 month	Relatively low cost. Includes hours worked afforded by LEMC members and Project Coordinator.	Post exercise debrief and analysis. Identify gaps and initiate appropriate action.

* Action simultaneously.

IMPLEMENTATION APPROVAL					
Agency	**Item(s)**	**Approved By (Print)**	**Position**	**Signature**	**Date**
City of Wanneroo					
City of Joondalup					
COW/COJ LEMC					
DPI					
FESA VMRS					

RISK TREATMENT – PLAN					
Hazard: Rail Transport Incident	**Risk Statement:** There is a risk that a train derailment will cause injury and loss of life to passengers and the public.				**Reference No:** **006**
	Likelihood: likely	**Consequence:** major	**Level of Risk:** extreme	**Risk Priority:** level 1	**Date Compiled:** **0**7/12/2005
Vulnerability Data: The COW/COJ community includes a rail transport system. The general public which utilise the rail transport system are those most vulnerable. The young (0-5 years) and the aged (65 years) may be less resilient.					

Risk Treatment Strategies	Action Priority	Responsible Agency(s)	Implementation Data	Implementation Timeframe	Budget Considerations	Monitor & Review
1. Conduct an emergency management exercise on a rail transport incident to test existing arrangements (include freeway closure).	1	COW, COJ, COW/COJ LEMC	Undertaken by a working group of the COW/COJ LEMC. Discussion type. Report including recommendations to be disseminated to all agencies involved and LEMC.	Approximately 1 month	Relatively low cost. Includes hours worked afforded by LEMC members and Project Coordinator.	Post exercise debrief and analysis. Identify gaps and initiate appropriate action.

* Action simultaneously.

IMPLEMENTATION APPROVAL					
Agency	**Item(s)**	**Approved By (Print)**	**Position**	**Signature**	**Date**
City of Wanneroo					
City of Joondalup					
COW/COJ LEMC					

RISK TREATMENT – PLAN					
Hazard: Human Epidemic	**Risk Statement:** There is a risk that a human epidemic will cause injury and or loss of life to the general public.				**Reference No:** **007**
	Likelihood: unlikely	**Consequence:** catastrophic	**Level of Risk:** extreme	**Risk Priority:** level 1	**Date Compiled:** **0**7/12/2005
Vulnerability Data: Members of the COW/COJ Community that are noticeably more vulnerable include the young (0-5), the aged (65 years and over), the sick, certain ethnic group and cultural groups, health and emergency workers.					

Risk Treatment Strategies	Action Priority	Responsible Agency(s)	Implementation Data	Implementation Timeframe	Budget Considerations	Monitor & Review
1. Review, develop and establish formal communication between local and state levels in relation to human epidemic.	1	COW, COJ, DOH	Coordinated by the Project Coordinator who will develop, establish and formalise in cooperation the Department of Health, COW and COJ.	Approximately 1 month	Relatively minimal cost. Includes hours worked and administration.	Monthly reports & Committee Meetings. Review annual communications via E/H Services.
2. Conduct an emergency management exercise on human epidemic to test existing arrangements and capabilities.	2	COW, COJ, COW/COJ LEMC	Undertaken by a working group of the COW/COJ LEMC. Discussion type. Report including recommendations to be disseminated to all agencies involved and LEMC.	Approximately 1 month	Relatively low cost. Includes hours worked afforded by LEMC members and Project Coordinator.	Post exercise debrief and analysis. Identify gaps and initiate appropriate action.

* Action simultaneously.

IMPLEMENTATION APPROVAL					
Agency	**Item(s)**	**Approved By (Print)**	**Position**	**Signature**	**Date**
City of Wanneroo					
City of Joondalup					
COW/COJ LEMC					
Department of Health					

LOCAL EMERGENCY MANAGEMENT PLAN FOR THE CITIES OF WANNEROO AND JOONDALUP

DRAFT

REVIEWED OCTOBER 2007

Note: This is a bridging document that must be read in conjunction with the City of Joondalup Community Emergency Management Arrangement and the City of Wanneroo Local Emergency Management Plan

TABLE OF CONTENTS

DISTRIBUTION LIST

ORGANISATION

Australian Red Cross
Department of the Environment & Conservation Wanneroo
City of Bayswater
City of Joondalup
City of Stirling
City of Wanneroo
Department of Planning & Infrastructure (Hillarys Marina)
Department for Child Protection – Joondalup District Office
Department of Health – Disaster Preparedness and Management Unit
Cities of Wanneroo / Joondalup Local Emergency Management Committee
North West Metropolitan District Emergency Management Committee
Fire & Emergency Services Authority Joondalup District Office (FESA)
FESA - Emergency Management Services
Joondalup Health Campus
Mullaloo Surf Lifesaving Club (SLSC)
WA Police - Clarkson Police Station
WA Police - Hillarys Police Station
WA Police - Joondalup Police Station
WA Police - Two Rocks Police Station
WA Police - Warwick Police Station
WA Police - Wanneroo Police Station
WA Police North West Metropolitan District Emergency Management Coordinator
St John's Ambulance - Joondalup
Shire of Gingin
Shire of Swan
Sorrento Surf Lifesaving Club
State Emergency Service - Wanneroo/Joondalup
State Emergency Management Committee
Whitfords Volunteer Sea Rescue Unit

CODES / ACRONYMS

AWARE – All Western Australians Reducing Emergencies
DCP – Department for Child Protection
DEC – Department of Environment and Conservation
DEMC - District Emergency Management Committee
ECC – Emergency coordination centre
HMA – Hazard Management Agency
IMG – Incident Management Group
LEMC - Local Emergency Management Committee
PPRR – Planning, preparedness, response, recovery
SEMC - State Emergency Management Committee
SES – State Emergency Service

PART ONE: MANAGEMENT

AUTHORITY

This plan has been prepared and endorsed by the City of Wanneroo /City of Joondalup Local Emergency Management Committee. The Plan has been reviewed by the North West Metropolitan District Emergency Management Committee (DEMC) and developed to, in conjunction with the related Community Emergency Management Arrangements, meet the requirements of the Emergency Management Act (2005).

DATE

Date of endorsement……

AREA COVERED

The geographical areas covered by this Plan are within the boundaries of the City of Wanneroo / City of Joondalup. Detailed descriptions of the geographic areas and demographic groups covered by these arrangements are provided in City of Joondalup Community Emergency Management Arrangements and the City of Wanneroo Local Emergency Management Plan.

PURPOSE

The purpose of this Plan is to document the management of potential emergencies likely to affect the community of the City of Wanneroo / City of Joondalup as listed in Section 4 of the Emergency Management Act (2005). These arrangements provide high-level detail of regional emergency management that is supplemented by the information in the City of Joondalup Community Emergency Management Arrangements and the City of Wanneroo Local Emergency Management Plan.

OBJECTIVES OF THIS EMERGENCY MANAGEMENT PLAN

- Establish the organisation and procedures for the management of emergencies within the City of Wanneroo /City of Joondalup.
- Establish a basis for the coordination of local emergency management for the Cities of Wanneroo and Joondalup.
- Provide a link to plans and arrangements for the management of local emergencies to agencies and organisations that participate at the LEMC level.
- Establish a common foundation from which training programs and exercises can be supported.
- Provide an emergency plan in a format that can be reviewed on a regular basis in accordance with the LEMC Business Plan and other review requirements.
- Assist with the implementation of emergency exercises in order to test the preparedness of this Plan.

SCOPE

- These arrangements cover areas within the boundaries of the Cities of Wanneroo and Joondalup and outline and provide a means for both government and non-government organisations to cooperate in a coordinated manner on emergency management (EM) issues in accordance with agreed roles and responsibilities.

- The emergency preparedness and planning activities carried out at the regional level by the Local and District Emergency Management Committee's and other working groups are noted in this Plan.
- This Plan is focused at the regional level and provides a support structure within which the following two local plans will operate:
  - The City of Joondalup Community Emergency Management Arrangements.
  - The City of Wanneroo Local Emergency Management Plan.

- A range of existing local and regional emergency management-related plans and agreements are nominated in this Plan.
- This shared Plan has been developed to assist emergency coordination in response to the following hazard types:
  ▹ Storm damage/tempest
  ▹ Earthquakes
  ▹ Tsunami
  ▹ Facility/building fire or explosion
  ▹ Transport accident (road, rail, air, water)
  ▹ Chemical , biological or radiological (CBR) incident
  ▹ Pollution incidents (air, land and sea)
  ▹ Public health epidemic
  ▹ Mass public gathering or civil disturbance.

  These hazards are in line with the provisions of 'Annex F" of the State Emergency Management Committee's Policy Statement 7 - State Emergency Management Arrangements. This list includes hazards identified through the 'All Western Australians Reducing Emergencies (AWARE)' emergency risk management project coordinated throughout the Cities of Wanneroo and Joondalup during 2005/2006.

EXISTING PLANS & ARRANGEMENTS

Documents related to these arrangements include-

1. City of Wanneroo Local Emergency Management Plan

2. City of Joondalup Community Emergency Management Arrangements.

3. The suite of West Plans produced in accordance with the State's Emergency Management Arrangements on behalf of the State Emergency Management Committee (SEMC).

4. Various "Support Plans" attached to the Cities of Wanneroo and Joondalup operational emergency management plans.

5. The Metropolitan North and East Recovery Group's 'Provision for Mutual Aid for Recovery During Emergencies' Partnering Agreement.

6. State Severe Storm Emergency Plan. (State Emergency Service)

7. Applicable state government agency operational emergency management plans

8. Local Recovery Arrangements of the Cities of Wanneroo and Joondalup.

9. Business continuity plans for the Cities of Wanneroo and Joondalup.

10. Local Welfare Emergency Management Support Plan. (Joondalup DCP District)

AGREEMENTS, UNDERSTANDINGS & COMMITTEES

The Cities of Wanneroo and Joondalup have a general agreement to cooperate with each other and organisations with emergency management responsibilities through the Local Emergency Management Committee (LEMC). This cooperation extends to operational emergency response and recovery activities as necessary. The LEMC has in place a number of sub-committees to which a range of LEMC member organisations contribute.

Organisations cooperating on EM through the Cities of Wanneroo and Joondalup LEMC agree to:

- Suitably and adequately resource their EM capabilities to ensure they can fulfil their legislated and agreed roles in local emergency planning and response.
- Cooperate with a Local Emergency Coordinator, HMA, support organisation or other EM stakeholder before, during or after an emergency incident to ensure the best outcome for the community within the LEMC's area.
- Share or provide resources to an emergency management effort, when required and in line with organisational capability, to assist in an emergency incident within the North West Metropolitan District.
- Provide a facility or site for use as an Emergency Control Centre or Incident Management Centre during an emergency, when required and in line with organisational capability.
- Provide for the use of established State or Local Welfare Centres as required for community evacuation, welfare or recovery purposes to assist management of an emergency incident within the North West Metropolitan District.
- Contribute to LEMC planning and preparation activities including attendance at relevant meetings and carrying out the duties of LEMC positions if required.
- Provide opportunities to other organisations participating in the LEMC to be involved in review, testing and exercising of regional and local emergency plans and capabilities wherever possible and where relevant.

The Cities of Wanneroo and Joondalup are signatories to the Partnering Agreement-Metropolitan North and East Recovery Group-The Provision of Mutual Aid for Recovery During Emergencies (October 2004). This agreement requires signatory local governments to provide mutual aid to each other in the form of 'physical and human' resources to assist with recovery management during emergencies' and to meet the costs of providing those resources unless otherwise agreed.

ADDITIONAL SUPPORT

Additional support for EM activities may apply through the following channels:

- Organisations participating in the Cities of Wanneroo and Joondalup LEMC can, at any time, request assistance with EM planning or other activities from any other participating organisation or the LEMC as a whole.
- Assistance with EM planning, training and other preparatory activities can be obtained from the Fire and Emergency Service Authority's Emergency Management Services office.
- The Western Australian Local Government Association's Emergency Management Officer can assist with EM planning issues affecting local governments.
- Funding for individual circumstances through the WA Natural Disaster Relief Arrangements if the Federal Minister for Family and Community Services has declared an area a 'major disaster'.

- The Emergency Management Act (2005) makes provision for the recovery of costs incurred by an organisation in meeting requests for resources from a HMA during an emergency operation.

SPECIAL CONSIDERATIONS

This Plan takes into consideration significant events, locations and seasonal conditions that occur within the Cities of Wanneroo and Joondalup and include the following:

- Rockit Concert (Joondalup Arena)
- Joondalup Festival
- V8 Supercars - Wanneroo Raceway
- Winter Storm Season
- Increased coastal usage during the summer months
- Increased bushfire risk during the summer months
- Joondalup Central Business District
- Yellagonga Regional Park
- Tamala Park Refuse Facility

RESOURCES

See Agreements, Understandings and Committees section of this Plan.

EMERGENCY COORDINATOR

The District Emergency Management Coordinator for the North West Metropolitan Emergency Management District is the WA Police District Superintendent.

The Local Emergency Coordinator will be the Officer in Charge of the Police Sub-District in which an emergency incident occurs. The WA Police sub-districts located within the Cities of Wanneroo and Joondalup are:

- Two Rocks Police Sub-District
- Clarkson Police Sub-District
- Joondalup Police Sub-District
- Wanneroo Police Sub-District
- Hillarys Police Sub-District
- Warwick Police Sub-District

EMERGENCY COORDINATION CENTRE (ECC) MANAGEMENT

During the occurrence of a major emergency event within the region it may be necessary to activate one of the following:

- An emergency coordination centre (ECC) through which requests for assistance and resources from the District or Local Emergency Coordinator, the HMA, a combat agency or support agency can be recorded and managed.
- An incident (or operations) control centre (ICC) from which a Local Emergency Coordinator, HMA or combat agency could coordinate the response to an emergency incident and establish an Incident Management Group (IMG);
- A coordination centre for emergency recovery operations during and after an emergency incident. This could be used as a meeting point for a Local Recovery Committee or Local Welfare Committee, as required.

Organisations participating in the City of Wanneroo – Joondalup LEMC should provide personnel (eg. a Liaison Officer) and other resources to an emergency coordination centre as required by the Local Emergency Coordinator. Liaison Officers provided from each organisation are required to have sufficient authority (or the ability to gain rapid approval for resource commitment) to make resources held by that organisation and required in the emergency response operation available for use.

A 'primary' and multiple 'alternate' locations have been identified by the LEMC for use as a base for emergency response operations which may involve the establishment of an ECC, ICC or recovery coordination centre as outlined above. The following locations, if required and suitable, could be used for emergency coordination or support:

WA Police Warwick Police Complex 37 Eddington Road WARWICK WA 6024	**Primary Location**	9246 8333 (ph) 9246 8303 (fax)
City of Wanneroo Works Depot, Building 1 1204 Wanneroo Road ASHBY WA 6065	Alternative Location Second Preference	9400 4114 (ph) 9400 4152 (fax)
Joondalup SES Unit Winton Road JOONDALUP WA 6027	Alternative Location Third Preference	9345 1499 (ph) 9345 5186 (fax)
Wanneroo Police Station 1 Friars Drive SINAGRA WA 6085	Alternative Location Fourth Preference	Tel: (08) 9406 2222 Fax: (08) 9406 2240

PART TWO: PLANNING

A Local Emergency Management Committee has been established to overview, plan and test the local emergency management plan. Membership of the LEMC is representative of agencies, organisations, community groups and expertise relevant to the identified community hazards and risks and this Plan.

EMERGENCY RISK MANAGEMENT (ERM)

The City of Wanneroo/Joondalup LEMC has taken an 'all hazards' approach to the identification of potential emergency risk sources within the region. The list of emergency risk sources given in the 'Scope' section of these Arrangements has been adapted from Annex F of SEMC Policy Statement No. 7 with those listed being considered as the greatest current priority for management within the North West Metropolitan District. The list of relevant hazards given in this document has also been developed using the All Western Australians Reducing Emergencies (AWARE) community risk management process. Relevant local emergency risks and their potential treatment strategies were developed through the AWARE process.

EMERGENCY MANAGEMENT FUNCTIONS

The City of Wanneroo/Joondalup LEMC operates in line with the requirements of the Emergency Management Act (2005) with EM activities being coordinated through the 'PPRR' approach of:

PREVENTION AND MITIGATION

Organisations cooperating through the City of Wanneroo/Joondalup LEMC carry out a range of activities aimed at preventing the occurrence of emergency incidents and limiting the damage effects of incidents that may occur. These activities include:

- The enforcement of state legislation and local laws such as those relating to fire control and public health.
- Using Town Planning controls and engineering design to improve community safety and area design to limit emergency risk sources.
- Coordinating community education and awareness programs relating to community safety and the mitigation of the effects of emergency incidents.
- Ensuring the coordination of suitable maintenance programs aimed at limiting the communities emergency risk exposure.

PREPAREDNESS

The City of Wanneroo/Joondalup LEMC works to encourage the following emergency preparatory activities:

- The provision of an open forum for EM cooperation and familiarity.
- The development of appropriate plans for emergency response and recovery.
- Promotion of training opportunities for EM stakeholders.
- Coordination with appropriate volunteer organisations working in EM.
- Promotion of community information programs that raise awareness about emergency preparedness.
- Coordination of and participation in relevant emergency exercises and simulations
- Resourcing of a suitable emergency management capability among local EM stakeholders in line with their responsibilities. This includes the development and maintenance of emergency asset registers within the area.

PART 3: RESPONSE

The relevant Hazard Management Agencies (HMA) as nominated in Policy Statement Number 7 (Annexure F) are responsible for response activities within the boundaries of the Cities of Wanneroo and Joondalup and these HMA's maintain relevant operational response plans for the emergency risks and hazard types for which they are responsible.

The relevant local government hazard and support plans can be found in both the Cities Community Emergency Management Arrangements and these response activities will be carried out in line with the HMA operational plans and requirements.

ACTIVATION

As the City of Wanneroo and Joondalup LEMC is a non-operational emergency planning group the entire committee will not be activated in response to an emergency incident. Some LEMC attendees may be brought together ('activated') to assist with resource coordination or emergency response activities as required by the Local Emergency Coordinator.

The HMA involved in an emergency incident is responsible for notifying relevant agencies of the nature of the incident and activating (requesting) the resources from the agencies as required. All HMA's & Combat Agencies have a responsibility to advise the Local Emergency Coordinator of any emergency, or any potential emergency, which may occur.

Requests for additional support in combating an incident are normally made to the district or state level commands of the relevant combat or support agency. In the event of a major emergency, requests for additional agency resources are directed to the Operation Area Manager at district or metropolitan level or the State Emergency Coordination Group.

EVACUATION

The need for an evacuation from locations within the Cities of Wanneroo and Joondalup LEMC area will be determined by the HMA which would then advise the active Local or District Emergency Coordinator. An Evacuation Support Plan is included in the community emergency management arrangements for the two local governments.

Local and State Welfare Centres have been established in cooperation with the Department for Child Protection. These facilities have been selected as the best local alternative as short-term emergency accommodation in their respective area. These facilities should be the subject of agreements between the organisation managing the facility (often a local government) and the Department for Child Protection in line with their requirements for 'Local' and 'State Welfare Centres'.

Each respective facility manager is responsible for ensuring that the details relating to each Local or State Welfare Centre in the Local Welfare Plan are accurate and should forward any relevant changes to Local Welfare Coordinator as they become available. Enquiries relating to the requirements of a State or Local Welfare Centre should be directed to the Department for Child Protection regional office for the area in which the Centre is located.

Note – The LEMC's evacuation planning activities should also consider evacuation INTO this community should an emergency occur in a neighbouring region that requires evacuation into the Cities of Wanneroo and Joondalup area.

Refer to the Department for Child Protection Joondalup District Local Welfare Emergency Management Support Plan for the following;

- Local and State Welfare Centres
- Emergency accommodation alternatives

DEMOGRAPHIC DETAILS

Detailed descriptions of geographic and demographic areas covered by these arrangements are provided in City of Joondalup Community Emergency Management Arrangements and the City of Wanneroo Local Emergency Management Plan.

EVACUATION MATRIX

A relevant evacuation matrix is provided in the City of Joondalup Community Emergency Management Arrangements (see Section 7.2.5) and the City of Wanneroo Local Emergency Management Plan.

PART 4: RECOVERY

The Emergency Management Act (2005) designates local governments as the coordinating agency for the community recovery process following an emergency incident. The Cities of Wanneroo and Joondalup recognise that role and their responsibilities and will work to ensure that any local emergency recovery operation will be coordinated in line with the requirements of the following, as applicable:

- Westplan – Recovery.
- The City of Wanneroo Local Recovery Arrangements.
- The City of Joondalup Local Recovery Plan.
- The DCP Joondalup District Local Welfare Emergency Management Support Plan.

For any community emergency requiring the implementation of a local recovery plan the corresponding local government will activate a Local Recovery Committee to manage recovery efforts. The Local Recovery Coordinator will ensure the designated Local Emergency Coordinator (WA Police) is involved in and kept informed about emergency recovery activities as necessary. The specific responsibilities of the Local Recovery Coordinator are provided in the local recovery plan of the relevant local government.

The 'Partnering Agreement – Metropolitan North and East Recovery Group for the Provision of Mutual Aid for Recovery During Emergencies' establishes a means through which local governments can contribute material, personnel and financial resources, as capable and appropriate, to assist other signatories to that agreement. Provisions have been made for emergency welfare during the community recovery process, as outlined in the Joondalup District Local Welfare Emergency Management Support Plan. These provisions include arrangements for emergency accommodation, meal supply, evacuee registration and emergency financial support. Emergency recovery efforts will be aimed at assisting social, structural and environmental restoration within the local community.

PART 5: TESTING, EXERCISING AND REVIEW

TESTING / EXERCISING OF THIS PLAN

The Cities of Wanneroo and Joondalup LEMC views the testing of the Arrangements as critical to ensuring they meet the needs of local emergency management and in maintaining their relevance to current EM issues. The LEMC will test / exercise its Arrangements at least annually in line with the requirements of State Emergency Management Policies. Such exercises will be in discussion, functional (discussion in an operational environment with some EM functions carried out) or field (deployment of emergency functions in a simulated incident) form and can involve the implementation of small or large elements of the Local Emergency Management Plan.

Relevant EM stakeholders will be advised of the planning and staging of emergency exercises relating to this Plan and the operational emergency response plans of organisations participating in the LEMC. An invitation to participate will be extended to LEMC member organisations by the agency coordinating an emergency exercise to ensure the maximum number of local EM stakeholders can benefit from the exercise. Emergency management exercise outcomes will be a key input into the regular review of this Plan.

REVIEW OF THIS PLAN

The Cities of Wanneroo and Joondalup LEMC will fully review and amend (as necessary) this Plan in line with the requirements of State Emergency Management Policies and the Emergency Management Act (2005) as follows:

- Contact lists are reviewed and updated quarterly.
- This Plan is reviewed and amended as necessary after an exercise or emergency incident during which the Local Emergency Management Plan was implemented.
- After any training that implements this Plan or that signifies a required change to this Plan.
- When changes to local geographic, demographic, environmental or climatic conditions create a need for a review.
- At least every five (5) years.
- When any other circumstances occur that may require and immediate or more frequent review of the Local Emergency Management Plan.

Minor amendments in line with legislative, EM policy and operational changes will be carried out by the LEMC, through its executive committee, as necessary to keep this Plan current. LEMC participant organisations will monitor contemporary EM issues and strategies and work to ensure the LEMC's Local Emergency Management Plan remains relevant in line with changes in the EM operating environment.

Suggestions for amendments to this Plan can be submitted by a representative of any of the organisations participating in the LEMC and should be tabled formerly at a LEMC meeting through inclusion on the meeting Agenda.

As the Emergency Management Act (2005) assigns responsibility for developing and maintaining the Local Emergency Management Arrangements to local government, it will be these organisations that determine the final information included in any amendment to this Plan.

PART 6: EMERGENCY CONTACT DIRECTORY

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