




Newcastle Environmental **Management Strategy** 2013



Production
Newcastle Environmental Management Strategy
prepared by the
Future City Group
of The City of Newcastle

Published by
The City of Newcastle
PO Box 489, Newcastle NSW 2300
Ph: 4974 2000 Fax: 4974 2222
Email: mail@ncc.nsw.gov.au
Web: www.newcastle.nsw.gov.au

December 2013
© 2013 The City of Newcastle

Table of Contents

1. Introduction.....	1
1.1 Newcastle Environmental Management Strategy	1
1.2 Preparation and Scope	2
1.3 How to use this document	2
2. Background.....	3
2.1 State and Regional Context	3
2.2 Integrated Planning and Reporting	5
2.3 Newcastle Community Strategic Plan.....	5
2.4 Local Government and the Environment	8
2.5 Environmental Activities	9
2.6 Environmental Assets.....	11
2.7 Best Practice Environmental Management	12
2.8 Council Environmental Policies, Strategies and Plans.....	14
3. Greater efficiency in the use of resources	17
3.1 Background and Achievements	17
3.1.1 Carbon	18
3.1.2 Water	19
3.1.3 Waste	19
3.2 Issues and Challenges	20
3.2.1 Carbon	20
3.2.2 Water	20
3.2.3 Waste	20
3.3 Appraisal of issues and their management	21
4. Our unique natural environment is maintained, enhanced and connected	24
4.1 Background and Achievements	24
4.2 Issues and Challenges	28
4.3 Appraisal of issues and their management	29
5. Environment and climate change risks and impacts are understood and managed	33
5.1 Background and Achievements	33
5.2 Issues and Challenges	34
5.3 Appraisal of issues and their management	35
6. Strategies and Implementation	38
7. Glossary	47
8. References	49
Appendix	
Appendix A – Snapshot of Achievements from 2003 NEMP	52
Appendix B – Key Planning Documents	53
Appendix C – Environmental Forums	56
Appendix D – Selected Reading	58



List of Figures

Figure 2-1 Integrated Planning Framework.....	7
Figure 2-2 Land Use Categories within Council's care and control	12
Figure 2-3 Example of MER and the adaptive management cycle (from DECCW, 2010).	13
Figure 2-4 Example of suggested direction provided from the release of the Newcastle Green Corridor and Landscape Precincts Plan (TCoN, 2005).....	14

Abbreviations

CSP	Community Strategic Plan
CWMAP	Carbon and Water Management Plan
DCP	Development Control Plan
EEC	Endangered Ecological Community
ESD	Ecologically Sustainable Development
IPR	Integrated Planning and Reporting
LEP	Local Environmental Plan
LGA	Local Government Area
NBS	Newcastle Biodiversity Strategy
NEMP	Newcastle Environment Management Plan
NEMS	Newcastle Environmental Management Strategy (this document)
NGO	Non-Government Organisation
NCFRMSP	Newcastle City-wide Floodplain Risk Management Study and Plan
PoM	Plan of Management
SEI	Stream Erosion Index
TCoN	The City of Newcastle
WSUD	Water Sensitive Urban Design

1. Introduction

In 2011 Council adopted the Newcastle 2030 Community Strategic Plan (CSP), a shared community vision for our city. The CSP represents what we value as a community and our aspirations for the city. Preparation of the CSP identified that as a community we seek a sustainable natural environment, where the use of the community's resources improve the quality of life both now and in the future, in a way that maintains the ecological processes on which life depends.

The plan states that:

- We value the biodiversity and ecosystems of our city and want to preserve and enhance the natural attributes and the species that live in them, acknowledge and believe it imperative that we address our vulnerability to climate change by building our resilience and seek to reduce our carbon footprint and move towards renewable energy options including wind, solar and harnessing landfill gas
- That we recognise the need to understand and proactively address environmental risk such as flooding and coastal erosion, better access to local produce, with improved connections to the 'Hunter Valley food bowl', community gardens in our neighbourhoods and produce-producing plants and trees in our parks and along our streets
- We want more connection with nature, with a greener more enriching environment, where natural areas are preserved and enhanced and bushland and our urban forest are maintained, enhanced and connected. We want greater efficiencies in the use of our valuable energy and water resources and a reduction in waste. A clean and healthy environment, with clean air and access to nature, clean water and fresh food

Council, residents, the business community, government agencies and community groups all play a role in achieving the CSP objectives.

Seven strategic directions have been identified to guide the city forward being:

- Connected City
- Vibrant and Activated Public Places
- Caring and Inclusive Community

- Liveable and Distinctive Built Environment
- Protected and Enhanced Environment
- Smart and Innovative City
- Open and Collaborative Leadership

The Newcastle Environmental Management Strategy (the Strategy) is intended to direct Council's contribution to the strategic direction 'Protected and Enhanced Environment'.

1.1 Newcastle Environmental Management Strategy

The Strategy has been prepared to define how Council aims to meet the challenge of achieving the community's environmental vision. Within the strategic direction 'Protected and Enhanced Environment', the CSP defines three core environmental objectives.

These are:

1. Greater efficiency in the use of resources
2. Our unique natural environment is maintained, enhanced and connected
3. Environment and climate change risks and impacts are understood and managed

The Strategy provides an overall framework for environmental management within Council to:

- ensure alignment with the CSP
- identify our legislative responsibilities
- bring together existing programs and present a consolidated overview of Council's environmental activities
- refine environmental objectives and strategies
- celebrate past achievements
- identify gaps, new issues and priorities

The Strategy deliberately focuses on the responsibilities, activities and functions that are within Council's direct control or ability to significantly influence. Specific strategies for other organisations and the community have not been provided, but the document may be used by others to better understand Council's role, achievements and future direction.

The Strategy is intended to be a 'live' document not static. Improvements and changes to the document are expected overtime as strategies are implemented, new directions are identified, to accommodate change in Council structure and as funding opportunities arise.

1.2 Preparation and Scope

The Strategy has been prepared primarily through internal consultation, working groups and holding workshops with Council staff. An online voluntary survey and a series of workshops were held to provide an opportunity for Council staff from across the organisation to identify and assess key environmental issues. The Strategy also draws upon the extensive community and external stakeholder consultation undertaken for the CSP, previous studies, plans and policy and the suite of relevant national and state legislation.

The Strategy will be appraised annually with a major review undertaken every four years. This review will allow any new directions set by Council, plus information gathered through research and monitoring, to influence and amend the objectives and strategies.

1.3 How To Use This Document

Understanding the range of environmental activities and responsibilities of Council, as well as past activities and initiatives, is challenging, more so when high staff turnover can result in a loss of corporate knowledge. The Strategy to some degree ameliorates this issue by providing a reference platform which can be built upon in coming years and a guide to the future direction of Council's environmental activities.

Section 1 Introduction describes the background to the Strategy, how the document was prepared and structure of the report. **Section 2** Background provides information on the range of environmental responsibilities and activities of Council, including the role of other agencies in the region and key state and regional planning documents.

Section 3 (Greater efficiency in the use of resources), **Section 4** (Our unique natural environment is maintained, enhanced and connected) and **Section 5** (Environment and climate change risks and impacts are understood and managed) provides a brief description of the issues considered under the objective, describes some of the achievements of Council in recent years and provides discussion on future challenges including a synopsis of current issues against the existing and proposed planning framework within Council.

Section 6 Strategies and Implementation provides a list of strategies for achieving the three core objectives including information on the lead functional area of Council to oversee delivery of the strategy, supporting documents, resources for implementation, timeframe for delivery, linkages to existing documents and expected deliverables.

2. Background

2.1 State and Regional Context

There are a number of state and regional planning documents applicable to the Newcastle LGA that have been considered when preparing the Strategy. Key documents include:

NSW 2021: A Plan to make NSW Number One (DPC, 2011) is the principle strategic plan for delivering the vision for NSW. Environmental directions for the Hunter considered include improving environmental outcomes for native vegetation, biodiversity, land, rivers and coastal waterways (including improved water quality).

The **NSW Waste Avoidance and Resource Recovery Strategy** (DECC, 2007) provide guidance and priorities for action to ensure that efficient resource use and impacts on the environment are considered throughout the life cycle of goods and materials. This includes extraction of raw materials, manufacturing, distribution, consumption and recovery for reprocessing or safe disposal.

The **Lower Hunter Regional Strategy: 2006-2031** (DP, 2006) is the NSW Government's 25-year land use strategy for the Hunter Region (DoP, 2006). The Regional Strategy applies to the period 2006–31 and is to be reviewed every five years. The next review is currently underway. The primary purpose of the Regional Strategy was to ensure that adequate land is available and appropriately located to accommodate the projected housing and employment needs of the region's population.

The document identifies a number of principles and policy directions to guide development in the Lower Hunter Region. The key environmental challenges for the Region are to accommodate significant population growth whilst:

- Protecting and managing the biodiversity and conservation values of the key green corridors of the Region
- Maintaining or improving the biodiversity value of the Region
- Protecting the rural character and viable agricultural lands of the Region
- Protecting the mineral and coal resources of the Region.

The discussion paper **The Lower Hunter over the next 20 years** (DPI, 2013) is the first step in the development of a new regional strategy for the Lower Hunter. The document was developed to help frame the conversation around how the Lower Hunter should grow over the next 20 years. Importantly, it reflects the Government's new planning agenda as well as the priorities and decisions outlined in the NSW 2021 State Plan.

The Lower Hunter Regional Strategy is intended to work with the **Lower Hunter Regional Conservation Plan** (DECCW, 2009) to ensure that the future growth of the Hunter makes a positive contribution to the protection of sensitive environments and biodiversity.

This Regional Conservation Plan (RCP) sets out a 25-year program to direct and drive conservation planning and efforts in the Lower Hunter Valley (DECCW, 2009). It is a partner document to the Government's *Lower Hunter Regional Strategy* that sets out the full range of Government planning priorities, and identifies the proposed areas of growth. The RCP is focused on the next 25 years and seeks to establish a framework to guide conservation efforts in the Lower Hunter.

The principles of biodiversity planning adopted in the RCP are:

- to improve or maintain ecological processes and the dynamics of terrestrial ecosystems in their landscape context
- to improve or maintain viable examples of terrestrial ecosystems throughout their natural ranges
- to improve or maintain viable populations of the various biological organisms throughout their natural ranges
- to improve or maintain the genetic diversity of the living components of terrestrial ecosystems.

The key priorities for biodiversity planning in relation to improving or maintaining biodiversity values are:

- the first priority – to avoid losses to biodiversity and promote protection of biodiversity values in situ
- the second priority, where the first priority is unachievable – to mitigate adverse impacts to biodiversity
- as a last resort, compensate for unavoidable losses to biodiversity.

The **Hunter-Central Rivers Catchment Action Plan 2013-2023** (HCRCMA, 2013) guides the management and protection of the natural resources in the Hunter-Central Rivers region.

The **Newcastle-Lake Macquarie Western Corridor Planning Strategy** (DP, 2010) identifies infrastructure and planning requirements to assist future urban development and conservation within the western corridor.

The **Hunter Central Coast Regional Environmental Management Strategy** (HCCREMS) is essentially a framework developed to guide and coordinate the efforts of 14 member councils in addressing a range of environmental issues that are best managed within a strategic regional context. The HCCREM Strategic Plan 2013-2015 (in prep) is reviewed and updated every three years.

Council is required to act within the NSW legislative framework¹. The following list is provided to give an overview of the legislation that Council must consider either by outlining the powers that Council may have or Council legal obligations.

- *Catchments Management Authorities Act 2003*
- *Coastal Protection Act 1979*
- *Companion Animals Act 1998*
- *Contaminated Land Management Act 1997*
- *Crown Lands Act 1989*
- *Environmentally Hazardous Chemicals Act 1989*
- *Environmental Planning and Assessment Act 1979*
- *Environmental Planning and Assessment Regulation 2000*
- *Fisheries Management Act 1994*
- *Forestry Act 1916*
- *National Parks and Wildlife Act 1974*
- *National Greenhouse and Energy Reporting Act 2007*
- *Newcastle Local Environment Plan 2012*
- *Noxious Weeds Act 1993*
- *Pesticides Act 1999*
- *Protection of the Environment Operations Act (POEO Act) 1997*

- *Protection of the Environment Operations Clean Air Regulation 2010*
- *Protection of the Environment Operations (Waste) Regulations 2005*
- *Public Works Act 1912*
- *Roads Act 1993*
- *Rural Lands Protection Act 1998*
- *Rural Fires Act 1997*
- *Soil Conservation Act 1938*
- *SEPP Exempt and Complying Development Codes 2008*
- *SEPP 14 Coastal Wetlands*
- *SEPP (Infrastructure) 2007*
- *SEPP 71 (Coastal Protection)*
- *SEPP 55 (Remediation of Land)*
- *SEPP (State and Regional Development) 2011*
- *SEPP (Major Development) 2005*
- *SEPP (Mining Petroleum Production & Extractive Industries) 2007*
- *SEPP Basix 2004*
- *Threatened Species Conservation Act 1995*
- *Trees (Disputes between neighbors) Act 2006*
- *Waste Avoidance and Resource Recovery Act 2001*
- *Water Management Act 2000*

¹ Note that the *Native Vegetation Act 2003* does not apply to the Newcastle LGA

2.2 Integrated Planning and Reporting

Under changes to the *Local Government Act 1993* in 2010, Integrated Planning and Reporting (IPR) was implemented in NSW which introduces longer term strategic planning for Councils in collaboration with their communities, allowing consultation regarding funding, service levels and sustainability for their local government area.

The framework introduces quadruple bottom line reporting providing a more holistic focus for strategic planning processes under economic, social, environmental and governance areas. The fundamental principle of the IPR Framework is the sustainability of communities and Local Government in Australia through longer term strategic planning in collaboration with our communities.

Key documents to be developed within the IPR Framework include:

- 10 year Community Strategic Plan
- 4 year Delivery Program and Operation Plan
- Long Term Financial Plan
- Asset Management Strategy
- Workforce Management Plan

2.3 Newcastle Community Strategic Plan

The Community Strategic Plan (CSP) (TCoN, 2013) is a long-term community vision developed as a guide to inform policies and actions throughout the city for the next twenty years. The vision is that:

“In 2030 Newcastle will be a Smart, Liveable and Sustainable City. We will celebrate our unique city and protect our natural assets. We will build resilience in the face of future challenges and encourage innovation and creativity. As an inclusive community, we will embrace new residents and foster a culture of care. We will be a leading lifestyle city with vibrant public places, connected transport networks and a distinctive built environment. And as we make our way toward 2030, we will achieve all this within a framework of open and collaborative leadership.”

Council, residents, the business community, government agencies and community groups all play a role in implementing the actions within the CSP. Seven strategic directions have been identified to guide the city forward:

- Connected City
- Vibrant and Activated Public Places
- Caring and Inclusive Community
- Liveable and Distinctive Built Environment
- Protected and Enhanced Environment
- Smart and Innovative City
- Open and Collaborative Leadership

Objectives and strategies for the direction and expected outcomes are as follows.

Objective

2.1 Greater efficiency in the use of resources

No.	Strategies	Responsibility	Key Partners	Community Outcomes
2.1a	Improve waste minimisation and recycling practices in homes, work places, development sites and public places	The City of Newcastle	Together Today, NSW Government	<ul style="list-style-type: none"> • Sustainable supply and use of water • Improved air quality • Sustainable use of resources • Achieving a reduction in waste generation and turning waste into recoverable resources • Increased use of renewables
2.1b	Investigate and implement alternative energy technologies, such as wind, tidal, solar and harnessing landfill gas	Federal Government	Energy Australia, NSW Government, Energy research organisations	
2.1c	Educate, promote and support low consumption, sustainable lifestyles	The City of Newcastle	Together Today, Transition Towns, NSW Government	
2.1d	Maximise water efficiency and recycling through water sensitive urban design, capturing stormwater, encouraging substitution of potable water with alternative supply and improving water usage behaviour	Hunter Water	The City of Newcastle, NSW Government	

Objective

2.2 Our unique natural environment is maintained, enhanced and connected

No.	Strategies	Responsibility	Key Partners	Community Outcomes
2.2a	Encourage and support active community participation in local environmental projects	The City of Newcastle	Landcare NSW	<ul style="list-style-type: none"> • Preserved and enhanced natural environment • Protection of biodiversity • Bushland and urban forest maintained • Appropriate access to natural areas
2.2b	Protect and rehabilitate degraded and fragmented natural areas and manage major impacts on corridors, remnant bushland, estuaries and coastal areas	The City of Newcastle	Hunter-Central Rivers CMA	
2.2c	Protect the diversity of flora, fauna and ecological communities, with a particular emphasis on threatened species and endangered ecological communities		Hunter-Central Rivers CMA, NSW Government	
2.2d	Ensure that future land use planning and management enhances and protects biodiversity and natural heritage	NSW Government	The City of Newcastle	
2.2e	Improve environmental monitoring and reporting	NSW Government	Hunter Councils, The City of Newcastle	

Objective

2.3 Environment and climate change risks and impacts are understood and managed

No.	Strategies	Responsibility	Key Partners	Community Outcomes
2.3a	Develop and communicate a clear understanding of environmental and climate change risks	The City of Newcastle	Federal Government, NSW Government	<ul style="list-style-type: none"> • Reduce vulnerability to climate change • Community awareness and preparedness of potential risks
2.3b	Build community readiness by engaging the community in risk management processes including the development and implementation of action plans	The City of Newcastle	NSW Government	
2.3c	Ensure that all actions, decisions and policy response to climate change remains current and reflects capacity, community expectations and changes in environmental and climate change information	The City of Newcastle	Federal Government, NSW Government	

Source: CSP, 2013.

Strategic planning documents are being prepared for each of the seven strategic directions. These planning documents will ensure alignment with the CSP.

Figure 2-1 shows the integration of these key planning documents.

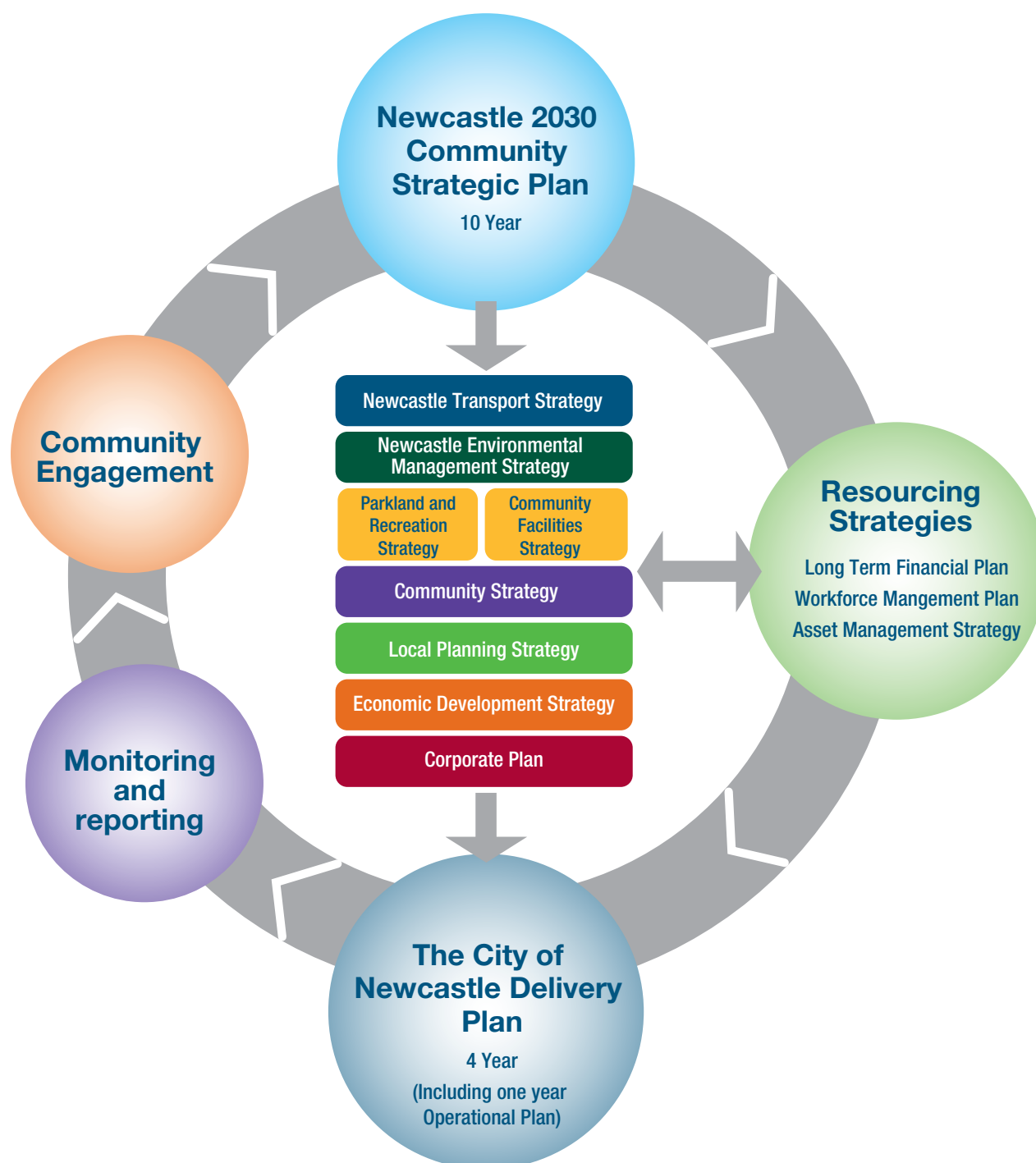


Figure 2-1 Integrated Planning Framework

2.4 Local Government and the Environment

The NSW *Local Government Act 1993* Section 8 details Council's charter in respect to the environment as:

“To properly manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible, in a manner that is consistent with and promotes the principles of ecologically sustainable development.”

Local government has a range of functions, powers and responsibilities based on delegated powers that can influence environmental management on both private and community land. These include:

- Monitor and enforce compliance with environmental regulation
- Strategic and statutory planning including settlement and land use strategies, land use zonings and provisions or clauses in Local Environment Plans (LEPs) and Development Control Plans (DCPs)
- Development assessment including conditions of consent and development contributions
- Flood and coastal hazard planning
- Preparation of Plans of Management (PoM) for community land
- Management of community lands and open space (e.g. playing fields, parks and reserves, bushland)
- On-ground works including site-based rehabilitation projects, renewal and management of street and park trees, tree planting/revegetation projects/bush regeneration, roadside vegetation management, noxious and environmental weed control, wetland and/or water body restoration, water quality monitoring and stormwater management and control

- Incentive programs such as rate rebates and acquisition programs for environmentally significant lands
- Community engagement including education, information (brochures, website, fact sheets), community feedback, community focus groups, community standing advisory committees, and partnerships with local community groups and volunteers
- Waste education, collection, resource recovery and disposal
- Asset management (construction, maintenance, renewal) of Council assets such as stormwater quality infrastructure
- Fostering and participating in partnering opportunities
- Advocacy and representation, for example lobby for Council's and the communities interest and seek external funding for programs

There are many government and statutory agencies, non-government and community organisations which have an important role in managing and addressing environmental issues within the Newcastle region. It is recognised that the effectiveness and scale of many environmental initiatives relies heavily on establishing partnerships, cooperation and funding arrangements with other stakeholders. Where appropriate, Council will continue to seek and welcome opportunities for collaboration, sharing information and exchange of specialist skills and knowledge.

For many environmental issues, it must be recognised that Council is not the lead authority, statutory authority having been delegated to other levels of government. For such matters, Council's role may be limited to representing the community through collaboration and advocacy. Table 2-1 documents some of the core activities undertaken by state agencies and other organisations which are not Council's primary responsibility.

Table 2-1 Key environmental activities undertaken by state agencies and non – government agencies

Agency	Activity
Catchment Management Authority	Vegetation Management
	Floodplain Mitigation and Education
	Catchment Management
Department of Primary Industries	Agriculture and Biosecurity
Department of Planning and Infrastructure	Major Development
Environment Protection Authority	Air Quality
	Licensed Discharges
	Pollution Incidents
	Waste Resource Recovery
	Legislation and Administration
Hunter Water	Reticulated water supply
	Wastewater management
	Major trunk stormwater channels
Newcastle Port Corporation	Newcastle Port
	Harbour Dredging
National Parks and Wildlife	National Parks and Reserves
NSW Aboriginal Land Council	Maintenance and enhancement of Aboriginal culture, identity and heritage
NSW Fisheries	Fisheries and Aquatic Habitat
Office Environment and Heritage	Sustainability, biodiversity, native vegetation, coastal protection, floodplain management and Aboriginal cultural heritage, grants
Roads and Maritime Service	Boating safety and licensing
Office of Water	Water Extraction
	Watercourse
	Ground Water
Rural Fire Service	Bushfire Emergency Response
State Emergency Service	Flood Emergency Response
	Rescue
WIRES	Rescue or care for injured wildlife

2.5 Environmental Activities

The City of Newcastle owns and operates a vast range of facilities, including administration buildings, libraries, aquatic centres, parks, childcare centres, cemeteries, community halls, works depot, Civic Precinct, Newcastle Art Gallery, Newcastle Regional Museum, Fort Scratchley and Summerhill Waste Management Centre.

In delivering our services, Council is a major consumer of resources such as energy and water. Council has a responsibility to prevent or minimise the environmental impact of its operations and the ongoing rehabilitation of the environment wherever possible. Sustainability is

an ongoing challenge but there are many opportunities for improvement that benefit the environment and enhance our financial sustainability.

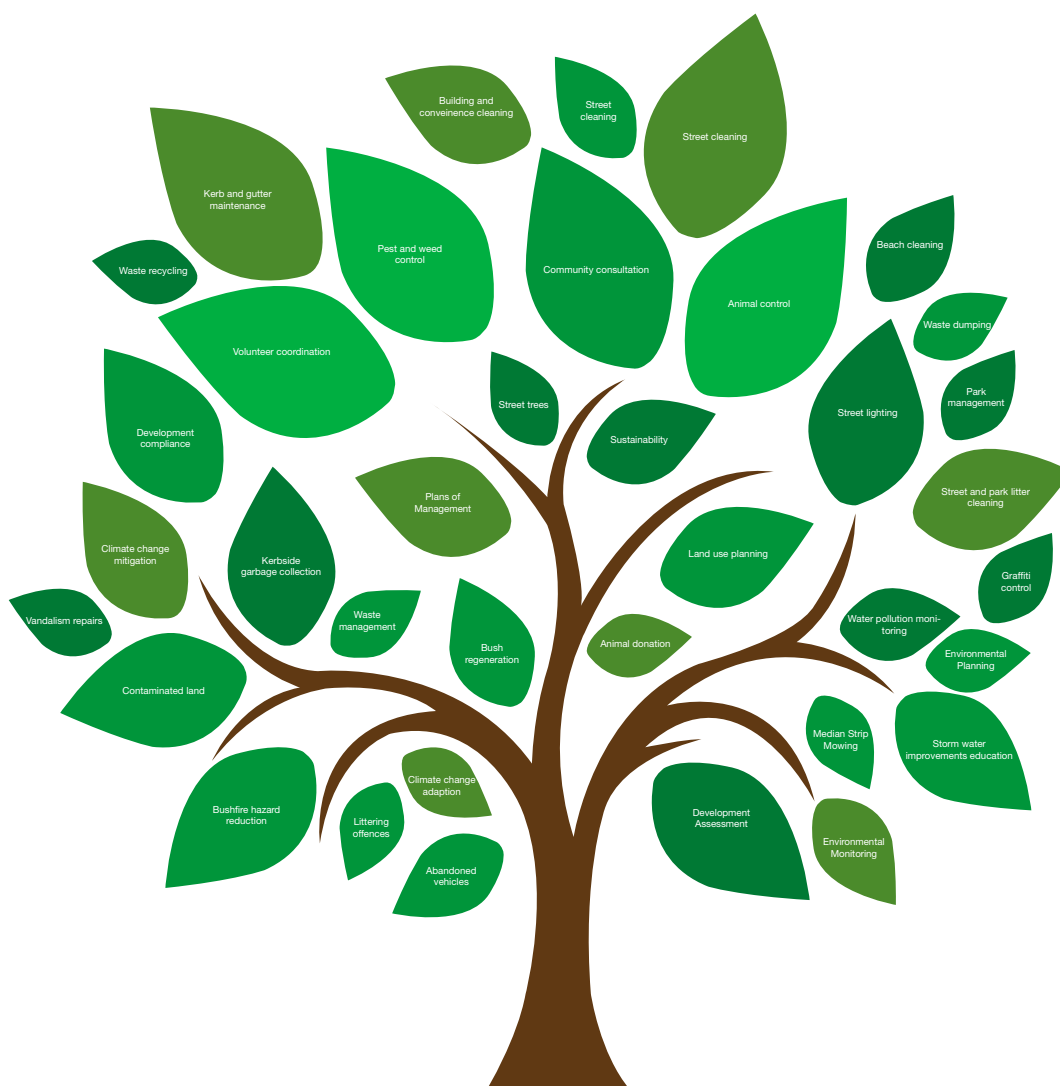
Council is also responsible for planning, undertaking, managing, supporting and regulating a wide range of activities that may impact upon the environment including working within and/ or enforcing environmental legislation for land use planning, environment protection and public health. The *Local Government Act 1993* (LGA Act) sets the broad legal requirement for local government to ensure their operational activities are carried

out in an environmentally responsible manner (i.e. statutory requirement). The current review of the *Local Government Act 1993* by the state government may see future amendments to the Act which may influence the responsibilities and approach of Council on land management issues.

The primary vehicle for controlling development, the Newcastle Local Environment Plan (LEP) is a legal instrument that comprises a written document and accompanying maps that imposes standards to control development and achieve the objectives of the *Environmental Planning and Assessment Act 1979*. The Newcastle Development Control Plan (DCP) and associated technical manuals are provided primarily to assist with the preparation of development applications in line with the LEP and includes direction for issues such as flooding, bushfire, soils, land and tree management, stormwater, energy and water efficiency and waste management.

Non-statutory activities may also be undertaken or funded by Council if they have a community or environmental benefit, community support or an elected Council directive but defining statutory or non-statutory activities can be challenging as some activities may appear non-statutory but indirectly address statutory requirements. For example, one of the core objectives for the management of community land categorised as a natural area is to conserve biodiversity and maintain ecosystem function (s36e *Local Government Act 1993*) which may require environmental weed and pest management, erosion control, revegetation, education and monitoring to meet this objective.

Key environmental activities undertaken by Council include:



The City of Newcastle environmental programs and services generally reflect the statutory and policy frameworks established in the Act. The principal functions of Council in relation to environmental management include:

- Vegetation management (e.g. roadside vegetation, noxious weeds, parklands)
- Biodiversity and landscape management (e.g. threatened species conservation, rehabilitation of degraded sites, volunteer coordination)
- Flood mitigation and floodplain management (e.g. Floodplain Risk Management Plans)
- Estuary and coastal management (e.g. Coastline Management Plans)
- Land use planning (e.g. zoning, Local Environmental Plans, Plans of Management)
- Development and building controls of nearly all activities and works on freehold and crown land
- Pollution control and environmental management of land, water and air (including public health issues)
- Construction and maintenance of infrastructure (e.g. roads and bridges, cycleways, street lighting, drainage systems, recreation/leisure facilities)
- Waste management (e.g. kerbside collection and disposal)
- Stormwater quality and drainage management (part)
- Sustainability and climate change mitigation and adaptation (e.g. reducing greenhouse gas emissions, renewable energy sources, sea level rise planning)
- support and participation in a range of inter-agency forums which advise, identify, fund, research, train, educate and develop management actions on a wide range of environmental topics. Appendix C provides a list of such forums in the Lower Hunter region

As a land manager, a planning authority, a regulator, an educator and asset owner, Council is often identified by the Australian Government as a key stakeholder in the delivery of programs and services that support delivery of their priorities. As the sphere of government with the most direct contact with the community, Council holds a position of substantial influence in delivering collaborative and effective environmental management programs.

These programs and services are not mandated however often reflect local management issues and thus offer mutual efficiencies and benefits to both parties. In most instances they are linked to funding programs, for example the Hunter-Central Rivers Catchment Management Authority Catchment Action Plan (HCRCMA, 2013) is linked to grant funds for undertaking initiatives which meet the objectives of the plan.

It's noteworthy that services provided by local governments have expanded in recent years but have not been matched by an equivalent increase in revenue, particularly when compared to the increased revenue for state and federal governments (LGSA, 2006). Financial sustainability is a basic necessity for Council. Expenditure on the environment is one of many competing priorities for Council. It's therefore vital that funding for the environment within Council is directed towards those issues and actions that have the highest environmental gains.

2.6 Environmental Assets

Across our local government area, Council is responsible for effectively managing the following assets to meet community service levels:

- 85 bushland parcels covering 570 hectares
- Over 60 kilometres of creeks
- 64 wetlands covering 210 hectares
- Over 16 000 stormwater pits
- Over 200 water quality improvement devices
- Over 500 kilometres of stormwater drainage
- 130 recreational parks
- 1,487 kilometres of kerbs and guttering
- 19 kilometres of retaining walls
- 8 kilometres of river walls
- 105,000 individual street and park public trees

Whilst Council has a major role in managing, supporting and regulating a wide range of activities that may impact upon the environment, Council also has the responsibility for the management of community land and infrastructure in its care and control. In addition to Council owned land, Council also has the responsibility to manage certain parcels of Crown Land in accordance to the *Crown Lands Act 1989*.

Figure 2-2 illustrates land use categories within Council care and control.

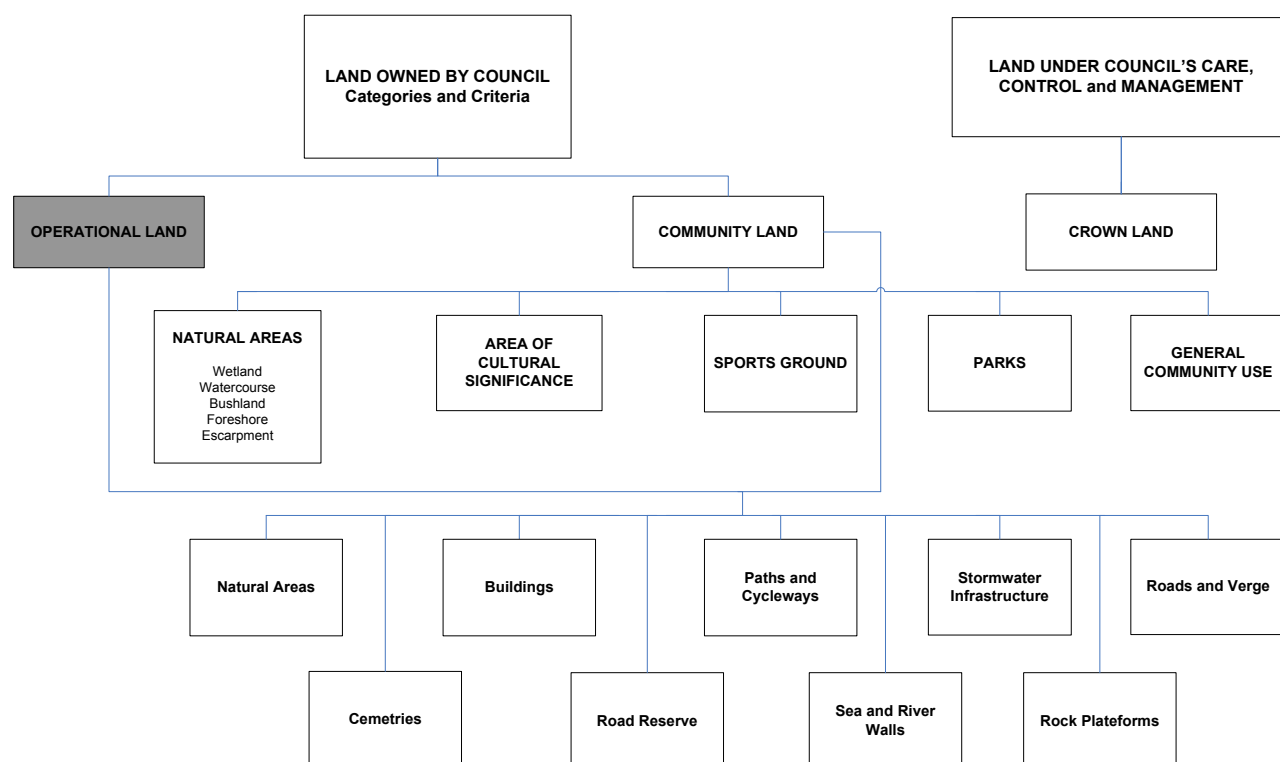


Figure 2-2 Land Use Categories within Council's care and control²

Land owned by Council can be classified as either operational or community land. Operational land has no special restrictions other than those that may apply to any piece of land. Operational land would ordinarily comprise land held as a temporary asset or as an investment, land which facilitates the carrying out by a council of its functions or land which may not be open to the general public, such as a works depot or a council garage.

Community land is usually land intended for public access and must be managed in accordance to the requirements of the *Local Government Act 1993*, such as the requirement for a Plan of Management.

Community land can be further classified into a number of categories that focus on the essential intent of the land. Community land within Newcastle sometimes has special attributes such as threatened species or communities which must be managed in accordance to the *Threatened Species Act 1995*, *Fisheries Management Act 1995* and *National Parks and Wildlife Act 1995*.

² Note that operational land and other land parcels such as roads, road reserves, cemeteries, drainage reserves and leased land may possess environmental values worthy of preservation and management

Council has significant investment in built infrastructure such as stormwater drainage which, through the provision of water quality improvement devices, helps improve the quality of stormwater discharged into the regions waterways, estuary and beaches. Environmental assets may also extend to measures to reduce potable water usage, energy usage and the installation of green energy supplies such as solar panels.

2.7 Best Practice Environmental Management

Council's approach to best practice focuses on fostering improvements in quality and promoting continuous learning. Principles for Best Practice Environmental Management include:

- Environmental awareness of Councillors and council personnel through education, training and ready access to information
- Effective governance framework including decision making and establishing strategic partnerships with key internal and external environmental stakeholders

- c) Measure and report environmental performance as part of a process of continual improvement, applying Monitoring, Evaluation and Reporting principles (MER) where applicable. MER enables program outcomes to be measured, evaluated and reported upon, and helps to improve our knowledge and practices
- d) Where appropriate, establish quantifiable performance indicators and targets. Targets should ideally set stretch targets so as to drive change (as opposed to business as usual), set dates for (a) baseline data as point of comparison and (b) a timeframe for the target to be met. Targets should be specific, measurable, achievable, realistic and timely (SMART targets)

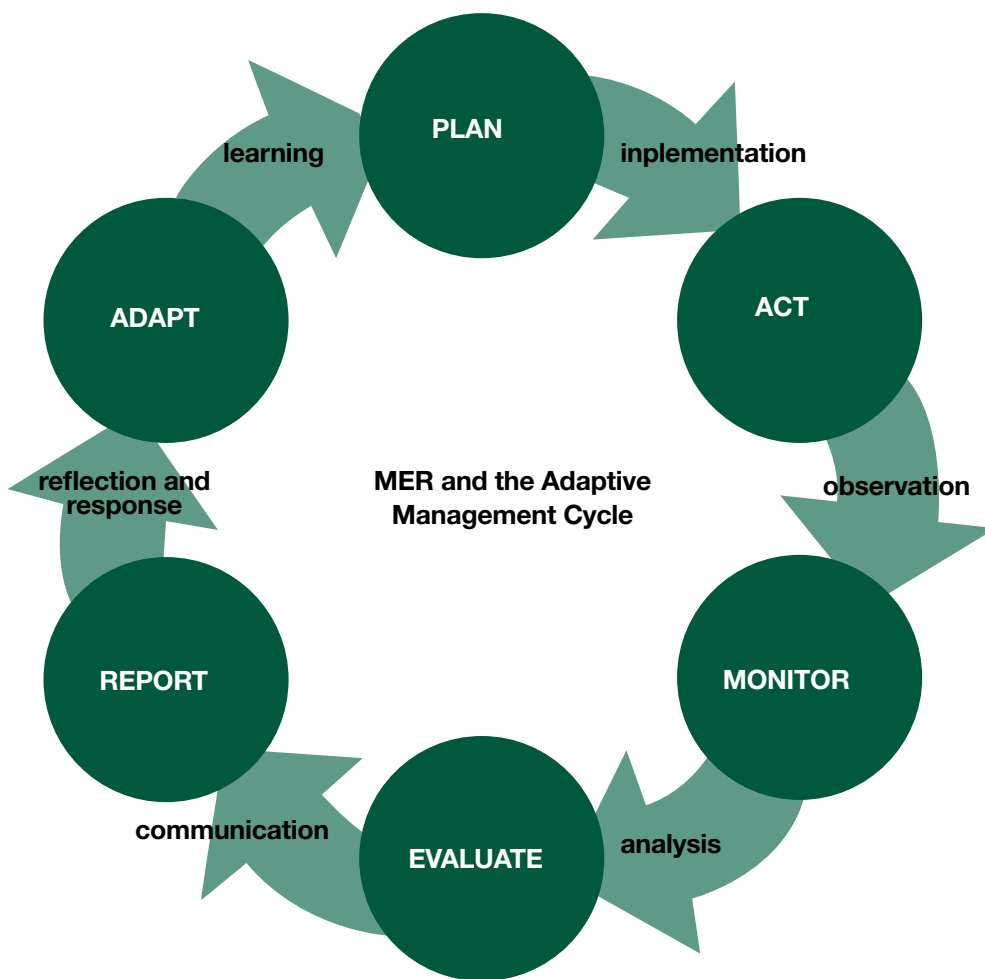


Figure 2-3 Example of MER and the adaptive management cycle (from DECCW, 2010).

2.8 Council Environmental Policies, Strategies and Plans

In 2003 Council adopted the Newcastle Environmental Management Plan (NEMP) as a framework to prioritise Newcastle's environmental issues and to guide planning and implementation of the identified priority actions in a coordinated and efficient manner (TCon, 2003). Today the initiatives and objectives of the 2003 NEMP have largely been achieved. Appendix A provides a summary of the key achievements of the NEMP.

Council has developed many environmental policies, strategies and plans over time relating to the environment. To maintain relevance, regular review and where appropriate amendment of core documents is usually undertaken within five years of preparation.

An example of the intended outcome is provided in Figure 2-4 using the Newcastle Green Corridor and Landscape Precincts Plan (TCoN, 2005a).

The purposes of such documents include:

- A statutory requirements, for example Plans of Management on Community Land
- A requirement to gain access to external funding, for example a Floodplain Policy or Study and Plan are a requirement to gain state funding for flood management activities
- Information to support access to both internal and external funding, for example the preparation of the Green Corridors and Landscape Plan in 2005 provided the basis for a grant from the NSW environmental trust for habitat corridor improvements
- Are an initiative of the elected Council
- Guiding information and direction to inform both staff and the community
- Supporting studies

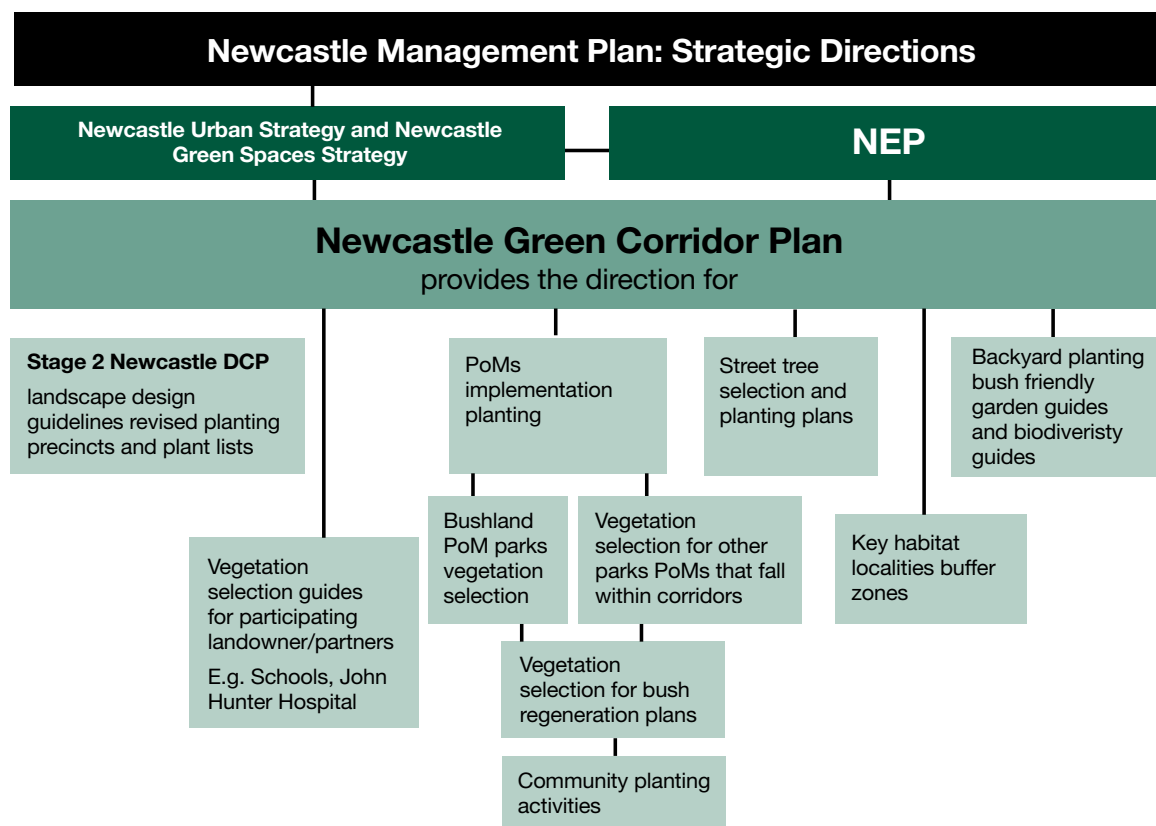


Figure 2-4 Example of suggested direction provided from the release of the Newcastle Green Corridor and Landscape Precincts Plan (TCoN, 2005a)

The following provides a summary of the key environmental documents guiding Council's activities. The majority of these documents are publicly available on Council's website. Further details of key document are provided in Appendix B.

Principal Document	Biodiversity Strategy 2006	Carbon & Water Management Action Plan 2011	Coastal Zone Management Plan 2003	Hunter Estuary Coastal Zone Management Plan 2009	Newcastle LEP 2012	Newcastle Solid Waste Management Strategy 1996	City-wide Floodplain Risk Management Plan & Study 2012	
	Green Corridors & Landscape Precincts Plan 2005	Climate Change Adaptation Plan	Coastal Zone Management Plan		Local Planning Strategy	Waste Management Plan	Floodplain Risk Management Plan & Study for the Wallsend Commercial Centre 2009	Stormwater Management Plan 2004
	Biodiversity Plan	GAIN 2001-2008 2001					Flood Planning Stage 1 – Concept Planning 2009	Water Sensitive City Vision
	Newcastle Bushfire Risk Management Plan 2012						Low Lying Suburbs Study	
	Street Tree Master Plan 2011	Climate Change Risk Assessment 2010	Coastal Zone Management Study	Hunter Estuary Management Study 2009	Development Control Plan 2012		Throsby, Cottage & CBD Flood Study 2008	Review of Stream Erosion Index 2013
Supporting Documents	Urban Forest Background Paper 2007	Newcastle Airshed Management Action Plan 2005	Newcastle Coastline Management Study 2003		Urban Forest Technical Manual 2013	Newcastle Energy and Water Savings Action Plan 2007	Dark Creek Flood Study 2008	Cottage Creek Catchment Gross Pollutant Study 2005
	Newcastle Public Bushland Asset Inventory 2010		Stockton Beach Coastal Processes Study 2006		Stormwater & Water Efficiency for Development Technical Manual 2013		Wallsend-Plattsburg Flood Study 2008	Stormwater Asset Management Plan 2012
	Vegetation Management Plans		Stockton Beach Sand Scoping and Funding Feasibility Study 2012		Contaminated Land Management Technical Manual 2012		Upgrade Lower Hunter Flood Model at Hexham 2008	
	Natural Assets Asset Management Plan 2012		Stockton Coastline Management Study 2009		Waste Management Technical Manual 2012		City Flash Flood Warning System 2008	
					Environmental Assessment Manual		Extreme Ocean Analysis 2008	
Policy	Biodiversity Policy 2006	Strategic Climate Change Policy 2010			Compliance Policy 2013	Waste Avoidance & Resource Recovery Policy 2010	Flood Policy 2004	Urban Water Cycle Policy 2004
	Urban Forest Policy 2008							
<div> <div>• Asset Management Policy 2012</div> <div>• City-wide Maintenance Policy 2012</div> <div>• ESD Procurement Policy 2008</div> </div>								
	Document still current							
	Document to be replaced							
	Document in preparation or to be prepared							

Document requires review (Scheduled or 5 years or older)

Document redundant



3. Greater Efficiency in the Use of Resources

This topic relates to the utilisation of natural resources. Non-renewable resources include metals, coal, gas and petroleum (which may be used for a variety of purposes such as energy production, fertiliser and medical products). Since their rate of formation is extremely slow, they cannot be replenished once they are depleted. Renewable resources such as timber and water, can be replenished at varying timeframes, whilst other such as sunlight and wind, are perpetual, available continuously, irrespective of consumption.

The over utilisation of certain resources, such as carbon emitting coal and petroleum, have been contributing to climate change, but also as they are depleted, the cost of extracting and using such resources increases. Reductions and changes in resource usage can derive both environmental and financial benefits. Sustainable development is a pattern of resource use that aims to meet our current needs while preserving the environment for future generations.

3.1 Background and Achievements

The State Environmental Planning Policy – Building Sustainability Index (BASIX) 2004 (the BASIX SEPP) and the Environmental Planning and Assessment Amendment (Building Sustainability Index (BASIX)) Regulation 2004 incorporated BASIX as a mandatory component in the development approval process ensuring that prescribed sustainability targets are achieved. The introduction ensured that all new residences included water harvesting, water efficient showers, toilets and taps and storm water retention.

Council has further strengthened the requirements for energy efficiency and water efficiency by incorporating specific elements into Council's Development Control Plan (see Appendix B) and developed technical manuals to provide guidance to residents and developers.

The *National Greenhouse and Energy Reporting Act 2007* required companies (including Councils) to report facility-level emissions data if their energy production, energy use, or greenhouse gas emissions are above certain thresholds. This information is used to inform the National Greenhouse Gas Inventory.

In 2008 Council prepared an Ecologically Sustainable Development (ESD) Procurement Policy (TCoN, 2008a). The objective of the Policy was to embed principles in Council's procurement process. Its aim is to give preference to procuring services or products that apply ESD goals to their design, manufacture or operation. The policy is applied to all relevant procurement decisions and is a factor in tender assessment criteria.

To achieve this, the Policy focuses on three ESD criteria for consideration in procuring services or products for Council. These objectives are:

- Waste Reduction
- Energy Efficiency
- Water Conservation

In 2011, Council adopted a Carbon and Water Management Action Plan (TCoN, 2011a). The plan was developed to lead our carbon mitigation and water management into the next decade. It includes a range of aspirational goals and stretch targets and details of Council's carbon emissions and water usage.

In partnership with Archicentre, Council also has recently piloted a free Sustainable Building Advisory Service to provide environmental advice at the initial design stage of residential developments. The pilot service involved an experienced architect providing an environmental assessment and scorecard which identifies sustainability features of the house or alteration including passive design, energy saving, water saving features and the potential financial savings. The provision of this service in the future is dependant on external funding.

The following discusses some of Council's achievements in terms of carbon, water and waste management.

3.1.1 Carbon

Since 1998, Council has been identifying opportunities to reduce resource usage internally and educate the residential, business and education sectors. The benefits of reducing usage are twofold; it reduces the emission of gases which contribute to Climate Change and potentially provides financial benefits, especially as the cost of energy climbs.

Council completed the delivery of its Greenhouse Action in Newcastle (GAIN) Plan 2001-08, with outstanding reductions in greenhouse gas emissions across the Newcastle LGA. Council achieved a 13.6% reduction in its greenhouse gas emissions below 1995 levels, despite having additional facilities and expanded operations during the measurement period. This achievement was assisted significantly through a 39% reduction in Council's electricity consumption. The investment in electricity efficiency projects totals an estimated \$3 million since 1995 and savings to date have been estimated at \$8 million since the project commenced.

Council has also implemented a number of successful Council, community, business and school projects as part of the GAIN Plan, including its world-first ClimateCam initiative. The ClimateCam suite of programs show households, schools, businesses and other councils how they can reduce their greenhouse gas emissions, while providing the Newcastle community with access to real-time information on the City's performance via the world-first greenhouse gas speedometer at www.climatecam.com. This work was awarded both Category Winner and the National Award for Excellence in the 2009 National Local Government Awards.

Key achievements include:

- Providing Green Energy Learning Programs to over 200 cities and towns throughout Australia and New Zealand
- Establishing the "ClimateCam for Schools" program which encourages 24,000 students from the 52 participating schools to improve their energy efficiency and recycling practices
- Creating the world's first greenhouse gas speedometer "ClimateCam" that provides hourly updates of the City's electricity usage and monthly carbon pollution estimates. A website tracks

monthly data for a number of parameters (http://www.newcastle.nsw.gov.au/environment/climate_cam/climatecam)

- Contributing to the consortium which resulted in the Australian Government awarding the \$100Million Smart Grid Smart City program to be undertaken in the Newcastle area
- The establishment of Australia's largest local government biodiesel program in 2002
- A reduction in Council's overall electricity consumption by 39% below 1995 year levels through extensive systematic retro-fits of community facilities
- The development of the Newcastle 2020 Carbon and Water Management Action Plan (2011) which sets aspirational goals and identifies actions to minimise carbon emissions up to 2020 but with a strong focus on the next three years

In June 2012 Council successfully applied for \$1.7m of funding under the Australian Governments 'Clean Energy Future' Community Energy Efficiency Grant Scheme. The project is called 'Newcastle Smart Buildings Smart Workforce'.

The Smart Buildings refers to 16 key energy efficiency projects across seven of our major sites:

- CAC - Lighting Upgrade and HVAC plant and control upgrade
- City Hall - Lighting Upgrade and HVAC plant and Control Upgrade
- Civic Theatre - Lighting Upgrade and Energy Dashboard - Automated Fault Detection/Tuning (CSIRO)
- Depot - Lighting Upgrade, Voltage Optimisation and Energy Dashboard - Automated Fault Detection/Tuning (CSIRO)
- Lambton Pool - Lighting Upgrade and Voltage Optimisation
- Newcastle Library - Lighting Upgrade, Double Glazing and Energy Dashboard - Automated Fault Detection/Tuning (CSIRO)
- Summerhill Waste Management Centre - Lighting Upgrade and Voltage Optimisation

The Smart Workforce program 'ClimateCam for Council' involved a series of projects and education around Council to encourage sustainable energy,

water, waste and liquid fuels work practices amongst our staff

Council provides monthly updates (available at www.climatecam.com) relating to the quantities of greenhouse gas emissions attributed to the city's consumption of electricity, water and gas, motor vehicle use and waste sent to landfill.

3.1.2 Water

Water audits have been undertaken at Council operated sites to identify financial and consumption saving opportunities. The audit identified the five biggest consumers of water to be Harbour Foreshore, No1 and No 2 sports grounds, Civic Park, Lambton Pool and Turton Road Works Depot. Proactive integration of ECO*STAR systematic retrofits have been completed at parks, pools, beaches, childcare centres, libraries, community facilities and surf clubs. The work included the replacement of shower heads and dual-flush toilets.

Water harvesting systems have been installed at the Harbour Foreshore, No1 & No2 sports grounds, Brickworks Park, Stockton Caravan Park, Gregson Park, Waratah Park, Adamstown Oval and the Beresfield Golf Course. Some irrigation systems have been fully upgraded to include variable speed pumps and a wetting agent injection system.

3.1.3 Waste

Council continues to seek to reduce waste generated within the Newcastle LGA through encouraging resource recovery and implementing such strategies as the third bin initiatives. However, Council has recognised the need for a landfilling site to responsibly manage wastes that cannot be recovered or recycled.

NSW's major economic instrument for waste, the Waste and Environment Levy (the Levy), was reviewed in 2005 and 2012 (see KPMG, 2012). An outcome of both reviews has been staged increases in the Levy so as to provide stronger incentives to reduce waste to landfill and to encourage increased resource recovery and recycling. Higher disposal costs are intended to help make innovative recycling and recovery waste processing options more attractive and competitive for potential investors and existing companies within the waste collection and reprocessing sectors.

The Levy also funds a substantial range of environmental programs, including an annual performance payments scheme for local government in the leviable area; to reward waste reduction and help deliver improved waste service performance standards.

- Council participates in waste management through the following functions:
- Providing kerbside collection services for residual domestic waste, green wastes and recyclables
- Providing waste disposal and resource recovery services at the Summerhill Waste Management Centre (SWMC)
- Processing and marketing recyclable materials under contract
- Planning and implementation of waste management projects within the LGA
- Landuse planning and development control within the LGA
- Community education and program delivery
- Collection of the Waste and Environment Levy and waste data on behalf of the NSW Office of Environment & Heritage

Council adopted a Solid Waste Management Strategy in 1996 in order to meet State waste legislation requirements. Ongoing programs flowing from the strategy include kerbside green waste and recycling collections, on-site resource recovery at Summerhill and the development of the Regional Waste Project. Recent initiatives have included domestic waste audits, the Chemical Cleanout program and E-Waste collections.

Two landfill gas power electricity generators were commissioned at Summerhill Waste Management Centre in 2009. Using gas generated from the breakdown of organic waste, the facility generates 18,000 megawatt hours of electricity every year whilst reducing methane emissions from the site. A similar project was investigated at the closed Astra Street site however the waste facility was at an age that gas extraction was not sustainable over the long term.

In 2010 Council adopted the Waste Reduction and Resource Recovery Policy which supports the NSW Waste Hierarchy. An example of initiatives in this area is the introduction of the green waste bin. In the first

year this resulted in an additional 10,000 tonnes of organics being collected from residential properties which were previously going to landfill.

Ongoing waste education has also improved practices throughout the community and resulted in a 14% reduction in waste collection between 2003 and 2011/12. In 2011, Council introduced the three bin system which aimed to reduce the amount of rubbish going to landfill and encourage residents to be more waste-aware by recycling more. Council is also looking at its own operations to divert waste from landfill such as recovery and reuse of concrete for construction projects.

Summerhill Waste Management Centre Stage 2 development, entailing the construction of additional landfill cells, was approved in July 2011 thus extending the life of the facility to beyond 2030.

3.2 Issues and Challenges

3.2.1 Carbon

The efficient use of finite resources will continue to be a significant focus for both Council and the community moving into the future. Although the rising costs of utility prices may be a strong motivator, our increased understanding of climate change science will make changing our existing practices a necessity. Actions to decrease greenhouse gas emissions have become more urgent.

The introduction of the Carbon Emissions Scheme (or alternatives) will increase research and investment in sources of renewable energy such as wind, solar and wave and energy efficiency. The availability and access to new and affordable clean technology and practices is predicted to grow dramatically over the next decade.

Peak oil³ is approaching and has the potential to have a significant impact to Council operations directly through increased costs of materials and energy used in council services and facilities. It also is likely to impact on Council operations indirectly through its impact on our community which is likely to change demand levels for Council services and facilities.

³ 'Peak Oil' refers to the time when the world reaches its maximum petroleum extraction and the remaining petroleum will be increasingly difficult and expensive to find and access.

3.2.2 Water

The Lower Hunter Regional Strategy predicts that an additional 160,000 people will reside in the Hunter by 2031. Such growth will increasingly place extra pressure on water resources. Water supply in the lower Hunter is considered highly vulnerable to drought as water levels can drop faster than in most other major Australian urban centres because storages are small or shallow and have high evaporation. Water supplies also face uncertainties due to possible climate change impacts.

The planning process to secure water for the Lower Hunter is currently underway. The Metropolitan Water Directorate within the Department of Finance and Services is leading development of a Lower Hunter Water Plan in close consultation with Hunter Water, other government agencies and the Lower Hunter community.

Regardless of the outcome of the Lower Hunter Water Plan, there remain many opportunities for improved water efficiency within Council which can help delay or prevent the need for future expansion of water infrastructure.

3.2.3 Waste

With expected urban development and population growth in the Lower Hunter in the coming decades, meeting State targets of increasing recovery and use of materials from the municipal waste stream will become increasingly challenging. Current management trends aim to minimise waste generation, then recover resources from any wastes produced, however, all current waste processing or resource recovery technologies produce a residual fraction which requires disposal to landfill.

The Carbon Emissions Scheme (CES) introduced by the Australian Government⁴ will have a significant financial impact on Council and hence the ratepayers of Newcastle due to local government's traditional role as landfill operators. The waste sector is included in the Scheme due to methane emissions from landfill. Methane is formed from the anaerobic decomposition of organic wastes. It is a potent greenhouse gas, with a global warming potential that is currently recognised

⁴ Subject to Go-vernment policy change but if amended is likely to still entail some form of user pays system

as being 25 times greater than CO₂. Emissions from the waste sector represent approximately 2-3% of Australia's total emissions.

Emissions resulting from landfilling of waste will occur over a 30-40 year period. This means that the disposal fee for waste accepted in year one must include an adequate provision to allow purchase and surrender of carbon credits for over 30 years based on a flexible, market-driven price for those permits.

3.3 Appraisal of Issues and Their Management

Comments received from the community during the preparation of the CSP and internal consultation during the preparation of the Strategy identified key issues in regards to the use of resources. The following table illustrates these key issues, and where each of these issues may be addressed within the existing planning documentation. Documents in bold reflect projects that are yet to be prepared but have been identified to be undertaken as part of this Strategy. These documents in part or fully address the issue by proposing actions or setting Council's position in relation to the issue.

Issue	ESD Procurement Policy (2008)	LEP and DCP	Climate Change Policy (2010)	Waste Avoidance and Resource Recovery Policy (2010)	Carbon and Water Management Action Plan (2011)	Water Sensitive City Vision and Strategy	Waste Management Review
Carbon sequestration					✓		
Climate change mitigation			✓		✓		●
Energy conservation	✓	✓			✓		
Energy generation and storage		✓			✓		
Liquid fuel management	✓				✓		
Peak oil					✓		
Sustainable purchasing	✓			✓	✓		
Waste management	✓	✓		✓	✓		●
Resource recovery				✓	✓		●
Waste education				✓	✓		●
Waste water re-use and recycling					✓	●	
Water conservation	✓	✓			✓	●	
Water harvesting		✓			✓	●	
Water sensitive urban design		✓			✓	●	

✓ Addressed partially, fully and/or consideration in review

● To be considered, developed and incorporated

For the majority of issues identified there are existing strategies and policies which can assist in managing the issue to varying degree.

Whilst carbon sequestration (carbon capture and storage) is identified as a management goal only within the Carbon and Water Management Plan, many of Council's goals in terms of maintaining and increasing urban forest and bushland management indirectly provide a mechanism by which to increase carbon capture in the LGA. Other opportunities, such as carbon forestry, are unlikely to be an option for Council due to the scale required to be financially viable and risk involved.

Peak oil is likely to impact on all aspects of council operations through increased costs of materials and energy used in council services and facilities. Peak oil is not currently imbedded into any specific strategy or plan within council though it is a consideration in the Carbon and Water Management Plan and the Transport Strategy (currently in prep). An appraisal of the issue in regards to Council activities is warranted.

The existing Carbon and Water Management Plan and the proposed Water Sensitive City Vision and Strategy have the potential to consider a range of water resource issues. Section 4.1 discusses the Water Sensitive Vision in more detail.

As space within the Summerhill facility diminishes, a long term challenge will be determining appropriate waste disposal beyond the life of Summerhill. The proposed Waste Management Review is intended to appraise the state of play in terms of Council's delivery of waste management services with the intent of developing a long term waste plan considerate of waste collection, waste disposal, resource recovery and education needs both within Newcastle and the wider region.



4. Our Unique Natural Environment is Maintained, Enhanced and Connected

As a coastal city located within the estuary of a major waterway, our region enjoys a comparatively rich variety of aquatic and terrestrial environments that support a diversity of habitats ranging from open ocean to estuary, rocky shores to mangrove forests, saline to freshwater wetlands, floodplains to uplands and coastal heath to bushland.

Our relatively high biological diversity is reflective of such habitat richness, wetland permanency (the region is an important drought refuge), our biogeographic setting (the region is recognised as an overlapping point between more northern tropical species and southern temperate species) and conservation measures to date. This natural heritage contributes to our quality of life and provides many social and economic benefits to our community.

Many of the ecosystems and species found here either permanently or episodically, are considered endangered or threatened under the NSW Threatened Species Act 1995 and Fisheries Management Act 1995 and Commonwealth Environmental Protection and Biodiversity Conservation Act 1999. The majority are highly mobile such as birds and bats but other groups are also represented including frogs, marine reptiles and mammals, terrestrial mammals, several threatened flora species and endangered ecological communities. Many of the migratory bird species are protected under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA).

The importance of local wetlands is reflected in RAMSAR listing of Kooragang Nature Reserve (in 1984 and now part of Hunter Wetlands National Park) and the Hunter Wetland Centre in 2002.

Biodiversity values are under pressure from a multitude of natural and human induced processes to varying degrees. The ongoing loss of biodiversity is a major concern at all levels of government and the community. As a major landowner of natural areas (bushland, wetlands, watercourse, escarpment and foreshore) and key planning authority, TCoN has responsibilities to recognise threatened species,

endangered ecological communities and key threatening processes. Council aims to support biodiversity conservation when undertaking the many and varied activities that comprise the role of local government. For more information on Newcastle's biodiversity, see the Newcastle Biodiversity Strategy (TCoN, 2006).

4.1 Background and Achievements

In the last ten years there have been many changes in terms of how the natural environment is both perceived and managed by local government, other agencies and the community. In recent years, whilst species specific or single site management still has an important role, there has been a growth in concepts such as urban forest, landscape and ecosystem scale management, ecosystem resilience, connectivity conservation and biodiversity offsetting. Understanding the future environmental risks posed by climate change have also become a priority at all levels of government.

Council can be justifiably proud of its many environmental achievements in the past decade. The environmental program has undergone significant growth over recent years with the emergence of new priorities, the application of new standards and shifting community expectations.

An environmental special rate between 2002 and 2007 underpinned a significant component of Council's environmental program and leveraged additional investment. Funds were used to deliver a wide range of environmental activities including planning, works, research and monitoring, community education and community action.

In 2005 Council adopted its Green Corridors and Landscape Precinct Plan (TCoN, 2005a) followed by the Biodiversity Strategy and Policy in 2006 (TCoN, 2006a). These documents continue to form the basis for natural area management, community engagement and funding applications.

The Hunter Estuary Coastal Zone Management Study and Plan (BMT, 2009) was adopted in 2009. The

Plan guides future planning and management of the Hunter Estuary. The Study and Plan were prepared in accordance with the NSW Estuary Management Manual, in partnership with the State Government, Port Stephens and Maitland Councils.

In 2007, natural assets were incorporated into Council's Major Asset Preservation Program (MAPP) thus ensuring funding for natural asset management is part of Council's standard operating expenditure.

Council now identifies 'natural asset' projects in its management plan, along with the traditional built asset requirements for the City. Natural assets are those that rely on natural systems for their performance. Examples of natural asset projects include bushland management, urban forest, coastal vegetation maintenance and creek rehabilitation works. To include natural assets in Council's management planning in this fashion acknowledges that natural assets, like their built counterparts, have a value, and require planned expenditure on maintenance and enhancement in order to sustain their serviceability, condition and functionality.

The Newcastle Urban Forest package has been prepared to respond to the need for a co-ordinated approach to the management of the existing urban forest and to provide direction for the enhancement and enlargement of the urban forest. The package includes:

- Newcastle Urban Forest Background Paper (TCoN, 2006b). The Background paper provides an outline of the principles of urban forestry, and provides an analysis of Newcastle's existing urban forest, including the problems and issues facing it
- Newcastle Urban Forest Policy (TCoN, 2008). The Policy provides goals and objectives to allow for a co-ordinated approach to the management of Newcastle's Urban Forest. The policy also contains four guiding principles that outline the roles and responsibilities for the management of the Urban Forest both for Council and for the community
- Newcastle Street Tree Masterplan (TCoN, 2011b) details the rationale and methodology underpinning street tree planting Newcastle
- Newcastle Local Environmental Plan. A number of changes to the Exempt and Complying provisions of the Newcastle Local Environmental Plan (LEP) to

reduce the regulatory burden currently associated with management of trees, primarily on public land

- Newcastle Development Control Plan - Tree Management. In order to provide a consistent and co-ordinated approach to the management of trees on private land an additional element has been prepared for inclusion within the Newcastle Development Control Plan
- Newcastle Urban Forest Technical Manual. The Newcastle Urban Forest Technical Manual provides technical guidelines to facilitate the objectives of both the Urban Forest Policy and the Development Control Plan. It is envisaged that the guidelines will be further refined and evolve over time

Public trees within parks and along streets are a major environmental asset, contributing to the urban forest that provides many environmental, health and social benefits. Considerable ongoing effort is required to manage public safety, tree health, maintenance and planning for replacement and expansion. Council has invested in effective planning tools, inspection and maintenance routines and renewal programs for this 'green infrastructure' just as it does for built assets.

Council currently has a tree replacement program under the banner of Living Streets. Living Streets is the communication and consultation component of the street tree program and urban forest policy which involves the planting of 30,000 trees across the Newcastle area by 2030. Living Streets central objectives are to create an awareness of the benefits of street trees and establish a sense of pride and ownership for trees in the local community. Living Streets engages Newcastle residents, schools and businesses in the management of street trees and supports the overall goals of the Newcastle Urban Forest Policy. It is anticipated that this program will provide for replacement trees required as a result of tree removal works.

Environmental education through programs such as 'Creeks Alive' and 'Roof to Creeks' has played a role in influencing environmental knowledge and behaviour. The participation in environmental management by community volunteers has continued to grow both in terms of participation and achievements. Further gains have also been achieved through community actions funded under Council's Community Small Grants program and through the activities of many community

and non-government organisations including Trees in Newcastle, the Hunter Wetlands Centre, Conservation Volunteers Australia and Hunter Bird Observers Club.

The Newcastle Streets to Sea program is aimed at improving catchment health through introducing the community to their local creek. The program offers residents an opportunity to take a close-up look at creek life, the tools to recognise problems and the support to run stream rehabilitation projects that will improve habitat and biodiversity.

Actions for management and control of weeds and feral animals include continued removal of Bitou Bush, an introduced and declared noxious weed, from beaches and coastal areas (and follow up revegetation) and continued control of a number of noxious aquatic weeds, especially in waterbodies that feed into or form part of important wetlands.

In recent years, weed management has become much more regionally focused in recognition of significant resource efficiencies and strategic outcomes that can be realised from assessing and managing weed risk at a regional landscape scale. This led to the preparation of the Hunter and Central Coast Regional Weed Strategy (HCCREMS, 2010). Traditionally weed management in Australia has tended to target a small number of priority species. Present-day approaches extended weed control to include all species and environments and provide a more coordinated strategic and less reactive model of weed control.

The increasing number and intensity of storm events is putting additional pressure on the stormwater network in Newcastle. Responsibility for the network is shared between Hunter Water and Council for open channels and stormwater pipes respectively. Council plans to operate and maintain the stormwater drainage asset network to achieve the following strategic objectives (from TCoN, 2012):

- ensure the stormwater drainage asset network is maintained at a safe and functional standard as set out in the asset management plan and asset planning documents
- ensure the asset set is maintained to meet statutory obligations eg environmental compliance and Australian standards for buried pipeline
- maintain stormwater drainage asset in a manner that is sustainable and ensures highest priority risk

is addressed in planning process

- utilise technical advances to reduce the resource demand of construction works where possible e.g. trenchless technologies
- stormwater drainage asset to be maintained in accordance with the Urban Water Cycle Policy 2004, Stormwater Management Plan (TCoN, 2005) and the City Wide Maintenance Policy 2008.

Work programs to improve the quality of the stormwater through the reduction of gross pollutants and sediment and erosion control contribute to the capacity of the stormwater system, improve water quality and ultimately benefits the environment. Works include both capital projects and recurrent expenditure including planning, construction and maintenance of drainage systems, stormwater treatment measures, stormwater harvesting projects, stormwater education projects and cleaning up stormwater pollution incidents.

There has been a coordinated approach to many water related environmental issues at a regional level through the partnerships established between Council, Hunter Water, Hunter Councils, the Hunter-Central Rivers Catchment Management Authority and neighbouring councils. The principle guiding documents for the region are the Hunter & Central Coast Regional Environmental Management Strategy, the Hunter-Central Rivers Catchment Action Plan and the Lower Hunter Water Plan. Together these organisations are driving the implementation of Water Sensitive Urban Design (WSUD)⁵ principles across the region.

In addition to the environmental advantages of using this approach, there are also the social benefits of the increased aesthetics and livability of the city and the economic result of less potable water usage. Council has been actively incorporating WSUD principles into key urban planning documents (such as the stormwater development control plans), and ongoing maintenance of assets and construction projects.

In 2013, the Stormwater Development Control Plan (DCP) and associated Stormwater Technical Manual were updated to reflect current best practice including

⁵ "Water Sensitive Urban Design implementation reduces the demand for potable water, the amount of runoff from urban areas, and nutrient and sediment loads. It also increases the amount of water returning to waterways so that the water cycle becomes more natural." (Hunter-Central Rivers Catchment Action Plan, Hunter-Central Rivers Catchment Management Authority, January 2007)

a requirement for the use of the modelling tool MUSIC to model and confirm proposals meet treatment standards development and the incorporation of a stream erosion index (SEI). Council is usually responsible for the rehabilitation of waterways which have eroded; a significant cost to Council. Having a requirement in the DCP for a SEI should assist in reducing the level of waterway rehabilitation required to be undertaken. Council will also continue to update planning controls to ensure the community applies these principles in future developments.

In recognition of the benefits of these principles, Council is currently developing a Water Sensitive Vision for the City. The planning and design of a Water Sensitive City responds to issues of water conservation and water security, risk of flooding, degradation of urban waterways and rising temperatures, in a way that enhances the livability of our city.

Council's activities in environmental compliance provides a crucial function to protect the environment from contamination and pollution through the enforcement of relevant legislation including the *Local Government Act 1993*, *Protection of the Environment Operations Act 1997*, *Environmental Planning and Assessment Act 1979* and *Noxious Weed Act 1993* as well as planning controls such as the Local Environment Plan and Development Control Plans.

The range of responsibilities covered by legislation, regulations and policies is extensive and includes water pollution, air pollution, noise, litter, illegal dumping, sediment and erosion control, unauthorised tree removal, illegal clearing and earthworks.

With its industrial history, Newcastle has traditionally had a strong focus on monitoring air quality, land contamination and other forms of pollution. The Newcastle Air Emission Inventory Report (TCoN 2004) documented the sources of the five most common air pollutants: carbon monoxide, nitrogen oxides, sulphur dioxide, volatile organic compounds and fine particulate matter (PM10). The report showed that industry and transportation sources are by far the largest contributors to these emissions, which are regulated by state government authorities. Nonetheless, air quality monitoring shows a substantial improvement in Newcastle's air quality over the period 1951 to present, specifically in the area of fine particulate pollution.

Since the closure of BHP steelworks in September 1999 there has been around a 30% reduction in the level of fine particulate matter detected at Mayfield and Stockton (TCoN, 2009).

The 2005 Newcastle Airshed Management Action Plan (TCoN, 2005b), outlines Council's approach to air quality management and contained actions focussing on leadership and advocacy roles. With the ending of an environmental levy granted to council, the funding for the project officer dedicated to implementing the Plan ceased in June 2007.

In recent years the state government has commenced a regional air quality monitoring network and reporting framework that has complemented and succeeded much of the work undertaken by Council such as addressing wood fire smoke pollution by prohibiting the sale of wood heaters in NSW that do not meet the current standards set by Standards Australia and schemes to replace old wood heaters.

The NSW Environment Protection Authority (EPA) have the primary responsibility for research, setting standards, emissions monitoring and management of ambient air, motor vehicles and industry emissions. The increased focus on air quality in the region by the EPA has enabled Council's role in regards to air quality shift from monitoring towards advocacy.

Council has recently adopted the 'Smart Compliance Framework' and is rolling this approach out for all its compliance activities. The framework is a decision support tool which uses data to determine which issues to target and develops incentives to encourage compliance. Council develops a range of compliance assistance tools from education material, to help customers understand how to comply with regulations, to incentives such as 'stars' on shop windows to show the level of compliance, or increasing the fee for second inspections. Ideally this results in high compliance levels and minimal enforcement and therefore Council is able to use the limited compliance resources across a broader range of activities whilst targeting the most significant issues.

In 2013 Council adopted a Compliance Policy which applies to the regulatory functions carried out by the Council including:

- Developing approval conditions for activities requiring approval

- Monitoring compliance with approvals, regulations or laws
- Providing information to improve compliance within a regulated community
- Providing incentives to achieve compliance
- Enforcement decisions and actions.

4.2 Issues and Challenges

Whilst the majority of past and current threats to the natural environment will undoubtedly persist in the future, perhaps the major future uncertainty is the impact of climate change. The potential biodiversity impacts from climate change are many including loss, degradation and change in a variety of terrestrial and aquatic habitats due to sea level rise, ocean acidification, changes in fire regimes, temperature, rainfall and other weather extremes. Behavioural and physiological factors are also likely to see changes in species distributions or their loss as their preferred climatic zone shifts. Climate change poses a serious threat to biodiversity, not only because of the range of potential direct consequences but because ecosystems are already stressed by other human impacts (see OEH, 2011 for a discussion on the potential impacts of climate change on biodiversity).

Building environmental resilience is increasingly seen as the approach to protecting biodiversity against the vagaries of climate change (NRMCC, 2010). The implementation of adaptation measures, such as actions that reduce the vulnerability of species and ecosystems to the impacts of climate change by strengthening their resilience and reducing other pressures such as the impact of invasive species and habitat fragmentation, will be essential to maintaining biodiversity values. Some local shoreline ecosystems will be particularly vulnerable to sea level rise as adjoining development prevents succession retreat.

If sea levels rise, coastal erosion and other climate change events such as increased storm frequency may also impact on the life cycle, maintenance and function of stormwater assets, including the failure and loss of such assets.

Aside from the impacts of climate change, a range of threatening processes and challenges will continue to impact our natural environment on both private and community land.

These include:

- Habitat loss, deterioration, change and fragmentation by
 - Erosion of beaches and waterways
 - Development and infrastructure
 - Invasion of noxious and environmental weeds
 - Backyard encroachment
 - Water quality changes
 - Vegetation change in response to multiple processes
 - Illegal dumping
 - Vandalism
- Disease (such as rust) and Biosecurity
- Pollution
 - Stormwater
 - Industry
 - Commercial
 - Residential
 - Marine debris
- Pests
 - Predation
 - Competition
 - Habitat impacts
- Bushland fragmentation and associated edge effect
- Loss of functionality and connection of habitat corridors
- Loss of vegetation cover through natural events such as aging and removal of hazardous trees exceeding replacement
- Fire management (frequency, intensity) taking into account both natural values and risk to people and property. Appropriate fire frequency may be necessary for maintaining existing vegetation communities.
- Impacts of unsustainable and unauthorised informal recreation activities in environmentally sensitive areas
- Hydrology changes within the estuary due to infrastructure, increased tidal flows, dredging, reclamation, filling, sea level rise and water extraction.
- Flooding frequency and intensity

- Disturbance of ground nesting birds during breeding
- Disturbance of ground roosting birds

There are a number of issues facing Newcastle's urban forest, such as the declining condition of trees, and the loss of trees due to age, infrastructure interactions and disease and the community expectations for neighbourhood amenity. Opportunities for planting large, long lived trees are reducing as development increases to meet urban consolidation objectives. Although a number of vegetation mapping products in the region exists, there remains no accurate current single point of reference of high resolution vegetation mapping across the LGA.

Significant population growth and associated greenfield and infill development (especially in the western corridor), major industrial developments such as the expansion of rail and port facilities, the coal seam gas industry and major infrastructure projects, such as the extension of the Newcastle inner city bypass and F3 bypass will be major challenges. Due to the significance of these projects to the State of NSW, Council's ability to influence such major development can be limited. Further loss and fragmentation of remnant vegetation appears unavoidable and predicted population increases will place additional pressure on local resources, waste management (including effluent) and existing community open space.

How to adequately compensate for the loss of native vegetation and habitat within the LGA as a result of development will become increasingly challenging. Whilst initiatives such as the NSW Government's BioBanking program provides one mechanism to compensate for the loss of vegetation, offsets are most likely to occur outside of the LGA because of limited land availability and expense. Whilst strategically placed offsets outside of the LGA may ultimately be in the long term interests of flora and fauna, the issue remains that if we are to continue to accommodate a growing population, local vegetation will continue to be lost and degraded.

Increasing pressure from urban development will have many impacts on the environment ranging from the increase in incidence of acid sulphate soils and salinity levels to illegal dumping of waste, increases in erosion and risks to the health and flow of waterways. There

are also legacy issues of past developments resulting in the need to remediate contaminated land and responsibly dispose of dangerous materials such as asbestos. With increased coal production in the region and associated movement of coal through rail and port facilities, the health implications of coal dust requires ongoing vigilance.

4.3 Appraisal of Issues and Their Management

Comments received from the community during the preparation of the CSP and internal consultation during the preparation of the Strategy identified key issues in regards to our natural environment. The following table illustrates these key issues, and where each of these issues may be addressed within the existing planning documentation. Documents in bold reflect projects that are yet to be prepared but have been identified to be undertaken as part of this Strategy. These documents in some part or fully address the issue by proposing actions or setting Council's position in relation to the issue.

The following table illustrates where each of these issues may be addressed within the existing planning documentation. Documents in bold reflect projects that have been identified to be undertaken as part of this Strategy. These documents in some part or fully address the issue by proposing actions or setting Council's position in relation to the issue.

Issue	Bushland Plan of Management (in review)	Vegetation and Wetland Management Plans	Green Corridor and Landscape Precinct Plan	Estuary Management Plan	Coastline Management Plan (in review)	Local Environment Plan	Development Control Plans and Technical Manuals	Relevant legislation and standards	Urban Forest Policy and associated documents	Newcastle Stormwater Management Plan	Water Sensitive City (proposed)	Biodiversity Management Plan (proposed)	Natural Area Plan of Management (in prep)
Acid sulphate soils	✓	✓				✓	✓	✓					
Air quality								✓	✓				
Asbestos								✓					
Biodiversity offsets	●											●	●
Bushland protection	✓	✓	✓		✓	✓	✓		✓		●	●	●
Coastal management		✓	✓	✓	✓						●	●	
Contaminated land	✓					✓	✓	✓				●	●
Corridors			✓						✓			●	●
Erosion and sediment	✓	✓		✓	✓	✓	✓	✓	✓	✓	●	●	●
Estuary management		✓	✓	✓		✓	✓			✓	●	●	●
Greenhouse gases									✓				
Groundwater contaminants						✓	✓	✓			●		
Habitats - Aquatic	✓	✓	✓	✓	✓	✓	✓			✓	●	●	●
Habitats - Terrestrial	✓	✓	✓		✓	✓	✓		✓		●	●	●
Illegal dumping	✓	✓		✓	✓	✓	✓	✓					
Indoor air quality								✓					
Light								✓					
Litter	✓	✓		✓	✓			✓					
Migratory shorebirds		✓	●	✓	✓							●	●
Noise								✓					
On-site wastewater management						✓	✓	✓					
Salinity				✓									
Threatened flora, fauna and habitats	✓	✓	✓	✓		✓			✓			●	●
Threatening processes	✓	✓	✓	✓			✓				●	●	●
Urban development pressure			✓	✓	✓	✓	✓		✓	✓	●	●	
Urban forest	✓	✓	✓			✓	✓		✓			●	●
Watercourses		✓	✓	✓		✓	✓			✓	●	●	●
Water quality	✓	✓		✓	✓			✓	✓	✓	●	●	●
Weeds and pests	✓	✓		✓	✓							●	●
Wetlands		✓	✓	✓		✓	✓			✓	●	●	●
Wood fire heating								✓					
Stormwater conveyance		✓					✓			✓	●	●	●
Stormwater quality		✓					✓			✓	●	●	●

- ✓ Addressed partially, fully and/or consideration in review
 ● To be considered, developed and incorporated

For the majority of issues identified there are existing strategies and policies which can assist in managing the issue to varying degree. Certain issues have limited planning document links which is usually reflective of lesser importance or the strength of the existing legislative framework.

Biodiversity offsetting mechanisms remains a planning gap. With limited 'greenfield' development opportunities remaining, the development of an offsetting method is not justifiable so the preferred mechanism for large scale offsetting is the use of the State Government BioBanking method (although this approach is likely to see offsets provided outside of the LGA).

A council specific approach to offsetting is required in relation to council operations. A review of Council's Biodiversity Strategy and preparation of a Biodiversity Action Plan will consider this issue.

Whilst a number of vegetation mapping exercises has occurred in the region in recent years, such mapping is not comprehensive. There remains no LGA wide high quality low resolution vegetation community map for Newcastle. Whilst surveys of Council's vegetation and habitat trees have occurred in recent years, there is a comparatively limited appraisal of fauna values within council's natural assets. These issues will be considered during the preparation of the proposed Biodiversity Management Plan.

There are several planning documents in relation to stormwater and water usage, however the core planning document, the stormwater management plan, is now almost a decade old. Membership with the CRC for Water Sensitive Cities and preparation of a Water Sensitive City Vision is aimed to enhance water security through efficient use of the diversity of water resources available, enhance and protect the health of watercourses and wetlands, mitigate flood risk and damage and create public spaces that harvest, clean and recycle water.



5. Environment and Climate Change Risks and Impacts are Understood and Managed

There are multiple lines of evidence that show the climate system is changing. Some level of climate change is now considered inevitable (IPCC, 2007). The projected impacts of climate change will affect all areas of local government responsibility. For Council, climate change impacts will have significant short, medium and long term social, environmental, governance and economic consequences. With its significant natural and built assets, its diversity of land uses, and low-lying coastal topography, Newcastle is particularly vulnerable to the impacts of climate change.

In the face of climate change, it is generally accepted that two approaches are required in tandem; management and reduction of greenhouse gas emissions (mitigation) and making adjustments to existing activities and practices so that vulnerability to potential impacts associated with climate change can be reduced and opportunities realised (adaptation).

Council's focus in regards to climate change adaptation includes planning and managing risks associated with predicted future sea level rise and associated inundation, coastal erosion, cliff instability and increased weather extremes, such as potentially increased frequency of high rainfall intensity events and associated frequency, duration and severity of flooding events.

Climate change adaptation needs to be a consideration for all service elements of Council. Infrastructure needs to be considerate of potential climate change impacts in terms of life cycle and materials. It is recognised that we need to build resilience into our natural and built assets, take opportunities to reduce the impacts of weather events, such as high temperature by greening our city, and ensure land use planning factors in climate change.

5.1 Background and Achievements

In the past ten years the concept of climate change and its potential impact on our society, economy and environment has increasingly gained acceptance from the scientific community, governments and the general community.

Since worldwide temperature recording began in 1861, nine of the ten warmest years have been in the last decade. In 2007, the Intergovernmental Panel on Climate Change projected a global warming of between 0.1°C to 0.2°C per decade in the coming century (IPCC, 2007). Recent studies suggest higher rates of warming are likely.

Climate modelling and the projection of future sea level rise based on different scenarios is a complex field of research that is evolving rapidly. By some estimates, global sea levels have risen in the order of 0.2 metres since 1880 and the rate of this rise is accelerating (CC, 2011). There is evidence that the migration patterns and seasonal cycles of species have changed in accordance with the warmer weather, so migrating birds arrive and native trees and shrubs flower and bear fruit earlier than they used to (IPCC, 2007).

Despite pockets of resistance, there has been acceleration in response from all levels of governments to better understand the science of climate change and to develop and implement actions that mitigate the leading causes of climate change and enable adaptation against the impacts of climate change that are now unavoidable.

A number of recent studies have attempted to predict the likely impact of climate change on regional climate (see Blackmore and Wilson, 2009; Blackmore *et al.* 2010 a-c, HCCREMS 2010a). In summary, the Hunter region may expect:

- Increases in extreme heat events
- Increases in extreme rainfall events in summer

- Increased frequency of east coast lows (and associated major storm events)
- Increased incidence of extreme sea levels in autumn and winter
- Heighten risk of wildfire during autumn

Policy, regulatory requirements and other initiatives are rapidly evolving in response to growing concerns regarding water security, sea level rise and climate variability. The state and federal governments have produced a number of documents to assist councils plan for climate change. Two climate change risk assessments have been undertaken locally to begin the process of providing future direction and priority (Echelon 2010; HCCREMS 2010b). In 2012, a decision support tool was prepared by Hunter Councils to help guide councils and communities through the many challenging considerations in planning for climate change (HCCREMS, 2012b).

In 2010 the Newcastle Strategic Climate Change Policy (TCoN, 2010) was adopted to provide Council and the community with the guiding principles to begin the process of embedding climate change considerations and responses within existing policy, planning and decision making frameworks.

In 2009 the Floodplain Risk Management Plan and Study for the Wallsend Commercial Centre (WP, 2009) was prepared in recognition of the importance of flood management in this locality followed by a separate City-wide Floodplain Risk Management Study and Plan (BMT, 2012). The culmination of many years of flood policy development, study and research, the plans sets out a strategy of short term and long term actions and initiatives to be implemented by council, other government agencies and the community in order to adequately address the risks posed by flooding.

In 2012, council completed a draft Newcastle Coastal Zone Hazard and Management Study as a basis for updating the Newcastle Coastal Management Plan. The Newcastle Coastal Zone Management Plan is currently being prepared.

5.2 Issues and Challenges

Some social, economic and environmental impacts are already observable from the current level of climate change and the number and magnitude of climate risks will rise as the climate warms further (CC, 2011).

There is potentially a wide range of impacts from climate change including:

- Planning policy and development assessment (e.g. loss of private property and community assets, increase in insurance costs and public liability claims, increased pressure on disaster management and response resources, early retirement of capital infrastructure)
- Litigation (e.g. potential legal challenges if it is argued that councils have unreasonably failed to take into account the likely effects of climate change in exercising a wide range of their service, planning and development activities)
- Coastal infrastructure (e.g. Increased coastal erosion and inundation, increased frequency, or permanent inundation of, coastal infrastructure and utilities e.g. water, sewerage, gas, telecommunications, electricity, transportation and increased erosion and/or exceedance of seawalls, jetties and other coastal defences)
- Economic Development and Tourism (e.g. impacts on viability of industries, impacts on tourism/recreation activities along the coast and increased costs associated with operation and maintenance costs of community amenities/recreational sites due to climate variation)
- Social and community planning (e.g. increased population pressure on temperate zones and internal migration and accommodation of new migrants and climate change refugees)
- Provision and use of recreational facilities (e.g. impacts on coastal recreational infrastructure, loss of existing community space in coastal areas and increased costs associated with operation and maintenance costs of community amenities/recreational sites due to storm damage)
- Maintenance of recreational facilities (e.g. reduced water quality and quantity resulting in less watering/irrigation of open space and sports grounds and closure of beaches due to bacterial levels after storms, need for more open space shelters)

- Biodiversity (e.g. changes in distribution of invasive species due to changes in climate and associated loss of biodiversity, changes to bushfire intensity, shifts in distributions of plant and animal species)
- Water (e.g. inundation of storm water and sewerage systems, changes in groundwater levels, exceedance of drainage capacity, reduction in drainage capacity due to sea level rise and storm surge, salination of surface and groundwater)
- Increased sickness and mortality within vulnerable groups (very young, ill and aged) due to urban heat island effects

Planning for climate change will need to address adaptation measures in respect of issues such as:

- managing climate sensitive areas to protect ecosystem services
- minimising the heat island effects of high intensity urban or built up areas
- retrofitting existing urban areas, including the modification of urban form to accommodate the adaptability of older communities to the adverse effects of climate change
- incorporating climate change into risk assessments
- managing inundation, coastal erosion, flooding and stormwater, and in some instances the planned strategic retreat from highly exposed areas

Perhaps the most challenging future issue in regards to climate change adaptation will be funding. Many protect and/or retreat options will be expensive but in the context of potential impacts may still be considered worthwhile investments. Aside from Council's financial sustainability and ability to fund adaptation measures itself, most if not all coastal councils face similar issues. Extracting additional funding from external sources is likely to be both limited and competitive.

Challenges will also arise where actions benefits private residential, commercial and industrial interests. The beneficiaries of such expenditure are relatively localised to the coast; should there be equitable distribution of cost to all ratepayers?

Opposition to climate change adaptation measures is likely to remain a challenge and may increase. As our understanding of the future potential impacts in our region improves and options are short listed, the

reality of the situation for many in the community may only then be realised. Community and stakeholder engagement and acceptance of proposed adaptation measures (and the reasons why) will be essential for success. The politics of climate change at all levels of government will continue to be a challenge.

At which point in time future adaptation measures must be implemented will also need careful planning. As time progresses, there is potentially a growing degree of risk whilst at the same time the window of opportunity to reduce or prevent impact diminishes. We need to be considerate of the time required to attract funding and deliver actions. Determining appropriate triggers for implementation and where appropriate, monitoring, may be required to guide climate change adaptation measures (see HCCREMS 2012). Monitoring and reacting to new science and policy regarding climate change will remain critical. It is inevitable that unexpected impacts of climate change will arise.

5.3 Appraisal of Issues and Their Management

Comments received from the community during the preparation of the CSP and internal consultation during the preparation of the Strategy identified key issues in regards to climate change. The following table illustrates these key issues, and where each of these issues may be addressed within the existing planning documentation. Documents in bold reflect projects that are yet to be prepared but have been identified to be undertaken as part of this Strategy. These documents in some part or fully address the issue by proposing actions or setting Council's position in relation to the issue.

Issue	Green Corridor and Landscape Precinct Plan	Estuary Management Plan	Coastal Management Plan (in review)	City-wide Floodplain Risk Management Plan	Urban Forest Policy and associated documents	Newcastle Bushfire Management Plan	Carbon and Water Management Action Plan	Natural Area Plan of Management (in prep)	Biodiversity Action Plan (proposed)	Water Sensitive City (proposed)	Climate Change Adaptation Plan (proposed)
Biodiversity impacts		✓	✓		●			●	●	●	●
Bushfire					●	✓		●	●	●	●
Business continuity					✓						●
Coastal hazards		✓	✓	✓							●
Emergency response						✓					●
Extreme & more frequent weather events			✓	✓	✓	✓			●		●
Financial impacts			✓	✓							●
Flood management				✓						●	●
Infrastructure			✓	✓	✓					●	●
Sea level rise		✓	✓	✓					●	●	●
Social impact			✓	✓							●
Sustainable development							✓			●	●
Urban heat island					✓		✓			●	●

- ✓ Addressed partially, fully and/or consideration in review
 ● To be considered, developed and incorporated

Issues associated with sea level rise, coastal erosion and flooding have been the focus of recent studies. A number of recommended actions are underway or will be implemented in coming years. Climate change will also be a consideration during the preparation and delivery of the proposed biodiversity management plan and water sensitive city vision and strategy. Certain issues, such as heat waves, bushfire and the social

and economic risks of climate change, are recognised but to a large extent are yet to be fully investigated and managed within Council. The proposed Climate Change Adaptation Plan is intended to address this gap by establishing a strategic position considerate of all the risks and issues related to climate change considerate of recent regional and council specific climate change risk assessments.



6. Strategies and Implementation

The following section documents the strategies proposed to meet the environmental objectives. Bold wording within the following tables indicates an existing strategy listed in the Newcastle 2030 CSP. Details for delivering each of the strategies, such as objective, scope, resources, methods, communication and reporting, are to be developed by the responsible area of Council.

Council is divided into different service units with variable responsibility for aspects of environmental management. Given that the structure of Council evolves over time, assigning responsibility for the delivery of individual strategies to a specific service unit is problematic. To overcome this uncertainty, strategies have been assigned a functional area for implementation as opposed to allocating responsibility to individual service units.

Functional areas have been defined as the following:

- Asset Management
- Communications
- Compliance
- Development
- Education
- Information Technology
- Planning
- Sustainability

Resources for delivery of the strategies have been broadly categorised as:

- Staff. To be delivered using existing staff resources
- Administration and production. Requires funding to facilitate delivery including printing, workshops, advertising and/or exhibition costs.
- MAPP. Funded through the Major Asset Preservation Program.
- Stormwater. Funded through the Stormwater levy.
- Grants. Funding may be partially or fully met through external grant applications. Delivery of the strategy may be dependant on grant approval.

Timing for implementation of strategies has been defined as within 1 year, within 4 years or ongoing (beyond four years).

Linkages between the proposed strategies and existing or proposed planning documents have been provided to firstly indicate the primary source of information that may provide background information to the issue, and in some cases provide detailed actions, targets and indicators.

Expected deliverables of the strategy have been provided as a means to define the outcome of the strategy and as a means to measure implementation of the Strategy. Such deliverables are essentially based on completion of the strategy as opposed to an appraisal of success or failure of the strategy. Although CSP indicators exist, the establishment of meaningful, Council specific indicators and targets measuring progress is incomplete and requires consideration during future reviews of the Strategy.

An annual appraisal of the Strategy will be undertaken inclusive of all Council staff through the establishment of a Project Group (see Strategy 2.5d). An annual progress report on delivery of the Strategy will also be submitted to the Environmental Advisory Committee including scope for discussion and proposed amendment to the Strategy.

Objective 1 Greater efficiency in the use of resources						
Strategy		Implementation	Resources	Timing	Linkages	Deliverables
1.1	Improve waste minimisation and recycling practices in homes, work places, development sites and public places					
1.1a	Support the objectives and implementation of the Newcastle Carbon and Water Management Action Plan as it applies to Council	Sustainability	Staff Grants Administration and production	Ongoing	Carbon Water Management Plan	A reduction in material, energy and water waste within Council using baseline data established through the Carbon and Water Management Plan
1.1b	Ongoing education and reinforcement of carbon and water management to council personnel	Sustainability	Staff Grants Administration and production	Ongoing	Carbon Water Management Plan	A reduction in material, energy and water waste within Council using baseline data established through the Carbon and Water Management Plan
1.1c	Review the Newcastle Solid Waste Management Strategy and prepare a new Strategy inclusive of waste collection, waste disposal, recycling and education	Planning	Staff Grants Administration and production	< 4 years	Solid Waste Management Strategy	Preparation of new Waste Management Strategy
1.2	Educate, promote and support low consumption, sustainable lifestyles					
1.2a	Support the objectives and implementation of the Newcastle Carbon and Water Management Action Plan as it applies to Council	Sustainability	Staff Grants Administration and production	Ongoing	Carbon Water Management Plan	Delivery of actions from the Carbon and Water Management Plan
1.2b	Undertake a review of Peak Oil to guide Council's future direction on this issue	Planning	Staff Grants Administration and production	< 4 years	Carbon Water Management Plan	Preparation of a discussion paper
1.3	Maximise water efficiency and recycling through water sensitive urban design, capturing stormwater, encouraging substitution of potable water with alternative supply and improving water usage behaviour					
1.3a	Develop and implement a Water Sensitive City Strategy	Planning	Staff Administration and production Stormwater levy MAPP Grants	< 4 years	Carbon Water Management Plan Development Control Plans Technical Manuals Stormwater Management Plan Stormwater Asset Management Plan	Water Sensitive City Strategy prepared
1.3b	Support the objectives and implementation of the Newcastle Carbon and Water Management Action Plan as it applies to Council	Sustainability	Staff Grants Administration and production	Ongoing	Carbon Water Management Plan	Delivery of actions from the Carbon and Water Management Plan

Strategy		Implementation	Resources	Timing	Linkages	Deliverables
2.1	Encourage and support active community participation in local environmental projects					
2.1a	Prepare a communications strategy for all management strategies and plans to ensure opportunity for community involvement	Education	Staff Administration and production Stormwater levy MAPP Grants	Ongoing	Hunter Estuary Coastal Zone Management Plan Newcastle Biodiversity Strategy Carbon Water Management Plan City-wide Floodplain Risk Management Study and Plan Urban Forest Policy Coastal Zone Management Plan	Communications strategy prepared
2.1b	Ensure Council's website contains relevant and accurate program and project information	Planning	Staff Administration and production	< 4 years	Hunter Estuary Coastal Zone Management Plan Newcastle Biodiversity Strategy Carbon Water Management Plan City-wide Floodplain Risk Management Study and Plan Urban Forest Policy Coastal Zone Management Plan Bushland Plan of Management	Website up to date and accurate
2.1c	Continue to support and promote Landcare and other volunteer groups as ancillary delivery mechanism for natural asset management	Asset Management	Staff Administration and production MAPP Grants	Ongoing	Hunter Estuary Coastal Zone Management Plan Newcastle Biodiversity Strategy Carbon Water Management Plan City-wide Floodplain Risk Management Study and Plan Urban Forest Policy Coastal Zone Management Plan Blackbutt Plan of Management Bushland Plan of Management	Number of volunteers and number of volunteer hours within Landcare is documented and numbers maintained or improved

Objective 2 Our unique natural environment is maintained, enhanced and connected						
Strategy		Implementation	Resources	Timing	Linkages	Deliverables
2.2	Protect and rehabilitate degraded and fragmented natural areas and manage major impacts on corridors, remnant bushland, estuaries and coastal areas					
2.2a	Develop and implement a City-wide Biodiversity Management Plan incorporating habitat corridors, bushfire, climate change, vegetation mapping, weed and pest management and biodiversity offsetting	Planning Asset Management	Staff Administration and production Grants	< 4 years	Newcastle Biodiversity Strategy Plans of Management Vegetation Management Plans	Biodiversity Management Plan prepared
2.2b	Support the implementation of the Coastal and Estuary Management Plans	Asset Management Planning Education	Staff Administration and production Grants	Ongoing	Hunter Estuary Coastal Zone Management Plan Coastal Zone Management Plan	Actions implemented according to each Plan and scheduled review implemented
2.2c	Support the development and implementation of Plans of Management (or equivalent) and Vegetation Management Plans	Planning Asset Management	Staff Administration and production MAPP Grants	Ongoing	Plans of Management Vegetation Management Plans Public Bushland Asset Inventory Natural Asset Management Plan Newcastle Biodiversity Strategy	Actions implemented according to each Plan and scheduled review implemented
2.2d	Ongoing noxious and environmental weed and pest management and education and support regional initiatives (see 2.4g)	Asset Management Planning Education	Staff Administration and production Grants	Ongoing	Plans of Management Vegetation Management Plans Regional Weed Management Strategy Noxious Weed Act	Actions implemented according to each Plan and Strategy

Strategy		Implementation	Resources	Timing	Linkages	Deliverables
2.3	Protect the diversity of flora, fauna and ecological communities, with a particular emphasis on threatened species and endangered ecological communities					
2.3a	Undertake a review of the Urban Forest Policy	Planning	Staff Administration and production	< 4 years	Urban Forest Policy Newcastle Biodiversity Strategy Green Corridors and Landscape Precincts Plan	Urban Forest Policy reviewed
2.3b	Review the Strategic Asset Management Plan – Natural Assets	Planning Asset Management	Staff Administration and production	< 1 year	Strategic Asset Management Plan	Natural Assets Asset Management Plan – reviewed
2.3c	Establish an Environmental Community of Practice (ECoP) within Council	All	Staff Administration and production	< 1 year		Community of Practice established
2.3d	Raise and maintain environmental awareness of Councillors and council personnel through education, training and ready access to information	All	Staff Administration and production	Ongoing		Environmental awareness improved
2.3e	Maintain an active role in catchment committees, working groups and other regional forums and share outcomes and direction	All	Staff Administration and production	Ongoing		Participation and sharing of information
2.3f	Review and where appropriate amend internal environmental guidelines	Planning Asset Management	Staff Administration and production	< 4 years	Environmental Management for Parks and Waterway Maintenance.	Guideline reviewed and amended

Objective 2 Our unique natural environment is maintained, enhanced and connected						
Strategy		Implementation	Resources	Timing	Linkages	Deliverables
2.4	Ensure that future land use planning and management enhances and protects biodiversity and natural heritage					
2.4a	Review adequacy and effectiveness of Council's environmental activities after review of the Local Government Act 1993 is completed	Planning Asset Management	Staff Administration and production	< 4 years	Various	Review undertaken
2.4b	Ensure that environmental values and key threatening processes are adequately considered in the preparation of the Local Planning Strategy	Planning	Staff Administration and production	< 1 year		Environment incorporated in Local Planning Strategy
2.4c	Remain vigilant against pollution and advocate for the conservation and protection of environmental values in the City.	Compliance	Staff Administration and production	Ongoing	Various Statutory	High level of environmental compliance
2.4d	Establish, maintain and promote the Natural Resource Atlas context within Exponare as the primary source of environmental information for staff	Planning Information Technology	Staff Administration and production	< 1 year	Newcastle Biodiversity Strategy Environmental Assessment Manual	Natural Resource Atlas established
2.4e	Establish a Council specific Environmental Assessment Manual and Review of Environmental Factors process for ensuring appropriate environmental considerations and approvals are incorporated into all of Council's activities	Planning Development Asset Management	Staff Administration and production	< 1 year	Environmental Assessment Manual Review of Environmental Factors	Environmental Assessment Manual prepared Review of Environmental Factors prepared
2.4f	Investigate a mechanism for incorporating environmental information from development applications into Council's environmental information systems	Planning Development	Staff Administration and production	< 4 years		Options investigated and if feasible, preferred option implemented

Strategy		Implementation	Resources	Timing	Linkages	Deliverables
2.4g	Integrate best practice weed and pest management principles into systems and practices across all relevant council operations (see 2.4d)	Planning Development Asset Management	Staff Administration and production	< 4 years	LEP Regional Weeds Strategy	Weed and pest management principles incorporated
2.4h	Review and update Newcastle Bush Fire Prone Land Map	Planning	Staff Administration and production	< 4 years	Newcastle Bushfire Prone Land Map	Bushfire map updated
2.5	Improve environmental monitoring and reporting					
2.5a	Undertake a review of environmental monitoring activities within Council to document purpose, methods, localities, analysis and reporting and measure and report environmental performance as part of a process of continual improvement	Planning Asset Management	Staff Administration and production	< 4 years		Environmental monitoring documented
2.5b	Prepare four yearly State of the City Report which reports on the environmental objectives in the Newcastle 2030 Community Strategic Plan	Planning	Staff Administration and production	Ongoing	State of the City Community Strategic Plan	State of the City Report prepared
2.5c	Investigate and apply the MERI concept to integrate Council with the programs and targets set by other Council's, CMAs, as well as state and federal government programs	Planning	Staff Administration and production	Ongoing		Framework for monitoring key environmental indicators developed and in place
2.5d	Establish a staff based Project Group to oversee implementation and amendment to the NEMS	All	Staff Administration and production	Ongoing		Project Group established

Objective 3 Environment and Climate Change risks and impacts are understood and managed						
Strategy		Implementation	Resources	Timing	Linkages	Deliverables
3.1	Develop and communicate a clear understanding of environmental and climate change risks					
3.1a	Develop and implement a climate change adaptation communication strategy	Planning Communications	Staff Administration and production	< 1year	Climate Change Policy Coastal Zone Management Plan City-wide Floodplain Risk Management Study and Plan	Climate change adaptation communication strategy prepared
3.1b	Incorporate climate change information into Council's Natural Resource Atlas context within Exponare	Information Technology	Staff Administration and production	< 1year	Climate Change Policy Coastal Zone Management Plan City-wide Floodplain Risk Management Study and Plan	Climate change information incorporated into Council's Natural Resource Atlas
3.2	Build community readiness by engaging the community in risk management processes including the development and implementation of action plans					
3.2a	Value and provide the opportunity for the community to be informed, engaged and involved in the development of climate change adaptation measures consistent with adopted plans (see 3.1a)	All	Staff Administration and production Grant	Ongoing	Climate Change Policy Coastal Zone Management Plan City-wide Floodplain Risk Management Study and Plan	Community engaged and informed on Climate Change and adaptation issues

Objective 3 Environment and Climate Change risks and impacts are understood and managed						
Strategy		Implementation	Resources	Timing	Linkages	Deliverables
3.3	Ensure that all actions, decisions and policy response to climate change remains current and reflects capacity, community expectations and changes in environmental and climate change information					
3.3a	Develop and implement a Climate Change Adaptation Plan	Planning Asset Management	Staff Administration and production	< 4 years	Climate Change Policy Coastal Zone Management Plan City-wide Floodplain Risk Management Study and Plan Climate Change Risk	Climate Change Adaptation Plan prepared
3.3b	Review the Newcastle Strategic Climate Change Policy	Planning	Staff Administration and production	< 4 years	Climate Change Policy Coastal Zone Management Plan City-wide Floodplain Risk Management Study and Plan	Climate Change Policy reviewed
3.3c	Support implementation of the priority actions in the Newcastle City-wide Floodplain Risk Management Plan and Study and Wallsend Commercial Centre Floodplain Risk Management Plan and Study including an annual and five year major review or after a major flood event	Planning Development Asset Management	Staff Administration and production Stormwater levy MAPP Grants	Ongoing	City-wide Floodplain Risk Management Study and Plan Wallsend Commercial Centre Floodplain Risk Management Study and Plan	Priority actions implemented subject to funding
3.3d	Support and implement the priority actions in the Hunter Estuary Coastal Zone Management Plan including annual and five year major review	Planning Development Asset Management	Staff Administration and production Stormwater levy MAPP Grants	Ongoing	Hunter Estuary Coastal Zone Management Plan	Priority actions implemented subject to funding
3.3e	Support and implement the priority actions in the Newcastle Coastline Management Plan including annual and five year major review	Planning Development Asset Management	Staff Administration and production Stormwater levy MAPP Grants	Ongoing	Coastal Zone Management Plan	Priority actions implemented subject to funding
3.3f	Incorporate Climate Change adaptation into the preparation of policy, strategies and plans	Planning Asset Management	Staff Administration and production	Ongoing	Climate Change Policy	Climate Change adaptation incorporated

7. Glossary

Adaptation	Adjustment in natural or human systems in response to actual or expected climatic changes or their effects, which moderates harm or exploit beneficial opportunities. This is the primary means for maximising gains and minimising the losses associated with climate change.
Adaptive Management	Process of implementing land management activities in incremental steps and evaluating whether desired outcomes are being achieved at each step. If conditions deviate substantially from predictions, management activities are adjusted to achieve desired outcomes
Best Practice	The practice of seeking out, emulating, and measuring performance against the best standard available
Biodiversity	The variety of all life forms: the different plants, animals and micro-organisms, the genes they contain, and the ecosystem they form. Often considered at three levels: genetic diversity; species diversity; and ecosystem diversity. It emphasises the interrelatedness of the biological world, and encompasses the terrestrial, marine and aquatic environments
Bush Regeneration	Means the rehabilitation of bushland from a weed-infested or otherwise degraded plant community to a healthy community composed of native species. Natural regeneration relies on germination and resprouting of native plants, with a focus on weed removal, management of disturbances and the maintenance of natural processes
Climate Change	Any change in the climate over time, due to either natural variability or human activities.
ClimateCam	A Council concept to report on electricity usage across the city now expanded to include a range of sustainability indicators
Corridor	Areas of native vegetation linking larger areas of remaining native vegetation that enables migration, colonization and interbreeding of plants and animals, often referred to as a habitat corridor
Conservation	One of the approaches to ecosystem management which incorporates protection, maintenance and monitoring. It aims to maintain the continuity of a system, with or without change, and refers to the process and actions of looking after a place to retain its natural significance and functioning
Ecological Community	Means an assemblage of species occupying a particular area
Ecosystem	Communities of organisms and their physical, non-living environment interacting as a functional unit, characterised by ecological processes such as the flow of energy and nutrient through food webs.
Habitat	An area or place where an animal or a plant normally lives and reproduces, It includes terrestrial and aquatic (freshwater and marine) habitats. It may be occupied permanently, periodically or occasionally
MER	Monitoring, evaluation and reporting enables program outcomes to be measured, evaluated and reported upon, and helps to improve our knowledge and practices. Effective MERI enables the identification, collection, assessment and reporting of information to help determine if natural resources management activities produce the desired results and outcomes.
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.
Monitoring	A systematic process involving planned and repeated data collection, analysis interpretation, reporting and acting on the data
Resilience	Ability of an ecosystem, species and communities to withstand change from various environmental and human induced impacts
Threatening Processes	A threatening process is a process that threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community
Weed	A plant that is undesirable because it is out of place; including native species outside their natural range



8. References

- Blackmore K.L, Goodwin I.D and Wilson S. (2010a). CASE STUDY 2: Potential Impacts of Climate Change on Extreme Heat Events Affecting Public Health in the Hunter, Lower North Coast and Central Coast Region. A report prepared for the Hunter and Central Coast Regional Environmental Management Strategy, NSW.
- Blackmore K.L, Goodwin I.D and Wilson S. (2010b). CASE STUDY 3: Potential Impacts of Climate Change on Bushfire Risk in the Hunter, Central and Lower North Coast region. A report prepared for the Hunter and Central Coast Regional Environmental Management Strategy, NSW.
- Blackmore K.L, Goodwin I.D and Wilson S. (2010c). CASE STUDY 4: Potential Impacts of Climate Change on Extreme Events in the Coastal Zone of the Hunter, Lower North Coast and Central Coast region. A report prepared for the Hunter and Central Coast Regional Environmental Management Strategy, NSW.
- Blackmore K.L and Goodwin I.D (2009). Climate Change impact for the Hunter, Central and Lower North Coast region. A report prepared for the Hunter and Central Coast Regional Environmental Management Strategy, NSW.
- BMT WBM (2009). Hunter Estuary Coastal Zone Management Plan. Prepared for the City of Newcastle
- BMT WBM (2012). Newcastle City-wide Floodplain Risk Management Study and Plan. Prepared for The City of Newcastle.
- CC (2011). The Critical Decade. Climate science, risks and responses. Climate Commission. Department of Climate Change and Energy Efficiency.
- DECC (2007). NSW Waste Avoidance and Resource Recovery Strategy.
- DECCW (2009). Lower Hunter Regional Conservation Plan. NSW Department of Environment, Climate Change and Water.
- DECCW (2010). NSW Natural Resources Monitoring, Evaluation and Reporting Strategy 2010-2015.
- DoP (2006). The Lower Hunter Regional Strategy: 2006-2031 NSW Department of Planning
- DP (2010). Newcastle-Lake Macquarie Western Corridor Planning Strategy. NSW Department of Planning
- DPC (2011). NSW 2021: A Plan to Make NSW Number One. NSW Department of Premier and Cabinet.
- DPI (2013). The Lower Hunter over the next 20 years: A Discussion Paper Department of Planning and Infrastructure.
- Echelon (2010). Climate Change Risk Assessment. Adaptation report. Prepared for The City of Newcastle.
- HCCREMS (2010). Hunter and Central Coast Regional Weed Strategy 2010-2015.
- HCCREMS (2010a). Potential Impacts of Climate Change on the Hunter, Central and Lower North Coast of NSW. Hunter Councils NSW.
- HCCREMS (2010b). Climate Change Risk Assessment and Adaptation Plan: Coastal Councils, Hunter Councils NSW.
- HCCREMS (2012). Climate Change and Coastal Decision-making: The Workbook. Hunter Councils NSW.
- HCRCMA (2013). Hunter-Central Rivers Catchment Action Plan 2013-2023. Hunter-Central Rivers Catchment Management Authority.
- IPCC (2007). Climate Change 2007. Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.
- KPMG (2012). Review of the NSW Waste and Environment Levy. Prepared for the NSW Environment Protection Authority
- LGSA (2006). Are Councils Sustainable? Final Report: Findings and Recommendations Independent Inquiry into the Financial Sustainability of NSW Local Government. Local Government and Shires Association.
- NRMCMC (2010). Australia's Biodiversity Conservation Strategy 2010-2030, Natural Resource Management Ministerial Council Australian Government, Department of Sustainability, Environment, Water, Population and Communities, Canberra
- OEH (2011). New South Wales Climate Impact Profile Technical Report. Potential impacts of climate change on biodiversity. NSW Office of Environment and Heritage.
- TCoN (2003). Newcastle Environmental Management Plan. Newcastle City Council
- TCoN (2004). Newcastle Stormwater Management Plan. Prepared by the City of Newcastle
- TCoN (2004). Newcastle Air Emissions Inventory Report. Prepared by the City of Newcastle.
- TCoN (2005a). Green Corridors and Landscape Precinct Plan. Implementing the Newcastle Green Spaces Strategy. The City of Newcastle.

TCoN (2005b). Newcastle Airshed Management Action Plan. Prepared by the City of Newcastle.

TCoN (2006a). Newcastle Biodiversity Strategy. Prepared by the City of Newcastle.

TCoN (2006b). Urban Forest Background Paper. Prepared by the City of Newcastle

TCoN (2008a). Newcastle ESD Procurement Policy. Prepared by the City of Newcastle.

TCoN (2008). Newcastle Urban Forest Policy. The City of Newcastle.

TCoN (2009). Newcastle State of the Environment. The City of Newcastle.

TCoN (2010). Strategic Climate Change Policy. The City of Newcastle.

TCoN (2011a). Newcastle 2020 Carbon and Water Management Action Plan. The City of Newcastle.

TCoN (2011b). Newcastle Street Tree Masterplan. Prepared by the City of Newcastle

TCoN (2012c). Stormwater Drainage Asset Management Plan. Prepared by the City of Newcastle.

TCoN (2013). Newcastle Community Strategic Plan. Prepared by the City of Newcastle.

WP (2009). Floodplain Risk Management Plan and Study for the Wallsend Commercial Centre. Prepared for the City of Newcastle by WorleyParsons.



Appendix A – Snapshot of Achievements from 2003 NEMP

Topic	Key Achievements
Air	<ul style="list-style-type: none"> • Completion of Air Emission Inventory • Newcastle was the first Council in Australia to introduce a biodiesel fleet
Biodiversity	<ul style="list-style-type: none"> • Adoption of the Urban Forest Policy • Completion of the Natural creeks / riparian zone audit • Adoption of the Blackbutt Plan of Management in 2012 • Completion of the Green Corridor and Landscape Precincts Plan • Supported the Regional Biodiversity Conservation Strategy
Council	<ul style="list-style-type: none"> • Incorporation of natural assets into Council's asset management system and maintenance program • Increase in funding for Major Asset Preservation Program in recognition of the increase in Council's asset base
Coast	<ul style="list-style-type: none"> • Adoption of the Newcastle Coastline Management Plan • Completion of the Rock Platform Ecological Review • Provided support to the Hunter Coast and Estuary Management Committee
Estuary	<ul style="list-style-type: none"> • Completion of the Hunter Estuary Management Study and Plan • The Hunter River Healthy Rivers Commission Report was reviewed and adopted • Provided support to the Kooragang Wetlands Rehabilitation Project • Completion of the Newcastle Wetland and Market Swamp Action Plan
Energy & Greenhouse	<ul style="list-style-type: none"> • Successful implementation of the Greenhouse Action In Newcastle (GAIN) Plan resulting in a reduction of greenhouse gas emissions for Council and the community of 13.6% and 20.2% respectively • The ClimateCam website continues to educate the community about greenhouse gas emissions by providing monthly consumption data
Land Use	<ul style="list-style-type: none"> • The Newcastle Development Control Plan includes provisions for environmental protection, energy and water efficiency and has various technical manuals to provide guidance on environmental considerations for developments.
Transport	<ul style="list-style-type: none"> • Active involvement in the Lower Hunter Transport Group • Development of the Lower Hunter Transport Guide • The Lower Hunter Regional Strategy is currently being reviewed and updated • Adoption of the Newcastle Cycling Strategy and Action Plan
Waste	<ul style="list-style-type: none"> • Domestic waste going to landfill has been reduced by 14% from 2003 to 2011/12 • Introduction of green waste bin for residential properties increased organic collections from 1,954 tonnes in 2010/11 to 10,814 tonnes in 2011/12 • Methane gas from landfill at the Summerhill site is captured and used for electricity generation
Water	<ul style="list-style-type: none"> • Urban Water Cycle Management Policy was adopted and a technical manual developed to guide future developments • Guidelines developed for the treatment of watercourses in road reserves using WSUD principles • Stormwater provisions included in the DCP and a technical manual has been developed

Appendix B – Key Planning Documents

Newcastle Local Environmental Plan (2012) and Development Control Plan

The Newcastle Local Environmental Plan 2012 (LEP) is a legal document that provides rules and standards to guide the use of private and public land. The LEP is made up of a written document and maps. The Newcastle LEP 2012 was gazetted on Friday 15 June 2012. Newcastle LEP 2012 replaces Newcastle LEP 2003 and Newcastle City Centre LEP 2008.

The LEP rules and standards control the use of private and public land primarily through zoning. It aims to reduce possible conflict between adjoining land uses, and ensure that there is adequate land to meet the diverse needs of a viable city.

The Newcastle Development Control Plan 2012 (DCP) supplements the Newcastle Local Environmental Plan. The provisions of the DCP are largely assessment criteria to be used in the assessment of Development Applications. Key environmental provisions include:

- Section 4.01 Flood Management
- Section 4.02 Bush Fire Protection
- Section 5.01 Soil Management
- Section 5.02 Land Contamination (supplemented by Contaminated Land Management Technical Manual)
- Section 5.03 Tree Management (supplemented by Urban Forest Technical Manual)
- Section 7.05 Energy Efficiency
- Section 7.06 Stormwater (Stormwater and Water Efficiency for Development Technical Manual)
- Section 7.07 Water Efficiency (Stormwater and Water Efficiency for Development Technical Manual)
- Section 7.08 Waste Management (supplemented by Waste Management Technical Manual)

Newcastle 2020 Carbon and Water Management Action Plan (2011)

Council adopted the 2020 Carbon and Water Management Action Plan (CWMAP) in October 2011. The CWMAP was developed to guide The City of Newcastle's mitigation response to Climate Change and in doing so meet objective (g) of the Newcastle Climate Change Policy (TCoN, 2010).

CWMAP was developed by attaining an understanding of carbon emissions and water consumption, establishing a range of aspirational goals and accompanying actions for four key focus areas - Energy, Water, Waste and Liquid Fuels. In addition to Council, the document provides strategic direction for the community, education and business sectors operations. The document lists out Council's Vision, Mission and Objectives, its Carbon and Water Footprint and 64 guiding actions for Council Operations to take to work towards achieving this continuous goal.

CWMAP will equip Council with a set of minimum standard policies and support programs for its own use of electricity, gas, liquid fuels and water. It will also address waste management throughout Council facilities and activities. This in turn will help build the resilience of Council as utility prices rise going into the future.

Newcastle Biodiversity Strategy (2006)

Council adopted the Newcastle Strategy (NBS) in September 2006. Consisting of 6 objectives, 13 strategies and 54 actions, the NBPS provides first steps toward making biodiversity issues an important and integrated part of decision-making, especially in relation to strategic land use planning, management of the City's open spaces, design and maintenance of urban infrastructure, development control and education. The document describes the important values of Newcastle's biodiversity, identifies issues resulting in the continuing loss of biodiversity, provides a clear direction for conservation and provides a framework for prioritising and implementing actions.

Newcastle Coastline Management Plan (2003)	<p>The Newcastle Coastline Management Plan (2003) provides a management framework for the entire coastline of Newcastle City. The primary objective of the Newcastle Coastline Management Plan is to develop an integrated management planning framework for Newcastle coastline that effectively ensures a balance between long-term use and conservation. The Plan describes how the coastline will be used and managed to achieve desired outcomes. Strategic actions have been developed for the effective management of a range of issues. A revised Newcastle Coastline Management Plan is currently being prepared.</p>
Hunter Estuary Coastal Zone Management Plan (2009)	<p>Implementation of the plan is overseen by the Newcastle Coastal Technical Working Party whose membership comprises both government and community representatives. Council adopted the Hunter Estuary Coastal Zone Management Plan (NECZMP) in October 2009. With 25 objectives and 123 actions, the NECZMP is a strategic and long-term plan developed through a specifically designed and legislated framework. The document has been prepared in partnership with Maitland City Council and Port Stephens Council. It aims primarily to provide guidance for achieving a sustainable estuary in the future, giving balanced consideration to environment, social and economic demands on the river system.</p> <p>The NECZMP identifies actions for other agencies in addition to Council. Implementation of the plan is overseen by the Hunter Estuary Technical Working Party whose membership comprises both government and community representatives.</p>
Floodplain Risk Management Plan and Study for the Wallsend Commercial Centre (2009) and City-wide Floodplain Risk Management Study and Plan (2012)	<p>Council adopted the Floodplain Risk Management Plan and Study for the Wallsend Commercial Centre in 2009 and Newcastle City-wide Floodplain Risk Management Study and Plan (NCFRMP) in 2012. Complementary to each other, the primary objective of the flood plans is to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property, and to reduce private and public losses resulting from floods, utilising ecologically positive methods where possible.</p> <p>With 16 strategies and 59 actions, the NCFRMP is intended to form the basis for the immediate and future management of flood prone lands across the Newcastle LGA. The City-wide Flood Plan aims to help direct and coordinate the responsibilities of Government and the community in undertaking immediate and future flood management works and initiatives. The culmination of many years of studies and research, this document aims to manage risks associated with the vast 'legacy development' across Newcastle's floodplains, as well as guiding appropriate future development on these floodplains.</p> <p>The NECZMP identifies actions for other agencies in addition to Council. Implementation of the plan is overseen by the Newcastle Floodplain Risk Management Working Party, whose membership comprises both government and community representatives.</p>
Newcastle Stormwater Management Plan (2004)	<p>Council adopted the Newcastle Stormwater Management Plan (NSMP) in March 2004. With 20 objectives 70 strategies and 77 actions, the primary purpose of the NSMP is to facilitate the coordinated and integrated catchment based management of stormwater quality and quantity within the City. The focus of the Plan is environmental protection through improved understanding, awareness and cooperation, and an emphasis on developing and implementing actions.</p>

Newcastle Green Corridor and Landscape Precincts Plan (2005)	Council adopted the Newcastle Green Corridor and Landscape Precincts Plan in June 2005. The Plan has developed the original intention of linking the City's green spaces by defining major green corridors and provides a basis for reinforcing or rehabilitating their structure. The Plan identifies 13 specific actions that provide for increasing connectivity between green spaces by using the existing urban infrastructure, increasing the quality and quantity of local native vegetation in green spaces, strengthening catchment management outcomes, improved quality and delivery of plant information to community groups, individuals, developers and other landowner partners and inking land management and landscaping practices more closely to the underlying natural systems.
Newcastle Bush Fire Risk Management Plan (2012)	Jointly prepared by regional stakeholders, a strategic document that identifies community assets at risk and sets out a five-year program of coordinated multi-agency treatments to reduce the risk of bush fire to the assets. Treatments may include such things as hazard reduction burning, grazing, community education, fire trail maintenance and establishing community fireguard groups.

Appendix C – Environmental Forums

Council is an active member and participant in a range of environmental forums in the region. The following is a summary of the key forums involving council.

Directors Forum

The Directors of Planning and Environment from each of the Hunter Central Coast Regional Environmental Management Strategy (HCCREMS) member councils meet quarterly to provide strategic guidance and support to the HCCREMS team and its projects.

Member Hunter Councils Hunter Central Coast Regional Biodiversity Strategy

The Hunter and Central Coast Regional Environmental Management Strategy (HCCREMS) have 14 member councils. The organisation was formed to guide and coordinate the efforts of all members in addressing a range of environmental issues that are best managed within a strategic regional context.

Regional Environmental Educators Network

This is comprised of Environmental Educators from each of the 14 HCCREMS member councils. The Network's purpose is to share resources of common interest, share experiences regarding the success or failure of individual Council and regional projects, undertake professional development, raise the capacity of all member Councils in relation to environmental education and deliver regional education projects

Regional Compliance Officers Network

This is currently facilitated by HCCREMS to assist in the design, development and delivery of environmental compliance activities and projects across the region.

Regional Weeds Technical Group

To assist in the design, development and delivery of weed management activities and projects across the region. Meets monthly.

Regional Weeds Managers Group

To assist in the design, development and delivery of weed management activities and projects across the region. Meets quarterly.

Newcastle Coastal Technical Working Party

To investigate and make recommendations on coastal issues including management of coastal erosion. Responsible for the development and implementation of the Coastal Management Plan.

Newcastle Catchment Management Forum

Managed by the Hunter Central Rivers Catchment Management Authority⁶ (HCRCMA) the Newcastle Catchment Management Forum is one of four community reference groups which operate as subcommittees of the HCRCMA Board and provide the CMA with valuable advice and insight on local natural resource issues and important social and economic factors affecting communities in our region.

Hunter Estuary Technical Working Party

Responsible for implementation of the Hunter Estuary Management Plan. The Working Party also provides advice to Council on strategic estuarine issues.

Environmental Advisory Committee

The Environmental Advisory Committee provides strategic advice and guidance on, and assist in the development of, environmental strategies for Council. Meets quarterly.

Newcastle Floodplain Risk Management Committee

Advise and assist the elected Council in the development and implementation of the City-wide Floodplain Risk Management Plan and the Wallsend Floodplain Risk Management Plan. Provide a link between the local community and Council. Act as both a focus and a forum

⁶ The Hunter Central Rivers Catchment Management Authority will become part of the new Hunter Local Land Services in January 2014

for the discussion of social, economic, environmental implications of flooding, as well as risk to life and property issues. Ensure that all stakeholders (often with competing desires) are equally represented. Meets quarterly.

Hunter Water Corporation Consultation Forum

The Consultative Forum is an advisory body that provides advice to Hunter Water on customer and consumer interests in relation to the Corporation's Customer Contract and the operational performance requirements of its Operating Licence.

Hexham Swamp and Kooragang Rehabilitation Steering Committee

Provide advice and assistance to the HCRCMA Board in relation to the Hexham Swamp Rehabilitation Project, the Kooragang Wetlands Rehabilitation Project and other wetland projects within the Hunter Estuary may be identified from time to time and be referred to the committee for discussion and advice.

Newcastle Community Consultative Committee on the Environment

Established by the NSW Minister for the Environment in 2011. It enables people living in the Newcastle Local Government Area to identify important environmental and amenity issues associated with nearby industrial activities. It also helps local industry understand the community's concerns.

Newcastle Port Technical Advisory and Consultative Committee

Established by Newcastle Port Corporation, the Technical Advisory and Consultative Committee (TACC) is an important consultative mechanism for dredging proposals. Meets quarterly.

Newcastle Bushfire Management Committee

The Bush Fire Management Committee provides a forum for cooperative and coordinated bushfire management in a local area. It also provides for community involvement in the Bush Fire Risk Management process and assists the Bush Fire Coordinating Committee to consider issues relevant to the protection of life, property and the environment from bushfires. A range of stakeholders participate in order to ensure the whole community has a say on bushfire management activities. They include landholders, land managers, fire authorities and community organisations.

Member CRC for Water Sensitive Cities

In 2012 Council joined the CRC for Water Sensitive Cities. The CRC is a collaboration with over 70 research, industry and government partners, that aims to deliver socio-technical urban water management solutions, education and training programs, and industry engagement required to make towns and cities water sensitive.

Appendix D – Selected Reading

Greater Efficiency in the Use Of Resources

Council

- GHD (2010). Summerhill Waste Management Centre Stage II Development. Environmental Impact Statement. Prepared for the City of Newcastle.
- TCoN (1996). Newcastle Solid Waste Management Strategy. The City of Newcastle.
- TCoN (2003). GAIN Plan. The City of Newcastle.
- TCoN (2007). Newcastle Energy and Water Savings Action Plan. The City of Newcastle.
- TCoN (2010). Newcastle Waste Avoidance and Resource Recovery Policy. The City of Newcastle.
- TCoN (2011). Newcastle 2020 Carbon and Water Management Action Plan. The City of Newcastle.

Other

- CRC for Water Sensitive Cities (2013). Blueprint2013 - Stormwater Management in a Water Sensitive City
- DECC (2007). NSW Waste Avoidance and Resource Recovery Strategy. Department of Environment and Climate Change.
- DECCW (2010). Review of Waste Strategy and Policy in NSW. Department of Environment and Climate Change and Water
- DECCW (2010). Waste Avoidance and Resource Recovery Strategy Progress Report Vol 1 and 2. Department of Environment and Climate Change and Water
- DECCW (2011). Reducing Waste. Implementation Strategy 2011 -2015. Department of Environment and Climate Change and Water
- DEWHA (2009). National Waste Policy: Less Waste, More Resources. Department of the Environment, Water, Heritage and the Arts.
- EPA (2013). Draft strategy to combat illegal dumping. NSW Environment Protection Authority.
- HWC (2011). Greenprint for sustainable urban water management. Hunter Water Corporation.
- KPMG (2012). Review of the NSW Waste and Environment Levy. Prepared for the NSW Environment Protection Authority

Our Unique Natural Environment is Maintained, Enhanced and Connected

Council

- BMT WBM (2009). Hunter Estuary Coastal Zone Management Plan. Prepared for the City of Newcastle and partners
- BMT -WBM (2009). Hunter Estuary Management Study. Prepared for the City of Newcastle and partners
- BMT WBM (2011). Wetland Action Plan for Market Swamp and Newcastle Wetland Reserve. Prepared for the City of Newcastle.
- Clulow, S. (2012). Amphibian survey and impact assessment of Market Swamp and Newcastle Wetland Reserve, including targeted green and golden bell frog assessment. Prepared for the City of Newcastle.
- Ecobiological (2011). Ecological assessment of Themeda grassland on sea cliffs and coastal headlands in the NSW north Coast, Sydney Basin and South East Corner regions. King Edward Park and Obelisk Recreation Areas. Prepared for the City of Newcastle.
- FBNBS (2002). Pilot survey for Microchiropteran bats of the Mangrove Forest of Kooragang Island in the Hunter Estuary, NSW. Report to Newcastle City Council by Fly by Night Bat Surveys.
- FFS (2007). Jesmond Bushland Blackbutt Reserve Habitat Tree Mapping. Forest Fauna Surveys Prepared for the City of Newcastle.
- FFS (2011). City of Newcastle Habitat Tree Mapping. Prepared for the City of Newcastle.
- FFS (2013). Habitat Tree Mapping, Stages 1 – 3b (Glenrock – Minmi – Blackhill – Mayfield). Prepared for the City of Newcastle.
- Gladstone, W and Herbert, C. (2006). Newcastle Coastal Rock Platforms Biodiversity and Management Study.
- Herbert (2006). Birds of Newcastle's Coastal Rock Platforms. Hunter Bird Observers Club Special Report No.3.
- Herbert (2007). Distribution, Abundance and Status of Birds in the Hunter Estuary. Prepared for the City of Newcastle.
- Kidd, and Winning, G. (2005). Preliminary Investigation into Hydraulic and Environmental Conditions of Warabrook Wetlands. Prepared by WBM Oceanics Australia and HWR Ecological Prepared for the City of Newcastle.

LRI (2013). Stockton Cemetery Vegetation Management Plan. Prepared by Land Resource Industries for the City of Newcastle.

PB and BMT (2006). Hunter Estuary Issues Paper. Prepared for the City of Newcastle and partners

Payne, R. (2003). Flora and Fauna Survey of Wallsend Brickworks. Prepared for the City of Newcastle.

Roberts, B. (2009). Assessment of the Blackbutt Reserve Flying Fox Colony, Newcastle NFi. Prepared for the City of Newcastle.

Rodd, T., Burley, R., Clements, A. and Rodd, J. (2010). Newcastle Public Bushland Asset Inventory Report. Prepared by Anne Clements and associates for the City of Newcastle.

TCoN (2003). Newcastle Bushland Plan of Management. Prepared by the City of Newcastle

TCoN (2004). Newcastle Stormwater Management Plan. Prepared by the City of Newcastle

TCoN (2004). Environmental Management for Parks and Waterway Maintenance. Prepared by the City of Newcastle

TCoN (2005). Green Corridors and Landscape Precinct Plan. Implementing the Newcastle Green Spaces Strategy. Prepared by the City of Newcastle

TCoN (2005). Cottage Creek Catchment Gross Pollutant Study. Prepared by the City of Newcastle

TCoN (2006). Urban Creek Prioritisation. Prepared by the City of Newcastle

TCoN (2006). Newcastle Biodiversity Strategy. Prepared by the City of Newcastle

TCoN (2006). Urban Forest Background Paper. Prepared by the City of Newcastle

TCoN (2008). Newcastle Urban Forest Policy. Prepared by the City of Newcastle

TCoN (2011). Newcastle Street Tree Masterplan. Prepared by the City of Newcastle

TCoN (2012). Stormwater Drainage Asset Management Plan. Prepared by the City of Newcastle

TCoN (2012). Blackbutt Reserve Plan of Management. Prepared by the City of Newcastle

WBM (2007). Wentworth Creek Catchment Frog Study. Prepared for the City of Newcastle

Other

Brereton, R., and Taylor-Wood, E., (2010). Ecological Character Description of the Kooragang Component of the Hunter Estuary Wetlands Ramsar Site. Report to the Department of Sustainability, Environment, Water, Population and Communities (SEWPAC), Canberra.

CRC for Water Sensitive Cities (2013). Blueprint2013 - Stormwater Management in a Water Sensitive City

DECCW (2009). Lower Hunter Regional Conservation Plan. NSW Department of Environment, Climate Change and Water.

DP (2006). Lower Hunter Regional Strategy 2006 -2031. Department of Planning

DECCW (2010). Draft New South Wales Biodiversity Strategy 2010-2015.

HCCREMS (2010). Hunter and Central Coast Regional Weed Strategy 2010-2015.

HCRCMA (2012). Hunter Central Rivers Catchment Action Plan. A strategy for regional natural resource management.

NBFRMC (2012). Newcastle Bush Fire Risk Management Plan. Prepared by the Newcastle Bush Fire Management Committee.

Environment and Climate Change Risks and Impacts Are Understood and Managed

Council

BMT WBM (2012). Newcastle City-wide Floodplain Risk Management Study and Plan. Prepared for the City of Newcastle.

DHI (2007). Stockton Beach Coastal Processes Study. Stage 1 – Sediment Transport Analysis and Description of Ongoing Processes. Prepared for the City of Newcastle.

DHI (2008). Wallsend-Plattsburg (Ironbark Creek) Flood Study. Prepared for the City of Newcastle.

DHI (2008). Analysis of Extreme Ocean Water Levels at the Hunter River Entrance. Prepared for the City of Newcastle.

DHI (2008). Dark Creek Flood Study. Prepared for the City of Newcastle.

DHI (2008). Upgrading of Lower Hunter Flood Model at Hexham. Prepared for the City of Newcastle.

- Echelon (2010). Climate Change Risk Assessment. Adaptation report. Prepared for the City of Newcastle
- TCoN (2004). Newcastle Air Emissions Inventory Report. Prepared by the City of Newcastle.
- TCoN (2005). Newcastle Airshed Management Action Plan. Prepared by the City of Newcastle.
- TCoN (2010). Strategic Climate Change Policy. Prepared by the City of Newcastle.
- Umwelt (2002). Shifting Sands at Stockton Beach. Prepared for the City of Newcastle by Umwelt and SMEC.
- Umwelt (2003). Newcastle Coastline Management Plan. Prepared for the City of Newcastle.
- Umwelt (2003). Newcastle Coastline Management Study. Prepared for the City of Newcastle.
- WBM (2008). Throsby, Cottage and CBD Flood Study. Prepared for the City of Newcastle.
- WBM (2008). Newcastle Flood Planning Stage 1 – Concept Planning. Prepared for the City of Newcastle.
- WBM (2008). Newcastle City Flash Flood Warning System. Prepared for the City of Newcastle.
- WBM (2010). Newcastle Coastline Hazard Definition Study. Prepared for the City of Newcastle by WBM and Robert Carr and Associates.
- WP (2009). Floodplain Risk Management Plan and Study for the Wallsend Commercial Centre. Prepared for the City of Newcastle. Prepared by WorleyParsons.
- Worley Parsons (2011). Stockton Beach Sand Scoping and Funding Feasibility Study. Prepared for the City of Newcastle
- Blackmore K.L, Goodwin I.D and Wilson S. (2010c). CASE STUDY 4: Potential Impacts of Climate Change on Extreme Events in the Coastal Zone of the Hunter, Lower North Coast and Central Coast region. A report prepared for the Hunter and Central Coast Regional Environmental Management Strategy, NSW.
- Blackmore K.L and Goodwin I.D (2009). Climate Change impact for the Hunter, Central and Lower North Coast region. A report prepared for the Hunter and Central Coast Regional Environmental Management Strategy, NSW.
- Climate Commission (2013). The Critical Decade 2013: Climate Change science, risks and response.
- COAG (2007). National Climate Change Adaptation Framework. Council of Australian Governments.
- DECCW (2010). Guidelines for preparing a Coastal Management Plan. Department of Environment Climate Change and Water.
- DIPNR (2005). Floodplain Development Manual: the management of flood liable land.
- HCCREMS (2010). Potential Impacts of Climate Change on the Hunter, Central and Lower North Coast of NSW. Hunter Councils NSW.
- HCCREMS (2010b). Climate Change Risk Assessment and Adaptation Plan: Coastal Councils, Hunter Councils NSW.
- HCCREMS (2012). Climate Change and Coastal Decision-making: The Workbook. Hunter Councils NSW.

Other

- Blackmore K.L, Goodwin I.D and Wilson S. (2010a). CASE STUDY 2: Potential Impacts of Climate Change on Extreme Heat Events Affecting Public Health in the Hunter, Lower North Coast and Central Coast Region. A report prepared for the Hunter and Central Coast Regional Environmental Management Strategy, NSW.
- Blackmore K.L, Goodwin I.D and Wilson S. (2010b). CASE STUDY 3: Potential Impacts of Climate Change on Bushfire Risk in the Hunter, Central and Lower North Coast region. A report prepared for the Hunter and Central Coast Regional Environmental Management Strategy, NSW.



For more information visit:
www.newcastle.nsw.gov.au

