

3. PLANNING AND MANAGEMENT CONTEXT

3.1 LEGISLATIVE REQUIREMENTS

In view of the extremely broad range of land uses within the catchment – from a nuclear reactor to a national park – a very wide range of environmental, planning and other legislation will have an influence on the area’s planning, development and on-going management. Therefore only the most relevant elements of those legislation most applicable to the Strategic Management Plan’s core areas are briefly summarised below.

3.1.1 Commonwealth Legislation

□ *Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) relates to biodiversity conservation issues of national interest. Its primary objective is to “provide for the protection of the environment, especially those aspects of the environment that are matters of National Environmental Significance.” It provides the framework for environmental assessment of projects considered to have national importance and the listing of nationally endangered species. Environmental approvals under the EPBC Act may be required for an “action” (considered to include a project, development, undertaking, activity or series of activities) that is likely to have a significant impact on Matters of National Environmental Significance (known as “NES matters”), these include nationally listed threatened species and ecological communities.

Within the catchment, at Little Forest, the Sydney Turpentine Ironbark Forest Endangered Ecological Community (EEC) is a listed community under the Commonwealth EPBC Act. Twenty seven of the threatened or endangered flora species previously recorded in the catchment, and two of the fauna species recorded in the catchment’s vicinity, are also nationally listed threatened species under the EPBC Act.

3.1.2 State Legislation

□ *Environmental Planning and Assessment Act 1979*

The *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the legislative framework for the State’s planning system.

The objectives of the EP&A Act are to:

- a) encourage:
 - i) the proposed management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forest, minerals, water, cities, towns

- and villages for the purpose of promoting the social and economic welfare of the community and a better environment,
- ii) the promotion and coordination of the orderly and economic use and development of land;
 - iii) the protection, provision and co-ordination of communication and utility services;
 - iv) the provision of land for public purposes;
 - v) the provision and co-ordination of community services and facilities;
 - vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats; and
 - vii) ecologically sustainable development.
- b) promote the sharing of the responsibility for environmental planning between the different levels of government in the State; and
 - c) provide increased opportunity for public involvement and participation in environmental planning and assessment.

The Act addresses the preparation of environmental planning instruments and undertaking development control actions, including environmental impact assessment. It also provides for the preparation of three types of environmental planning instruments - State Environmental Planning Policies, Regional Environmental Plans and Local Environmental Plans.

Under Section 5A of the EP&A Act an assessment of the impacts of any proposed activities on land that is critical habitat or is known to support threatened species, populations or ecological communities listed under the *Threatened Species Conservation Act 1995* (TSC Act), or their habitats, must be undertaken in the form of Assessments of Significance. If an Assessment of Significance concludes that a significant impact is likely on threatened species, populations or endangered ecological communities, then a Development Application must be accompanied by a Species Impact Statement (SIS).

❑ ***Threatened Species Conservation Act 1995***

The objectives of the *Threatened Species Conservation Act 1995* (TSC Act) include:

- ❑ to conserve biological diversity and promote ecologically sustainable development;
- ❑ to prevent the extinction and promote the recovery of threatened species, populations and ecological communities;
- ❑ to protect the critical habitat of those threatened species, populations and ecological communities that are endangered;
- ❑ to eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities;
- ❑ to ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed; and
- ❑ to encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

This Act forms the foundation on which to base assessments under Section 5A of the EP&A Act. The TSC Act provides for identification, and classification, of the State-listed species, populations and ecological communities that need to be considered under Section 5A of the EP&A Act. It also provides for the identification of key threatening processes that are most likely to jeopardise the survival of those species, populations and ecological communities.

As described in Chapter 2, five Endangered Ecological Communities (EECs) and a range of threatened flora occur within the catchment and a number of threatened fauna species have been recorded from the surrounding district.

❑ ***Threatened Species Legislation Amendment Act 1994***

The *Threatened Species Legislation Amendment Act 1994* (TSLA Act) builds on the earlier legislation's mechanisms for conserving threatened species, populations and ecological communities and their habitats. Parallel amendments have also been made to the *Fisheries Management Act 1994*.

The key areas of reform are:

- ❑ in urban and coastal areas, integration of biodiversity values into better strategic land-use planning, changes to the development assessment process and accreditation of flora and fauna consultants;
- ❑ in rural areas, threatened species conservation is embedded within native vegetation protection to deliver a simpler and more supportive system of conservation incentives for landholders;
- ❑ listing of threatened species maintained as a scientific process, with enhanced transparency;
- ❑ transparent prioritisation of actions for recovery and threat abatement;
- ❑ upgraded enforcement and compliance provisions; and
- ❑ expert advisory councils to advise the Minister for the Environment on social, economic and biodiversity implications.

❑ ***National Parks and Wildlife Act 1974***

This Act establishes the National Parks and Wildlife Service and provides it with responsibility for the management of national parks and other conservation reserves, native flora and fauna protection, the protection of Aboriginal sites/resources, and administration of the TSC Act.

The *National Parks and Wildlife Act 1974* (NPW Act) is the principal legislation governing the protection and management of Aboriginal heritage in NSW. The Act defines an Aboriginal Object as "any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains".

All Aboriginal objects, including sites with physical evidence, are protected under the NPW Act regardless of their size or level of significance or land tenure (with the exception of Commonwealth Lands). The Act makes it an offence to damage, deface, destroy, disturb or collect any Aboriginal object or evidence site without the approval of the Director of the DEC. However this offence only applies if the action was undertaken "knowingly" with an offender being aware of their actions and impacts.

The NPW Act also provides for the reservation and gazettal of lands as an Aboriginal Area, or the declaration and gazettal of lands as a Protected Archaeological Area.

❑ ***Noxious Weeds Act 1993***

The *Noxious Weeds Act 1993* (NW Act) defines the roles of government, councils, private landholders and public authorities in the management of noxious weeds. The Act sets up categorisation and control actions for the various noxious weeds, according to their potential to cause harm to our local environment.

The objectives of the *Noxious Weeds Act 1993* include:

- ❑ to identify noxious weeds in respect of which particular control measures need to be taken;
- ❑ to specify those control measures;
- ❑ to specify the duties of public and private landholders as to the control of those noxious weeds; and

- to provide a framework for the State-wide control of those noxious weeds by the Minister and local control authorities.

Under this Act, noxious weeds have been identified for Local Government Areas and assigned Control Categories (eg. 1, 2, 3, 4 and 5). Part 3 provides that occupiers of land (this includes owners of land) have responsibility for controlling noxious weeds on the land they occupy.

□ **Local Government Act 1993**

The purposes of the *Local Government Act 1993* include:

- to provide the legal framework for an effective, efficient, environmentally responsible and open system of local government in New South Wales;
- to regulate the relationships between the people and bodies comprising the system of local government in New South Wales;
- to encourage and assist the effective participation of local communities in the affairs of local government;
- to require councils, councillors and council employees to have regard to the principles of ecologically sustainable development in carrying out their responsibilities.

Under Section 36 of the *Local Government Act 1993*, Council's have an obligation to produce site-specific Plans of Management (PoMs) for land in community ownership. For the purposes of this section, land is to be categorised as one or more of the following - a natural area, a sportsground, a park, an area of cultural significance, or general community use. Land that is categorised as a natural area is to be further categorised as one or more of the following – bushland, wetland, escarpment, watercourse, foreshore, or a category prescribed by the regulations. Each of these categories has a set of core objectives, detailed in the Act and its Regulations, to guide their management.

□ **Crown Lands Act 1989**

Section 10 of the *Crown Lands Act 1989* details the objects of the Act to ensure that Crown Land is managed for the benefit of the people of New South Wales. Section 11 of the Act details the principles of Crown Land management, which are:

- that environmental protection principals be observed in relation to the management and administration of Crown land;
- that the natural resources (including water, soil, flora, fauna and scenic quality) be conserved wherever possible;
- that public use and enjoyment be encouraged;
- that, where appropriate, multiple use of the land be encouraged;
- that, where appropriate, Crown land should be used and managed in such a way that both the land and its resources are sustained in perpetuity; and
- that Crown land be occupied, used, sold, leased, licensed or otherwise dealt with in the best interest of the state consistent with the above principles.

□ **Heritage Act 1977**

The *Heritage Act 1977* includes references to the “cultural” value and “archaeological” value of items or places, both of which may include Aboriginal heritage values, in the assessment of both state and local heritage significance (section 4A(1)). Items listed on the State Heritage Register, or subject to an Interim Heritage Order, are afforded protection from a range of damaging or disruptive activities - except with the prior approval of the NSW Heritage Office.

□ **Rural Fires Act 1997**

Section 3 of the *Rural Fires Act 1997* states the objects of the Act as to provide:

- (a) for the prevention, mitigation and suppression of bush and other fires in local government areas (or parts of areas) and other parts of the State constituted as rural fire districts, and
- (b) for the co-ordination of bush fire fighting and bush fire prevention throughout the State, and
- (c) for the protection of persons from injury or death, and property from damage, arising from fires, and
- (d) for the protection of the environment by requiring certain activities referred to in paragraphs (a)–(c) to be carried out having regard to the principles of ecologically sustainable development described in section 6 (2) of the Protection of the Environment Administration Act 1991.

❑ ***Fisheries Management Act 1994***

The objects of the *Fisheries Management Act 1994* are to “conserve, develop and share the fishery resources of the State for the benefit of present and future generations”.

In particular, the objects of this Act include:

- ❑ to conserve fish stocks and key fish habitats; and
- ❑ to conserve threatened species, populations and ecological communities of fish and marine vegetation; and
- ❑ to promote ecologically sustainable development, including the conservation of biological diversity.

And, consistently with those objects:

- ❑ to promote viable commercial fishing and aquaculture industries; and
- ❑ to promote quality recreational fishing opportunities; and
- ❑ to appropriately share fisheries resources between the users of those resources; and
- ❑ to provide social and economic benefits for the wider community of New South Wales.

Marine vegetation, including mangroves, are protected under Part 7 Division 4 of the FM Act and therefore is applicable to lower reaches of the catchment.

❑ ***Native Vegetation Conservation Act 1997 and Native Vegetation Act 2003***

The objectives of the *Native Vegetation Conservation Act 1997* are to provide for the conservation and management of native vegetation on a regional basis, protect native vegetation of high conservation value, encourage revegetation and to prevent inappropriate clearing of vegetation. This is achieved via regional vegetation management plans, property plans and agreements, and development consent requirements.

This Act was replaced by the *Native Vegetation Act 2003*, and the Sutherland Shire is excluded (under Schedule 1) from this later Act’s operation.

❑ ***Soil Conservation Act 1938***

The *Soil Conservation Act 1938* provides for the conservation of soil resources, and farm water resources, and for the mitigation of erosion.

❑ ***Recreational Vehicles Act 1983***

The *Recreational Vehicles Act 1983* creates a framework within which recreational driving can be contained on suitable premises and whereby activities can be monitored by the appropriate authorities.

The Act enables an occupier of land to apply to Environmental Protection Agency (EPA) for designation of land as a recreation vehicles area. Upon consideration of an application, the EPA may then designate land for that purpose. The Act applies only to private land. Vehicles that

are driven in recreation vehicle areas are required to be registered, in registrable condition and to have number-plates.

Authorised EPA officers and Police Officers have a range of functions and powers under the Act, including to inspect and test vehicles in recreation vehicle area, remove vehicles from land and issue directions not to drive vehicles upon restricted land.

□ ***Rivers and Foreshores Improvement Act 1948***

The aim of the *Rivers and Foreshores Improvement Act 1948* was to ensure the stability of river and estuary systems. However this Act was repealed on 4 February 2008, with most aspects incorporated into the Controlled Activity Provisions of the amended *Water Management Act 2000*. The *Water Management Amendment (Controlled Activities) Regulation 2008* commenced on 4 February 2008.

Under the *Rivers and Foreshores Improvement Act 1948*, local council authorities were exempt from the approvals process for controlled activities on waterfront land. Waterfront land extended for up to 40 metres from the top of a creek bank, depending on the type of watercourse under consideration, and also included the bed and banks of the watercourse.

3.1.3 Environmental Planning Controls

3.1.3.1 State Environmental Planning Policies (SEPPs)

SEPP 19 – Bushland in Urban Areas

State Environmental Planning Policy No. 19 - Bushland in Urban Areas, applies to 41 local government areas in the Sydney region and Lake Macquarie including the Sutherland Shire. The policy specifically applies to those areas of land zoned or reserved for public open space and which satisfy the definition of urban bushland in the policy. SEPP 19 requires the listed councils, when preparing draft local environmental plans, give priority to preserving bushland and to have regard to the general and specific aims of the policy, which are as follows:

- to protect the remnants of plant communities which were once characteristic of land now within an urban area;
- to retain bushland in parcels of a size and configuration which will enable the existing plant and animal communities to survive in the long term;
- to protect rare and endangered flora and fauna species;
- to protect habitats for native flora and fauna;
- to protect wildlife corridors and vegetation links with other nearby bushland;
- to protect bushland as a natural stabiliser of the soil surface;
- to protect bushland for its scenic values, and to retain the unique visual identity of the landscape;
- to protect significant geological features;
- to protect existing landforms, such as natural drainage lines, watercourses and foreshores;
- to protect archaeological relics;
- to protect the recreational potential of bushland;
- to protect the educational potential of bushland;
- to maintain bushland in locations which are readily accessible to the community; and
- to promote the management of bushland in a manner which protects and enhances the quality of the bushland and facilitates public enjoyment of the bushland compatible with its conservation.

This SEPP applies to those areas of the catchment zoned or reserved for public open space.

SEPP 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection encourages the conservation and management of natural vegetation areas that provide habitat for Koalas to ensure permanent free-living populations will be maintained over their present range. Local councils cannot approve development in an area affected by the policy without an investigation of core Koala habitat. The policy provides the state-wide approach needed to enable appropriate development to continue, while ensuring there is ongoing protection of Koalas and their habitat.

3.1.3.2 Regional Planning Instruments

Greater Metropolitan Regional Environmental Plan No. 2 – Georges River Catchment

This Regional Environmental Plan applies to the Georges River Catchment, within the Greater Metropolitan Region. The Catchment consists of parts of Bankstown City, Blacktown City, Campbelltown City, Camden, Canterbury City, Fairfield City, Holroyd City, Hurstville City, Kogarah, Liverpool City, Rockdale City, Sutherland, Wollondilly and Wollongong City local government areas that are within the Georges River Catchment.

The REP aims to protect the water quality of the Georges River and tributaries, as well as the environmental quality of the wider catchment. It sets out a framework within which local, state and federal governments and authorities will liaise and apply consistent policy-driven approach to planning and development within the catchment.

The specific aims and objectives of this plan are as follows:

- ❑ to preserve and protect and to encourage the restoration or rehabilitation of regionally significant sensitive natural environments such as wetlands (including mangroves, saltmarsh and seagrass areas), bushland and open space corridors within the Catchment, by identifying environmentally sensitive areas and providing for appropriate land use planning and development controls;
- ❑ to preserve, enhance and protect the freshwater and estuarine ecosystems within the Catchment by providing appropriate development;
- ❑ to ensure that development achieves the environmental objectives for the Catchment;
- ❑ to identify land uses in the Catchment which have the potential to impact adversely on the water quality and river flows in the Georges River and its tributaries and to provide appropriate planning controls aimed at reducing adverse impacts on the water quality and river flows;
- ❑ to conserve, manage and improve the aquatic environment within the Catchment which is a significant resource base for the aquaculture industry, by providing controls aimed at reducing pollution entering the Catchment's watercourses;
- ❑ to protect the safety and well-being of the local and regional community in accordance with standards and processes aimed at improving the water quality and river flows in the Catchment to enable recreation; and
- ❑ to aid in the improvement of the environmental quality of Botany Bay in conjunction with other regional planning instruments.

The REP applies land use planning and development control initiatives and requirements to achieve these aims and objectives.

This REP is especially relevant to the catchment's planning and management.

3.1.3.3 Local Environmental Plans and Development Control Plans

A Local Environment Plan (LEP) is a planning tool that sets legal controls over development in the area to which it applies. It contains zoning controls as well as controls for precincts, heritage conservation areas and protected areas. Together, these controls will determine where and to what extent development may occur.

Sutherland Shire Local Environment Plan 2006 (SSLEP), and SSLEP 2000

The aims of the Sutherland Shire Local Environment Plan (SSLEP) 2006 include:

- ❑ to enable the achievement of the community's vision for Sutherland Shire through the proper management, development and conservation of the Shire's environmental resources;
- ❑ to describe the intended environmental outcomes that will result from the effective implementation of this plan;
- ❑ to promote an appropriate balance of development and management of the environment that will be ecologically sustainable, socially equitable and economically viable;
- ❑ to provide for appropriate land use controls that protect critical requirements relating to the use of Commonwealth land for defence purposes;
- ❑ to establish a broad planning framework for controlling development in Sutherland Shire;
- ❑ to conserve items of environmental heritage;
- ❑ to preserve and enhance the quality of native vegetation and fauna;
- ❑ to protect environmentally sensitive areas;
- ❑ to conserve natural, indigenous and built heritage sites throughout Sutherland Shire;
- ❑ to encourage development that is energy efficient and supports access by public transport, walking and cycling;
- ❑ to provide opportunities for business interests to respond to the demands of the community for shopping and the provision of services;
- ❑ to provide employment opportunities in Sutherland Shire;
- ❑ to put in place a framework of controls to address current and future housing needs;
- ❑ to allow for provision of community facilities and land for public purposes;
- ❑ to preserve or enhance the quality of life of the local community; and
- ❑ to allow for improvements and appropriate additions to the recreational assets of Sutherland Shire.

The SSLEP 2006 only applies to approximately 60% of the catchment – mainly the eastern, northern and southern areas. Most of the western uplands are shown in SSLEP as “Excluded – refer to Sutherland Shire Local Environment Plan 2000 Zone 1(b) Rural (Future Urban)”. Other areas – notably the hillslopes east of Mill Creek are shown in SSLEP 2006 as “Deferred matter – existing zoning under SSLEP 2000 continues until resolved”.

❑ Sutherland Shire Development Control Plan

The purpose of Sutherland Shire Development Control Plan 2006 (SSDCP 2006) is to establish controls and standards for future development to ensure that it protects local amenity and the surrounding environment. The DCP sets benchmarks of what is acceptable in land use, development and environmental management decisions.

The DCP works towards Council's strategy to manage significant vegetation, vegetated links and waterways throughout Sutherland Shire to ensure the long-term conservation of the biodiversity of the Shire and surrounds. Council's strategy for the management of natural resources is based on three roles for Council:

- ❑ as a manager of land under its care;
- ❑ as an approval authority for development; and
- ❑ as an educator and information provider to the community.

Of particular relevance to the catchment the DCP contains provisions in relation to vegetated links and wildlife corridors (“Greenweb”), wetlands, bushfire prone land, flood liable lands, and acid sulphate soils (reference maps for all these attributes or hazards form part of the SSDCP 2006).

The objectives of the Greenweb section of the DCP include:

- ❑ to prevent direct loss of habitat in core and support areas by requiring the retention or restoration of areas of habitat in a size and configuration that will enhance long term sustainability;
- ❑ to prevent fragmentation of bushland by requiring the landscaped component of a site to function as a wildlife corridor, linking proximate areas of core habitat;
- ❑ to improve the function of riparian zones and foreshores as natural areas so that they provide linkages and corridors between areas of habitat;
- ❑ to minimise weed invasion and spread by requiring appropriate landscape treatment of developments within Greenweb areas;
- ❑ to require revegetation of habitat or corridor, so as to compensate for detrimental impacts accruing from the development of land; and
- ❑ to utilise landscaped areas to re-establish corridors in urban areas through the establishment of canopy and groundcover links across properties.

The objectives of the Wetland and Waterways section of the DCP include:

- ❑ to protect, restore and maintain ecological processes, natural systems and biodiversity within wetlands and waterways;
- ❑ to minimise sedimentation and pollution of wetlands and waterways;
- ❑ to restore degraded wetlands, wetland buffer areas, waterways and riparian zones;
- ❑ to ensure appropriate fire management regimes and hazard reduction techniques for wetlands, wetland buffer areas, waterways and riparian zones; and
- ❑ to encourage best practice environmental design measures so that the sustainability of wetlands and waterways is maintained or improved.

❑ **Sutherland Shire Stormwater Management Development Control Plan 2005**

Council’s Stormwater Management Development Control Plan 2005 aims to ensure that all development has regard to managing stormwater in an environmentally sustainable way and that the impacts of any stormwater discharge are reduced/managed.

The objectives of the DCP are:

- (a) to ensure that Water Sensitive Urban Design techniques are incorporated and fully exploited in all new developments prior to consideration of on-site detention and stormwater discharge off-site;
- (b) to minimise the volume of stormwater runoff;
- (c) to preserve, restore and enhance water body and riparian zones as natural systems;
- (d) to promote water conservation through on-site water retention and reuse;
- (e) to protect downstream properties from the impacts of excessive runoff and flooding;
- (f) to ensure that building areas are free from flooding;
- (g) to ensure that stormwater management is integrated with urban design to maximise opportunities to reuse stormwater;
- (h) to ensure that the quality of stormwater discharged from a development does not impact on the environment and receiving waters in terms of sedimentation, water pollution and other impacts;
- (i) to utilise natural surfaces and landforms to act as natural influences on overland flow paths and to allow for on-site infiltration where suitable; and
- (j) to maintain stormwater runoff in its natural catchment by the most direct route.

3.1.4 Other Strategies and Plans

3.1.4.1 Metropolitan Strategy: South Subregion – Draft Subregional Strategy, 2007

This Subregional Strategy was part of a larger metropolitan-scale strategic planning exercise endeavoured to set broad direction for both Sydney as whole and discrete sub-regions using a set of key Directions and Key Actions across 6 planning themes.

In relation to the “Environment Heritage and Resources” theme the Strategy’s “Structure Plan” identified the following conservation and bushland areas within the catchment:

- Georges River National Park;
- most of the bushland slopes along the eastern side of Mill Creek, below the residential/urban areas (from Alfords Point to Menai) as “bushland, national park, regional”; and
- the Lucas Heights Conservation Area (mapped as an “urban park”).

In relation to the “Economy and Employment” theme the Strategy made specific reference to the catchment (referred to as the West Menai Lands) flagging the area as possibly suitable for “industrial activities” and as possible additional “Employment Lands” stating:

West Menai is a substantial area of rural zoned land on the eastern side of Heathcote Road. While there are large areas of Crown Land (understood to be the subject of a successful Aboriginal Land Claim) which are relatively flat, the area is relatively isolated from urban development. It adjoins Holsworthy military reserve which is actively used, much of it has environmental significance and its development could impact significantly on adjoining land and be impacted itself from activity on adjoining land such as bush fire and emissions from the waste depot. The area therefore has limited potential for urban development but could be considered for industrial activities, provided development reflects the environmental significance and any Native Title implications of the site and its surroundings, and the requirements of the Department of Defence.

3.1.4.2 Sutherland Shire Council Greenweb Strategy

The aim of Council’s Greenweb Strategy is to identify and manage significant vegetation and vegetated links throughout the Sutherland Shire to ensure the long term conservation of the Shire and surrounds, while providing for recreation opportunities and improvements in water and air quality. This is to be achieved through a “greenweb” network of habitat nodes and corridors. The strategy applies to those areas within the Sutherland identified in the Greenweb maps as containing remnant bushland vegetation or significant tree canopy providing links to areas of core habitat and supplements the aims and objectives of the Sutherland Shire Local Environmental Plan 2000 (SSLEP 2000). Greenweb lands have been prioritised for protection depending on the potential contribution they may play in the conservation of the Shire’s wildlife.

Objectives of the strategy include:

1. To identify, conserve and enhance biodiversity, environmental health, natural heritage and landscape amenity;
2. To maintain and enhance the unique bushland character of the Shire;
3. To protect habitat from degradation caused by inappropriate use and management;
4. To create and conserve core habitat areas for the conservation of native flora and fauna;
5. To create and conserve wildlife corridors between core habitat areas for the movement of native flora and fauna;

6. To encourage natural vegetation regeneration and encourage planting of native vegetation on public and private lands;
7. To maintain and enhance aquatic ecosystems;
8. To establish, enhance and protect riparian vegetation for its contribution to improved water quality;
9. To assist Council with the implementation of its obligations under the *Threatened Species Conservation Act 1995*;
10. To provide for public access to publicly owned bushland;
11. To facilitate pedestrian movement through the Shire via a network of green corridors;
12. To identify options for funding of biodiversity conservation measures; and
13. To conserve and enhance links with bushland and corridors in adjoining Local Government Areas.

3.1.4.3 Georges River Built Environment and Foreshore Access Study, 2004

The Georges River Built Environment and Foreshore Access Study undertaken by the then Department of Infrastructure Planning and Natural Resources provides a framework for improvements to built form and scenic quality, foreshore access, recreation and leisure, cultural heritage and natural environment of the Georges River and its tributaries. The study provides a comprehensive analysis of the existing conditions of the Georges River and its tributaries as well as identifying planning and management principles that can provide a foundation for future local plans, programmes and projects.

Within the catchment the study recommended a feasibility study into a proposed trial link along the southern side of the Georges River (this area as still military land at the time of the study).

3.1.4.4 Southern Sydney Region - Assessing Recreation Demand and Opportunities, 2004

The Southern Sydney regional recreation demand and opportunity assessment study was one of four such broad-area investigations undertaken across metropolitan Sydney for the then Department of Infrastructure, Planning and Natural Resources.

It focused on recreation demand and opportunities for open space and key facilities in the Southern Sydney Region - using existing state and local government planning - to summarise the recreation supply/opportunities, develop a regional recreation demand perspective, and identify existing and any new recreation potential.

The study identified the following recreation trends relevant to the catchment:

- ❑ greater participation in non-competitive and passive activities instead of traditional organised sports, evident across several age and socio-economic groups;
- ❑ the use of natural areas for a wide range of uses - including conservation and nature studies, educational activities, bushwalking, adventure or challenge sports, and the like;
- ❑ a significant growth in concern for the protection and well-being of a sustainable natural environment, as both a recreational asset and for its own values;
- ❑ the widening appreciation of informal outdoor leisure and recreation settings;
- ❑ significant increases in non-competitive but active pursuits - notably cycling, walking and swimming; and
- ❑ recognition of the links between exercise and health for an ageing population and of the personal, social, environmental and other beneficial outcomes of recreation (leading to a significantly increased demand for active, non-competitive undertakings, such as walking and cycling as noted above).

The following recreational needs/demands, of relevance to the catchment's future recreational planning and use, were identified:

- ❑ better access to track and trail networks, and new connecting walking and bike trails;
- ❑ more off-road bike paths;
- ❑ greater BMX and mountain bike riding opportunities; and
- ❑ realising recreational development opportunities along the Georges River.

3.1.4.5 Sydney Metropolitan Regional Recreation Trails Framework, 2005

The *Sydney Metropolitan Regional Recreation Trails Framework* prepared by the then Department of Infrastructure, Planning and Natural Resources identified a regional network of corridors or system of recreational trails to link and provide access to the city's greenspaces. In the southern Sydney Region, which included the Sutherland Shire, the study identified 29 proposed regional trails to supplement the 11 regional routes that were already largely in place. One of these regional trails was "The Georges River (Kai' Mia)" route passing along the Georges River foreshore at the northern end of the catchment.

The Framework also identified 5 overall regional priorities in southern Sydney - two of which were "BMX/mountain bike facilities" and "off-road cycleways".

3.1.4.6 Great Kai'mia Way Project

The Great Kai'mia Way Project is a community-driven initiative to establish a network of over 200 kilometres of sustainable access routes along the Georges and Woronora Rivers and linking the Illawarra Escarpment and Botany Bay. The project is co-ordinated by the Sutherland Shire Environment Centre and Georges River Environmental Alliance (an umbrella organisation comprising nearly 200 local community groups along the Georges River).

The Great Kai'mia Way routes are intended to link existing tracks and trails, and establish new track links where needed, to connect river foreshores, parks, bushland reserves, public transport and other facilities in the Georges River Region.

A 2003 Feasibility Study described the rationale underlying the concept, identified the most suitable spine routes, and made recommendations for the co-ordination and actions required to implement the Great Kai'mia Way.

Two of the projects proposed spine routes pass through, or close by, the Mill Creek Catchment— the planned Georges River Way runs east-west along the southern foreshore of the river across the northern end on the catchment, and the proposed Woronora Way runs north-south along the ridgeline forming the catchment's eastern edge.

These spines routes are supplemented by local loops and connections. Within the Mill Creek Catchment the "Mill Creek/Rock Wallaby Track", "Burnum Burnum Track" and "Mill Creek Spur–Gandangara Link" are planned as looping along the eastern bank of Mill Creek and over the western bushland uplands following "existing fire trails, utility easements and long established bush walking tracks, with only one recommended short section of new track" (as shown on Figure 7). These links/routes are yet to be formally established and marked as part of the larger Great Kai'mia Way Project.

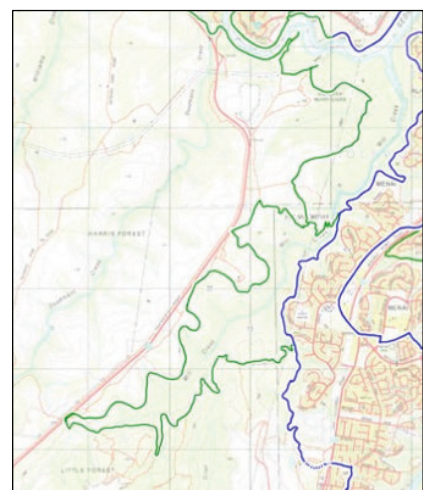


Figure 7 Proposed walking tracks within the Mill Creek Catchment, as part of the Great Kai'mia Way Project

Source: Great Kai'mia Way website

3.1.4.7 Agency or Landholder Specific Plans

The following plans apply to specific areas of the catchment and specific landholdings or operations:

- *Georges River National Park Plan of Management* – however this plan pre-dates the southern extension of this park within the catchment, and so makes no specific references to this area;
- *Plan of Management for Natural Areas – Lucas Heights Conservation Area 2002*, by Sutherland Shire Council, provides management directions for the Lucas Heights Conservation Area;
- *Lucas Heights Science and Technology Centre Buffer Zone Plan of Management* – applying to the ANSTO Buffer Zone; and
- *Soil and Water Management Plan for the Lucas Heights Waste and Recycling Centre*.

4. PLANNING AND MANAGEMENT ISSUES

The priority issues identified as warranting attention in this Strategic Management Plan have largely been generated by the catchment's current and past land uses - both formal and informal - and their resulting impacts, conflicts or pressures for the area's values and their long term sustainability as well as the area's suitability for various, often competing, land uses or activities.

Many of these issues are typical of those evident in urban bushland areas or natural landscapes on the urban fringes throughout Sydney.

However the distinctive, and large-scale, land uses present in the catchment add a further layer of complexity to the areas' planning and management. Other factors having a major bearing on the future planning and management of the catchment are also discussed below – notably land ownership, land use planning, and development intention or control issues which individually or together introduce a high degree of uncertainty into the area's future directions.

Many of the issues identified have impacts and implications across all aspects of the Strategic Management Plan's key areas - habitat and vegetation management, water quality, and managing recreational uses and impacts. Therefore issue have not been grouped and discussed according to these "receptors", but grouped into specific or similar issues as presented below.

4.1 OVERVIEW

In overview the issues, pressures and impacts to be faced in sustainable management of the Mill Creek Catchment can be described strategically in terms of their location-pressure-management as follows. These are presented graphically in Figure 8.

The upper catchment features three large land holders/users operating potentially high impact activities, on very modified sites, that could generate significant off-site and downstream environmental impacts. However these are point-source risks under single owners/operators, with comprehensive environmental protection/management and monitoring regimes in place. They are also subject to stringent and auditable performance standards and under licencing and/or operating permits.

The eastern residential ridgeline is a highly modified landscape presenting a multitude of small landholders, each generating comparatively minor off-site impacts but with a significant cumulative effect – especially when combined with other pollutant/impact sources in this area (such as main roads). Management and amelioration measures are rudimentary to non-existent, and the "impact front" of this zone is spread along a significant area of the catchment with only a short transport distance to the main waterway of Mill Creek. Monitoring measures are largely absent.

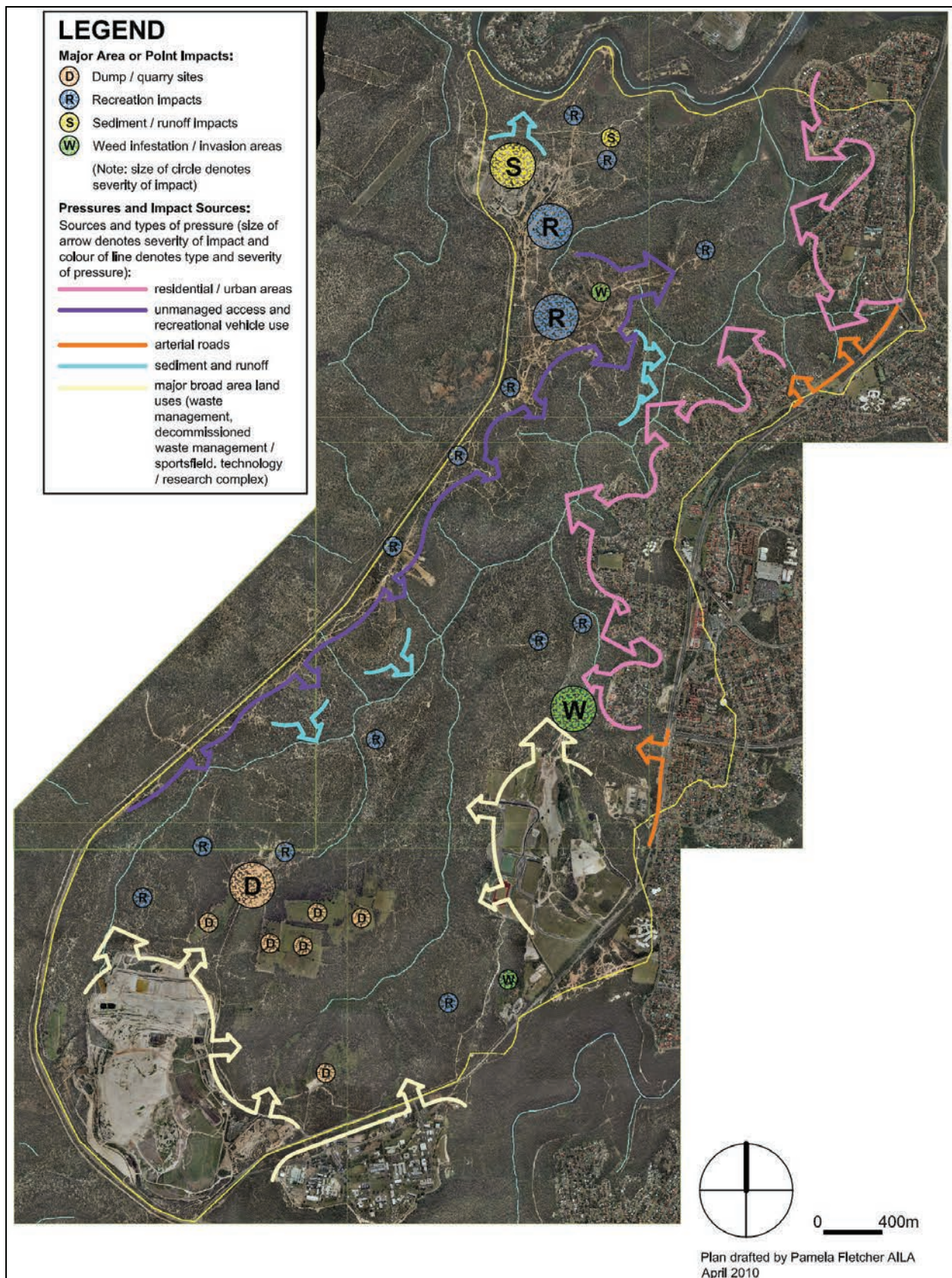


Figure 8 Pressures and impacts within and on the Mill Creek Catchment

The western uplands are a semi-natural and regenerating natural landscape largely under a single owner, but with a very limited management presence and capacity. Disturbances and impacting activities are spread throughout much of this area, however intensities are varied and most effects (even when significant) are largely localised and usually dispersed amongst larger non-impacted lands. Bushland offers a buffer and filter to downslope impacts moving off-site and towards Mill Creek. Management, amelioration and monitoring are absent.

Spread elsewhere throughout the area, and with a notable concentration in the upper catchment, are a number of smaller area or point-source activities generating a range of on-site, off-site and downstream impacts. These activities include quarries and old waste disposal sites, but also include major weed infestations or high-risk areas subject to persistent weed invasion as well as sites of concentrated recreational activities/impacts and residual peri-urban land use sites (such as unmanaged club venues/facilities). Impacts vary widely, from high toxicity wastes to persistent weed or sediment point-sources. Management, amelioration and monitoring vary but are generally lacking or absent.

4.2 PLANNING UNCERTAINTY AND CO-OPERATION

The majority of the catchment – perhaps as much as 80% (after the pending land transfers to the Gandangara LALC) – is, or will be, in private ownership.

The comparatively limited area of the catchment that is public land, or under the management of a public authority, means that this Strategic Management Plan's successful implementation will be dependent on the key landholders/managers coming "on-board" and supporting the plan and its directions/actions. Many actions could be undertaken on public land or by public land managers independently – but for the greatest effect the Strategic Management Plan requires the co-operative efforts of the catchment's larger landholders – as well as the many residents of the eastern ridgeline.

Compounding the challenges in implementing (and shaping) the Strategic Management Plan is the catchment's extended and often conflicted land use planning history.

Previous planning for the area has ranged from major residential release strategies, some progressed to the structure planning stage such as the 1984 West Menai Release Area project, to repeated calls for the majority of the remaining bushlands to be conserved through addition to the Georges River National Park. This planning uncertainty continues today. A definitive land use zoning for a large part of the catchment is in abeyance, being "deferred" or "excluded" under the Sutherland Shire Local Environmental Plan 2006 while the 2007 *Metropolitan Strategy South Subregion – Draft Subregional Strategy* makes specific reference to the catchment and flags it as possibly suitable for "industrial activities" and additional "Employment Lands".

ANSTO has, in the past, mooted the development of a "Technology and IT Business Park" on part of the Buffer Zone within the catchment – immediately north of New Illawarra Road. However the status of this possibility is also unknown.

More significantly within this lack of a definite overall planning direction, it is not known what development or land uses the Gandangara Local Aboriginal Land Council – as the major private landholder in the catchment – is seeking to realise on their parts of the catchment. Their land use aspirations, and the as yet unresolved planning framework that will influence them, were

not fully known at the time of this Strategic Management Plan's preparation. However it is understood that the Land Council definitely seeks to keep its land use options open, particularly in the flatter western plateau and ridgetop, and has identified projects to protect riparian areas and the steep slopes and valleys.

In accordance with the expressed wishes of the Gandangara LALC, management actions that might limit the Land Council's future use options across the extensive western uplands have not been identified or included in this Plan – despite the future use and management of these areas having major repercussions not only on this Plan's implementation and effectiveness, but also on the character of the catchment and district as a whole. Management recommendations relating to features or values found across the Gandangara LALC's lands, that are required under relevant state or commonwealth legislation or planning requirements, have been identified where applicable.

4.3 PLANNING AND MANAGEMENT ISSUES

4.3.1 Conservation Management

The catchment's Endangered Ecological Communities are very significant conservation assets and are provided with special legislative protection.

Estuarine complex vegetation communities occur along the Georges River frontage and the lower sections of Mill Creek. Three of these communities are listed as Endangered Ecological Communities (EECs) under the *Threatened Species Conservation Act 1995* (TSC Act) – Coastal Saltmarsh, Swamp Oak Floodplain Forest and River-flat Eucalypt Forest. Mangrove communities which are also found in these areas, while not listed under the TSC Act, are also protected under the *Fisheries Management Act 1994*. The Department of Environment, Climate Change and Water included Mill Creek on the "Indicative Coastal Floodplain Endangered Ecological Community (EEC) Map Series", which highlights areas where these communities are likely to occur. The "Georges River Wetlands", as a whole, are listed on Register of the National Estate

Higher in the catchment the Shale/Sandstone Transition Forest and Sydney Turpentine Ironbark Forest are also listed as Endangered Ecological Communities under the TSC Act. These shale based vegetation communities have been extensively cleared from southern Sydney, with the Mill Creek Catchment communities representing significant regional remnants of these types. The area of Sydney Turpentine Ironbark Forest EEC at Little Forest is also a listed community under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Numerous threatened flora and fauna species, also listed under the TSC Act (and some also listed as threatened species under the EPBC Act), are known from the catchment - as described in Chapter 2.

The catchment's predominantly natural state, combined with the extent of its bushland and significant vegetation communities, have been recognised with the area identified as a Core Biodiversity Regional Management Area within the Georges River Catchment in a biodiversity study carried out by the Department of Infrastructure Planning and Natural Resource in 2004. The same study acknowledged Mill Creek as a key bushland corridor, linking the Woronora River Catchment and Holsworthy Military Area with the lower sections of the Georges River and facilitating wildlife movement between these areas and into the Georges River National Park.

The catchment also contains land identified as Biodiversity Support and Biodiversity Enhancement regional management areas.

The lack of a comprehensive, and methodologically consistent, biodiversity survey of the entire catchment is a drawback for planning for conservation or sustainable management of the area's natural heritage values. However several of the known high conservation value areas are already in national parks, on Council owned and managed lands, or under protective management regimes - as follows:

- all 3 estuarine EECs are entirely within Georges River National Park, with the exception of a 400 metre long area of River-flat Eucalypt Forest below Royal Oak Drive;
- much of the northernmost band of Shale/Sandstone Transition Forest EEC is also within Georges River National Park (and extra areas could possibly be "fenced into" the national park with agreement from the incoming quarry lessee) ;
- the Shale/Sandstone Transition Forest EEC at Hall Drive Bushland Reserve is under Council management;
- almost all of the Sydney Turpentine Ironbark Forest EEC at Little Forest is contained within land owned by ANSTO, Council, or an area owned by the NSW Minister for Conservation; and
- two-thirds of the ring of Shale/Sandstone Transition Forest EEC at Little Forest is within ANSTO or Council lands plus small areas on Crown Land or under WSN Environmental Solutions ownership/management (the north-eastern area of this EEC is on Gandangara LALC land).

However most of the remaining areas of Shale/Sandstone Transition Forest EEC, mainly in the catchment's north, are in private ownership on Gandangara LALC lands. The location, land tenure or management status of significant flora and fauna species within the catchment is much less well known, due to the absence of overall natural resources data.

The *Threatened Species Conservation Act 1995* provides legislative security for listed endangered ecological communities and threatened species, but does not always guarantee their absolute protection. Acquisition, or reservation, and management under an appropriate conservation regime are the more secure means of protecting biodiversity values. However a range of non-reservation conservation mechanisms – such as Conservation Partner Programmes (Wildlife Refuges and Conservation Agreements), Biodiversity Banking (including the DECCW brokered "Land Alive" programme, for biodiversity conservation and bio-banking on Aboriginal lands), and privately owned/managed conservation areas - are also now options for biodiversity conservation and the management of natural heritage values.

Many previous land release/development plans for the Mill Creek Catchment (such as the 1984 West Menai Release Area Study) have proposed limited reservation of the immediate Mill Creek Valley and hillslopes as bushland or conservation zone, with development focused on the flatter upper sections. At the other end of the land use planning spectrum, the National Parks Association (manly through the efforts of the Sydney South Branch) have consistently advocated addition of most of the catchment's remaining less disturbed natural areas – from the Georges River south to the WSN Environmental Solutions and ANSTO landholdings – as an addition to Georges River National Park.

The Bardens Trig area, Little Forest nightsoil area, Lucas Heights and West Menai – as well as Georges River National Park – have all been identified as environmentally sensitive lands by Sutherland Shire Council. These are lands that have been identified as being areas deemed worthy of environmental protection, containing unique biological communities or natural features.

Several areas or features of landscape or natural heritage value within the catchment have been listed in Heritage Schedule to the Sutherland Shire Local Environmental Plan 2006 and so

are afforded protections in the local planning and development assessment process. These are:

- ❑ two areas of sandstone escarpment fronting Georges River (now in Georges River National Park) - sites Lf1 and Lf2;
- ❑ an area of Spotted Gum (*Eucalyptus maculata*), on the northern margin of the Sandy Point Quarry in Georges River National Park – site T1;
- ❑ a single *Angophora costata x bakerii* in Georges River National Park above the lower reaches of Mill Creek – site T2;
- ❑ a stand of *Eucalyptus squamosa* on the middle section of Heathcote Road on the catchment's western edge – site T4; and
- ❑ three areas of Grey Ironbark (*Eucalyptus paniculata*) at Little Forest, associated with the Sydney Turpentine Ironbark Forest – site T5.

4.3.2 Bushland Regeneration and Revegetation

Beyond the high-value areas discussed above, much of the catchment's bushland is naturally regenerating from previous disturbances or disruptive land uses.

The western uplands, in particular, were impacted by clearing and topsoil removal as part of winning surface gravels. The former minibike/trailbike course south-east of Sandy Point Quarry, partially on the quarry lands, is another residual highly impacted and mostly bare site. While many areas are recovering naturally some sites have been so severely stripped that recovery is extremely slow, or almost none-existent. Measures may be warranted to assist the revegetation of these areas.



Barren former gravel scrape near the centre of the large western plateau.

4.3.3 Pests and Weeds

As described above (Section 2.4.1), numerous weed and pest species are known to occur within the catchment – including declared noxious weeds within Sutherland Shire and a range of environmental weeds.

Introduced plants, including both noxious and environmental weeds, are recognised as one of the major threats to the Shire's terrestrial biodiversity (Sutherland Shire Council, 2007). Control of weeds and their impacts within the catchment will be a central – and high priority – issue to protect, restore and enhance the area's habitat and natural bushland values.

Vigorous and invasive introduced plant species infest natural or disturbed bushland areas and waterways where they out compete or smother native plants, change the structure and nature of bushland, limit native species regeneration, reduce habitat values, and alter fire and water regimes. Weeds can also impact the recreational and scenic values of an area. Weed species often thrive in disturbed areas, such as bushland edges, and where nutrients and moisture levels have been increased due to urban stormwater, sewer leaks and other disturbance that promote rapid plant growth. Garden wastes and escapees are also common sources for the introduction and spread of environmental weeds. There is ample evidence of all these factors and impacts at play within the catchment – as discussed above (Chapter 2). A comparison of

1994 and recent aerial photography indicates that, in places, weed plumes down the moist gullies draining from the residential areas, along the eastern side of the Mill Creek valley, have continued to expand (mainly downslope towards the creekline).

Pampas Grass (*Cortaderia selloana*) is a Class 3 Noxious Weed within Sutherland Shire, meaning it is a “regionally controlled weed” that requires full and continuous suppression and destruction. Blackberry (*Rubus fruticosus*), Lantana (*Lantana camara*), Bitou Bush (*Chrysanthemoides monilifera ssp. rotundata*), Boneseed (*Chrysanthemoides monilifera ssp. monilifera*) and Castor Oil Bush (*Ricinus communis*) are all Class 4 (Locally Controlled) Noxious Weeds within the Sutherland Shire – requiring that their growth and spread be controlled (in accordance with a management plan or direction published by the “local control authority”) and that they are not sold, propagated or knowingly distributed. As a requirement of the amended *Noxious Weeds Act 1993*, Sutherland Shire Council has developed Noxious Weed Management Plans for each of these species. Blackberry, Lantana, Bitou Bush and Boneseed are also Weeds of National Significance (WONS) – with applicable management guidelines also in place.

Many of the more invasive weeds within the catchment are considered serious environmental weeds. Environmental weeds within the catchment that are considered by Council as priority species for control efforts include Pampas Grass (*Cortaderia selloana*), Ludwigia (*Ludwigia peruviana*), Crofton Weed (*Ageratina adenophora*), and African Love Grass (*Eragrostis curvula*).

Sutherland Shire Council has active weed control and bush regeneration programmes. These include:

- Bushcare – a community-based programme where volunteers, assisted by Council, are involved in managing and maintaining remnant bushland areas;
- bushland values, Bushcare and weed management community education and training initiatives;
- assistance to community groups – such as schools and community organisation – undertaking environmental programmes, including help in sourcing and obtaining grant funds;
- resident/community information initiatives – including a limited community bushwalks programme;
- annual native tree and plant “giveaways”; and
- enforcing noxious weed controls – including property inspections and control orders.

Council supports an extensive network of Bushcare Groups across Sutherland Shire – with over 100 groups having scheduled, usually monthly, work days and nearly 30 other “active” groups. However the suburbs in, and flanking, the Mill Creek area are under-represented among these groups. The only Bushcare Groups now functioning in the catchment, or on its margins, are at Hall Drive in Menai and the “Mill Creek” group also at Menai (work location not specified). Bushcare Groups not only offer a useful weed control, bush regeneration and fire hazard management workforce but also engender a sense of ownership or custodianship of the bushland among nearby residents and help promote “bush-friendly” practices.

Council’s specific weed control initiatives and recent efforts in the Mill Creek Catchment include:

- an on-going weed control and bush regeneration contract in the Lucas Heights Conservation Area (around the former Bourke’s clay Quarry site) targeting Pampas Grass, Boneseed, African Lovegrass, Rhodes Grass, *Senecio angularis* and other “disturbance” weeds;
- trialling spray-based weed control techniques around the margins of the former nightsoil sites at Little Forest to promote regeneration from the remaining native seedbank, with encouraging results to-date;
- treatment of Pampas Grass on the slope below the Jenko Sutherland Shire Pony Club and Menai Sand and Soil;

- liaising with WSN Environmental Solutions regarding the control of Ludwigia along Lucas Height 1 Creek and within containment ponds at the Lucas Heights Waste Management Centre as well as minor Pampas Grass and Bitou Bush occurrences;
- working with ANSTO (who are contributing \$15,000 over 3-years) for an Environmental Trust partnership programme of weed control, bush regeneration and EEC reinforcement and connectivity within the ANSTO buffer zone; and
- a current Crown Land Management grant application to undertake Pampas Grass control on Gandangara LALC land south-east of the Sandy Point Quarry.

Despite these area-specific current control efforts, no weed mapping or bushland condition assessment has been undertaken across the catchment’s public lands or natural areas to guide future weed control decision-making. However based on sound local knowledge Council’s Noxious Weeds Officer considers the priority weeds and locations to target within the catchment are – noxious weeds and Pampas Grass wherever these occur, and the approximately 3.5 km section of Mill Creek bed and banks downstream from the LH1 lower dam and spillway which is infested with environmental weeds and sporadic occurrences of Ludwigia.

Of the pest animals known to occur across the catchment (Section 2.4.1 above) Foxes and Cats present the greatest problem given their levels of predation on native fauna. Council undertakes trapping and culling (baiting, virus releases and shooting) operations at various reserves and other locations across the Shire – but no recent efforts have been targeted to the Mill Creek area. Council is a member of the South West Sydney Regional Weeds Committee and Sydney South Regional Animal Management Committee to, among other matters, co-ordinate control efforts at a regional scale. Co-ordinated control measures are especially important for the catchment’s management, given its location on the Shire’s western margin.

4.3.4 Upper Catchment Water Quality Management and Monitoring

Mill Creek is classified as Class C waters under the regulations associated with the *Protection of the Environment Operations Act 1997*.

Within the upper catchment both WSN Environmental Solutions and ANSTO have comprehensive water quality management and monitoring regimes in place in conjunction with, and tailored to, their respective operations. In addition to the Lucas Heights Waste Management Centre, WSN Environmental Solutions has responsibility for the water management at old Lucas Heights 1 Waste Facility (LH1) (the present Bardens Ridge Sports Complex) and the former Harrington’s Quarry and landfill at Little Forest

On Lucas Heights 1 Creek surface water from the majority of the old Lucas Heights 1 Waste Facility, including all of the landfill area, passes through two large sedimentation dams before entering this eastern tributary of Mill Creek. A variety of water quality monitoring sites have operated at differing times during the history of the Lucas Heights 1 Waste Facility, including – 4 surface water monitoring sites (1 upstream bedside New Illawarra Road, and 3 downstream of the landfill area on Lucas Heights 1 Creek), a downstream leachate monitoring site, and 2 downstream boreholes for monitoring groundwater. The sampling efforts addressed a wide range of water quality



Water treatment/management on Lucas Heights 1 Creek.

parameters, with a focus on leachate and legislative water quality targets. Monitoring over three periods – ranging from 5 years to one month duration – since the landfill’s closure as a putrescible waste site in 1987 have indicated that “groundwater is not being significantly effected by the landfill” and that surface water results, with the exception of ammonia, “all fell within ranges recommended by the ANZECC guidelines”. Leachate from the old Lucas Heights 1 Waste Facility is collected by a network of trenches and drains feeding to a pumping station at the northern end of the site from where leachate is pumped to the Sydney Water sewer system, with some also used for on-going controlled irrigation of the open space and recreational redevelopment areas.

WSN Environmental Solutions has an on-going responsibility for water quality monitoring at the Lucas Heights 1 Waste Facility. The present monitoring regime comprises the following sites and attributes:

- Site SW1 on the headwaters of Lucas Heights 1 Creek (near New Illawarra Road) and Site SW3 on Lucas Heights 1 Creek (below the landfill/sportsfield sites and leachate pumping station) – monthly surface water monitoring for temperature, Ph, conductivity, turbidity, dissolved oxygen, suspended solids, total organic carbon, ammonia and phenolic compounds as well as annual monitoring for the above parameters plus a range of heavy metals, hydrocarbons and other chemical pollutants;
- during “wet weather conditions”, or in the event of storage dam overflows, the incidence of surface water monitoring at Site SW3 is increased to weekly;
- Site SW2 on Lucas Heights 1 Creek (between the power station/leachate dam and leachate pumping station) and Site SW3 – quarterly sediment sampling for lead, zinc, organochlorins, polychlorinated biphenyls, polyaromatic hydrocarbons and organophosphates as well as annual sediment sampling for these and arsenic, cadmium, copper and total petroleum hydrocarbons;
- boreholes BH16 (upslope) and BH17 (creekside) below the landfill/sportsfield sites and leachate pumping station – a monthly groundwater monitoring schedule, and a wider set of annual monitoring parameters, aimed mainly at leachate analytes (this is as part of the wider borehole leachate monitoring programme involving 14 other sites across the landfill area); and
- leachate is monitored monthly at the leachate pumping station in compliance with WSN Environmental Solutions’ trade waste agreement with Sydney Water.

At the current Lucas Heights Waste Management Centre leachate from this site and the former Harrington’s Quarry waste disposal site, is collected via perforated pipes and holding ponds and then pumped to holding tanks (with capacity for up to 6 weeks of leachate generation) before disposal into the Sydney Water sewer system. Leachate quality is monitored in accordance with relevant trade waste disposal agreements. Surface and stormwater is managed via a series of sediment and storage ponds, channels, bunds and pump stations.

Surface water quality monitoring has been carried out at 2 sites in the upper section of Mill Creek downstream of the Lucas Heights Waste Management Centre since October 1986 (12 months prior to the facility’s operation) and has continued monthly since then. Site MC1 is in the north-west corner of the WSN area and receives runoff from both this site and the adjacent Sydney International Clay Target Association permissive occupancy (beside Heathcote Road). Site MC3 is 1.5 kilometres northwards downstream and receives runoff from these sites as well as part of the Little Forest Ridge and the sites of the former Harrington’s Quarry and waste disposal area, the former IWC liquid waste depot, a former shale quarry, part of ANSTO’s Little Forest Burial Ground and possibly a small area of Council’s former nightsoil depot. Surface water is monitored at both locations for pH, biological oxygen demand, chemical oxygen demand, total dissolved solids, total organic carbon, suspended solids, nitrogen-ammonia, chlorides, filterable iron and total iron.

A 1997 consultant’s report of water sampling results at these sites concluded that “water quality in Mill Creek has not been significantly affected by Lucas Heights Regional Waste Depot”.

However total organic carbon, an indicator for organic pollutants, is higher at Site MC3 than MC1 – indicating that organic material is entering the creek below Site MC1, with the source believed to be the former ICW liquid waste depot. Anecdotal evidence also indicates that the previous land uses of the Little Forest Ridge are adversely affecting water quality in this unnamed tributary of Mill Creek. However there has been no known water quality monitoring of this drainage line.

Groundwater outflow and quality is not, at present, monitored at the Lucas Heights Waste Management Centre.

An aquatic macro-invertebrates study was carried out in Mill Creek in 1997 – at 6 sites from below the Lucas Heights Waste Management Centre to opposite Barnes Crescent – to provide baseline information as part of a study to assess the long-term impacts of landfill in the catchment (Lobo and Jarosinski, 1997). The study found that “a higher abundance of pollution sensitive taxa and pollution tolerant taxa” indicated an improvement in water quality to allow “a more diverse macro-invertebrate community to colonise the habitat” (compared with an earlier 1994 study which recorded a general lack of aquatic life [Engel and Chafer, Lesryk Environmental Consultants, 1994]). However the study was constrained by several factors, including a limited sampling timetable.

ANSTO’s upper catchment water quality monitoring programme – for both surface and groundwater – comprises the following sites and attributes:

- upper section of the eastern arm of Bardens Creek (at a weir immediately north of New Illawarra Road) – weekly water sampling for tritium, and monthly sampling for Alpha and Beta particles;
- on Bardens Creek and also on Mill Creek, both sites immediately upstream of the junction of these two creeks – annual water sampling for tritium, Alpha and Beta particles, and Gamma spectrometry for radionuclides as well as annual sediment sampling for Alpha and Beta particles and Gamma spectrometry for radionuclides;
- 6 boreholes immediately south of New Illawarra Road (along the north side of the main areas of the Lucas Heights Facility) – quarterly groundwater sampling for water quality (for in-field parameters including water levels, pH and conductivity) and annual groundwater sampling for tritium, Alpha and Beta particles, Gamma spectrometry for radionuclides and chemical analysis (including suspended solids, organics and plant nutrients); and
- 19 boreholes in and around the Little Forest Burial Ground – half yearly groundwater sampling for tritium, Alpha and Beta particles, Gamma spectrometry for radionuclides and water quality (for in-field parameters including water levels, pH and conductivity).

4.3.5 Urban Stormwater Management

Urbanisation significantly impacts the quality, and volumes, of water flowing into surrounding creeks and rivers. Possible impacts on water quality from urban runoff can include illegally dumped materials, litter, dog faeces, rubber, grease, grass clippings, fertilisers and detergents. Motor vehicles and roads are a major source of heavy metal pollution contributing lead, zinc, cadmium, copper, metals, oils, grease and organic chemicals. The major pollutants found in stormwater in the Sutherland Shire are:

- bacteria - faecal coliforms and enterococci;
- nutrients - phosphorus and nitrogen;
- metals - copper, lead and zinc;
- oil and grease;
- oxygen demanding substances; and
- suspended solids (sediments).

At present stormwater from the urbanised eastern ridge of the catchment – the Alford's Point, Old Illawarra Road, Menai and Bardens Ridge area – enters creeklines and bushland of the

eastern hillslopes with very little treatment and few measures to manage water volumes and quality.

Between Moonah Road at Alford's Point and the entry to the Bardens Ridge Sports Complex, of the 64 main built drainage routes (pipelines or pipeline networks) that collect stormwater from the residential areas and roadways, only 7 of these include any water quality control devices. Specifically these are 6 silt traps, all in the northern or lower parts of the catchment, plus a single "Enviropod stormfilter" (as part of a self contained system at Windle Place, Bardens Ridge). The remainder are "untreated" or unmanaged (to the extent that most discharge points lack end grates or "trash racks") with the consequent issues associated with urban stormwater input to natural areas.

In addition to this overall lack of stormwater treatment, the following additional issues or problems are also notable.

The stormwater load is not evenly spread over the third and fourth order drainage lines in the gullies feeding westward from the urban areas into Mill Creek or its tributaries. From the north, drainage lines that have disproportionately large stormwater catchments (both in area terms as well as the number of inlet pits and length of drainage pipes) include:

- Melaleuca Place Gully (3 silt traps), as shown in Figure 9;
- Charlton Place Gully – off Lucas Heights 1 Creek (no stormwater management devices); and
- Ella Avenue Valley – off Lucas Heights 1 Creek (no stormwater management devices).

Stormwater from long sections of arterial or major roads, as well as from major intersections, drains untreated/unmanaged into the feeder creeks leading to Mill Creek. Specifically:

- a 650 metre section of Alford's Point Road (with 7 inlet pits) drains into Melaleuca Place Gully (by-passing all 3 silt traps on this system), as shown in Figure 9;
- the intersection of Old Illawarra Road, Fowlers Road and Alford's Point Road off ramp (as well as sections the first two roads, and a 400 metre section of Alford's Point Road) drain into the Monash Road Gully (via 42 inlet pits); and
- a 550 metre section of Old Illawarra Road and the Bangor Bypass (with 18 inlet pits) drains into Charlton Place Gully; and
- a 600 metre section of Old Illawarra Road and the Bangor Bypass (with 28 inlet pits), including the major intersection of these two roads, drains into Ella Avenue Valley.

Design of the existing stormwater drainage system offers a number of strategic points, where stormwater from a wider residential area is concentrated before being discharged into the natural drainage systems. An extreme example is at the head of Melaleuca Place Gully, where stormwater from 73 pits and 2,350 metres of pipe is funnelled through a single point where centralised treatment/management could be considered. Other locations present similar, but smaller, stormwater collection points and management opportunities.

At present Council does not carry out any regular water quality monitoring in Mill Creek or its tributaries – under the Strategic Water Monitoring Programme, Streamwatch or as part of State of the Environment reporting.

4.3.6 Sewer Overflows

Sewer mains run the entire length of the mid-slope on the eastern side of Mill Creek, from Windle Place in the south to Bottlebrush Place in the north. Overflow points are designed into the network at several locations within the bushland areas of the catchment, but these are infrequently triggered. A more regular occurrence is overflowing or leaking "pop-tops" and access/inspection points.

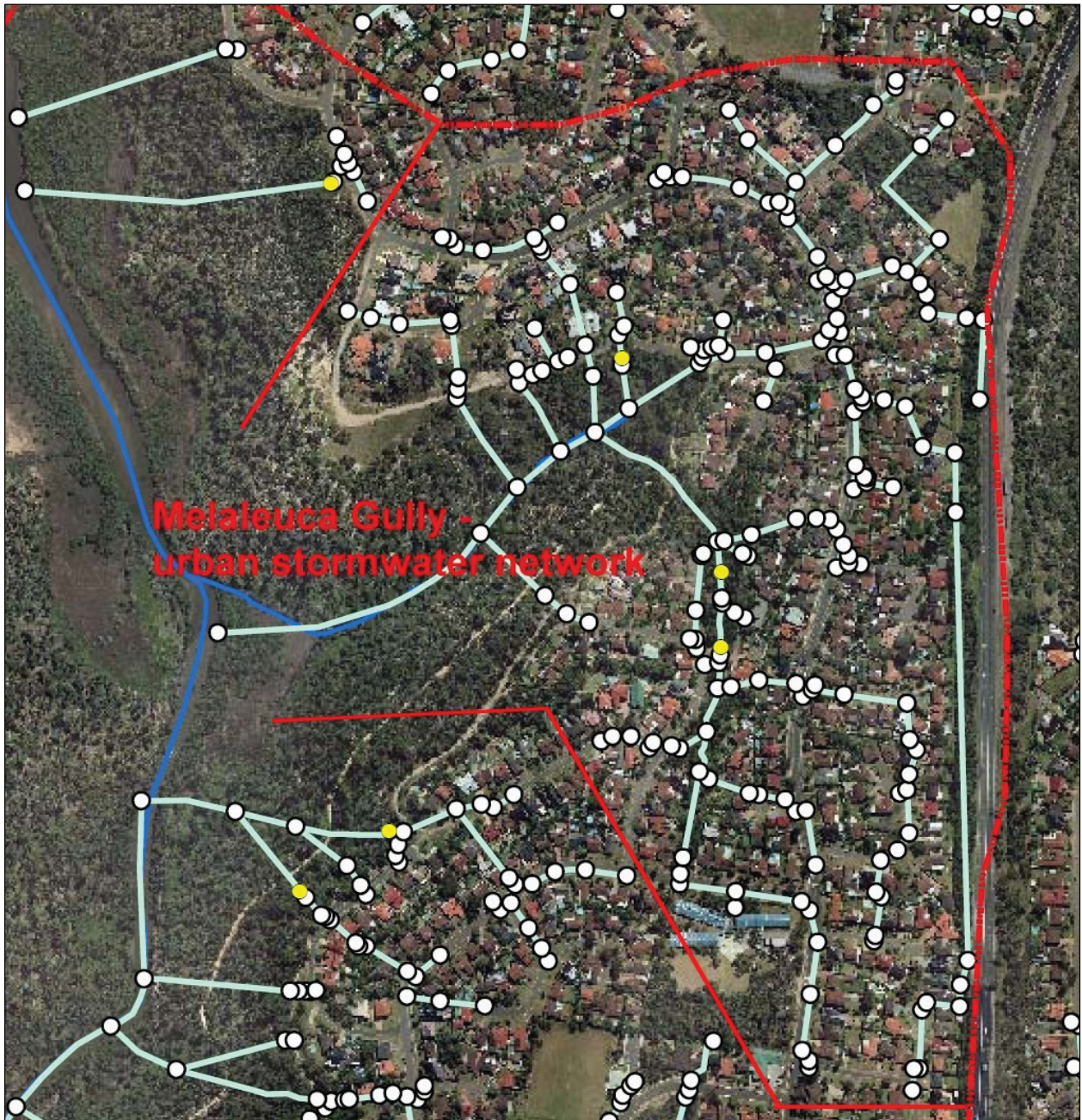


Figure 9 The Melaleuca Gully stormwater and road drainage network - one of the largest in the catchment, and drains a large area of main road, but also offer strategic advantages for retrofitting water quality devices (green lines = drainage pipe, white dots = drainage pit, yellow dots = silt traps)

Source: Sutherland Shire Council (base drainage map)

Sewage leaks, typically on or close to access tracks used as walking routes, both offend recreational users as well as being a potential health hazard. Prolonged leaks can adversely impact the surrounding environment and, if large volumes are involved, ultimately degrade water quality if sewage reaches drainage lines.

Residents have advised that Sydney Water is routinely slow in attending to sewer line leaks, when these are reported. Sydney Water does not have a system for remotely detecting a minor sewer leak.

4.3.7 Erosion and Sedimentation Issues and Sources

The catchment’s extensive network of natural-surfaced vehicle tracks – both fire rail or management accesses and the many more unofficial tracks – are a major source of erosion and sedimentation problems.

The fire trail and management access network in the catchment comprises the following main components:

- ❑ north-south trails generally following the alignment of the sewer mains east of Mill Creek, with numerous access points from the residential street network above;
- ❑ additional perimeter fire trails along the western edge of the residential areas of the eastern ridge;
- ❑ a major north-south trail along the high voltage powerline easement south from the Bardens Ridge Sports Complex to Old Illawarra Road (east of the ANSTO site);
- ❑ a network of trails, many now redundant, associated with the old waste sites on the Little Forest area;
- ❑ a major east-west trail along the dual high voltage powerline easement through Georges River National Park;
- ❑ the fire trail and management track network in Georges River National Park, including access to the Georges River (opposite Yeramba Lagoon);
- ❑ a partly sealed access road and several tracks in and around the Sandy Point Quarry;
- ❑ two “formal” access routes, west from Heathcote Road, and numerous practical access tracks for TransGrid access to the north-south high voltage power line easement;
- ❑ Rural Fire Service identified “strategic advantage” fire trails – principally close to the eastern residential areas; and
- ❑ minor access routes to antennas, transmitters, boreholes, trigs and other services/utility sites.



TransGrid access, and NPWS park management trail, running east-west through Georges River National Park.



Steep access trail sheeted with asphalt scalps and shale, but with no drainage protection.

The greater majority of tracks are natural-surfaced, most often compacted or crowned/graded, with some sections of imported compacted fill (most often crushed sandstone or mixed fill). Some sections, usually the steeper slopes along the eastern ridge/hills, are surfaced or sealed with imported materials – such as concrete, asphalt, bitumen scalps, and compacted gravel or shale. Drainage works are limited.

These trails provide access for a mix of agencies/authorities for a number of purposes – such as utility maintenance, fire management, bush regeneration, monitoring etc. The range of agencies/authorities that use the fire/service trail network may lead to some confusion about the preferred track standards, design requirements, maintenance responsibilities and works scheduling.

Although there are some local exceptions, such as where recent works have been carried out (as routine maintenance, or as part of adjacent development works), the fire/service trails are generally poorly maintained. This is especially in regard to drainage – with relatively few rollover drains, side drains, water pipes or crossings, and other drainage treatments in place. The result is that, even on gentle slopes, erosion and sedimentation are issues in many places with channelisation, guttering, scouring, undercutting, exposed rocks, drainage capture and diversion, and sediment deposition all evident. Poor drainage control on flatter sections, with an absence of windrow management, also leads to drainage capture and water ponding and altered flow patterns.



Badly eroded and impassable management access trail.

In addition to generating erosion and sedimentation impacts for the surrounding environment, all these impacts can reduce the serviceability of the track network as well as generating “knock-on” impacts such as track widening, braiding or detouring and damage to surrounding vegetation. These impacts are exacerbated when combined with extensive use of the trail network, when in poor condition, by 4WDs and trailbikes. In many instances the poor state of the trails attracts 4WD users who seek degraded, eroded, rocky, steeper or challenging track sections to test their vehicles and their driving abilities.

Residential subdivisions can also be a potent source of erosion and sedimentation problems for surrounding/downslope areas. Such issues should be addressed as part of the building approval and site management process. Nevertheless these subdivisions will entail both stormwater measures and boundary fire trails, which will have consequences for the adjacent and downstream/slope bushland and water quality.

The Sandy Point Quarry is another potent sediment source within the catchment.

4.3.8 Unauthorised Vehicle Access

As described in Chapter 2, the upland areas west of Mill Creek and southern head of the valley have a long and very entrenched history of use by 4WD and trailbike enthusiasts - by clubs, groups and individuals with a degree of inter-generational usage. The Gandangara LALC has taken a variety of approaches to this use in the past - from permit systems for approved clubs/members, to allowing access in return for working bees, to blanket bans.

An earth and fill mound was placed along much of the Heathcote Road edge in the 1990s in an effort to prevent 4WD and trailbike access. These mounds were reinforced in 2007 as part of the “Clean-up on Aboriginal-owned Lands Programme”, a pilot project involving Sutherland Shire Council and the Gandangara LALC with funding by the (then) Department of Environment and Climate Change. However this mounding has generally proved ineffective,



Breached and flattened roadside mound off Heathcote Road, a significant unauthorised vehicle entry point.

and is now breached at several points despite being further reinforced with post and wire fencing and signage in places. The Gandangara LALC has indicated, in meetings with the Project Manager MGRSI and staff from the Sydney Metropolitan Catchment Management Authority, that they are not supportive of further fencing or vehicle barriers along their lands fronting Heathcote Road. Instead, the Land Council sees greater opportunity and value in focusing their limited funds on track rehabilitation, stabilisation and erosion control as well as bush regeneration in degraded areas.



Long-term major rubbish dumping site off Heathcote Road.



Track widening and ponding, western bushland.

The impacts of irresponsible vehicle use in bushland areas have been well documented. These include - destruction of vegetation and habitat, track damage, track widening or braiding and new track creation, soil and land degradation, erosion, sediment mobilisation, disruption to fauna, pollution, litter and fire risks, aesthetic and noise impacts, reduced residential amenity and displacing or presenting a hazard for other users. While many clubs promote responsible driving amongst their members, there remain a sizeable number of reckless 4WD drivers and trailbikers who generate a disproportionate amount of impacts on bushland areas. This is exacerbated in bushlands around large population centres, such as Sydney's urban edge.



Hacksaw padlock assembly on a light-weight access gate on Treloar Place.

In situations such as the catchment the extra accessibility and tracks brings additional problems in the form of access for rubbish dumping (including contaminated wastes such as asbestos), car dumping/stripping, arson and a range of anti-social behaviours. All are apparent across many parts of the western bushland areas.

Along the catchment's eastern residential areas the entry gates at the numerous access points to the fire/access trail network are similarly under constant pressure from unauthorised access. These gates and access tracks are used by Sydney Water, the Rural Fire Service, Council and residents/builders with approval. Most gates installed by Council or other agencies are "standard" urban-reserve style gates – mainly light-weight steel pipe constructions with (often) unprotected padlocks and chains. These light-design gates are not capable of withstanding the

usage/access pressures exerted by illegal 4WD access – typical damage includes “no access” signs removed or vandalised, padlocks and locking lugs routinely hacksawed off, gates rammed and damaged/twisted, gates detoured (often leading to a succession of wings/barriers and further detour tracks), and posts winched or dragged from the ground. Gates in secluded locations are more vulnerable, however there is ample evidence of such damage in residential cul-de-sacs and other high visibility locations.

The NPWS has installed “heavy duty” gates, fencing and pedestrian pinch-point accesses along selected boundaries of Georges River National Park – with success in visible and roadside locations. However even these much more substantial gates are vulnerable, and have been breached, at remote sites.

4.3.9 Walking Opportunities

The only marked walking track at present within the catchment has been developed by ANSTO with community assistance in the Buffer Zone around the Lucas Heights Facility. The 2.6 kilometre “Blue Track” is essentially a nature walk with features of interest identified by on-site markers keyed to a brief track guide – focused largely on the area’s flora, but also accessing Aboriginal engravings and axe grinding grooves.

However the most heavily used nature-based recreation zone is the service trail network downslope of the residential areas of the eastern ridge. Here walkers make use mainly of the sewer main access/service tracks with access and way-finding principally through local knowledge – as none of these routes are signposted with direction, distance or destination marking. Although the vehicle trail network is discontinuous at a few points a continuous walking track link already exists from Alford’s Point to Bardens Ridge.

Although a regional-scale sports facility and attraction no walking tracks, or formalised trackheads accessing the wider trail network, have been developed as part of the Bardens Ridge Sports Complex. Access to this facility from the north is fenced off in places.

4.3.10 Mountain Biking Pressures and Opportunities

Cycling – including road cycles, mountain bikes, and BMX – is a frequent activity on the fire/service trail network below the residential areas along the eastern ridge. As for walking, this use is mainly by local residents as a recreation, fitness or “play” activity. This use can, on occasion, conflict with walkers or present a minor hazard but is generally a low impact activity when confined to well constructed and maintained vehicle service tracks. There is evidence of jumps and short courses being built beside the fire/service trail network and in Asset Protection Zones along the bushland’s urban perimeter in some places – however again any impacts are minor and localised. Like bush “cubby houses” and “hideouts”, these “safe” bushland experiences on the residential margin can be a valuable first step in environmental education and appreciation.



Mountain bike track cutting and erosion, east of Mill Creek at a short-cut on the fire trail network.

However off-track mountain bike activity is, according to anecdotal evidence, increasing within the catchment. As this usually entails track construction through otherwise intact/undisturbed bushland – as riders seek out natural

obstacles, or build their own “technical” courses – this type of mountain bike usage can present a range of adverse impacts. Impacts will be magnified in those areas where mountain bikers congregate and popular or frequently used circuits (mountain biking is also a “social”, rather than “solo”, recreation activity). Off-track mountain bike activity is evident at several locations along the catchment’s extensive fire/service trail network – especially in rockier areas. Mountain bikers appear to avoid the maze of western tracks, as these areas are flatter and less-interesting (as well as due to the hazards posed by trailbikes and 4WDs), but mountain bikers also seek longer “terrain” rides in addition to technical “courses”.

Two major mountain bike activity areas are known within the catchment – an established and reasonably extensive area at Bardens Trig, and a more recently popular but expanding area on the upper section of Bardens Creek (in the ANSTO Buffer Zone). This latter site is impacting areas of previously little-disturbed and comparatively weed-free bushland.

Mountain biking is predicted to continue to grow in popularity as a recreation and a sport, which will be exacerbated locally by the increasing residential population along the eastern margin of the catchment. Mountain bikers will also travel to regionally attractive tracks or courses. These factors, combined with the greater “reach” available to mountain bikers once within the area (compared with walkers), warrant active management of mountain biking as a recreational use of the catchment.