

5.2.5 Community Involvement

➤ ACTION 16

Promote establishment of Bushcare Groups in residential areas along the catchment's eastern ridge.

Priority – Very High

Council, with MGRSI assistance, to target and promote the establishment of Bushcare Groups in residential areas along the catchment's eastern ridge – in the Alford's Point, Menai and Bardens Ridge areas.

Rationale – to encourage community support for and involvement in protection and management of the catchment's natural areas, reduce impacts from the urban edge, and encourage passive surveillance and "ownership" of bushland.



Promotion of Bushcare Groups in and adjoining the catchment is a very high priority.

Source: National Trust of Australia

Bushcare Groups offer an additional "workforce" for weed control, bush regeneration and fire hazard management works as well as encouraging custodianship of the bushland among nearby residents, promoting "bush-friendly" practices, and playing a passive surveillance role. Although Council now supports an extensive network of Bushcare Groups across the Shire (in excess of 130 groups), there are none active within or immediately adjacent to the Mill Creek Catchment.

➤ ACTION 17

Undertake and promote continued community engagement and education regarding the catchment, its values and management.

Priority – Medium

Council, with assistance from the MGRSI, to continue to undertake community engagement and education measures regarding the catchment's natural, cultural, recreational and scenic values as well as providing practical information as to how residents and the wider community can assist and support the catchment's management and the opportunities to sustainably enjoy the area.

Rationale – to encourage local residents and community support for, and involvement in, protection and management of the catchment and to encourage "bush-friendly" practices/uses.

Council should continue its community education, awareness raising and appropriate behaviour campaigns in relation to remnant bushland, weeds and water quality issues generally. Residential areas along the catchment's eastern ridge – in the Alford's Point, Menai and Bardens Ridge areas – should be targeted for regular information campaigns, and especially for new or incoming residents as land release areas are completed and occupied.

Consideration should be given to Council or the MGRSI producing an information brochure, or similar, specific to the Mill Creek Catchment for distribution to local residents, schools and businesses. Information to better promote the recreational opportunities available in the catchment – especially walking tracks and longer/connecting trails as well as wildlife viewing opportunities and Aboriginal heritage sites (where appropriate) – is also warranted.

Similarly, Council or the MGRSI should provide, or encourage other groups (such as the Gandangara LALC, Sutherland Shire Environment Centre, National Parks Association, etc) to offer, guided experiences of the catchment and its attractions – such as bushwalks, mountain bike tours, or canoe/kayak paddles. These could be scheduled activities or held as part of special events such as World Environment Day or NAIDOC Week celebrations.



Education and extension material can help the community support the catchment's sustainable management.

WSN Environmental Solution and ANSTO could be encouraged/supported in offering “extension” activities to better promote their operations in the upper catchment – and especially those related to bushland and water quality management – reinforcing their performance as responsible environmental managers.

The NPWS (DECCW) also has a range of community education materials – as well as co-operative programmes – that could be referenced, or employed, in community engagement and education measures within the catchment.

Council, the MGRSI and the NPWS (DECCW) together should promote continued, and greater, educational use of the catchment and encourage/support use of the area by local schools and organisations such as Georges River Environmental Education Centre.

5.3 MANAGING WATER QUALITY, EROSION AND SEDIMENTATION

5.3.1 Water Quality Management/Improvement

5.3.1.1 Managing Residential and Urban Stormwater/Runoff

- **ACTION 18**
Progressive retrofitting of water quality, pollution control and WSUD devices/measures onto the existing stormwater drainage system from the residential and urban areas of the eastern ridge/slopes.

Priority – Very High

This action will require the retrofitting of appropriate water quality, pollution control and WSUD devices/measures onto the existing stormwater drainage system from the residential and urban areas of the eastern ridge/slopes according to a prioritised and staged programme.

Rationale – to improve the quality of urban stormwater and attenuate flows entering the catchment’s bushland areas and flowing into Mill Creek from the urbanised eastern ridgeline and slopes, and to progressively move towards the restoration of more natural hydrological systems.

Retrofitting the existing, basic-standard, stormwater drainage system of the eastern residential areas will be constrained by:

- the established residential/urban nature of these areas, with infrastructure and drainage works already in place;
- the general absence of gross pollutant and litter control measures across most of the existing stormwater drainage system;
- the lack of available flat or gently sloping land on the downslope perimeter of the residential areas where suitable devices/measures can be installed;
- the shallow bedrock and thin sandy soils across much of this ridge and slope area (the entire Mill Creek Catchment is considered an area of low “soil infiltration potential” by Council’s Stormwater Management Development Control Plan 2005); and
- the possible lack of public land at the head of gullies and major discharge points if the Crown Land areas of the eastern slopes are transferred to the Gandangara LALC (requiring negotiation for the siting and operation of WSUD devices, or their installation within adjacent road reserves).

Despite these limitations there remain opportunities for the retrofit installation of stormwater management measures at the “conveyance” and “discharge” control level, as well as at the “source” or residential level with the support and participation of local residents. Both primary (physical screening and rapid sedimentation) and secondary (finer particle sedimentation and filtration) measures are appropriate and possible within the catchment – to remove gross pollutants and litter, coarse sediments and finer particles, and free oil/grease as well as attached pollutants. Lack of suitable sites for larger scale devices, such as constructed wetlands, will preclude against these tertiary measures. However improving the quality of inflows by other measures will enhance tertiary treatment of stormwater by the area’s natural watercourses.

The installation of gross pollutant and litter control measures – such as inlet grates, “trash barriers”, and GPTs (Gross Pollutant Traps) at concentrated discharge points – is a fundamental first step to undertake across much of the existing older residential areas and their drainage systems. The few on-line silt traps that now exist in the stormwater drainage network, all in the northern or lower parts of the



Grates and Gross Pollutant Traps are essential first line stormwater management devices, and necessary to get the best from other secondary measures.

Source: Water By Design 2009a (top photograph)

catchment, should also be expanded with additional units across the system as a fundamental first step. As well as controlling the larger pollutants, and improving the aesthetics of discharge bushland areas by the containment and removal of litter, such gross pollutant and coarse sediment removal is necessary to improve the efficacy of other water quality measures.

In addition to front-line GPTs and sediment traps, sand filters are the secondary level water quality device most suited to use with the physical constraints of the eastern residential areas.

Sub-surface constructed/enclosed sand filters could be retrofitted beneath road surfaces, or adjacent to roadways, at collection points on stormwater networks in micro-catchments up to 4 hectares in size. Space requirements and the need for level ground, as well as their unattractive appearance, would limit the use of above ground or open sand filters in many residential areas. Sand filters offer high levels of water quality treatment and moderate levels of flow attenuation, but do little to reduce runoff volumes. However sand filters, especially sub-surface devices, also have the drawbacks of being higher capital cost items as well as needing regular inspection and maintenance.



A prefabricated sub-surface sand filter unit, suitable for retrofitting below roads and verges.

Source: Water By Design 2009a

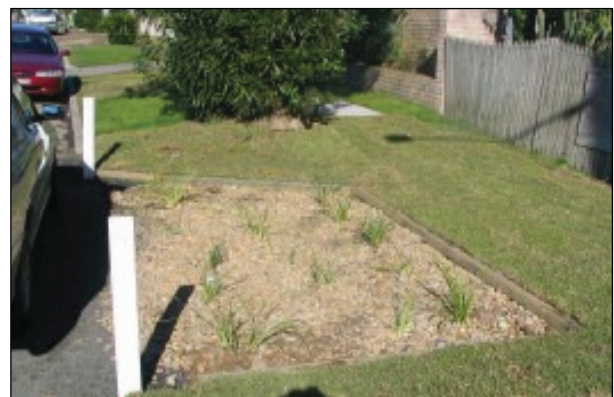
Other stormwater management measures that could be employed, but requiring more careful siting and design, are:

- ❑ vegetated roadside swales – a roadside and open space treatment, requires more gentle grades of 1% to 6%, suitable for micro-catchments of 2 to 4 hectares, offers high levels of water quality treatment and moderate levels of flow attenuation but low levels of reduction in runoff volumes;
- ❑ vegetated filter strips – more suited to open space areas with grades of less than 5%, suitable for micro-catchments up to 2 hectares in size, offers high levels of water quality treatment and moderate levels of flow attenuation but low levels of reduction in runoff volumes;
- ❑ infiltration trenches/pits – a roadside and open space treatment, requires careful location/substrate assessment and siting, suitable for micro-catchments up to 2 hectares in size, can be planted on surface, offers high levels of water quality treatment and flow attenuation and reduction in runoff volumes; and



Retrofitting a vegetated (grassed) roadside drainage swale, in a similar sandstone hillside environment to the Mill Creek Catchment residential areas.

Source: Ku-ring-gai Council

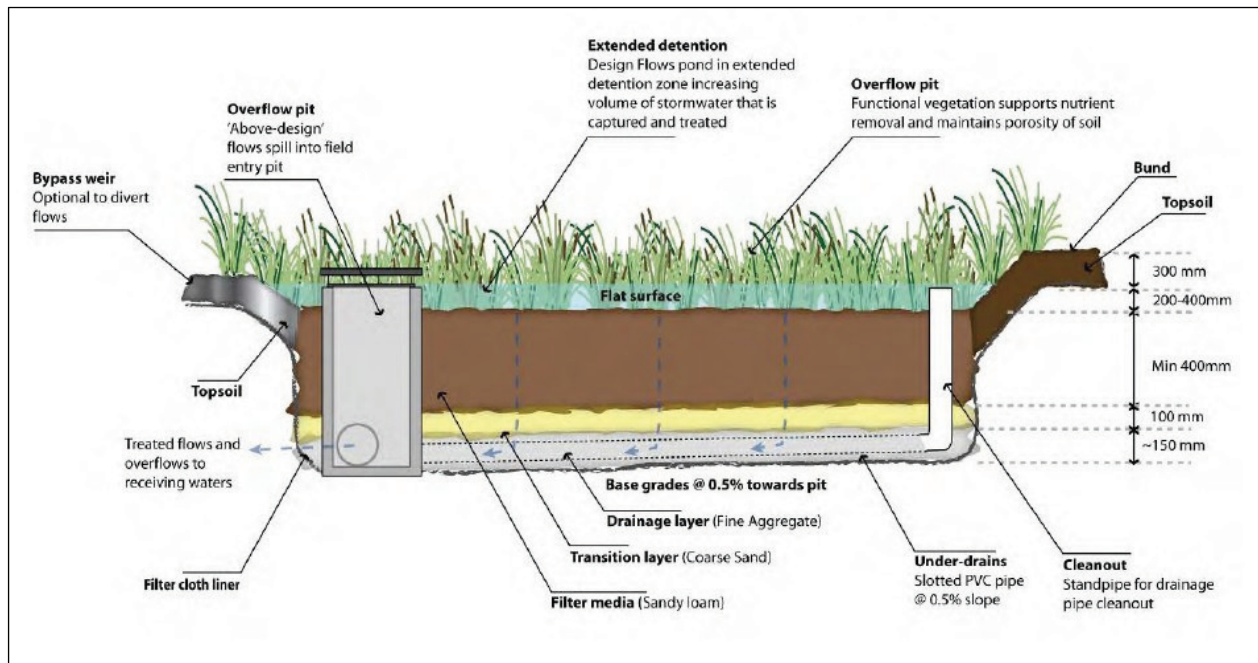


Roadside infiltration trench/pit.

Source: Gosford City Council

- bioretention systems – a combined surface and sub-surface filtration system, can be applied from small scale (dwelling or street-scale “planter boxes” or “rain gardens”) to micro-catchments up to 5 hectares in size, offers high levels of water quality treatment and moderate levels of flow attenuation but low levels of reduction in runoff volumes.

These measures offer a mix of collection/conveyance and discharge stormwater management and treatment options. Significantly, the layout of the existing stormwater drainage network offers a number of strategic points, where stormwater from a wider residential area is concentrated before being discharged into the natural drainage systems, where discharge treatment measures such as GPTs and sand filters could be located for greatest effect.



Cross section of a typical small-scale urban/roadside bioretention system.
Source: Water By Design 2009b



Small-scale roadside bioretention system.
Source: Water By Design 2009b

The stormwater management measures best suited to individual locations and micro-catchments within the eastern residential areas will need to be assessed, selected and designed on a site-by-site basis.

However priority drainage lines for improved stormwater treatment, especially in relation to stormwater quality, can be identified as follows – as shown in Figure 15:

1. Melaleuca Place Gully – which discharges into Georges River National Park through Coastal Saltmarsh and River Flat Eucalypt Forest Endangered Ecological Communities at its junction with Mill Creek (a top priority area for further stormwater treatments, despite already having 3 “silt traps” in place);

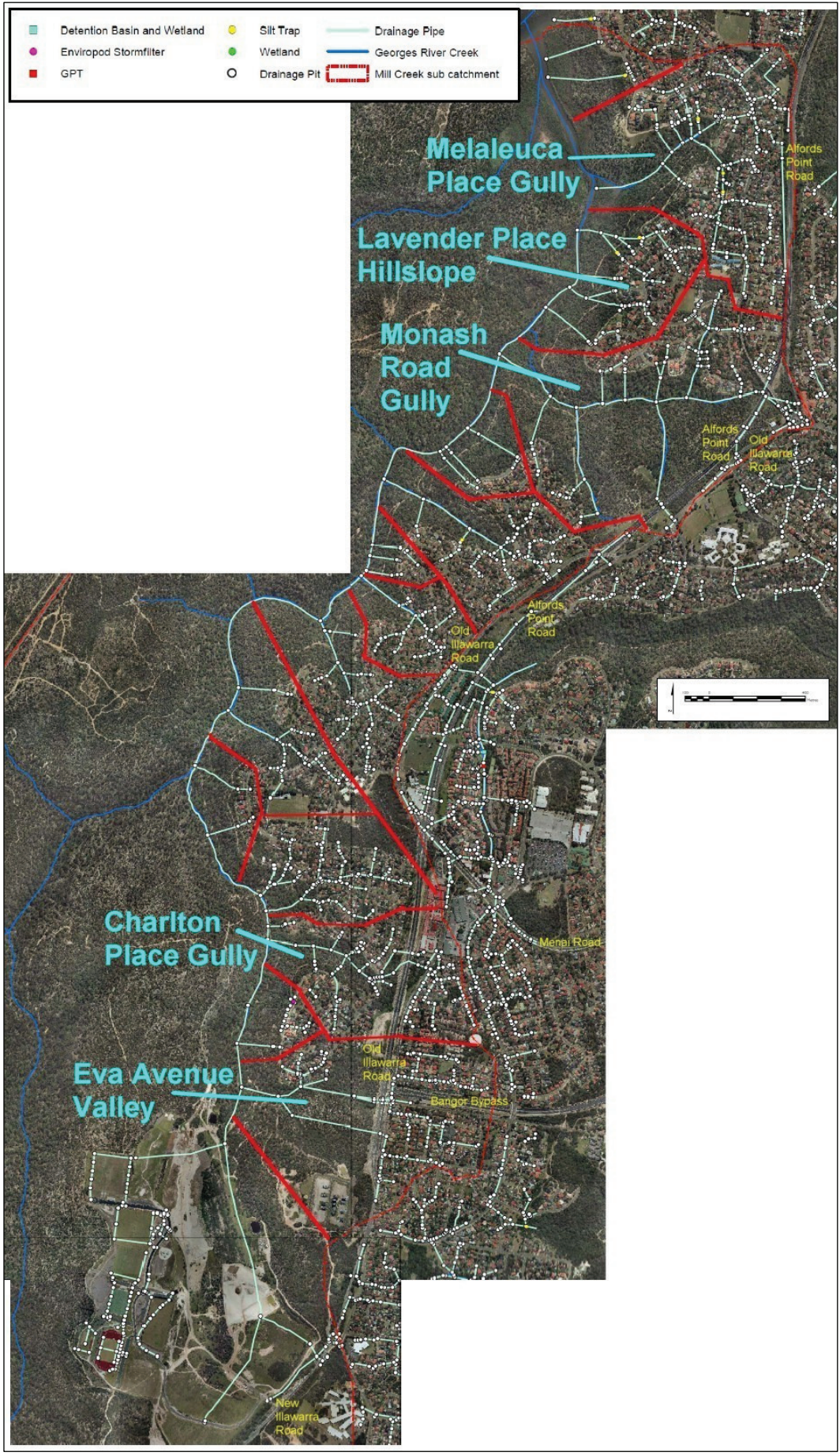


Figure 15
Priority
sub-
catchments
for the
installation
of
stormwater
manage-
ment
measures

2. Monash Road Gully – which discharges into Georges River National Park through an extensive area of River Flat Eucalypt Forest Endangered Ecological Community at its junction with Mill Creek, and is also one of the less weed-infested of the eastern residential gullies (a high priority area for further stormwater treatments, to retain the gully’s lower weed incidence and to support and build on WSUD initiatives in the current residential subdivision beside Alford’s Point Road);
3. the hillslope west of Lavender Place, Coachwood Crescent and Royal Oak Drive – drainage from which flows into Georges River National Park and through the River Flat Eucalypt Forest Endangered Ecological Community fringing Mill Creek (a priority area for further stormwater treatments despite already having 2 “silt traps” in place) (stormwater treatment measures in the south of this zone may be restricted to road reserves due to that private property between Royal Oak Drive and the strip of Crown Land (under claim) beside Mill Creek below);
4. Ella Avenue Valley – a less heavily weed-infested area with a disproportionately large stormwater catchment (both in area terms as well as the number of inlets pits and length of drainage pipes) flowing into Lucas Heights 1 Creek, and also to support/build on the WSUD initiatives being enforced in the current residential subdivision off Ella Avenue to the south; and
5. Charlton Place Gully – another disproportionately large stormwater catchment flowing into Lucas Heights 1 Creek, with no existing stormwater management devices.

Priority locations for stormwater management, and water quality improvements, from major roads are identified in Action 20.

Issues to consider in prioritising the retrofitting of stormwater management devices elsewhere along the eastern ridgeline include the quality of the receiving waters, valley habitat values and existing weed densities, the size of micro-catchments and extent of urban areas and roadways, standard of existing stormwater management, and pollutant sources/types.

Stormwater flow and water quality management measures should be progressively implemented on the existing stormwater systems draining into other third and fourth order creeklines flowing from the eastern residential on an opportunistic basis, in conjunction with road works and open space projects or as part of planned/future residential subdivisions (as per Action 19).

Council should continue to promote the installation of domestic rainwater tanks, the use of pervious pavements, and water-sensitive landscaping among the residents of the eastern ridge to assist in addressing stormwater management “at source”. Rainwater tanks are mandatory for all new developments under Council’s Stormwater Management Development Control Plan 2005.



Education and awareness is important in engendering community support, and care, for stormwater management infrastructure.
Source: Water By Design, 2007a

Community information/education regarding WSUD and stormwater quality improvement devices is also valuable as an awareness raising measure plus ensuring community support, understanding and “care” for the measures employed.

➤ **ACTION 19**

Continue to include, and enforce, stringent stormwater management and WSUD requirements in residential subdivision and urban development projects along the eastern ridge and elsewhere in the catchment.

Priority – High

This action requires continued application of Council's current comprehensive Stormwater Management Development Control Plan 2005 for new residential subdivisions on the eastern ridge, and to other developments or land use changes elsewhere in the catchment as/when appropriate.

Rationale – to ensure that current or planned residential subdivisions, and other developments, achieve best practice in stormwater management and WSUD principles in order to minimise their impacts on the catchment's hydrology.

Council's Stormwater Management Development Control Plan (DCP) 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 DCP addresses on-site retention, on-site detention and stormwater drainage from a site with attendant water quality considerations for discharged stormwater (including water quality objectives, by specified pollutants, for existing and new developments).

The DCP has been applied to recent "greenfield" residential subdivisions and developments in the eastern residential areas, as well as current land releases (such as at Monash Road). Planned or proposed subdivisions, such as the LandCom development at Monash Road and the joint Gandangara LALC/LandCom land release off Ella Avenue, will also be subject to these controls and standards.

➤ **ACTION 20**

Install specialised water quality devices in-line in selected existing stormwater systems that drain major roads to reduce the impacts of hydrocarbon and petroleum products, rubbers, organic chemicals, and other vehicle or road-based pollutants.

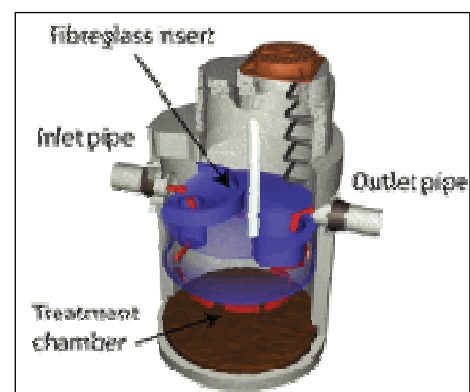
Priority – High

This action requires the retrofit installation of specialised water quality devices, such as "Humeceptors" or other infrastructure to remove/reduce road-sourced pollutants, as part of existing stormwater systems draining major roads.

Rationale – to remove or reduce the type and amount of road and vehicle sourced pollutants entering the catchment's drainage systems and, ultimately, Mill Creek.

Roads and motor vehicles are a potent source of free and floating oils, grease, hydrocarbon and petroleum products and fine suspended solids, from stormwater runoff generated from impervious surfaces.

Priority sub-catchments for the installation of "Humeceptors" or other specialised road and impervious surface water treatment devices, at strategic points along the existing stormwater networks prior to discharge into



*An In-line "Humeceptor" – the most commonly installed type, available in capacities from 3,000 to 27,000 litres.
Source: Humes Ltd*

natural drainage lines are – as also shown in Figure 15 include:

1. Melaleuca Place Gully – which receives drainage from a 650 metre section of Alford's Point Road (via 7 inlet pits, and by-passing all 3 silt traps on this system);
2. Monash Road Gully – which receives drainage from the intersection of Old Illawarra Road, Fowler 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 (via 42 inlet pits);
3. Charlton Place Gully – which receives drainage from a 550 metre section of Old Illawarra Road (via 18 inlet pits); and
4. Ella Avenue Valley – which receives drainage from a 600 metre section of Old Illawarra Road and the Bangor Bypass (via 28 inlet pits, and including the major intersection of these two roads).

➤ **ACTION 21**

Liaise with Sydney Water for improved repair and clean-up responses to sewer main leaks or overflows, and facilitate community reporting of sewer leaks and associated issues.

Priority – High

This action requires Council to undertake a liaison, and lobbying role, with Sydney Water to pressure that agency for an improved response to sewer leaks within the catchment – including prompt sewer main repairs and follow-up environmental remediation where required. Facilitating easier community reporting of sewer leaks is also a part of this action.

Rationale – to ensure that sewer leaks and overflows are addressed in a speedy manner, and impacted sites remediated where necessary, to minimise adverse effects on the catchment's bushland and waterways.

Sydney Water sewer lines run approximately midway up the eastern bushland slopes of Mill Creek, below the residential streets on the ridgeline of the catchment's north-eastern and eastern edge – as shown in Figure 16.

Council, with community assistance, can fulfil a liaison and lobbying role to ensure that Sydney Water is alerted to sewer leaks within the catchment – principally leaks, "blown" or defective access pits and wet weather overflows along the sewer mains below the eastern residential areas – and that these incidents are addressed as soon as possible by Sydney Water and its agents.

Council's involvement should extend to an informal monitoring or auditing role – to ensure that incidents are not only addressed by Sydney Water's maintenance crews, but that any environmental impacts are suitably remediated by the agency according to its legislative obligations and policies.

To support the timely reporting of sewer leaks and other incidents Council and the MGRSI will co-operate with Sydney Water to improve on-site signage within the vicinity of sewer lines in the catchment (such as on the regularly spaced vent pipes and other sewer infrastructure) advising users of the area of the relevant Sydney Water contact numbers to report sewer leaks.

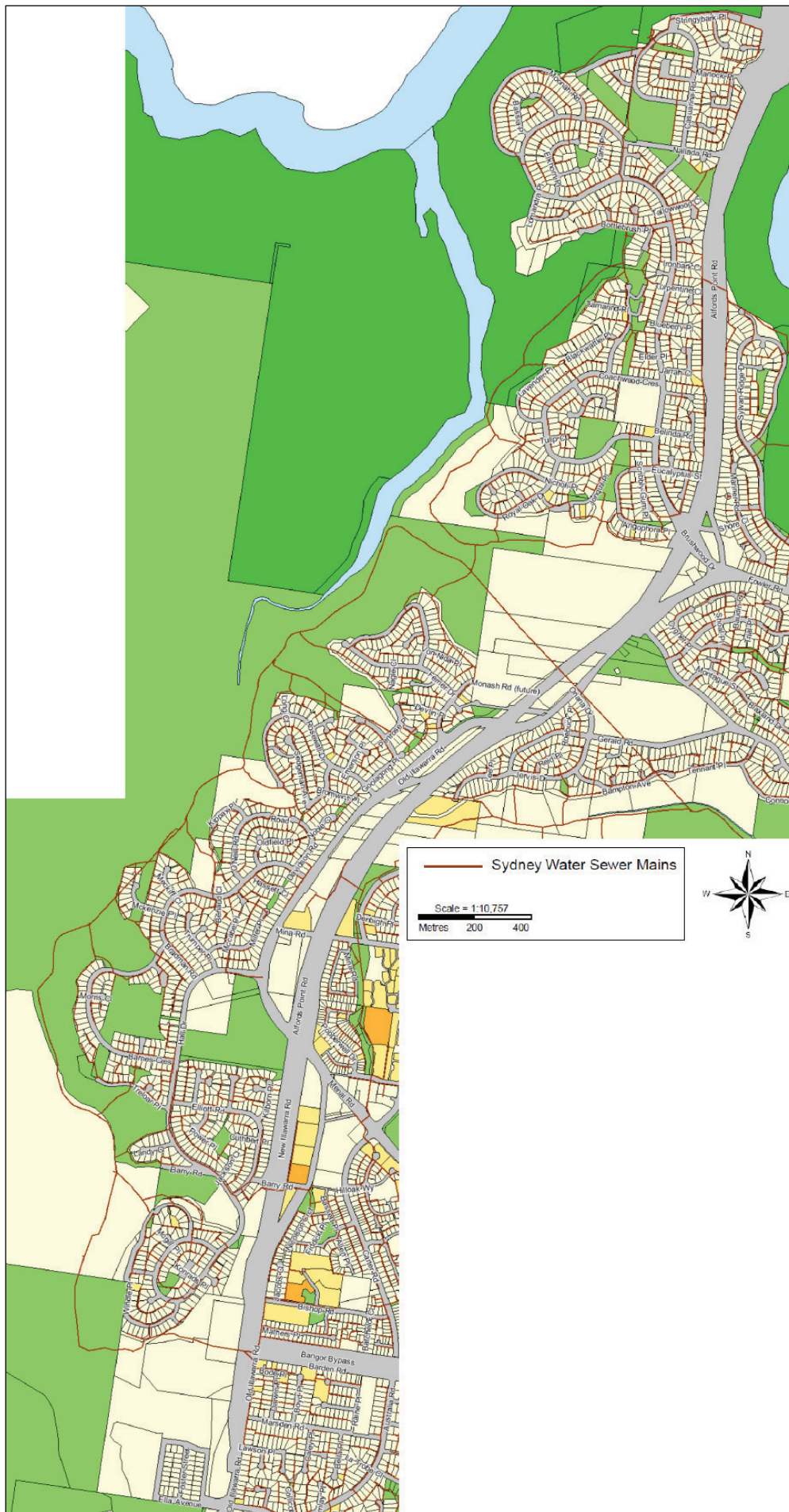


Figure 16
Location of
Sydney Water
sewer mains
across the
catchment's
eastern side

Source: Sutherland Shire Council

5.2.1.2 Managing Erosion and Sedimentation from Fire Trails and Management Accesses

➤ **Action 22**
Encourage/support the Gandangara LALC to rationalise the extensive vehicle track network on their lands west of Mill and Barden Creeks and around Barden Trig.

Priority – Very High

Council and/or the MGRSI should encourage, and if necessary assist (such as in providing planning advice, assistance in accessing land management funding, or advice/support regarding on-ground works) the Gandangara LALC in rationalising – in stages if appropriate – the extensive vehicle track network on their lands west of Mill and Bardens Creeks and in the Bardens Trig area.

Rationale – to rationalise the current extensive network of informal vehicle tracks across the Gandangara LALC lands to better present the Land Council as a responsible land manager, to reduce erosion/sedimentation as well as bushland fragmentation and other environmental impacts, deter unauthorised vehicle access/use and associated issues (such as rubbish dumping), and improve site conditions and preserve future land use options while still providing sufficient access for fire management/control, environmental management, recreational use (as appropriate), and utility maintenance.

The western side of Mill Creek, predominantly Gandangara LALC land, continues to be subject to high levels of unauthorised 4WD and trailbike use, track creation and proliferation, and associated impacts on the area's natural and cultural heritage values. The Land Council has attempted to manage off-road vehicle activity in this area in the past, principally by permits or "work for access" agreements with organised recreational vehicle groups. However the problems associated with unauthorised 4WD and trailbike use, as well as track creation, and their attendant impacts persist in these areas. Closure and rehabilitation of access tracks, and measures to prevent or control/manage unauthorised vehicle access to this large natural area, are the most effective means of managing these issues.

Council and/or the MGRSI, with the possible involvement of the NPWS (DECCW) and the Sydney Metropolitan Catchment Management Authority (under projects such as "Erosion and Sediment Control in Bushland Areas"), should liaise with the Gandangara LALC regarding the advantages offered by more actively managing the vehicle track network in the Land Council's lands. Assistance in preparing an access track plan, developing a track closure and rehabilitation works schedule, sourcing land management funding, and advice/support regarding on-ground works to close/rehabilitate redundant tracks would be appropriate.



Heavy duty fencing – similar to that recently installed along the southern boundary of Georges River National Park – could be used to partition the Gandangara LALC lands to support track closures and 4WD/trailbike management.

TransGrid will also need to be involved in regard to assuring vehicle access from Heathcote Road across the Land Council's

area to the reach their north-south high-voltage transmission line.

It may be a practical option to, if supported by Gandangara LALC, progressively partition the lands west of Mill Creek off Heathcote Road to achieve track closures and management of 4WD and trailbike access in stages. Using the natural “pinch points” offered by gullies and steeper terrain running west along tributary drainage lines up from Mill Creek, and reinforcing these with heavy-duty fencing back to Heathcote Road (similar to recent boundary fencing along the southern margin of Georges River National Park). Likely fencing distances would be between 350 and 650 metres in each instance. Possible constrictions for such a treatment include the following east-flowing tributaries, as shown on Figure 17 – the extended valley south of the Sandy Point Quarry, north of the junction of Mill and Lucas Heights 1 Creeks, and north and south of the Commonwealth land on Heathcote Road as well as two possible shorter sections of fenceline further southwards off Heathcote Road. Additional barriers would be needed for those flatter, more vulnerable, fence sections close to Heathcote Road (and the major existing north-south informal track). Fencing security would be a high maintenance issue, initially, until new usage patterns are enshrined, and This partitioning or staged approach would also allow the identification and management of an “approved” and managed 4WD and trailbike area, if appropriate (as per Action 38).

The large plateau area, immediately south/south-east from Sandy Point Quarry, is a priority area for track rationalisation and limiting 4WD and trailbike access/use. Despite its history of land use disturbance, and on-going impacts from unauthorised vehicle use, this area supports 3 extensive occurrences of Shale/Sandstone Transition Forest Endangered Ecological Community. As the land owner the Gandangara LALC has an obligation to prevent known damage/threat to an Endangered Ecological Community.

Any such track rationalisation/closure actions should be co-ordinated with vehicle track rationalisation across the catchment’s publicly managed lands (as per Action 25), and possible opportunities for a managed 4WD and trailbike use area within the catchment (as per Action 38).

➤ **Action 23**

Encourage/assist the Gandangara LALC to stabilise and remediate erosion and sedimentation areas associated with vehicle tracks along the margin of the western escarpment of the Mill Creek valley and around Barden Trig, and install suitable preventative measures.

Priority – Very High

Council and/or the MGRSI should encourage, and if necessary assist, the Gandangara LALC to remediate erosion and sedimentation impacts associated with vehicle tracks along the top sections and slopes of the western escarpment of the Mill Creek valley, and around Bardens Trig, on the Land Council’s lands and to put appropriate track treatments and drainage works in place to manage/limit the recurrence of these problems.

Rationale – to stabilise and remediate existing erosion and sediment deposition areas associated with vehicle tracks on steeper grades and more sloping terrain, to limit the further impact of sediment plumes/deltas on native vegetation, and prevent mobile sediment loads from reaching drainage lines. To ensure that future incidences of track-sourced erosion and deposition are minimised.

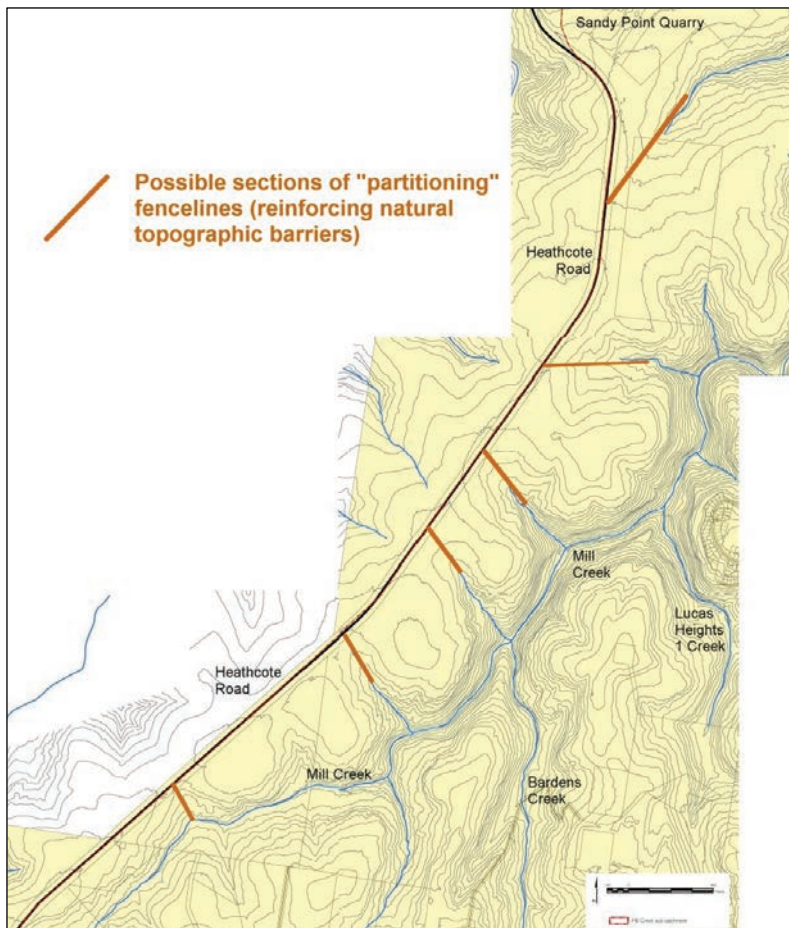


Figure 17 Possible partition fencing locations along Heathcote Road

Proven and widely-used erosion/sediment control and unsealed track management measures – such as roll-over drains, hay bale barriers, silt fencing, and ponding/windrow removal – could be readily, and relatively cheaply, implemented to manage these impacts and limit their future occurrence on the more sloping track sections (especially along the eastern edge of the western uplands).

The Sydney Metropolitan Catchment Management Authority (under projects such as the “Aboriginal Natural Resources Management Network” or “Erosion and Sediment Control in Bushland Areas”) could actively assist the Gandangara LALC in implementing these simple, but effective, practical measures.



Mobilised deposited sands smothering native vegetation beside vehicle tracks, along the top of the western Mill Creek escarpment.

The Soil Conservation Service could also be approached for advice and assistance.

➤ **ACTION 24**

Establish a co-ordinating Management Track Working Group of involved agencies/authorities to oversee fire trail and management access track standards and maintenance, works scheduling, and access arrangements.

Priority – High

Council would be the most appropriate agency, working closely with the Rural Fire Service and NPWS (DECCW), to co-ordinate a Management Track Working Group of agencies/authorities to address the on-going management, maintenance and use of the catchment's fire trail and management access network.

Rationale – to ensure a consistent and co-ordinated approach to track management and maintenance, so that essential trails/accesses are both serviceable and sustainable as well as generating the minimum environmental impact practicable and serving other functions (such as recreational use) where appropriate.

Council would most appropriately take a lead role in this task – with participation by the NPWS (DECCW) and the Land and Property Management Authority (as other public land holders/managers in the catchment), the Rural Fire Service, and Sydney Water and TransGrid (as utility providers with regular access requirements).

Best practice advice on unsealed access track development and maintenance in natural areas should be sourced from the NPWS (DECCW), Soil Conservation Service and State Forests NSW. The Sydney Metropolitan Catchment Management Authority's "Erosion and Sediment Control in Bushland Areas" project – a baseline study of eroding tracks and trails in naturally vegetated areas supported by educational and awareness raising material, plus limited on-ground demonstration works – could also be involved. Advice could also be provided to ANSTO and WSN Environmental Solutions to support the minimum impact management of bush tracks on their areas of the catchment.

This working group would play a key role in preparing an agreed Management Track Network Plan and schedule for the progressive closure and rehabilitation of redundant tracks (as per Action 25) and managing the access track network's targeted upgrading and on-going maintenance (as per Action 26).

➤ **ACTION 25**

Rationalise fire trails and management accesses within the catchment's public lands, and progressively close and rehabilitate redundant tracks, according to an agreed Management Track Network Plan.

Priority – High

This action requires Council to co-ordinate public land managers (NPWS and the Land and Property Management Authority), the Rural Fire Service, and utility agencies (Sydney Water and TransGrid) in undertaking a strategic review of their vehicle/service access management requirements within the catchment to prepare an agreed Management Track Network Plan and develop a schedule for the progressive closure and rehabilitation of redundant tracks.

Rationale – to rationalise the current access track network across public lands to reduce maintenance demands, reduce erosion/sedimentation and bushland fragmentation and other impacts, and deter unauthorised vehicle access/use and associated issues (such as rubbish dumping and arson) while still providing sufficient access for fire management/control, environmental management, recreational use, and utility maintenance.

The Management Track Working Group (as per Action 24 above) is the logical forum for development of an agreed Management Track Network Plan, with Council taking a lead role in this task.

Track network rationalisation will require close co-ordination with the Rural Fire Service in regard to access requirements for bushfire hazard management, Asset Protection Zones, strategic fire advantage zones, and fire fighting needs.

Sydney Water and TransGrid will need to be closely involved regarding their access requirement to the sewer mains and high-voltage transmissions lines within the catchment (TransGrid and the NPWS already have a Memorandum of Understanding in place regarding access, inspection and maintenance works on TransGrid infrastructure in NPWS areas). Consultation will also be required with ANSTO and WSN Environmental Solutions, as major landholders and practical entry points to the service track network.



An Asset Protection Zone, managed off the fire trail downslope (left) to residences upslope - on the eastern residential ridgeline.

This action should be co-ordinated with encouraging the Gandangara LALC to review and rationalise the extensive vehicle track network in their lands (as per Action 22), as well as measures to limit unauthorised 4WD and trailbike access (as per Actions 36-8).

Minimising the fragmentation of Endangered Ecological Communities and enhancing the integrity of these significant communities, track closures in the proximity of drainage lines where runoff and sedimentation risks are heightened, as well as tracks passing close to cultural heritage sites – should be priority considerations in track rationalisation planning.

The Lucas Heights Conservation Area is a priority location for track closure and rehabilitation – in view of the number of tracks at this site, the significant vegetation in this area, and its location at the headwaters of Mill Creek.



Large reinforced concrete pipes, dumped beside Mill Creek (just north of the old mill site), could be recycled/used as barriers in rationalisation of the vehicle track network.

The recreational value of the catchment's access track network will need to be acknowledged in rationalisation of the track network.

Tracks or track segments identified for closure should be cross-ripped and re-contoured and then rehabilitated using brush-matting, direct seeding, selected planting or other appropriate methods. Advice could also be sought from the Soil Conservation Service. Temporary vehicle barriers – such as placed sandstone boulders, heavy-duty fencing, inverted filled reinforced concrete pipes, or other obstacles – as well as temporary drainage control works and erosion/sediment control measures may be required in many places.

➤ **ACTION 26**

Undertake prioritised maintenance, and upgrading where appropriate (especially in relation to drainage works), of the catchment’s fire trail and management access network.

Priority – High

Public land managers (chiefly Council, the NPWS and the Land and Property Management Authority) to undertake regular maintenance and, where required, upgrading of the catchment’s fire trail and management access network – according to an agreed/prioritised works schedule.

Rationale – to ensure that the access track network within the catchment’s public lands, and elsewhere, is serviceable, sustainable, generates the minimum environmental impacts practicable, secure, and capable of serving other functions (such as recreational use) where appropriate.

Track maintenance standards, schedules and any upgrading works would preferably be as agreed through the Management Tracks Working Group (as per Action 26). Co-ordinated management track maintenance and upgrading works could be extended to other, private, landholders within the catchment – particularly ANSTO and the Gandangara LALC – to ensure a consistency of approach/standards as well as to take advantage of economies of scale. Track works for the major private landholders could also be undertaken by Council, or other public land managers or utility authorities, on a fee-for-service basis.

Fire trail and management access maintenance, and upgrading, works should be prioritised according to considerations such as:

- ❑ the type and standard of management access required, and trail serviceability;
- ❑ the significance and sensitivity of the surrounding vegetation or habitats;
- ❑ existing erosion and sedimentation problem areas;
- ❑ gradients and soil types, and susceptibility to erosion;
- ❑ proximity to watercourses, and the potential for sedimentation and other waterway impacts;
- ❑ proximity to cultural heritage sites; and
- ❑ the potential for “knock-on” impacts (such as trail braiding, fire risks, weed spread, creating 4WD “challenge” attractions, rubbish dumping, etc).



Upper section of the severely degraded fire trail leading downslope to the Georges River.

The steep north-south fire trail in Georges River National Park, leading to the saltmarsh point (opposite Yeramba Lagoon), is a particular priority location for remediation and upgrading works (and control of unauthorised 4WD access/use). This trail also warrants improvement as part of the proposed loop walking track along the Georges River foreshore (as per Action 43).

Problem sections of the existing trail network (to be retained) may also be re-routed – where this is practical, more efficient/effective, and offers a net environmental benefit (this should only generally occur outside of areas supporting Endangered Ecological Communities).

5.3.1.2 Managing Sandy Point Quarry Stormwater/Runoff

- **Action 27**
Liaise with the Land and Property Management Authority and incoming lessee to improve the management/discharge of stormwater, wastewater and sediment from the Sandy Point Quarry and ensure a high standard Environmental Management Plan.

Priority – High

Council, the NPWS (DECCW) and the MGRSI to liaise with the Land and Property Management Authority and incoming lessee of the Sandy Point Quarry to ensure that the management of stormwater, wastewater, runoff and sediment from the Sandy Point Quarry is adequately addressed in the Environmental Management Plan to be developed for this facility's future operation.

Rationale – to internalise the management of stormwater, wastewater, runoff and sediment associated with the quarry's operations, ensure that best practice management measures are identified and employed, and minimise discharges to and impacts on the adjoining Georges River National Park and Georges River.

In accordance with Council's Stormwater Management Development Control Plan 2005 significant/concentrated stormwater discharge from a site across other lands will require "a legally created easement and associated formal drainage system". Landholders generating stormwater and sediment discharges also have, through legal precedent, a responsibility not to detrimentally impact the quality of receiving land or waters.

Sediment-laden stormwater, particularly with fine suspended (clay) particles, flowing north from the Sandy Point Quarry has impacted on the national park – including areas of Shale/Sandstone Transition Forest Endangered Ecological Community – and Georges River in the past. This will need to be addressed in the quarry's future operation and environmental management. Stabilisation and remediation of the denuded and severely impacted areas that were associated with a former mini-bike club and circuit, south-east of the quarry (but within the lease area), will also be an important consideration.



Many of the water quality devices associated with the Sandy Point Quarry are no longer operational.

Council and the NPWS (DECCW) should approach the Land and Property Management Authority seeking a comment, and preferably a concurrence, role in relation to development and approval of the new Environmental Management Plan for the Sandy Point Quarry by the incoming lessee.

5.3.2 Water Quality Monitoring

- **Action 28**
Continuation of ANSTO and WSN Environmental Solutions water quality monitoring and reporting regimes – for their respective existing (and past) activities and operations in the upper catchment.

Priority – Very High

As consistent with their legal and licence obligations, both WSN Environmental Solutions and ANSTO have rigorous surface water and groundwater management systems in place for their respective operations in the upper catchment, and associated comprehensive water quality monitoring and reporting regimes.

Rationale – to ensure that WSN Environmental Solutions' and ANSTO's surface water and groundwater monitoring and reporting obligations continue into the future, with results regularly reported to Sutherland Shire Council and the local community as well as the relevant State and Federal regulatory agencies.

WSN Environmental Solutions' and ANSTO's surface water and groundwater monitoring programmes include both their operating sites and immediately downstream areas on drainage lines and across the upper areas of the catchment. Additional on and off site monitoring obligations are associated with wet weather events and incidents or non-conformances. WSN Environmental Solutions' monitoring obligations include both the current Waste and Recycling Centre as well as the former WSN site (Lucas Heights 1) which is now being redeveloped as the Bardens Ridge Sports Complex.

Monitoring results are regularly reported to Sutherland Shire Council, as well as being publicly available on the internet and in Sutherland Library. The transparency and availability of these monitoring results is an important element not only in management of Mill Creek and its catchment, but also in assuring the local and wider community that these facilities continue to be managed in an environmentally responsible manner.

- **ACTION 29**
Undertake or encourage targeted water quality monitoring, both surface and groundwater, on the small un-named creek draining north from the Little Forest Ridge area.

Priority – Very High

This action requires the MGRSI and/or Council to solicit, encourage and support the establishment of on-going surface and groundwater water monitoring sites on the small un-named creek draining north from the Little Forest Ridge area. The analytes will need to address both biological and chemical/pollutant indicators to capture the diverse land use and waste disposal history of this sub-catchment.

Rationale – this small creek and sub-catchment is at present un-monitored but drains an area with a concentration of earlier waste disposal sites (including ANSTO's Little Forest Burial Ground, Council's former night soil depots, and the unmanaged former IWC liquid waste disposal site which is suspected of being a high risk area and major source of chemical pollutants into surrounding/downstream areas) – as shown in Figure 18.

The low level radioactive waste burial ground is closely monitored by ANSTO. The two main former night soil disposal areas used by Sutherland Shire Council have been subject to a contamination assessment, which found that this area no longer represented a health risk and was “compatible with recreational use”. However the former Industrial Waste Collections Pty Ltd (IWC) liquid waste site has been known to be leaking pollutants for more than a decade with previous containment and capping measures at this contaminated site no longer functional. The issue of responsibility for management of the former IWC site is the subject of on-going legal proceedings between Brambles and the Commonwealth Government, with both the Commonwealth and NSW Environmental Protection Authority currently investigating the site and its impacts. The stability and pollution loads of the former quarries in the Little Forest area, excluding Harrington’s Quarry which is now managed by WSN Environmental Solutions, is also questionable.

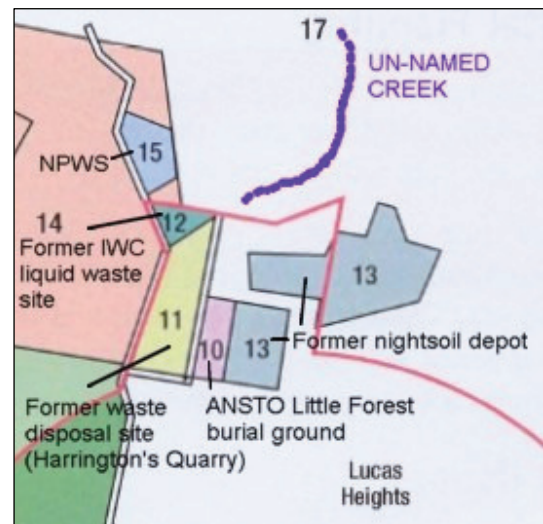


Figure 18 Former and current land uses at Little Forest, in the sub-catchment of the un-named tributary of Mill Creek

Base source: Gutteridge Haskins and Davey/ANSTO

This area represents a significant concentration of possible pollutants and warrants downstream monitoring to determine the off-site water quality and environmental impacts of these sites. The Commonwealth and State Governments, ANSTO, WSN Environmental Solutions and Sutherland Shire Council all have a history and involvement in this area – raising the possibility of joint funding for additional water quality monitoring effort downstream of this zone.

➤ **ACTION 30**

Include the Mill Creek Catchment in Council’s Strategic Water Monitoring Programme.

Priority – High

This action requires Council to extend its Strategic Water Monitoring Programme to include on-going priority, and periodic, sites within the Mill Creek Catchment.

Rationale – to provide on-going information on water quality within the catchment to assist in the area’s management, evaluate the effectiveness of stormwater quality and management measures employed, and to ensure that this area has a profile in Council’s overall environmental condition reporting.

Council’s Strategic Water Monitoring Programme (SWaMP) provides information on the quality of stormwater and receiving waters, as well as the efficacy and efficiency of stormwater quality improvement devices, and so highlights areas where actions to improve water quality or the effectiveness of stormwater treatment measures are required. This targeted annual programme assesses water in the field for floating litter, odours, surface film, conductivity, pH, dissolved oxygen, and temperature as well as laboratory testing for Bacteria (enterococci), nutrients (including phosphorus and nitrogen), oil and grease, biological oxygen demand (BOD), and total suspended solids (sediments). Water quality is assessed against the Australian Runoff Quality Guidelines (2006) for stormwater, and the ANZECC (2000) Protection of Aquatic Ecosystems 95% Species Protection (Freshwater) guidelines for natural or semi-natural waterways.

No SWaMP sites are at present located within the Mill Creek Catchment, and although water quality is monitored by ANSTO and WSN in various locations in the upper catchment

(associated with their respective operations) there would also be value in a wider water monitoring effort across the remaining, lower, areas of the catchment.

Priorities for establishing and maintaining water quality monitoring points, under Council's SWaMP or independently as part of the catchment's sustainable management, are:

1. an on-going surface water, and sediment, quality monitoring point below the junction of Mill and Lucas Heights 1 Creeks – to allow an assessment of the total cumulative water quality impacts of all major land uses in the upper catchment; and
2. a surface water quality monitoring point on a typical drainage line from the eastern ridge urban areas, and a "control site" on a comparable western drainage line flowing into Mill Creek – to assess water quality impacts from residential land use/development.

Periodic water quality monitoring, inflow and outflow, should be undertaken across a selection of the stormwater quality improvement devices installed on the catchment's urbanised eastern drainage lines – to assess the effectiveness of the various measures employed and promote continual improvement and the wider application of more successful measures.

There is also potential for water quality monitoring efforts within the catchment to be linked with the "Riverhealth" monitoring efforts of wider Georges Riverkeeper Programme, as managed by the Georges River Combined Councils Committee with the NSW Maritime Authority.

➤ **ACTION 31**

Extend Council's Streamwatch Programme into the Mill Creek Catchment.

Priority – High

This action requires Council to extend its Streamwatch Programme into the catchment, and encourage the participation of local schools and community groups in monitoring water quality within the area's waterways and stormwater.

Rationale – to support Council's in-house (and landholder) water monitoring efforts, while raising community awareness as well as empowering and encouraging community participation in protecting the health of waterways.

Council's Streamwatch Programme targets schools and community groups to become involved in testing water quality in local rivers and streams as an educational, awareness raising and action/behavioural programme. No Streamwatch sites or groups are at present active within the Mill Creek Catchment. However several local primary and high schools in the urban areas east of the catchment are possible candidates for involvement in this programme, and should be approached to participate.

➤ **Action 32**

Liaise with ANSTO regarding expanding the range of surface water quality parameters and sediment analytes, assessed at their two (annual) sampling sites upstream of the junction of Mills and Barden Creeks, to include ecological analytes.

Priority – Medium

This action requires the MGRSI or Council to negotiate with ANSTO to expand the range of surface water quality and sediment quality parameters, to include ecological analytes, at

their two annual sampling sites just upstream of the junction of Mills and Bardens Creeks (one site on each creek).

Rationale – to provide another comprehensive surface water quality monitoring location in relation to the water quality and health of Mill Creek, to assist in the creek and catchment's sustainable management.

The additional biological analytes could be added to ANSTO's current monitoring at these sites for minimal additional effort and expense, but would provide useful additional information for the creek and catchment's management. Appropriate monitoring parameters would be those used in Council's current Strategic Water monitoring Programme (SWaMP) including – nutrients (phosphorus and nitrogen), dissolved oxygen, conductivity (salinity), pH, temperature and turbidity (suspended particulate matter, SPM). Macro invertebrates (see Action 33) and excess/nuisance aquatic plant growth are other potentially useful indicators.

- **ACTION 33**
Encourage continuation of periodic macro-invertebrate sampling in Mill Creek.

Priority – Medium

This action requires the MGRSI and/or Council to encourage and support the on-going sampling of macro-invertebrates in Mill Creek, building on the earlier limited sampling programmes undertaken for WSN Environmental Solutions in 1994 and 1997.

Rationale – to provide another monitoring parameter, this one focused on aquatic biodiversity, in relation to the water quality and health of Mill Creek to assist in the creek and catchment's sustainable management.

WSN Environmental Solutions could be approached to sponsor this additional aquatic biodiversity monitoring on a two-yearly (or longer basis), as part their on-going assessment of any downstream impacts of their operations. Tertiary institutions are another possible contributor to this more opportunistic sampling effort.

5.4 MANAGING RECREATIONAL USES AND IMPACTS

5.4.1 Unauthorised Vehicle Access and Use

- **ACTION 34**
Upgrade the construction standards, security and strategic siting of gates at entry points to the fire trail and management access network.

Priority – Very High

Prioritised upgrading of the construction standards, security and strategic siting of gates at entry points to the public land fire trail and management access network to better prevent/control unauthorised vehicle access.

Rationale – to improve gate effectiveness to better prevent or actively discourage unauthorised vehicle access to the fire trail and management access network.

The NPWS (DECCW) has recently installed high strength (steel post and cable) fencing, with high-security gates, along most of the western and southern boundary of Georges River National Park within the catchment – which has proven very effective. However a range of improvements are possible to the primarily urban-park style gates that now protect the catchment’s vehicle track network and are subject to on-going failure/breaching and damage – especially along the eastern residential boundaries. These include:

- ❑ progressively replacing existing light-weight park gates with heavy-construction high security gates, such as recently installed with considerable effectiveness along the high-visibility boundaries of Georges River National Park and elsewhere in Sydney’s urban national parks;
- ❑ upgrade padlock protection/security, to prevent hack-sawing or angle-grinding;
- ❑ provide gates with high security (metal cable and post) “wing” fencing and/or boulders or other barriers to prevent detouring and damage to adjoining bushland – especially in flatter and more open vegetation (such as around Ella Avenue) – and including pedestrian “pinch-point” or “kissing-gate” access where required;
- ❑ include “lift and drop” lockable metal bollards in conjunction with entry gates where required in “high pressure” or problem sites (but not practical for all locations);
- ❑ relocating or siting gates in high visibility locations wherever possible – such as adjacent to roads or residences – to improve passive surveillance; and
- ❑ relocating or siting gates strategically to take advantage of local/micro topography – such as steep side-slopes and rock cuttings – to “defend” these structures/barriers and prevent detouring.



Examples of high security gates and padlock assemblies, from Botany Bay National Park.

Along the catchment’s eastern residential margins priority locations for improved gate security include the following sites (from north to south) – as shown in Figure 19:

- ❑ Bottlebrush Place;
- ❑ Lavender/Blackwattle Place;
- ❑ Von Nida Place/Monash Road;
- ❑ Penrose Place entrance, and the access track downslope to Mill Creek (which is well-suited to a topographically defended gate);
- ❑ Barnes Crescent (near Harvey Place)
- ❑ Treloar Place – at the cul-de-sac’s western end, and in the east at the entry to the Lucas Heights 1 Creek crossing track;
- ❑ Charlton Place;
- ❑ Windle Place – dual entries; and
- ❑ Ella Avenue – dual entries, both also requiring wing fencing.

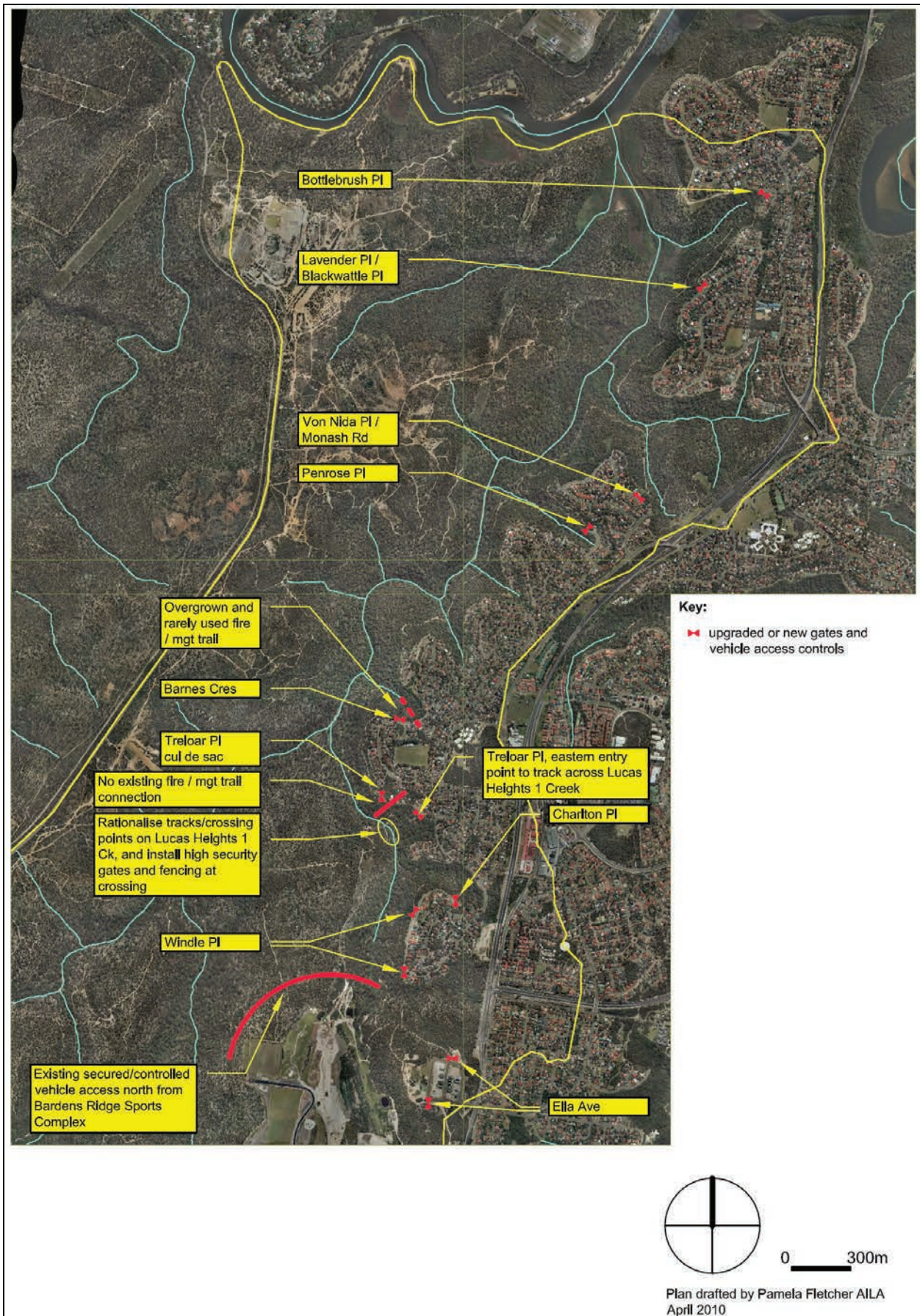


Figure 19 Priority locations for improved gate/access security



Treloar Place entry gate, low security level and repaired multiple times.



Penrose Place (lower) fire trail, well suited for the use of a gate protected by the site's micro-topography.

➤ **ACTION 35**

Exclude unauthorised vehicle access/use from the fire trail and management access network of the north-eastern hillslopes of Mill Creek, north from Treloar Place.

Priority – Very High

Upgrade gates, install additional barriers and increase signage and patrols/enforcement to exclude unauthorised vehicle access/use from the trail network of the north-eastern hillslopes of Mill Creek, downslope of the residential areas, north from Treloar Place.

Rationale - to better prevent and actively discourage unauthorised vehicle access to the fire trail and management access network in an area that is close to residences and heavily used for passive recreation.

The north-eastern side of the Mill Creek valley, below the residential areas, is not connected to the fire/access trail network in the remainder of the catchment. There is a gap in the trail network at Treloar Place (where vehicles are forced up onto the residential street, via two gates/entries) and also off Barnes Crescent (near Harvey Place) at Harvey Place Gully (where the old, overgrown and very rarely trafficked remains of a vehicle access passes around the gully's head) – as shown in Figure 19. The result is that more than 3.5 kilometres of creekside bushland north from this point has the advantage of having a limited number of access points and could readily be managed to exclude unauthorised 4WD access – especially with the upgrading of entry gates (as per Action 34 above) and the added surveillance offered by the residential context. The management track network in this area is also among the most heavily used locality for recreational walking in the entire catchment, due to the proximity of housing, making unauthorised 4WD and trailbike use a safety and amenity issue warranting greater control or exclusion.

➤ **ACTION 36**

Prevent unauthorised east-west vehicle access across Mill Creek headwater.

Priority - High

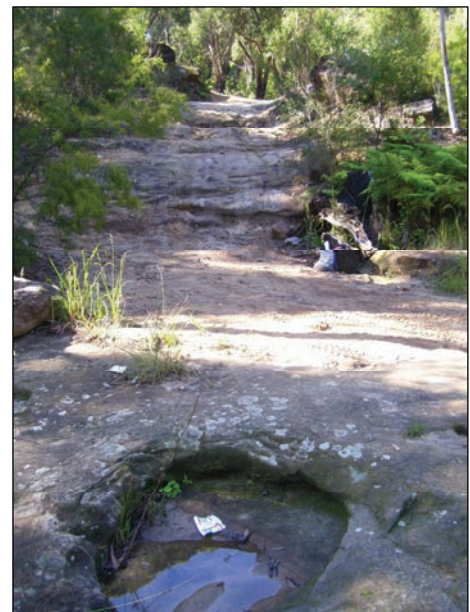
Install gates and other barriers to prevent unauthorised east-west vehicle access across the upper reaches of Mill Creek (via Bardens Trig).

Rationale – to remove the option/attraction of 4WD and, less definitely, trailbike access east-west and thence an extended “circuit” across the upper section of Mill and Bardens Creeks, by reinforcing or blocking three key access/entry routes along the catchment’s eastern side.

The vehicle track over Bardens Trig, part of the former (but no longer maintained) Menai Fire Trail, is the only east-west track link in the entire catchment. To the west this track connects into a track network north of the Little Forest area and ANSTO Buffer Zone, to ultimately cross the headwaters of Mill Creek and access the extensive trail network on the catchment’s western plateau. This link offers a “circuit” route taking in both sides of the catchment, and so is a particular attraction for unauthorised 4WD and trailbike use (as it considerably extends the length of track and route options available as well as enabling access from the eastern residential areas).

East of Bardens Trig this link is only accessible from the following six entry points – as shown in Figure 19 – a gated access off Treloar Place, a track entry off Charlton Place, two entry points off Windle Place, and two track entries further south off Ella Avenue (with secure/gated track connections to the Bardens Ridge Sports Complex). The five latter tracks all join, and all six routes come together at the two crossing points of Lucas Heights 1 Creek (which are key strategic points) below Treloar Place; and

Two gated/locked tracks north from the northern boundary of the Bardens Ridge Sports Complex also access Bardens Trig and the creek crossing. However these accesses are already secured against unauthorised entry – one being blocked by a substantial fence and locked gate near the leachate pumping station, and the other also fenced and only accessible across secure-access playing fields.



The crossing point on Lucas Heights 1 Creek, below Treloar Place, is a critical “control” point on the catchment’s access track network.

Upgrading gates and access security at these six entry points (as per Action 34), as well as installing additional high security locked gates at the Lucas Heights 1 Creek crossings (and possibly installing a barrier to rationalise this area into a single crossing point), is recommended in order to deny unauthorised access to this east-west connection – as shown in Figure 19. This route cannot be closed entirely due to its strategic fire control value. Additional fencing of the Lucas Heights Conservation Area, along its Heathcote Road edge and north-eastern corner would also assist, however alternative tracks exist around the reserve’s edge.

➤ **Action 37**

Increase patrol and enforcement presence along the catchment’s fire trail and management access network, and implement a more efficient and timely schedule for the repair and maintenance of breached/damaged gates.

Priority – High

Council and the NPWS to increase their patrol and enforcement presence along the catchment’s fire trail and management access network. Council to upgrade its response procedures and timeliness for the repair and maintenance of breached/damaged gates.

Rationale – to present a visible deterrence to unauthorised vehicle access, and maintain security of the fire trail and management access network.

This action includes improved signage and an education/advice role by Council regarding vehicle use within the catchment, as well as encouraging surveillance and reporting by local residents of unauthorised vehicle access/use plus reporting damage to entry gates and other infrastructure (possibly via a dedicated hotline or similar).

Sutherland Police Local Area Command also now has access to trailbikes for operations in bushland areas, and greater involvement by Police in patrolling the catchment's trail network during "high use" times should be sought.

The distribution of access keys to the third parties, such as building contractors, should be limited and a secure (no-copying) key system introduced.

➤ **Action 38**
Assist Gandangara LALC, if requested, to identify and plan for a suitable area to accommodate 4WD and trailbike usage.

Priority - High

Provide site identification, feasibility and planning assistance to the Gandangara LALC – if requested – to identify a suitable area, site layout/facilities and operating framework to accommodate managed 4WD and trailbike use on a commercial basis.

Rationale – to provide a possible income stream for the Land Council and assist in the management/exclusion of this activity from other parts of the catchment.

This initiative would have to be a request of the Gandangara LALC, but would potentially offer the dual advantages of providing an income stream for the Land Council and assisting in the management and exclusion of this activity from other bushland areas of the catchment. Managed 4WD use of part of this area would preferably be in a bushland setting, and so would permit retention of more of the area's natural landscapes than other broad-acre land clearing or development uses. To be successful, if requested by the Land Council, this initiative would need to proceed in parallel with aggressive measures to exclude or better manage 4WD and trailbike access/use elsewhere within the catchment.

Site selection would need to be a thorough and detailed process – considering factors such as the stability of soils/substrate, vegetation communities and natural heritage/habitat values, drainage and erosion/sedimentation issues, impacts on other/adjoining land uses, visual and amenity issues, access, and the availability of services/utilities.

The western plateau area would be a logical zone within which to locate such a dedicated 4WD/trailbike facility. However the three extensive occurrences of Shale/Sandstone Transition Forest Endangered Ecological Community over the larger northern flatter area (immediately south/south-east from Sandy Point Quarry) would suggest that a location further south is preferable on one of the smaller ridges already impacted by a proliferation of tracks and history of gravel scrapes, but without vegetation communities of major conservation significance.

The facility could be developed and operated according to a range of models – from a fully Gandangara LALC managed entity on a fee-for-entry or "club licence" basis, to a tendered commercial opportunity developed and managed on a leasehold or concessionaire basis.

The project would be subject to all necessary environmental and planning approvals.

5.4.2 Walking Tracks

- **Action 39**
Prepare an overall Walking Track Strategy or Plan for the entire catchment, with the involvement of all major landholders/managers.

Priority – Very High

Preparation of an overall Walking Track Strategy or Catchment Walking Track Plan for the entire catchment – sponsored jointly by Council, the MGRSI, or NPWS (DECCW) and ideally with the involvement of all major landholders/managers – to provide a co-ordinated plan for the type/standard, accessibility, location, inter-connectedness, signposting and promotion, and on-going management of walking or shared track within the catchment.

Rationale – to draw together past and current walking track proposals and projects within the catchment and provide an overall plan for the co-ordinated planning, development and management of walking tracks and shared tracks within the catchment.

The catchment has seen numerous walking track proposals in the past – such as those associated with the Great Kai'mia Way (including the Burnum Burnum Track, Mill Creek/Rock Wallaby Track, and the Mill Creek Spur–Gandangara Link), the extensive track network envisaged on the western plateau as part of the Gandangara Living Culture and Learning Centre project, a detailed orienteering map and recommended routes prepared in the 1990s, and numerous community initiated walking track proposals. The remains of a roughly built bridge over the lower/tidal section of Mill Creek (north-west of Ferrier Drive) also attest to an unknown former informal track link.

However, apart from the Bardens Creek Track (“The Blue Walk”) in the ANSTO Buffer Zone, developed for ANSTO by the Menai Wildflower Group, there are no dedicated and marked/signposted walking tracks within the catchment at present and facilities for walkers (or other recreational users) are virtually non-existent. This is despite its sizeable nearby residential population and considerable heritage and scenic attractions. Although used extensively for walking, jogging, bike riding and other leisure activities the management access



Remains of an informal bridge over Mill Creek, below Ferrier Drive.

network – especially along the eastern hillslopes of Mill Creek – is not signposted, not provided with any low key facilities, or otherwise unmanaged for this recreational use. Similarly, although the management trail network in Georges River National Park is open for walking and cycling, this network has not been signposted or promoted for such uses (however it is somewhat less accessible from major residential areas).

Efforts, both planning and on-ground works, to rationalise the extensive informal track network within the Lucas Heights Conservation Area have recently commenced. The Gandangara LALC is also understood to be considering an extended walking track linking north-south through their lands downstream to the Georges River, possibly as part of current the Land Alive projects. However the status of this proposal is uncertain. Despite these initiatives walking

track planning and provision in the catchment remains piecemeal and unco-ordinated, and a significant recreational opportunity not fully realised.

The Walking Track Strategy or Catchment Walking Track Plan will describe and locate a network of appropriate walking routes to develop and promote – considering conservation significance and sensitivity issues, track routing design and erosion susceptibility, loops and entry points, track standards, distances and difficulty, attractions and destinations, trackhead parking, facilities required (such as seating, low key picnic areas, lookouts, and possibly toilets), “all-abilities” access issues, hazards and safety issues, competing activities or land uses, land tenure/management, sustainability, and management demands. Priority considerations for such a Catchment Track Plan would be to make greater use of the Mill Creek valley and link “The Blue Walk” into the catchment’s wider track network (with ANSTO’s agreement).

To a degree the resolution of land tenure or long-term management arrangements for critical parts of the catchment – in visitor use terms – will have a major bearing on the shape of any Walking Track Strategy or Catchment Walking Track Plan. Legal access concerns, liability and risk management are key issues that will need to be addressed. An area of private land, extending almost to the eastern bank of Mill Creek below Royal Oak Drive, will also constrain walking track planning in this area.

Considering the safety risks they pose for walkers and the potential for usage conflict, the management of 4WD and trailbike use – and to a lesser extent mountain bikes – will also have a considerable bearing on walking track planning.

➤ **Action 40**
Install walking track destination, direction and distance marking on the already heavily used management trails of the eastern residential hillslopes of Mill Creek.
Priority – High

Installation of walking track destination, direction and distance marking on the already heavily used management trails of the eastern hillslopes of Mill Creek – as a possible collaborative undertaking by Council, Sydney Water and the MGRSI.

Rationale – to recognise and better accommodate recreational activity in an already popular and heavily used area of the catchment.

The management track network on the eastern hillslopes of Mill Creek is possibly the most heavily used bushland recreation area – mainly for walking, cycling, dog-walking, fitness training and casual play – in the entire catchment. However these routes, and especially access points to and from the residential streets above, are not signposted and none of the network is provided with destination, direction and distance marking to recognise or accommodate these high levels of use (or attract additional users with less local knowledge). Other visitor facilities, such as seating or low-key picnic areas, are also totally absent.

A linear network of relatively easy grade walking tracks (mostly along management/service tracks) is already physically in place, and could be signposted almost immediately, from Melaleuca Place Gully (Bottlebrush Place) in the north extending approximately 5 kilometres south to the Bardens Ridge Sports Complex. With the inclusion linking tracks to and from the residential streets above (east), the entire network suitable for immediate signposting would be approximately 8 kilometres or more.

Land tenure and access issues would need attention/resolution in places – such as the private landholding on the north side of Monash Road Gully, the Gandangara LALC lands on the east

side of Lucas Heights 1 Creek and the connection to the Bardens Ridge Sports Complex – however walkers and other recreational users already traverse these areas in significant numbers. Resolution of such land tenure or long-term management arrangements for this area will need to be resolved (as per Action 3) to enable public agencies to invest in and promote this zone for community use.

The provision of visitor facilities would need to be co-ordinated with Sydney Water, to ensure that service access to the sewer mains in this area is not impeded.

➤ **Action 41**
Provide a safe crossing point on the mid section of Mill Creek and a defined east-west walking track link across the valley.

Priority – High

Council and the Gandangara LALC to formalise and develop a safe crossing point on Mill Creek, near the Old Mill site, and develop a walking track connection up the western hillslope opposite.

Rationale – to improve safety and formalise a current crossing point, and provide a clearly defined waking connection between the valley’s eastern and western sides, enabling walker access to the extensive vehicle track system of the western plateau.

Despite being less than 5-600 metres distant in places, the residents of the eastern ridgeline make very little recreational use of the catchment’s western plateau area.



Remains of the Old Flour Mill weir which also serves as an informal creek crossing point.

The management track network on the eastern residential hillslopes passes close to the site of the Old Flour Mill (dating from the 1920s) with well-used trample tracks accessing the mill site and creek at this point. The remains of an old weir associated with the mill is now used as a reasonable dry weather crossing of the creek, however the trails on the western creekbank are indistinct and soon disappear. But upslope only approximately 180 metres north-west of the mill/weir crossing is a vehicle track which connects back to the extensive track network of the western plateau and bushland.

Upgrading of the creek crossing and the development of a short section of track, with drainage protection, would encourage east-west traffic across the Mill Creek valley and enable walker access to the extensive western bushlands.

Again this would be dependent on resolution of the land tenure or long-term management arrangements for the eastern hillslopes (as per Action 3) and the support for track development and public access to their western lands by the Gandangara LALC. The management of 4WD and trailbike use in the western bushland will also need resolution if walkers are to be encouraged in to this area (as per Actions 36, 37 and 38).

- **ACTION 42**
Develop one or more loop walking tracks radiating from the Bardens Ridge Sports Complex.

Priority – Medium

Council to develop one or more loop walking tracks as part of the Bardens Ridge Sports Complex, and formalise trackheads to access the wider fire/service trail network to the north and south.

Rationale – to build on an existing recreational hub, with established facilities, and provide additional passive nature-based recreational opportunities at this site.

Routing walking tracks from this location offers the opportunity to access the high quality bushland areas along Bardens Creek, as well as possibly linking with “The Blue Walk” in the ANSTO Buffer Zone (with ANSTO’s agreement).

- **ACTION 43**
Develop a medium standard foreshore walking track link east from Sandy Point into Georges River National Park.

Priority – Medium

NPWS, with support from the MGRSI, to develop a medium standard walking track connection along the foreshore of the Georges River, from the Sandy Point Community Centre on the national park boundary for approximately 800 metres east to link with the existing management track network – upgrading existing informal tracks and providing new track linkages where needed.

Rationale – to provide a “missing link” and attractive walking opportunity along the catchment’s northern river frontage, offering loop walks and other options.

This would require the upgrading of approximately 900 metres of existing informal tracks – a 300 metres section of foot track east from the park’s Sandy Point boundary and a 600 metre section of shared vehicle track/walking track west from the saltmarsh point (opposite Yeramba Lagoon) – as well as construction of a new 300 metre section of foreshore walking track, possibly with some sections of boardwalk, between these two existing tracks.



Eastern starting point for a possible foreshore walking track in Georges Rive National Park connecting west to Sandy Point.

This walking track link would be developed to a medium standard, NPWS “Class 2 Graded Track” or “Class 3 Walking Track”, and may require some sections of boardwalk through/over mangrove and saltmarsh communities. It would have considerable interpretive potential and scenic value. It would link to the national park’s existing management trail network and provide options for loop and longer walking experiences in an area of the park which is now under-supplied with marked walking opportunities.

5.4.3 Mountain Biking and Horseriding

- **Action 44**
Assist to ANSTO in managing mountain bike activity in the Bardens Creek area.

Priority – Very High

Council and the MGRSI to provide assistance to ANSTO in the on-ground management of mountain biking and its impacts in the Bardens Creek area.

Rationale – to manage a growing recreational use/pressure and its impacts in a high quality bushland area.

Mountain bike activity has recently become established on the upper section of Bardens Creek in the ANSTO Buffer Zone, and this increased use is impacting areas of previously little-disturbed and comparatively weed-free bushland. Council or the MGRSI can support and assist ANSTO, if requested, in the appropriate management of this activity and the remediation of damaged areas. The successful longer-term management of mountain biking within the area will require a catchment wide collaborative approach (as per Action 45 below).

- **ACTION 45**
Investigate more appropriate public land locations within the catchment to sustainably accommodate mountain bike activity.

Priority – High

Council, with assistance from the MGRSI and in collaboration with users, to investigate more appropriate public land (or other) locations within the catchment to sustainably accommodate mountain bike activity – both as concentrated “technical” courses and longer “terrain” rides.

Rationale – to sustainably cater for, and manage, mountain bike recreation within the catchment.

The catchment is a very attractive location for mountain biking and this activity is increasing in popularity within the area. As a result the number and severity of sites impacted by this use is growing – including track construction through otherwise intact/undisturbed bushland as riders seek out natural obstacles or build their own “technical” courses. Early intervention in terms of planning for this activity – in collaboration with users – will help place this activity on a more sustainable management footing within the catchment.

More appropriate public land locations for mountain biking should be investigated. This should include areas for technical courses as well as preferred/approved routes for longer rides (as both shared track and “single track” dedicated to mountain bike use).

A potential mountain bike hub area warranting investigation is the parcel of Crown Land – a bushland hillslope east of the Lucas Heights 1 Power Station (south of Ella Avenue and east of the Bardens Ridge Sport Complex) – suggested for transfer to Council (as per Action 1). This area could be developed as a “technical course” and facilities site for mountain bikers, with trails linking north to the wider management trail network. This venue could possibly be accessed via the Sports Complex to the west with impacts from the site, such as sediments, being captured

by the treatment measures already installed downstream on Lucas Heights 1 Creek as part of the LH1 remediation works.

The mountain bike community/users are an active and skilled recreational interest group and should be engaged, especially at a club level, regarding the minimum impact planning and management of their activity. High quality venues collaboratively designed and developed to meet the needs of mountain bikers will aid in discouraging the informal use of less appealing/interesting sites – and provide a sound basis for enforcement activities. Mountain bike groups should also be encouraged, and supported, to become involved in the on-ground management of their activity and its impacts – through projects such as track management (“Track Care”), erosion control works, facility maintenance, weed control and bush regeneration.

The Gandangara LALC could also be approached with regard to possibly accommodating mountain biking on their lands, potentially on a low-cost or club-concession basis (although the practicality and economic viability of this approach may be doubtful).

➤ **ACTION 46**
Investigate the impacts and sustainability of horseriding in the upper catchment.

Priority – Medium

Council and/or the MGRSI to investigate the extent of horseriding in the public lands of the catchment, the impacts associated with this use, and on-going sustainability and management issues.

Rationale – to determine the impacts, extent and management implications of this activity.

The Jenko Sutherland Shire Pony Club operates from a 4 hectare Crown Land site south of the Bardens Ridge Sports Complex, off Old Illawarra Rd at Lucas Heights. This site includes flat riding areas, dressage arenas and showjumping facilities. The site’s stormwater and sediment control measures are unknown, however the hillslope below this site (and the adjacent Menai Sand and Soil site) is heavily infested with Pampas Grass and Lantana. The club also advertises that it has “access to many thousands of acres of fire trails for trail riding” and is known to make considerable use of the catchment’s bushland areas and access tracks.

The extent, impacts and management of this activity – which has the potential to impact significantly on the catchment’s bushland values and water quality – has not been fully investigated to-date.