

PART 2: SITE CHARACTERISTICS AND DEVELOPMENT PRINCIPLES

This section of the Precinct Plan identifies the key planning issues, and opportunities and constraints that have informed preparation of the Precinct Plan and development of the Precinct Framework Plan. It also articulates the key development principles upon which the future development of the Precincts will be based.

The key physical site characteristics, and development opportunities and constraints identified in this Part are illustrated on **Figures 7 and 8**.

3.1 Employment

The St Marys EPS requires that:

“The total number of jobs generated by development on land to which this clause applies (including jobs generated on the surrounding land) is to approximate the number of workers who will be resident on the land to which this plan applies after the development has been carried out.”

This principle is designed to ensure that development of the site will not add to the existing employment deficit within the region and will contribute to greater employment containment in the region, and thereby contribute to a reduction in the proportion of people commuting long distances to work.

The Dunheved Precinct comprises 30.3ha of the total 73 ha of employment land contained within the St Marys development. The driving force behind the development of the Dunheved Precinct Plan is therefore the need to generate a high employment density.

An Employment Implementation Strategy has been prepared by SGS Economics and Planning to support the Dunheved Precinct Plan. This strategy addresses the employment objectives of the Dunheved Precinct.

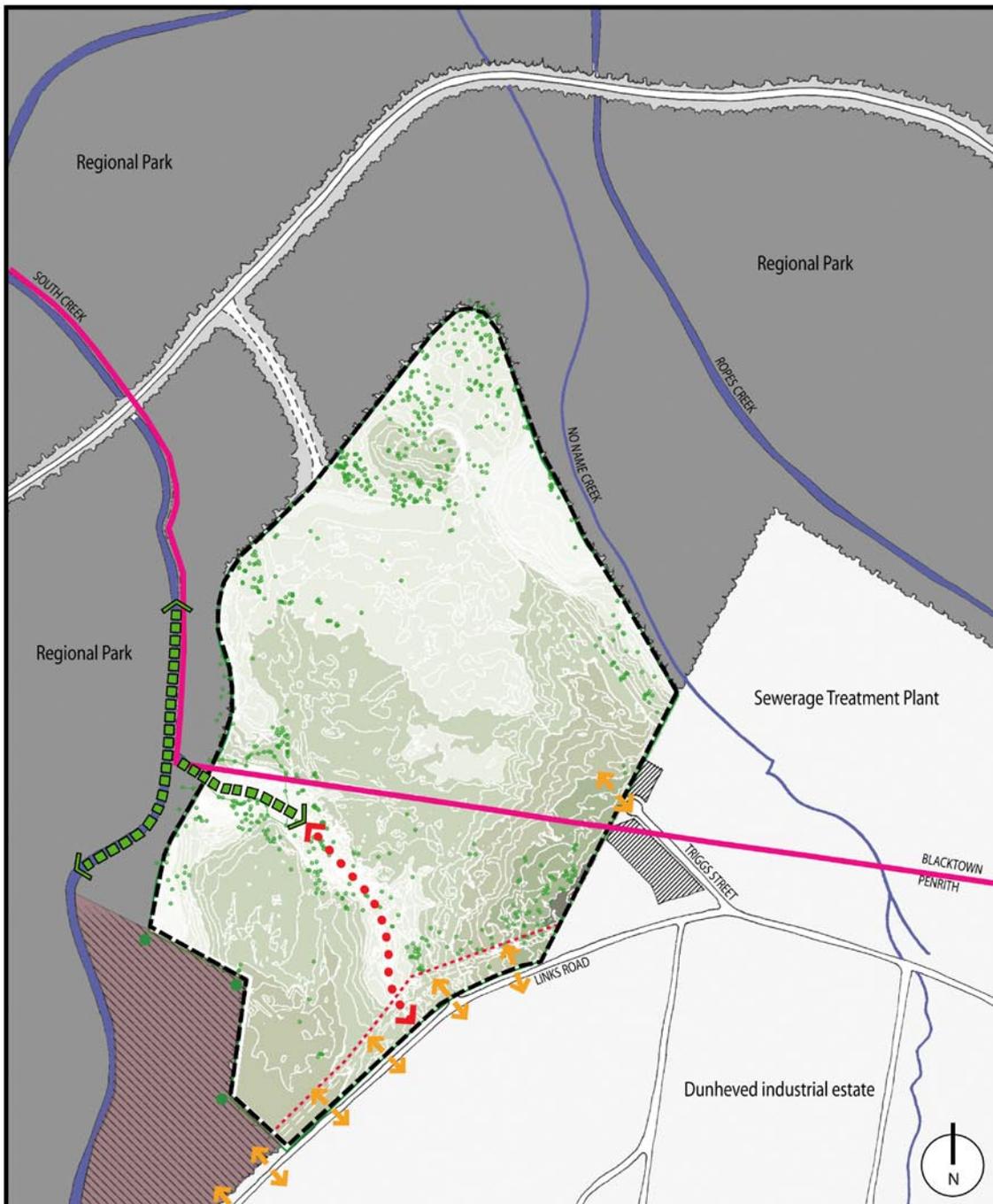
The aims of the strategy are to:

- Offer a refined industry target and a broad understanding of these industries’ needs;
- Identify target firms, industry attractions and incentives; and
- Explore the needs of industry.

An assessment of the ‘competitive place’ criteria for the North & South Dunheved Precincts has identified the following opportunities and constraints:

Opportunities

- There is a large labour pool within the region.
- The population working age is above average.
- The forecast population indicates an increasing supply of labour.
- The costs of labour in the region are relatively low.
- There is a strong intermediate and low skills employment population base, but under representation of high skills.
- High levels of unemployment suggest a ready supply of labour, although there may be issues of employability.
- The presence of University of Western Sydney (UWS) and Western Sydney Institute of TAFE in the region.
- There is a supply of graduates from UWS who are not currently being retained in the region due to lack of opportunities.
- The availability of new sites and premises through the release of the Dunheved Precinct.
- The presence of numerous business support services and infrastructure in the area.

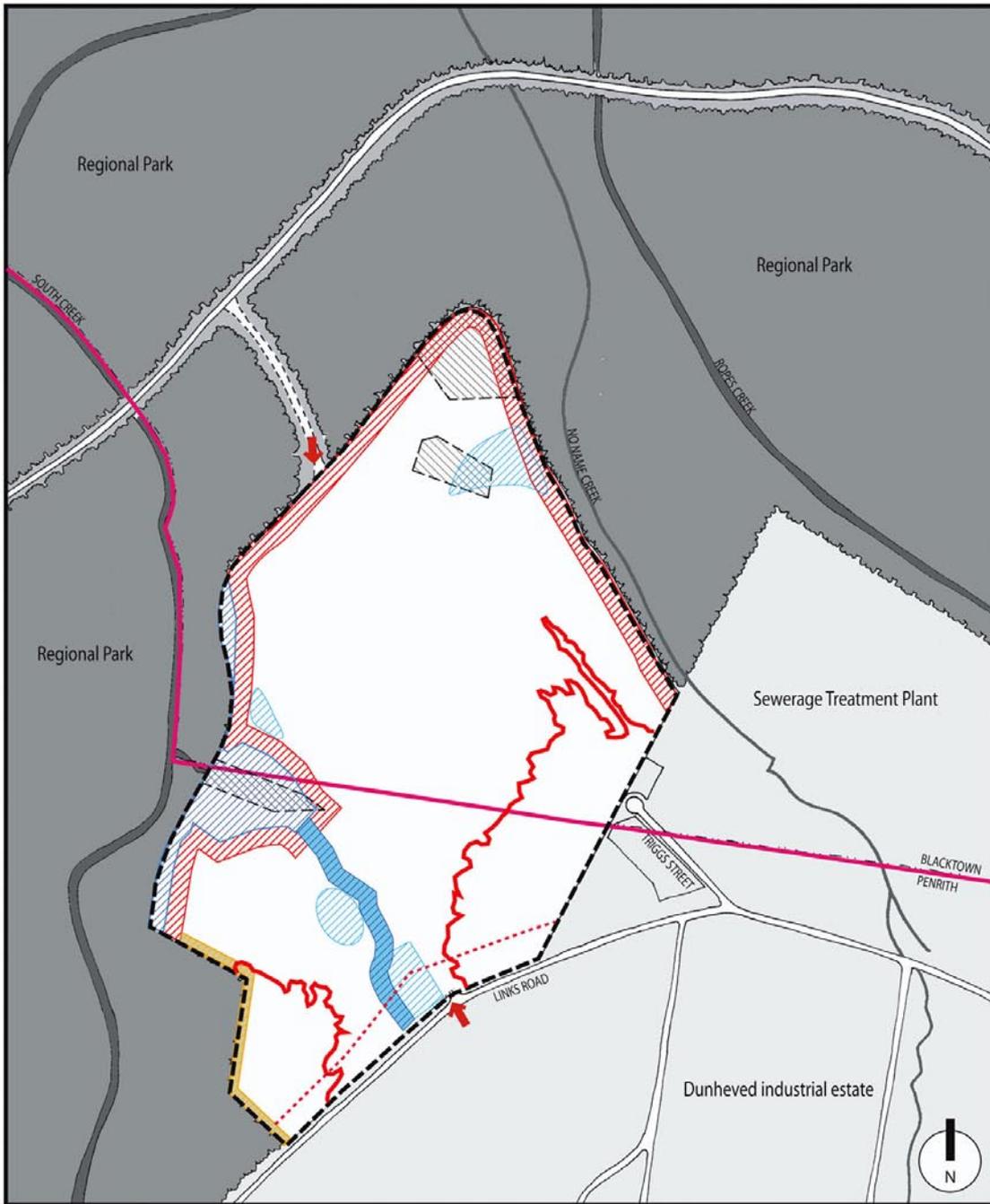


Site Characteristics

0 100 200 300
m

- | | | |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------|
| LGA boundary | Sydney Water Easement | Visual Exposure to Adjoining Roads |
| Precinct Boundary | Indicative Road Design
<small>(subject to separate future approval process)</small> | Vegetated Riparian Corridor (20m) |
| Housing | Topography with existing trees | |
| Dunheved Homestead Site
<small>(with boundary trees)</small> | Vegetated Riparian Corridor (40m) | |

Figure 7 - Site Characteristics



Constraints Plan

m0 100 200 300

- | | | |
|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
|  APZ (20 m) |  Heritage Landscape Setback (10 m) |  LGA Boundary |
|  Drainage Corridor (20 m) |  Detention Basin (Indicative Location) |  Precinct Boundary |
|  Riparian Corridor (40 m) |  Public Road Access to Site |  Sydney Water Easement |
|  Archaeological Areas |  1 in 100 year Flood Line (Indicative) | |

Figure 8 - Development Opportunities and Constraints

- The presence of clusters of metal manufacturing, timber wholesaling and manufacturing of timber products, plastic and chemical manufacturing and construction and fabrication activities in the area, offering a base of related and supportive industries to companies seeking to locate in this area.
- The high proportion of owner-occupier businesses, providing strong links between the decision maker and the region.
- The positive attributes of the existing industrial area including low cost location, labour supply, availability of sites and premises and ability to tap into the supply chain should outweigh this barrier amongst industries of similar types to the current tenants of the Dunheved industrial estate.
- The area is well positioned in regards to quality of life, offering access to a large Regional Park and the existing surrounding attributes of the area.
- There will be a wide range of housing types at competitive prices located within the wider St Marys site.

Constraints

- The prohibition on certain types of industrial uses under SREP 30.
- Comparable cost of utilities to elsewhere.
- The necessity to provide new public transport services to the site.
- The distance of the site (60km) from an international airport.
- The lack of direct access from the site to the motorway network (although it is relatively close to the M4 and M7) which influences the location selection by certain industries.
- Part of the site is located below the 1 in 100 year flood line.

Development Principles

Based on the opportunities and constraints identified above, the employment development principles that have been adopted for the future development of the North & South Dunheved Precincts are to:

- Capitalise on the unique opportunity offered by the North & South Dunheved Precincts to market an employment precinct “within” a Regional Park.
- Capitalise on the unique sense of place that is offered to workers through the opportunity to utilise the amenities presented by the Central Park.
- Capitalise on the services and facilities within the Eastern Precinct (Ropes Crossing) Village Centre.
- Cultivate a unique sense of place by offering quality architecture which provides an attractive streetscape and landscape and a high level of amenity designed to match industry needs.
- Lift the image and profile of St Marys as an investment location through the regeneration of the existing Dunheved industrial estate.
- Ensure that industries attracted to the North & South Dunheved Precincts exhibit synergy with local industry to facilitate the development of employment clusters.
- Ensure that industries locating within the North & South Dunheved Precincts are able to offer employment at high density and are environmentally, economically and socially sustainable.
- Ensure that the North & South Dunheved Precincts are able to compete on points of difference such as lot size flexibility, particularly catering for firms seeking smaller lots, which are lacking in Western Sydney.

3.2 Water, soils & drainage

A detailed analysis of the existing water, drainage and soil characteristics of the site is contained within the Water, Soils & Infrastructure Report prepared by SKM. A summary of key issues, opportunities and constraints follows.

Flooding

The Dunheved Precincts are located on the floodplain of South Creek, a tributary of the Hawkesbury Nepean River. South Creek runs along the western boundary of the site and Ropes Creek runs along the eastern boundary of the site. Due to the proximity of the site to these creeks the site may be flooded due to flooding in either creek. Flooding may be caused by rainfall in the catchments of Ropes and/or South Creeks themselves and may also be caused by backwater flooding from major events in the Hawkesbury-Nepean River.

A significant part of the Dunheved Precincts is located below the 100 year ARI flood level and hence filling on the flood plain is required to allow for development. Filling will provide some flood immunity for future development.

Topography

The topography of the Dunheved Precincts rises generally southwards between RL 19m AHD and RL 22m. Two minor gullies, which are tributaries of South Creek, drain towards the northwest and have cut down 2-4m below the prevailing terrace level.

The surface of the alluvial terrace is nearly level to undulating with a number of very shallow wet depressions. The generally level surface of the Dunheved Precincts ensures that almost all of the land is developable. The topography of the site is illustrated on **Figure 9**.

Groundwater

Two regional-scale groundwater systems, neither of them very permeable, are present beneath the Dunheved Precincts. The upper system comprises groundwater contained within the alluvial clay and in the shale weathering profile itself, to a typical depth of 3-10m. The lower groundwater system occurs in shale bedrock below the base of weathering. Neither of these systems are true aquifers, although they can discharge small volumes of saline water (generally along stream lines low in the landscape) and thereby create a nuisance.

The general characteristics of the shale bedrock aquifer include:

- Low but variable permeability;
- Limited storage and very low well yield;
- Widely spaced, poorly interconnected, nonpersistent water bearing fractures;
- Boreholes may appear to be dry when first drilled, yet gradually fill with water over several weeks;
- Standing water levels in piezometers 100-200m apart may differ by 1-3m;
- Seasonal variations of 3-4m in a single piezometer are common; and
- Nearby wells may differ greatly in salinity.

Soils

Two soil units are present within the Dunheved Precincts, the Berkshire Park and South Creek soil landscapes. According to the Penrith 1: 100,000 soil landscape sheet Berkshire Park soils dominate the southern third of the precincts, while the South Creek soils cover the remainder. Notwithstanding this the field observations in test pits suggest that the Berkshire Park soils in fact cover almost all of the Dunheved Precinct, except in the immediate vicinity of South and Ropes Creek below about 18m.

Both these soil landscapes are clay soil units of alluvial origin derived ultimately from weathering, erosion and fluvial transport of the Bringelly Shale bedrock. Berkshire Park soils are developed on older higher level terraces while the South Creek soils comprise those on the near recent and present day active flood plain of watercourse.

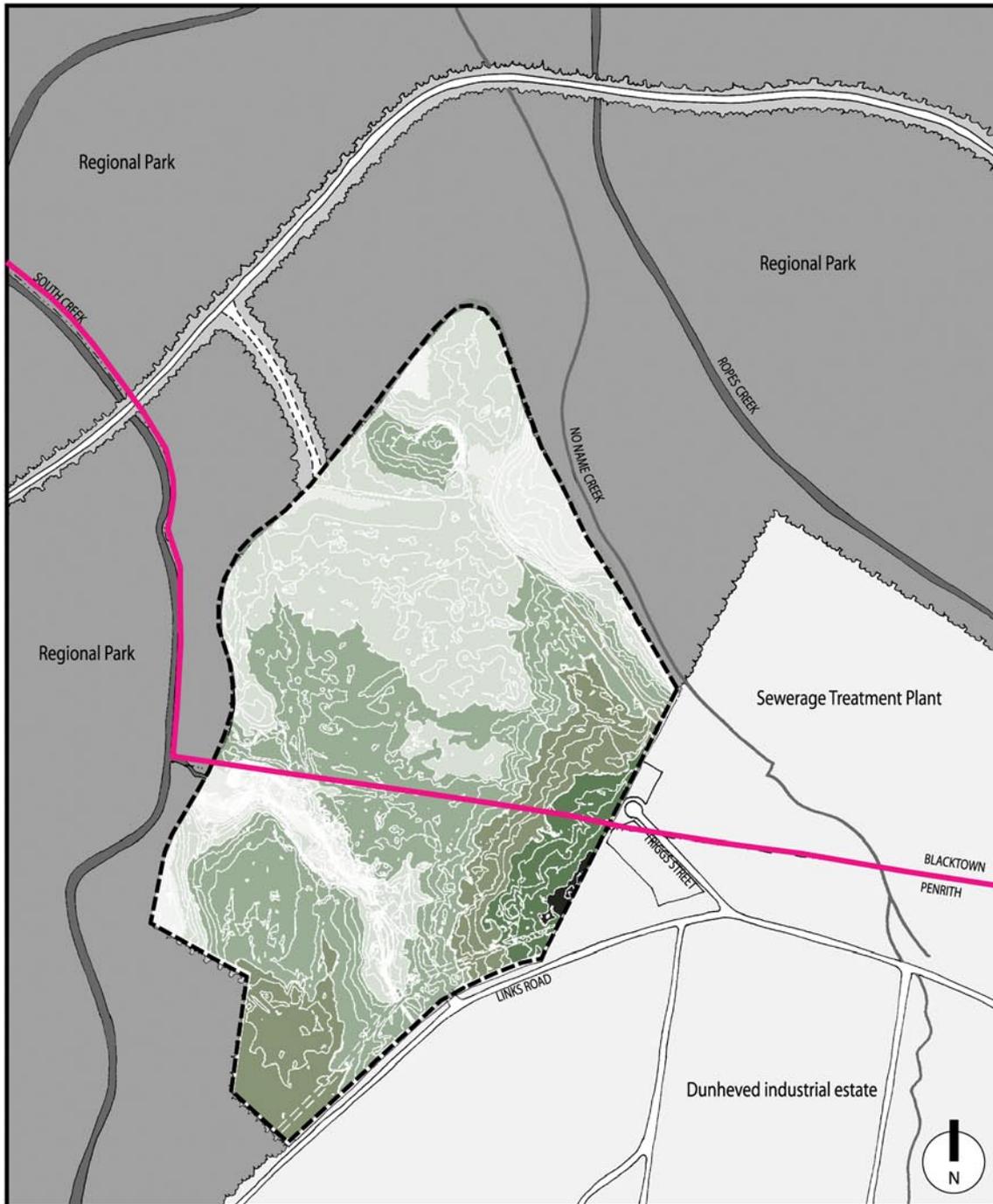
The South Creek soils tend to have a shallower depth to the water table and are more prone to erosion, waterlogging and flooding. The Berkshire Park soils are characterised by some degree of mottling and the presence of ironstone gravel. They are generally drier and stiffer than the soils of lower terrace.

The bedrock at the Dunheved Precinct is Bringelly Shale with a maximum thickness of approximately 90m when combined with the underlying Ashfield Shale. The Bringelly Shale is composed of shale, mudstone, claystone and some sandstone.

There are two drainage lines within which runoff leaves the site:

- The southern section of the site drains into a north-west flowing tributary of South Creek; and
- The northern section of the site drains to the north-east into a tributary of Ropes Creek.

Hydrology for the Dunheved Precincts is shown at **Figure 10**.



Existing Topography

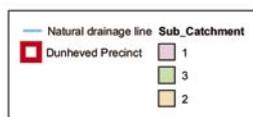
m0 100 200 300



Figure 9 - Site Topography



Figure 2-1 Existing Case Subcatchments



1:6,500

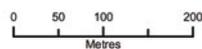


Figure 10 - Existing Hydrology

Development Principles

The development of the Dunheved Precincts will incorporate best practice water cycle, groundwater, flood and soil management practices. This is driven by the requirements of SREP 30 and the St Mary EPS.

Based on the issues, opportunities and constraints identified above, the development principles that have been adopted for water, drainage and soil management are set out in **Table 1** below.

Table 1 - Development principles for water, drainage and soil management

Total Catchment Management	Flood Management	Stormwater Quality Management & Reuse	Ground water	Trunk drainage system	Soils
<ol style="list-style-type: none"> 1. Ensure minimal increase in peak flow rates for all storms up to the 100 year ARI event. 2. Maximise source controls for runoff quantity and quality. 3. Achieve a no net increase in the annual pollutant load exported from the site. 4. Achieve a no net adverse impact upon the water quality in South Creek. 5. Ensure any increase in post peak runoff rates is minimal. 6. Achieve efficient use of water and minimise demand for potable water. 	<ol style="list-style-type: none"> 1. To utilise fill to ensure that development is located at least 0.5m above the 100 year ARI flood level. 2. To ensure that filling and development has a negligible impact on off-site flood levels. 3. To provide safe conveyance for local runoff; 4. To provide the necessary on site storage capacity for flood water flow. 5. To establish at least 2 safe flood evacuation routes on continually rising land to refuge facilities above the PMF level. 	<ol style="list-style-type: none"> 1. Ensure there is no long term impact on water quality as a result of the proposed Dunheved development. 2. Minimise the impact of flooding on upstream and downstream flood levels and provide safety for people and property. 3. Minimise water usage and the importation of potable water. 4. Maximise the conservation of indigenous flora around drainage lines and promote natural state drainage lines. 5. Ensure there is no impact on water quality during the construction phase of the development. 	<ol style="list-style-type: none"> 1. Ensure future development does not increase groundwater levels. 2. Ensure future development does not increase throughflow (lateral movement of water through the soil profile). 	<ol style="list-style-type: none"> 1. Safely convey runoff through the proposed development. 2. Integrate with the road and lot layout. 3. Integrate with the water cycle management system such that runoff quality and quantity are controlled efficiently. 	<ol style="list-style-type: none"> 1. Provide an overall erosion and sediment control concept for the proposed development. 2. Control the erosion of soil from disturbed areas on the site. 3. Limit the area of disturbance that is necessary. 4. Protect downstream water quality. 5. Prevent any sediment-laden water from entering South Creek

3.3 Vegetation and biodiversity

Detailed information relating to the site's vegetation and biodiversity is provided in the following documents:

- Biodiversity Assessment dated April 2005 prepared by Cumberland Ecology;
- Tree Survey prepared by Wheelans;
- Domestic & Feral Animals Strategy dated February 2005 prepared by Cumberland Ecology;
- Weed Management Plan dated February 2005 prepared by Cumberland Ecology.

The Biodiversity Assessment identifies the flora and fauna that is present or has the potential to occur within the Dunheved Precincts, and maps the vegetation communities, occurrences of threatened or migratory species and endangered ecological communities (as listed within Schedules of the NSW Threatened Species Conservation Act 1995, NSW Fisheries Management Act 1994 and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999).

The Tree Survey locates and maps all trees with a diameter greater than 10cm within the Dunheved Precincts. It records the approximate trunk diameter, canopy spread, height and number of trunks. The tree plan was plotted using GIS on an aerial photograph. This plan and ground truthing were used to assess the "significance" of stands of trees according to the following criteria:

- Size and stand (number of trees and spread);
- Condition of canopy;
- Condition of under storey; and
- Habitat value (ie whether the trees form part of a corridor, or display particular habitat features such as tree species or presence of hollows).

The tree survey has informed the Biodiversity Assessment of the Dunheved Precinct.

A copy of the Tree Survey is included at **Figure 11**.

Table 2 provides a summary of the key site vegetation characteristics.

Table 3 provides a summary of the key site fauna characteristics.

The development principles for vegetation and biodiversity are identified below.

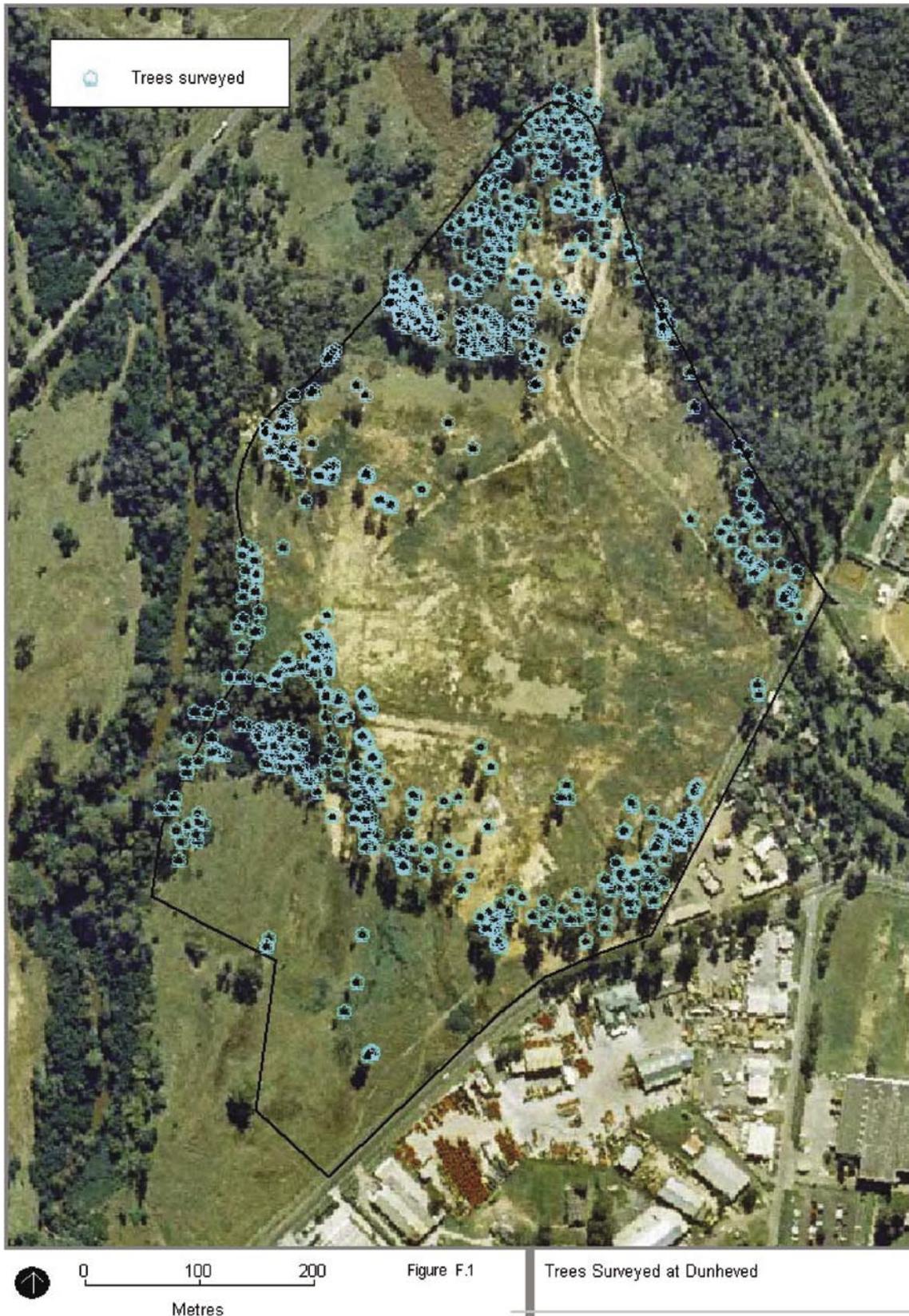


Figure 11 - Dunheved Precincts Existing Tree Survey

Table 2- Summary of key site vegetation characteristics

Dunheved Precincts Vegetation Characteristics		
Vegetation Communities	Threatened Flora Species	Weeds
<p>There are four main vegetation communities within the Dunheved Precincts:</p> <ul style="list-style-type: none"> - Cumberland Plain Woodlands; - Sydney Coastal River Flat Forest; - Shale/Gravel Transition Forest; and - Exotic Grassland. <p>The Cumberland Plan Woodlands (Shale Plans Woodland), Sydney Coastal River Flat Forest (Alluvial Woodland) and Shale/Gravel Transition Forest are listed as 'Endangered Ecological Communities' under the Threatened Species Conservation Act 1995.</p> <p>The location and extent of the 4 endangered ecological communities present within the Dunheved Precincts is shown indicatively on Figure 12. A brief description of each of these communities follows.</p> <p>Cumberland Plain Woodland</p> <p>Cumberland Plain Woodland occurs in the north of the Dunheved Precincts and occurs in a highly degraded patch to the north west of the precincts along the drainage line. The Cumberland Plain Woodland within the Dunheved Precincts and surrounds is consistent with Grey Box/Ironbark Woodland.</p> <p>The areas of Cumberland Plain Woodland within the Dunheved Precincts are moderately to highly disturbed. The Ground cover is often sparse and dominated by exotic grasses.</p> <p>Sydney Coastal River Flat Forest</p> <p>Sydney Coastal River Flat Forest occurs along the banks and flats of the original Ropes Creek channel in the form of Alluvial Woodland. Only small areas of this predominantly degraded vegetation type occur within the Dunheved Precinct along the eastern fringes around the sewer treatment plan outflow, along South Creek and located in an isolated patch along a drainage line. The structure and composition of the Sydney Coastal River Flat Forest is variable and comprises both native and exotic tall shrubs and trees.</p> <p>Shale/Gravel Transition Forest</p> <p>Only small patches of Shale-Gravel Transition Forest occur within the Dunheved Precincts. The community is highly degraded and lacks most of the characteristic understorey species.</p> <p>Exotic grasslands</p> <p>Exotic grasslands dominated by Couch and other exotic grasses and herbs occurs in both the northern and southern sections throughout the cleared areas of the Dunheved Precinct.</p>	<p>Although the remnant vegetation within the Dunheved Precincts is extensively disturbed by previous developments and in many cases lacks a substantial understorey, two flora species listed as either 'vulnerable' or 'endangered' under the Threatened Species Conservation Act 1995 occur within the Dunheved Precincts. These are <i>Grevillea juniperina</i> sub species <i>juniperina</i> (vulnerable) and <i>Pultenaea parviflora</i> (endangered). The <i>Pultenaea parviflora</i> is also listed as vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.</p> <p>Only one individual <i>Pultenaea parviflora</i> plant has been recorded on the subject site. A number of <i>Grevillea juniperina</i> sub species <i>juniperina</i> occur along the eastern fringes and the northern tip of the subject site.</p> <p>In addition to the flora listed under State and Commonwealth legislation outlined above, the Blue Box is considered to be significant at a regional scale. The majority of Blue Box occur in the Sydney Coastal River Flat Forest along South Creek outside the development area. A few mature individuals occur inside the subject site on the north western boundary.</p>	<p>Weed distribution within the Dunheved Precincts is strongly influenced by past land uses, with the greatest variety of weeds occurring on the sides of tracks and the drainage line where the moisture availability is greater. Many weeds occur in the vegetation surrounding South Creek and the sewerage treatment outflow.</p> <p>The open fields or fence lines that have not been mown or slashed support Blackberry infestations. The relatively undisturbed forest vegetation that occurs within the Regional Park supports relatively fewer significant weeds.</p> <p>The most significant infestations within the Dunheved Precincts are dense patches of Blackberry, Small-leaved Privet and African Love Grass.</p> <p>Blackberry infestations on the Dunheved Precincts range from very dense infestations along creek banks, to less than medium density occurrences and isolated occurrences along drainage lines in open fields in the precincts.</p> <p>Small-leaved Privet occurs as dense infestations on the banks of South Creek. These infestations increase in areas that have experienced higher levels of disturbance from soil movement due to erosion and past road construction.</p> <p>African Love Grass occurs throughout the precincts, particularly in open disturbed areas. It is also found colonising the road verges on the edges of the adjoining Regional Park.</p> <p>Weeds that are not widespread (generally occurring as isolated individual or small patches), that require minimal control are low to medium threats to the environmental values of the Dunheved Precincts development area and adjacent Regional Park. These include African Boxthorn, Briar Rose, Bridal Creeper, Crofton Weed, Large-leaved Privet, Osage Orange, Pampas Grass, Prickly Pear and Tiger Pear. In the case of Osage Orange, there is a low threat to the Dunheved Precinct as the species is not invasive and is not characteristically a weed.</p>

Table 3 - Summary of key site fauna characteristics

Dunheved Precincts Fauna Characteristics		
Fauna Habitats	Fauna Species	Domestic & Feral Animals
<p>Fauna habitats within the Dunheved Precincts and surrounds are generally associated with the regrowth woodland and creeklines. These habitats will be almost entirely conserved within the Regional Park. Disturbed habitats generally support populations of native and exotic species that are common in urban/rural environments.</p> <p>There are three main fauna habitats within the Dunheved Precincts:</p> <ul style="list-style-type: none"> - Woodland habitats; - Disturbed habitats; and - Wetland habitats. <p>A brief description of each of these habitats follows.</p> <p>Woodland habitats</p> <p>Woodland habitats provide sheltering, foraging, nesting and breeding habitat for most fauna within the area. The density of the shrub layer is variable. Within the Dunheved Precincts the Woodland habitat is in regrowth phase. The general absence of hollow bearing trees provides very little in the way of nesting habitat for hollow dependant fauna limiting the number of species that reside/breed within the Dunheved Precincts.</p> <p>Disturbed habitats</p> <p>Disturbed grassland habitats occur throughout most of the Dunheved Precinct. These areas are of little value to native fauna with the exception of kangaroos. Species that commonly occur in disturbed habitats are those that favour foraging on grassland including the Australian Raven, Crested Pigeon, Galah and Eastern Grey Kangaroo.</p> <p>Wetland Habitats</p> <p>Wetland habitats offer foraging and roosting/sheltering resources for wetland birds, bats and amphibians. Within the Dunheved Precincts there is at least one ephemeral water body created from previous excavations. It is a shallow wetland that dries out in winter and provides marginal wetland habitat during the wetter months providing seasonal habitat for birds, frogs and bats.</p>	<p>The most conspicuous fauna species found within the Dunheved Precincts are the Eastern Grey Kangaroo and the Red Kangaroo. It is believed that the Grey Kangaroo was reintroduced to the site to manage the grasslands. The Red Kangaroo is not native to this area and was introduced to the site.</p> <p>Many other native animals are also present on the site including various species of possum, echidnas, various species of bats, various species of birds including emus, Ravens, Magpie-larks and Noisy Miners and various species of reptiles, frogs and snails.</p> <p>Exotic species such as European foxes, cats, dogs, rabbits, hares, rats, mice are also common within the Dunheved Precincts.</p> <p>Threatened fauna species</p> <p>A number of Threatened fauna species occur within the Cumberland Plain area and within the vicinity of the overall St Marys site. Previous disturbances and land management activities have limited the suitability of habitats or maintenance of populations of some fauna groups in the Dunheved Precinct.</p> <p>Threatened terrestrial and aboreal mammals that may once have occurred within the overall St Marys Property include the Spotted-tailed Quoll, Long-nosed Potoroo, Koala and Squirrel Glider. However, there are no recent confirmed records for any of these species within the Dunheved Precincts.</p> <p>A number of threatened bat species are known to occur within the overall St Marys site. Within the Dunheved Precincts surveys revealed the presence of the Large-footed Myotis, a "vulnerable" species listed under the Threatened Species Conservation Act 1995.</p> <p>No threatened bird species were detected within the Dunheved Precincts during the 2004 surveys. However, a number of threatened bird species could occur in the locality may utilise habitats within the Dunheved Precincts. These include the migratory species of the Regent Honeyeater and Swift Parrot and the sedentary species of the Speckled Warbler, Black Bittern and Diamond Firetail.</p> <p>The threatened Cumberland Plain Land Snail occurs in the Dunheved Precinct.</p> <p>No threatened reptile, amphibian or fish species are likely to occur within the Dunheved Precincts.</p> <p>The conservation of habitats for these threatened fauna species are to be conserved within the Regional Park, the development of the Dunheved Precincts is not considered to be important habitat for any of these threatened fauna species.</p>	<p>There are a range of introduced vertebrates within the overall St Marys site that constitute a threat to native flora and fauna including foxes, dogs, rabbits and hares. These feral animals have potential to impact on native flora and fauna by predation, competition, grazing and land degradation. Other feral species such as introduced Rats, House Mice, Indian Mynas and Plague Minnow have also been recorded in the overall St Marys site.</p> <p>Stray cats</p> <p>Cats prey on native animals and have been shown to threaten the survival of some native species. Cats are defined as being either:</p> <ul style="list-style-type: none"> - feral cats – those that live and reproduce in the wild and none of their needs are satisfied intentionally by humans; - stray cats – those found in and around cities, towns and rural properties and may depend on some resources provided by humans; and - domestic cats – those owned by individuals, households or businesses, most of their needs are supplied by their owners. <p>There are currently stray cats and domestic cats that can be found within the Dunheved Precincts.</p> <p>Foxes and stray dogs</p> <p>Stray dogs currently occur within the overall St Marys site and it is possible that on occasion, some dogs may reside temporarily on site. Wild dogs are known to prey on native fauna and restrictions should be implemented to limit pet access into the site for recreation or exercise.</p> <p>Foxes will be attracted to construction areas and industrial sites if there is waste and rubbish left around during the construction phase and in the longer term. Foxes will frequent the site especially if there are high numbers of small mammals such as rabbits and rodents.</p> <p>Foxes generally forage best in open habitats where they are able to range widely and freely. They will generally use clearings, tracks and roads to move through dense vegetation or complex topography. Clearings and tracks may also provide better opportunities for capturing prey as many arboreal species are vulnerable when they are moving on the ground between trees.</p> <p>Rabbits and hares</p> <p>Rabbits compete with native species for resources, inhibit the native vegetation, support populations of introduced predators and cause soil erosion. Environmental</p>

Dunheved Precincts Fauna Characteristics		
Fauna Habitats	Fauna Species	Domestic & Feral Animals
		<p>damage includes significant degradation of vegetation and soil, loss of habitat and extinction of animal and plant species. Rabbits and hares forage throughout the overall St Marys site and have been observed in the Dunheved Precincts. Burrows are most likely to occur in areas where the ground is softer, including where soil has been moved to create bunkers and along the riparian corridor.</p> <p>Other feral animals</p> <p>Other feral animals that have been recorded within the St Marys property include the Black Rat, House Mouse, Indian Myna and Plague Minnow. Rats and mice are not likely to be having a major impact on native flora and fauna as there is very little in the way of native ground dwelling fauna that these species would compete with. Stockpiles and rubbish piles during construction may provide foraging and sheltering opportunities for rats and mice. However, the existence of rats and mice may assist in supporting populations of feral predators such as cats and foxes and may also encourage domestic cats to hunt within the Regional Park following construction.</p> <p>The aggressive nature of Indian Mynas can result in the exclusion of some native woodland bird species, while the Plague Minnow may influence the distribution and abundance of native fish and may also prey on the eggs and tadpoles of frogs and on macroinvertebrates.</p>

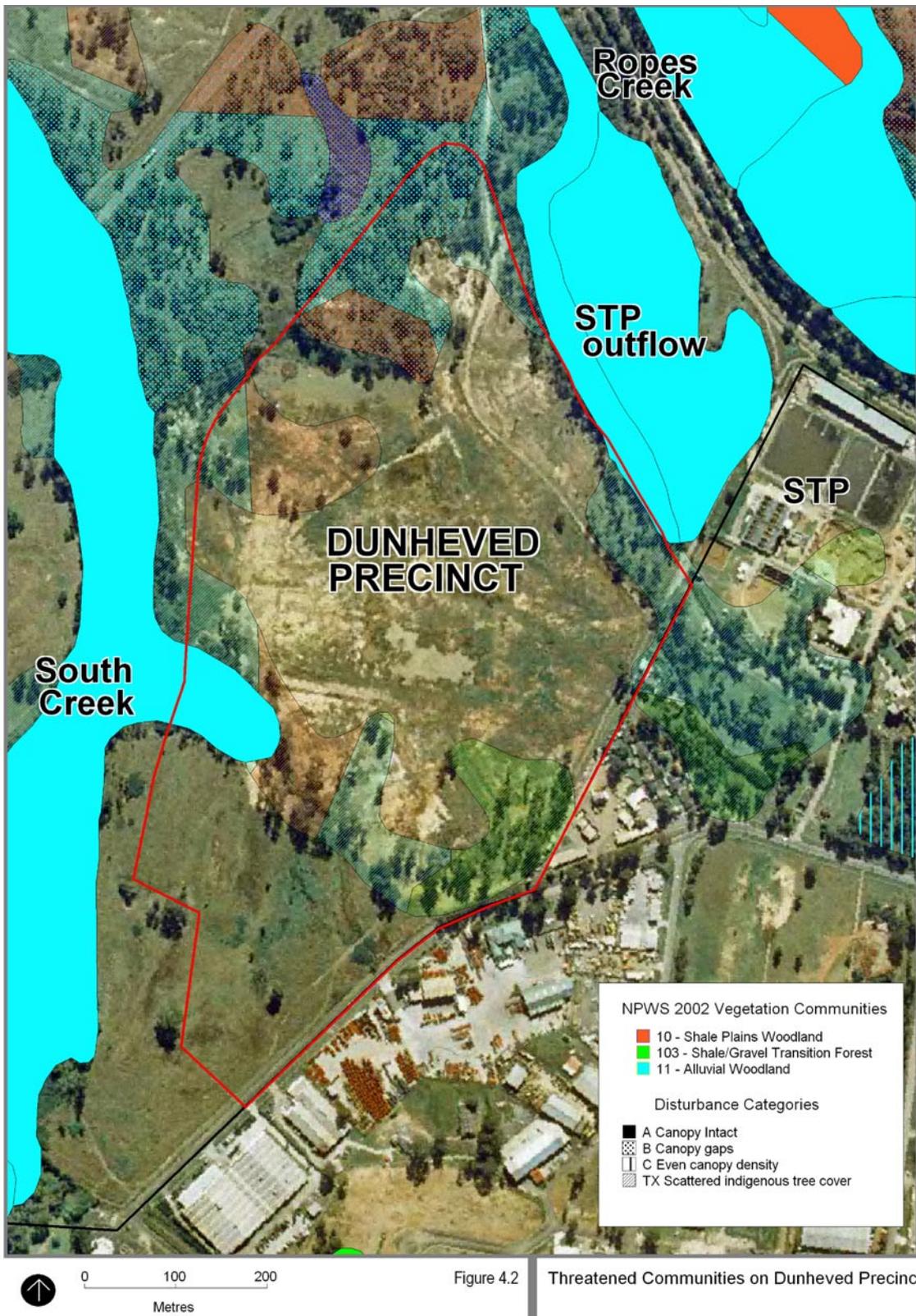


Figure 12 - Dunheved Precincts Endangered Ecological Communities

Development Principles

A representative and significant proportion of the natural values of the overall St Marys site will be protected within the Regional Park that is to be dedicated to the State Government.

The Regional Park is to be managed by the NSW NPWS in accordance with a plan of management that will address the provision of appropriate recreational facilities and the protection of conservation values.

The establishment of the Regional Park is the foremost conservation measure that accompanies development within the overall St Marys site. The Regional Park will protect the major occurrences of endangered woodland and forest communities as well as the habitats of threatened and regionally significant species.

Based on the analysis of site vegetation and fauna characteristics, the development principles that have been adopted for vegetation and biodiversity within the Dunheved Precincts are:

1. Species, communities and habitats of conservation significance must not be compromised in the long term.
2. A riparian corridor is to be retained along the South Creek drainage line and its tributary incorporating a native tree canopy with pockets or "stepping stones" of understorey vegetation.
3. The development of the Dunheved Precincts must not result in significant adverse indirect impacts to adjacent areas of native vegetation within the Regional Park, particularly in terms of increased levels of weed invasion, colonisation by feral animals or increased disturbances as a result of the need to clear for fire breaks.
4. Open space and streetscapes should be linked to regional links and corridors to corridor zones.
5. Individual trees and stands of existing trees are to be retained where appropriate to provide habitat potential for native fauna.
6. Quality stands of trees are to be retained within areas of open space and riparian corridors where possible.

7. Native seedbanks are to be used for replanting.
8. A precautionary approach shall be adopted with respect to the limited potential for development of the Dunheved Precincts to introduce additional feral animal species/improve feral animal habitat.
9. A precautionary approach shall be adopted towards management of the potential for domestic animals from surrounding residential precincts to access the site.
10. Appropriate management strategies shall be adopted to ensure that development of the Dunheved Precincts does not create favourable habitats for rabbits and hares such as piles of rubbish/building materials, additional aquatic habitats, or storing and stacking of equipment.
11. Control of weeds will be facilitated by development of the Dunheved Precincts as clearing, revegetation and development of the land will reduce the abundance of disturbed sites for weeds to colonise.

Total eradication of many weeds on the Dunheved Precinct is not feasible because of the tendency of weed re-colonisation and the existing degree of soil disturbance. Future management of weed colonies shall focus on:

- Lowering weed densities and containing the spread of species to reduce their impact on native vegetation, fauna and flora habitats.
- Containing the water and materials from the clean down site and regularly inspecting for weed species.
- Using weed free fully composted mulch and topsoil when carrying out bush regeneration, revegetation or landscaping works to prevent competition from weeds species and reduce weed invasion of restoration areas.
- Maintaining buffers along roads and tracks as per the St. Mary's Fire Management Plan (ERM 2002).

3.4 Bushfire prone land

The Dunheved Precinct has been identified as Bushfire Prone Land due to its proximity to large areas of unmanaged bushland within the adjacent Regional Park.

Woodland and open forest on a downslope of less than 5° lies adjacent to the Precinct along the north / northeast and western boundaries respectively. These bushfire hazard characteristics, and the nature of development (i.e. commercial development), requires a minimum 20m Asset Protection Zone (APZ) from unmanaged bushland at these boundary locations to any proposed buildings. An APZ is not required on the southern and eastern boundaries, adjacent the Regional Open Space and existing sewerage treatment plant respectively, as these neighbouring lands are adequately managed and are expected to be so into the future.

Proposed buildings will require to be constructed to comply with AS3959 (Construction of Buildings in Bushfire Prone Areas) at a level dependant on their distance from the boundary locations adjacent bushland. It is recommended that all buildings within the Precinct are constructed to a Level 1 standard to provide protection from ember attack. Other buildings closer to the western boundary of the Precinct may require a Level 2 or 3 construction standard.

A Fire Management Plan for the Precinct has been prepared by Bushfire and Environmental Services dated April 2005.

The objectives for the Dunheved Precinct in regard to the risk of bushfire are:

- To protect life and property from the threat of fire; and
- To utilise Asset Protection Zones and control measures and strategies in relation to the development of the Dunheved Precincts to minimise fire risk.

Development Principles

Based on the recommendations of the Fire Management Plan, the development principles that have been adopted for management of bushfire risk are:

1. Asset Protection Zones (APZ) are required for those assets that adjoin existing unmanaged bushland and grassland.
2. APZs can contain managed vegetation and can be utilised as areas of public open space, recreational areas such as sportsgrounds, access ways such as roads, and ancillary parts of development such as yards and car parks. As such, the APZ can be managed by a variety of land managers including Council for those sections of the APZ that fall over public roads, and individual lot owners for those sections that fall over lots.
3. A perimeter road or fire trail is required between all development and unmanaged vegetation. Perimeter access can form part of an APZ.
4. APZs are to be located wholly within the development site.

3.5 Traffic and transport

The information in this section is based upon the Dunheved Traffic and Transport Report dated April 2005 prepared by Hutcheson Transport Solutions.

A series of detailed transport (road planning and public transport) investigations have been previously conducted to examine the most appropriate methods of providing quality transport services to the St Marys site. These investigations resulted in the formulation of site access and transport strategy elements that were incorporated into SREP 30.

The approximate locations of public street access points for the North & South Dunheved Precincts are established in the SREP 30 Structure Plan (refer **Figure 6**).

Two public road access points are indicated on the Structure Plan:

- One serving the northern portion of the precinct from the proposed future road corridor to link the Eastern, Central and Western Precincts; and
- One serving the southern portion of the site from Links Road.

The transport goals for the North & South Precincts are to:

1. Promote the use of public transport;
2. Provide safe and convenient movement;
3. Integrate traffic movement with the existing road system.

Development Principles

Proposed Road System

The ability to move within, between and through places is fundamental to their success. Creating connections with the surrounding areas enables the development of sustainable patterns of movement and provides a high degree of flexibility for future transport connections.

The development principles that have been adopted for the North & South Dunheved Precincts road system are:

1. Ensure that the street system for the North and South Dunheved Precincts establishes a hierarchy.
2. Ensure that the system of public streets within the Precincts is designed to balance the needs of pedestrians, cyclists, motorists and buses.
3. Ensure that the vehicle movement network allows the opportunity for multiple routes to destinations.
4. Ensure that road and pedestrian linkages with the surrounding areas provide access to employment opportunities for neighbouring residential areas.

5. Design road linkages to provide routes for heavy haulage vehicles that avoid residential areas, minimising the potential impacts on the locality.
6. Design the road hierarchy to provide flexibility as to the future lot sizes, to suit a wide range of future employment uses.
7. Establish good public transport links at the early stages of development.
8. Ensure public transport is efficient, safe and reliable to increase patronage and reduce car use.
9. Allow for the future integration of the cycle network with the cycleways proposed within the Regional Park (subject to the DEC Regional Park Plan of Management).

Specific development principles adopted for vehicular access and movement for use during the detailed planning phase of the development are:

1. Public vehicular access is to be limited to one access point to the north off the eastwest link road and one connection point with Links Road to the south.
2. Direct vehicular access to Links Road is permitted for those lots fronting Links Road.
3. To distribute traffic through the site in an efficient manner, a main collector street will run generally north south through the site connecting to a main loop road (local street) within the site.
4. Local circulation roads running off the main connecting road will provide access to the remainder of the site.
5. On street parking should be maximised where possible to optimise the efficient use of land.

The expected volume of traffic to be generated by the development of the Dunheved Precincts will be relatively low, with a net traffic generation of 185 inbound trips and 33 outbound vehicle trips in the morning and 33 inbound and 185 outbound vehicle trips in the afternoon peak hour. The number of trips the precinct generates will decrease as the surrounding precincts are developed (self contained trips).

The slight increases in traffic flows expected are well within the capacity of the existing road network and accordingly will be satisfactorily accommodated without the need for any additional works.

A number of deficient intersections within the regional road network have been identified in the 2004 Sims Varley Traffic Study. However, these intersections are all located a considerable distance from the Dunheved Precincts.

This separation, combined with the low traffic volume expected to be generated by the development of the Dunheved Precincts, means that the development of the Dunheved Precincts does not warrant any upgrade works to individual intersections or roads.

Public Transport

The development of the east west road through the St Marys site to connect to the Eastern Precinct provides opportunities for local bus operators to loop through the Dunheved Precincts to improve accessibility.

Bus services provided within the Eastern Precinct are to provide access to the St Marys and Mt Druitt railway stations located on the main Western Railway Line that runs between the Sydney CBD and the Blue Mountains.

It is intended that bus stops will be provided on the main connecting road within the Dunheved Precincts.

Two bus stops/shelters will be located in the vicinity of the northern and southern ends of the main connecting road. However, the location of the bus stops/shelters will be confirmed in consultation with the local bus operator and the Ministry of Transport.

The NSW Department of Transport will be undertaking consultations with private bus operators to encourage the provision of bus services ahead of demand levels. This will assist in maximising the use of bus services.

Bicycles and Pedestrians

The Dunheved Precincts have been designed to promote pedestrian and cyclist activity.

The key development principles to be met during the detailed planning phase are as follows:

1. Pedestrian paths shall be provided along all roads.
2. A shared pedestrian cycleway shall be provided along or in close proximity to the main connecting road through the site, linking with the other cycle routes proposed within the St Marys site.
3. Ensure pedestrian routes are safe and are designed to maximise patronage.
4. On other local roads, traffic flows is sufficiently low to suggest cyclists share the traffic lanes and do not require separate shared pathways.

3.6 Cultural heritage

Aboriginal heritage

The information in this section is based on the Archaeological assessment of Indigenous Heritage Values in the Dunheved Precinct in the former ADI Site, St Marys (Jo McDonald, 2004).

Detailed work undertaken in relation to the archaeological resources of the overall 1,545 hectare St Marys site has targeted a conservation outcome for Indigenous cultural heritage across the site, whilst at the same time facilitating the orderly management of archaeological resources in the resultant developable land.

The early work undertaken on the overall site was known as the "Strategic Management Model", which identified previous land use disturbance and applied the use of a predictive model (SMM : McDonald and Mitchell 1994, Jo McDonald CHM 1997a). The overriding aim of

the archaeological SMM was the preservation of a representative sample of intact landscapes across the overall site to ensure that a range of human responses, as represented by the archaeology, were protected. Four zones within the overall site were identified, each zone having a different designated management outcome.

The identified zones are:

- Zone 1: Very high potential for intact archaeological evidence - potential conservation zone.
- Zone 2: High potential for intact archaeological evidence.
- Zone 3: Moderate potential for intact archaeological evidence.
- Zone 4: Low - no potential for archaeological evidence - no further work required.

The Dunheved Precincts have been assessed for archaeological sensitivity. In the past the precincts have suffered a variety of previous land use disturbance impacts, which have affected the ground surface and sub soil and would have resulted in the damage or destruction of potential Aboriginal sites.

As detailed in **Figure 13** the Dunheved Precincts contain small areas that have been zoned 2 and 3. The majority of the Dunheved Precinct is zoned 4.

The SMM presumed that once the conservation zone had been designated that all zones in the remaining lands would be developable and that the archaeology in these areas would be impacted upon by a range of development proposals. It was also envisaged that any remaining lands with sensitivity in the developable lands would provide the landscapes from which archaeological evidence would be salvaged. The management of any identified features that are assessed as having potential and/or significance within these developable areas to be managed by way of mitigation (i.e. excavation and/or removal).

The Archaeological Investigations carried out for the Dunheved Precincts have revealed that the developable lands within the Dunheved Precincts contain mostly (97%) lands that have already been highly (zone 4) or moderately (zone 3) disturbed. Only a small area (1.45 hectares) has been identified as being zone 2 and none of the lands are identified as having conservation potential (zone 1).

Ground truthing of the Precincts has generally confirmed that the majority of the zone 3 and 4 areas within the Dunheved Precincts do not require any further archaeological investigations. However, several areas are identified as requiring revised zoning, being upgraded as a result of these investigations to zone 2.

Two of these locations are identified as requiring archaeological salvage prior to development taking place, these are:

- An area of floodplain/terrace which includes two surface located features of Dunheved 3 and Dunheved 5, on the western side of the 1st order tributary of South Creek, near its confluence with South Creek, at the north of the Northern Precinct; and
- An elevated terrace remnant, possibly associated with palaeochannels of South Creek, at the vegetated northern 'point' of the north Precinct, associated with Dunheved Site-4.

These locations are identified in **Figure 14**.

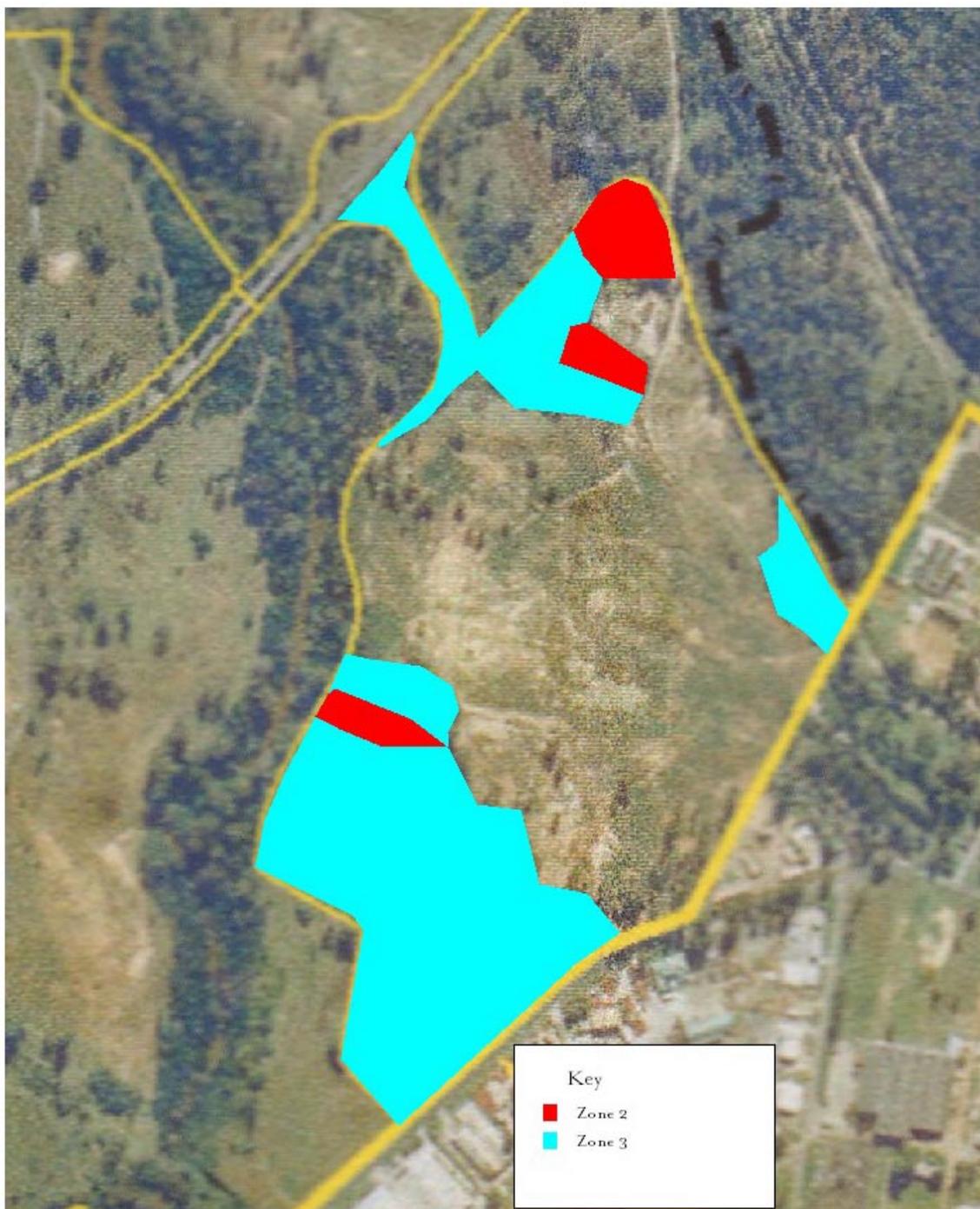
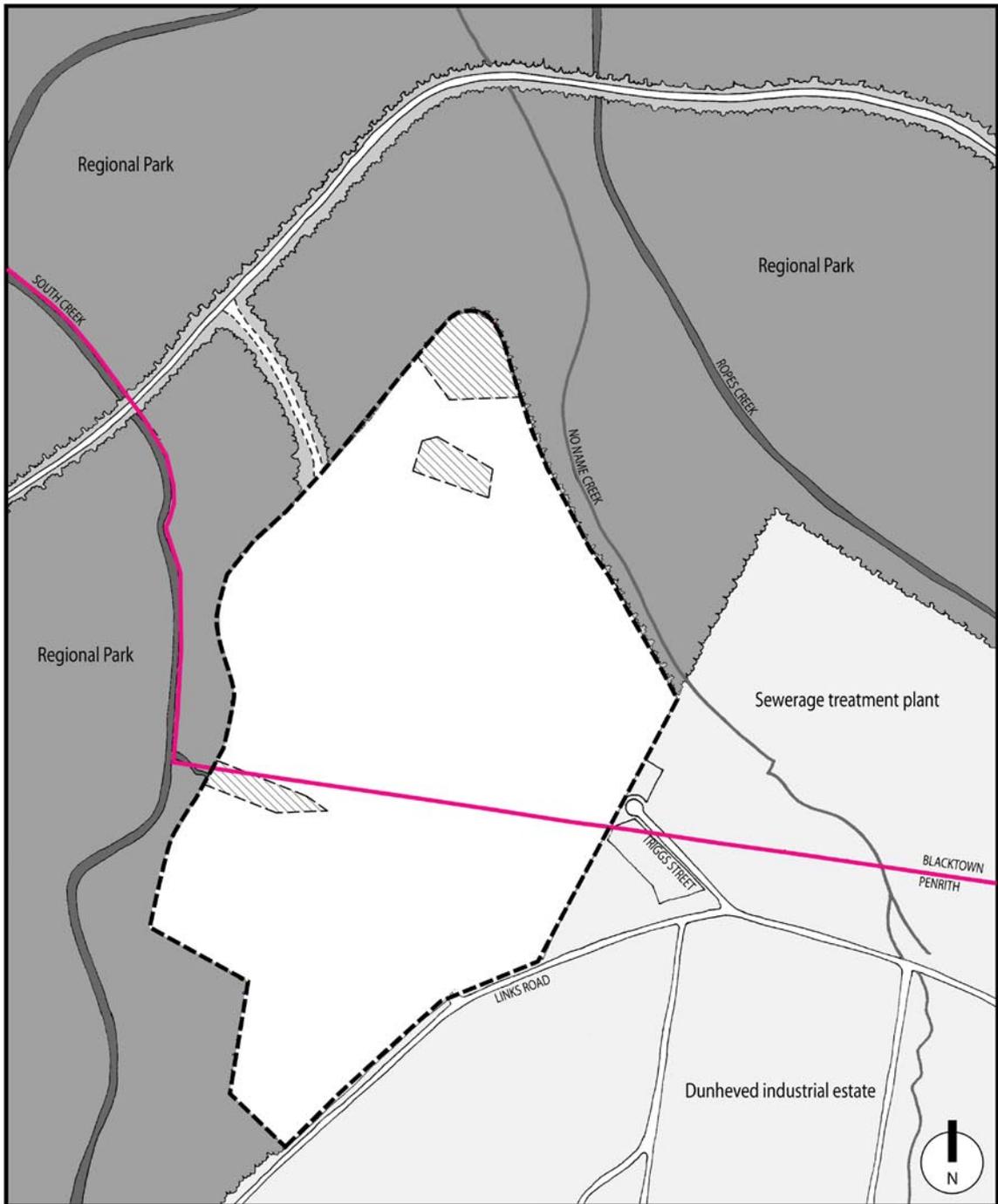


Figure 13 - Dunheved Precincts Indigenous Heritage Zones



Archaeological Areas

-  LGA Boundary
-  Precinct Boundary
-  Archaeological Areas

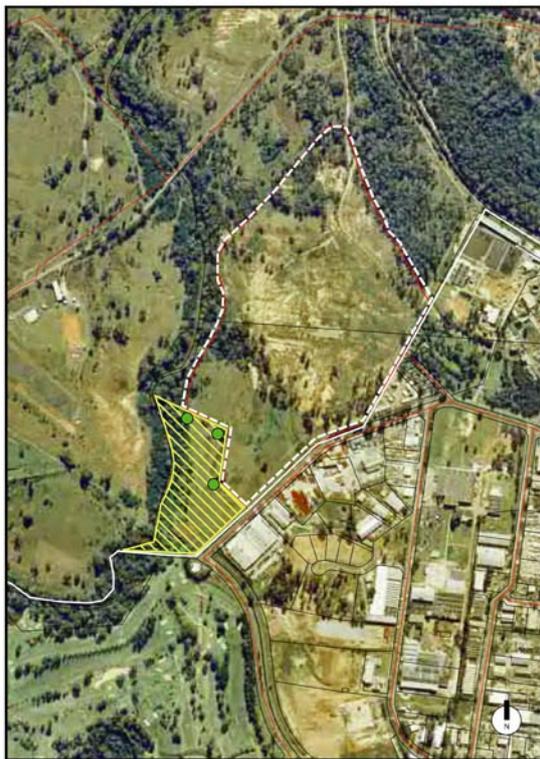
0 100 200 300
m

Figure 14 - Dunheved Precinct - Archaeological Areas

European heritage

Casey and Lowe have prepared a report to review and assess non-indigenous archaeological and heritage issues associated with the Dunheved Precincts. The information contained within this section of the Precinct Plan is based on the findings of the Casey and Lowe report.

None of the identified heritage items identified in SREP 30 are located within either the North or South Dunheved Precincts. However, the south western curtilage of the Dunheved Precincts borders the curtilage of the archaeological site of the Dunheved Homestead, which also includes various identified plantings (refer to **Figure 15**).



Dunheved Homestead Site



Figure 15 - Dunheved Homestead Site

In 1806 Governor Philip Gidley King granted his son Philip Parker King 600 acres on South Creek. Governor Macquarie granted a further 600 acres in July 1820. Other portions of the site were utilised as a Common.

Dunheved was described as the 'model farm of the Commonwealth in the first half of the nineteenth century'. It is likely that at least two homesteads were built during the life of Dunheved, and it is clear from the historical references that one of these was an extensive dwelling located at Dunheved in 1814. The second homestead was possibly a 'brick cottage with 7 or so rooms'.

Mr F.C. Pye owned the property at the time of the resumption for the Munitions Factory in 1941. Following the acquisition of the site the grazing rights were leased and in 1947 it was recommended that public tenders be invited for the purchase and removal of the old homestead and outbuildings known as 'Dunheved'. The buildings were subsequently disposed of.

The Dunheved Homestead site has historical, social, architectural and archaeological significance. The site is likely to contain extensive intact archaeological structures, features, deposits and relics that span 140 years of European settlement beginning circa 1807. It is of State Heritage significance.

The curtilage of the Dunheved site has been defined under SREP 30 to incorporate the remains of the main homestead group including the main heritage trees and plantings that were associated with the house. It is considered that 90% to 95% of the archaeological remains, including all of the known significant remains are located within the established curtilage of the Dunheved Homestead site.

Mayne-Wilson Associates have prepared a report analysing the curtilage and vistas associated with the homestead site and the potential impact on these associated with the development of the Dunheved Precincts. This report concluded that there will be little visual impact on the heritage site from the north-west, west and south west due to the location of the regional park and Dunheved Golf Course; and that historically, these are the most important views.

Development principles

Based on the findings and recommendations of the assessments prepared by Casey and Lowe and Mayne-Wilson Associates, the development principles that have been adopted for European heritage are:

1. Any relics that may be found within the Dunheved Precincts are to be recorded and removed in accordance with a s.140 excavation permit application.
2. Future development of the Precincts should incorporate an appropriate interface to the Homestead site so as not to impact upon its visual heritage values.
3. The design of the curtilage needs to account for the higher ground of the Dunheved Precincts and the use of appropriate planting species that suit the character of the landscape and which assist with rather than detract from the understanding of the Dunheved Homestead site.

3.7 Human Services

Elton Consulting has prepared a Human Services and Community Facilities Report for the Dunheved Precincts.

Components of the Human Services and Community Facilities Report have been prepared in consultation with various stakeholders including state agencies and the Penrith and Blacktown City Councils through the St Marys Infrastructure Coordination Group, (including the People and Place Working Group] established under SREP 30.

The Human Services and Community Facilities Report responds to the Human Services and Open Space Community Plan for the overall St. Marys Site that was prepared by Elton Consulting in 1999. It addresses the requirements of SREP 30 and the St. Marys EPS and considers how the aspirations to create a vibrant and liveable community with the Precincts will be realised.

The future development of the Dunheved Precincts will support the St. Marys Employment Development Strategy (EDS), which was finalised concurrently with the Eastern Precinct Plan, and

endorsed by the Employment Development Strategy Committee.

The Human Services and Community Facilities planned for the Dunheved Precincts have been derived from an examination of the likely future workforce of the Precincts and their needs for community facilities, human services and open space.

The projected size and nature of the Dunheved workforce is as follows:

- The St. Marys Employment Development Strategy sets out the ambition for 600 jobs to be created in the 30 hectares that comprises the Dunheved Precincts.
- Jobs are most likely to be provided in the fields of manufacturing, wholesale trade, construction, fabrication and environment and agri-business.
- The gender balance of the workforce at Dunheved is likely to be skewed towards a predominance of males due to the nature of the proposed industries.
- The age profile of the workforce is likely to span from 17 to 65 years.
- The nature of the employment sectors outlined above suggests that the bulk of jobs will be full-time rather than part-time.

Development principles

Based on the recommendations of the Human Services Facilities assessment, the development principles that have been adopted as the basis upon which to provide access to services and facilities required by the Dunheved workforce are:

1. The Dunheved Precincts should make provision for convenience retail and food outlets suitable to meet the daily convenience needs of the workforce.
2. The workforce is to be provided with access to shaded, safe and inviting spaces to socialise and network.
3. Extensive opportunities for exercise and recreation are to be met via the surrounding Regional Park and Regional Open Space.

4. The demand for childcare services generated by the Dunheved Precincts is to be met under the Development Agreement with Blacktown City Council, which requires a 40 place multipurpose children's service to be provided in the Eastern Precinct.
5. The Dunheved workforce is to have access to the adult education opportunities to be provided as part of the lifelong learning programs to be based within the Eastern and Western Precincts.
6. Within the Dunheved Precincts the only public facilities to be provided to meet the anticipated needs of the workforce are areas of open space (with suitable embellishments) and post boxes.
7. The social needs of the Dunheved workforce are to be met not only through providing access to appropriate services and facilities, but also by creating an attractive and safe environment, which enhances the health and well being of workers.
8. While there is a need to demonstrate that appropriate spaces and design controls have been proposed for shops which serve the daily convenience needs of the workforce employed within the zone, food outlets and an ATM for basic banking, the provision of such facilities is a matter for negotiation with private sector providers.

The urban structure, subdivision layout, road network and public domain of the Dunheved Precincts is to be designed to:

- Create a safe and secure place, both for the workforce and for the surrounding community;
- Provide for appropriate pedestrian, cycle and road linkages that will facilitate access;
- Create pleasant and appealing streets for pedestrians, with appropriate lighting, signage shade, bus shelters and attractive streetscapes; and
- Create a quality public domain which provides a pleasant and attractive setting for work.

3.8 Contamination

The St Marys Eastern Precinct has been the subject of extensive investigation and remediation through the 1990's. The EPA (now DEC) have been involved throughout the process, and subsequently an NSW EPA accredited Site Auditor was involved to produce and issue Site Audit Statements for the whole of the St Marys site.

The objectives of the investigation and remediation programme were to assess the nature and degree of chemical contamination and/or identify any potentially explosive ordnance to allow the remediation of the site to a level where it was suitable for redevelopment for a variety of uses. For the purposes of the remediation and validation the site was divided into nine sectors. The Dunheved Precincts are included in the Southern Sector East (Zone D, covered by Site Audit Statements CHK001/1).

The information presented in the remediation and validation report for the Southern Sector has been used to develop a Contamination Management Plan for the Dunheved Precincts.

The site has been remediated to a level where it is considered to pose a negligible risk to the public or the environment with regard to chemical contamination or explosive ordnance. Based on the independent QA/Verification survey of 10% of the "high risk" areas, the auditor considered that the risk of harm to the public from explosive ordnance on the property is 1 in 1,000,000.

Development principles

The development principles that have been adopted for the management of potential contamination risk are:

1. Provide a framework for identifying and addressing any unexpected discovery of chemical contamination or potentially explosive ordnance (this included exploded ordnance and ordnance parts or fragments).
2. Ensure a safe working environment.

3.9 Site services

Sewer

The St Marys Sewerage Treatment Plant has sufficient capacity to accommodate the additional flows expected from the development of the Dunheved Precincts.

Sewage from the Dunheved Precincts can be delivered to the St Marys Treatment Plant by tapping into an existing carrier that runs through the Dunheved Precincts.

The Dunheved Precincts are crossed by two sewerage easements, one easement is 3m wide and drains to the sewerage pumping station south of the Dunheved Precincts. The other easement is 6.095m and contains a carrier that drains to the St Marys Sewerage Treatment Plant.

The development principles for the proposed sewer system are:

1. Utilise Low Infiltration/Low Pressure to reduce the potential of ground water infiltration.
2. Generally locate sewer works within dedicated road reserves.
3. Pressure test sewer works prior to commissioning.
4. Utilise uPVC or similar pipes.

Water supply

Water supply for the development of the Dunheved Precincts is available from the Orchard Hills supply via the Erskine Park Reservoir.

Sydney Water has advised that a water main in Forrester Road has been constructed and is soon to be commissioned.

The development principles for the potable water system are:

1. Instal low pressure demand fixtures and appliances in buildings.
2. Utilise recycled water from the St Marys Sewer Treatment Plant, subject to continuing negotiations to Sydney Water,

and appropriate measures such as rainwater tanks in order to reduce demand on potable water supply.

Power

Servicing is possible within the Dunheved Precincts, however it will require the extension of the electricity reticulation network throughout the precincts.

Initial investigations reveal that the site could be supplied from the existing high voltage network from either the Cambridge Park or Werrington Substations.

The design of the power network will generally be located within dedicated road reserves.

Gas

The gas network will be extended to service the Dunheved Precincts if it is economically viable.

The design of the gas network system will generally be located within dedicated road reserves.

The provision of gas reticulation is recommended as it will reduce the expected load on electricity infrastructure and provides commercial customers with development options and pricing power.

Communications

Underground telecommunications cables will be extended throughout the Dunheved Precinct within the dedicated road reserves wherever possible.

The development principles for the communications system are:

1. Locate communications generally within dedicated road reserves.
2. Provide adequate 'spare' conduit capacity to facilities to facilitate future expansion and technology.
3. Provide modern telecommunications infrastructure and services subject to continuing negotiations with service providers.
4. Deliver high speed internet services through the provision of an optical fibre network.

3.10 Ecologically sustainable development

The Dunheved Precincts is to be developed in accordance with the principles of ecologically sustainable development (ESD). In order to achieve ESD there is a need to ensure the development utilises design principles and guidelines that are focussed on energy efficiency, water use, waste management and air quality.

- To encourage the use of public transport.
- To encourage the development of industries that practice emission minimizing practices.
- To encourage opportunities utilizing water efficiently in industrial processes and encouraging the use of recycled water.

Development principles

The development principles for the Dunheved Precinct are:

- To incorporate best practice energy management and implement energy efficient principles wherever possible.
- To minimise unnecessary waste production during design and construction.
- To provide facilities to recycle, reuse and reprocess waste locally.
- To minimise adverse impacts on air quality through the implementation of appropriate measures.
- To contribute to improved regional air quality by containing growth in vehicle kilometres travelled, achieving higher than average use of public transport, encouraging walking and cycling, and promoting energy efficient businesses and homes.
- To encourage opportunities for improving energy efficiency in industrial lighting, heating, motor operation and staff amenity areas.
- To encourage material efficiency and a reduction in the generation of waste.
- To encourage industries reuse discarded/ recycled materials.
- To foster industrial symbiosis within the precincts.
- To ensure that industrial lots can be accessed in an efficient manner by industrial related traffic entering the precincts.