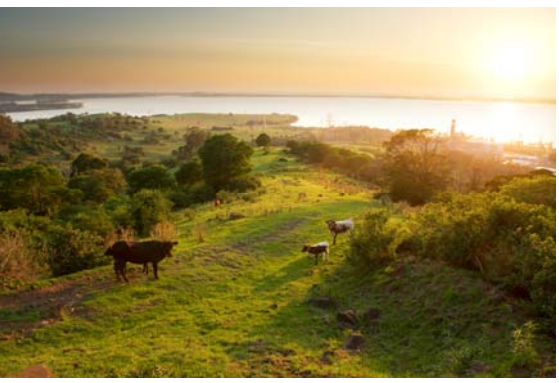
TALLAWARRA LANDS

LANDSCAPE PLAN



Corkery Consulting
Landscape Consultants

May 2012

TALLAWARRA LANDS –

LANDSCAPE PLAN

Prepared for

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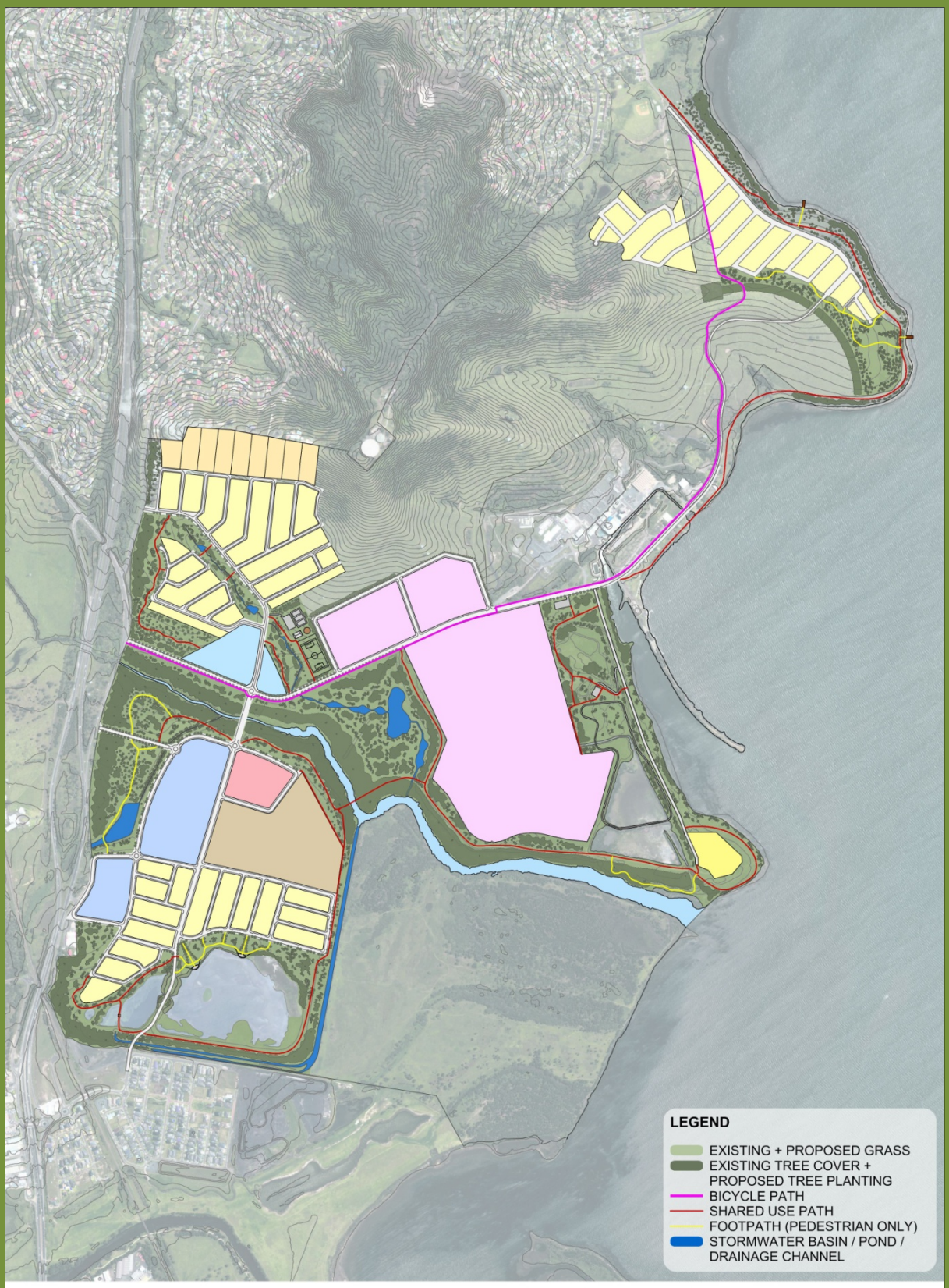
Contents



OPEN SPACE NETWORK
TALLAWARRA LANDS

DWG NO: LC-10-004-001
DATE: MARCH 2012

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Corkery Consulting

1.0 Introduction and Preliminaries

1.1 BACKGROUND AND PURPOSE

This Landscape Plan has been prepared for the proposed mixed use development Tallawarra Lands. The Tallawarra Lands Project has been declared as a 'major project' by the Minister for Planning and is therefore subject to the provisions of Part 3A of the *New South Wales Environment Planning and Assessment Act* 1979 (EP&A Act). Planning and design of the public domain and open space within the Tallawarra Lands has been carried out in accordance with the Director General's Requirements.

The Landscape Plan provides an integrated approach to the planning and design of all landscape components, including open space and recreation areas as well as streetscapes and environmental reserves. The Plan has been prepared through a process of collaboration with other members of the project team and has been coordinated with the Tallawarra Lands Masterplan prepared by Warren Lee Urban Design Pty. Ltd.

1.2 PROJECT SITE

The entire Tallawarra Lands Site covers approximately 572ha., which includes the Tallawarra gas-fired power station developed by TRUenergy and commissioned early 2010. This Landscape Plan is primarily focused on the 536ha. of land that is located outside of the power station precinct.

The Tallawarra Lands Site is located on the western foreshore of Lake Illawarra, south of Koonawarra and south-east of Dapto, within the Wollongong Local Government Area. A 6km section of lake foreshore located along the northern edge of the Site, is owned and managed by the Lake Illawarra Authority (L.I.A) and therefore does not form part of the Tallawarra Lands Site. However, account has been taken of the Landscape Master Plan prepared for the foreshore by others.

While much of the Tallawarra Lands Site has been cleared and currently used for grazing, a wide diversity in landscape character occurs throughout Site. There is a dramatic variation in landform over a relatively short distance, with the high elevation and steep slopes of Mount Brown contrasting strongly with the flat lake foreshore along the eastern edge of the Site and the extensive areas of flat low elevation land within the southern portion of the Site.

Much of the vegetation on the site has been impacted by weed invasion and grazing. While native vegetation communities occur in some patches, these communities have been extensively invaded by weed species that form much of the understory (Eco Logical, 2006). Several patches of endangered ecological communities (ECC) are located on the Site but they are relative small.

Water resources throughout the Site have been modified by previous land use. Where extensive clearing for grazing has occurred, many of the natural drainage lines have been altered via stormwater culverts and other works. Although Duck Creek and areas of wetland in the south-east portion of the Site are largely in their original condition, extensive dumping of ash from the former coal-fired power station has significantly altered the drainage pattern over a substantial area in the south east portion of the Site as well as the area between Duck Creek and the existing power station.

Soil types vary greatly across the Site with well drained loams occurring on the upper portion of Mount Brown and a variety of clay soils on the mid-slopes and the south-western portion of the Site. Alluvial and swamp soils associated with a high water table occur in the low-lying areas adjoining Duck Creek and Lake Illawarra.

A more detailed analysis of the landscape conditions of the Site is presented in Appendix 1 – Tallawarra Lands Landscape Assessment.

FIGURE 1 – REGIONAL CONTEXT

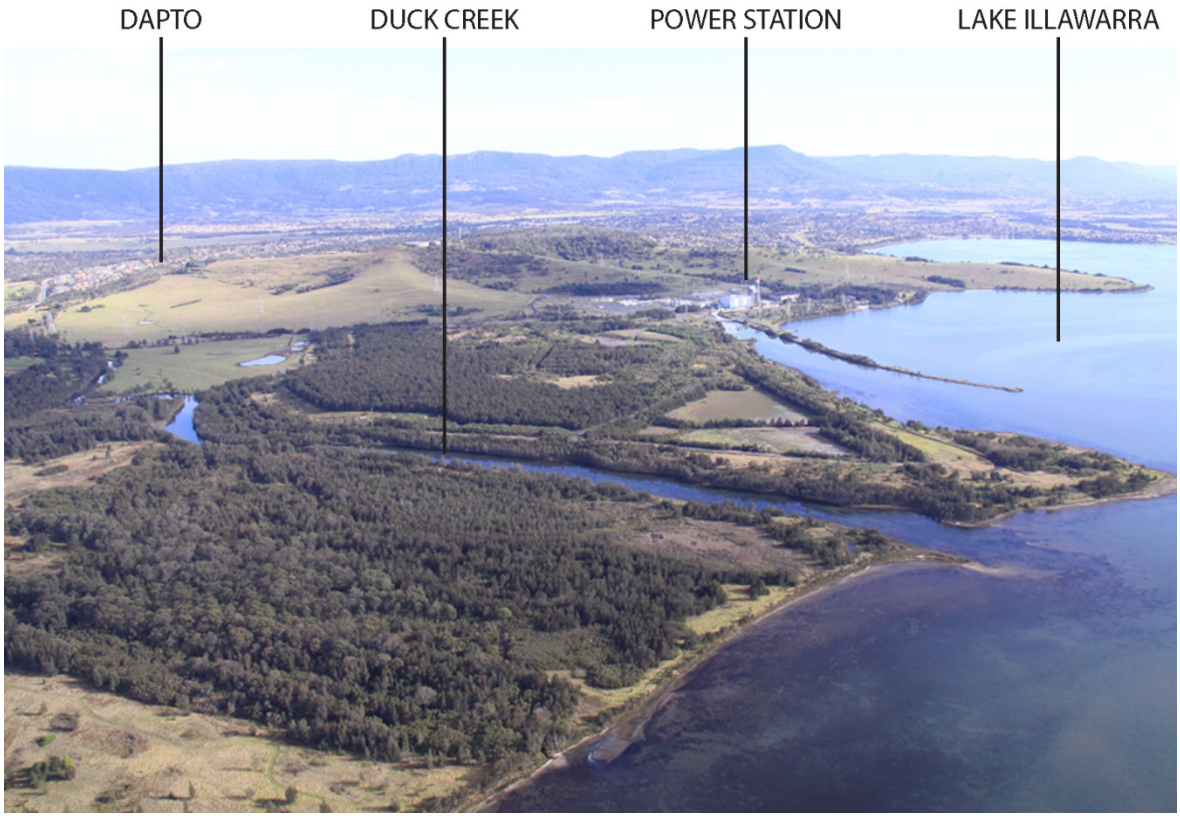


FIGURE 2 – AERIAL OBLIQUE VIEW NORTH ALONG LAKE ILLAWARRA FORESHORE

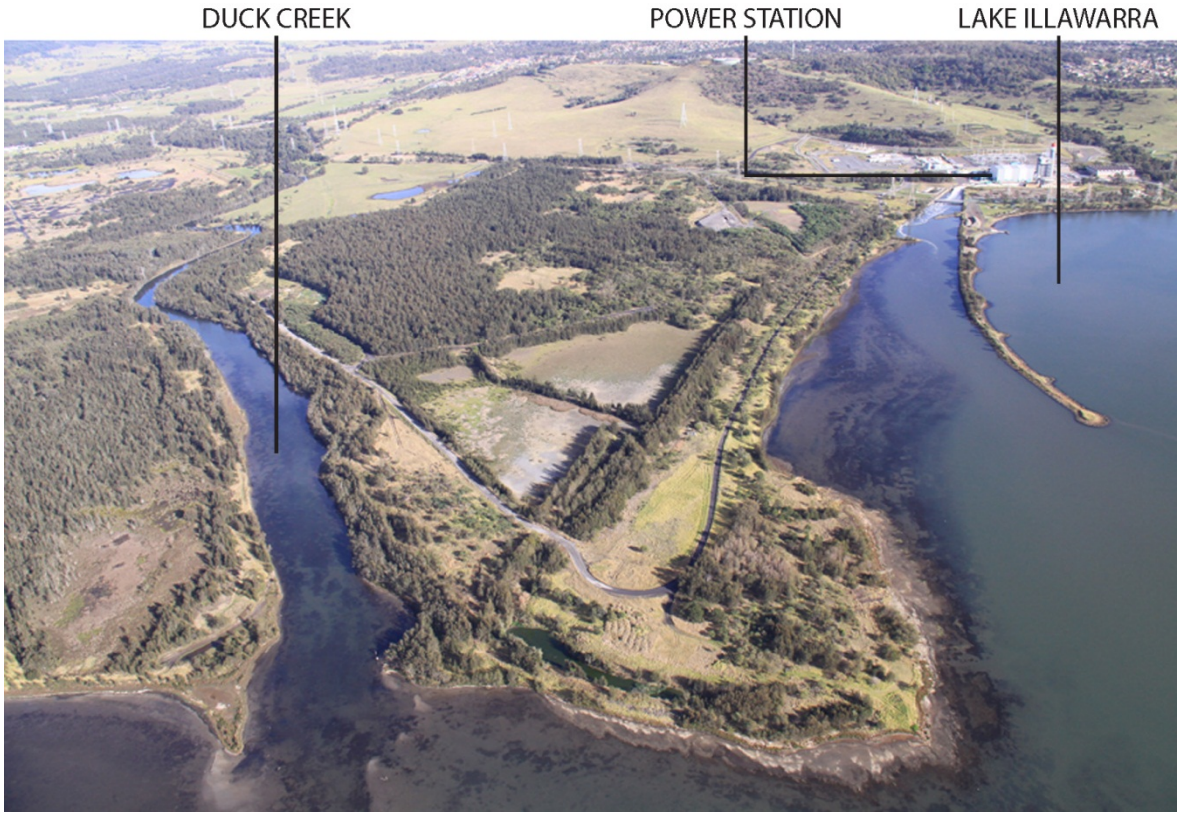
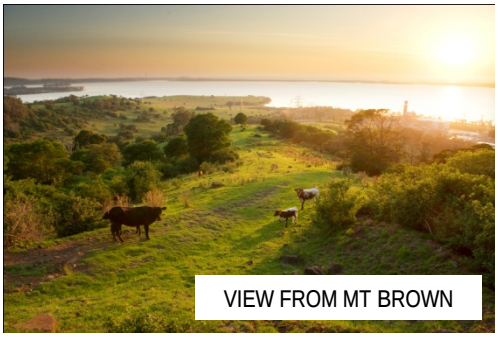
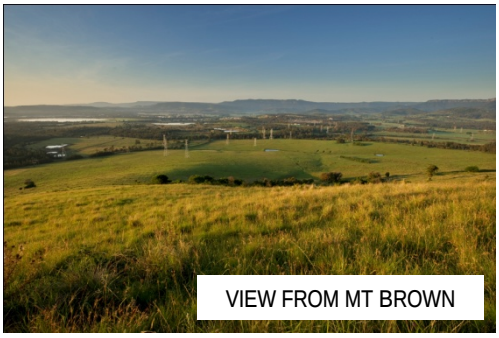


FIGURE 3 – AERIAL OBLIQUE VIEW NORTH-WEST ALONG DUCK CREEK CORRIDOR


DUCK CREEK


VIEW FROM MT BROWN


VIEW FROM MT BROWN


LAKE ILLAWARRA FORESHORE


VIEW FROM MT BROWN ACROSS SITE AND LAKE ILLAWARRA

FIGURE 4 – LANDSCAPE CHARACTER IMAGES

1.3 DEFINING THE PUBLIC DOMAIN

The 'Public Domain' of the Tallawarra Lands site includes not only public open space containing playgrounds, picnic grounds and playing fields, but also streetscapes, urban plazas, open space corridors and all other places in the urban environment that people use for recreation and social interaction.

The Public Domain Network throughout the Site will incorporate:

- Parks and reserves.
- Sports field.
- Playgrounds
- Civic spaces.
- Road corridors and local streets.
- Pedestrian and cycle paths.
- Lake foreshore open space.
- Creek corridors.
- Ecological conservation areas.

This Landscape Plan provides an integrated approached to the design and development of the various components of the Public Domain throughout the Tallawarra Lands.

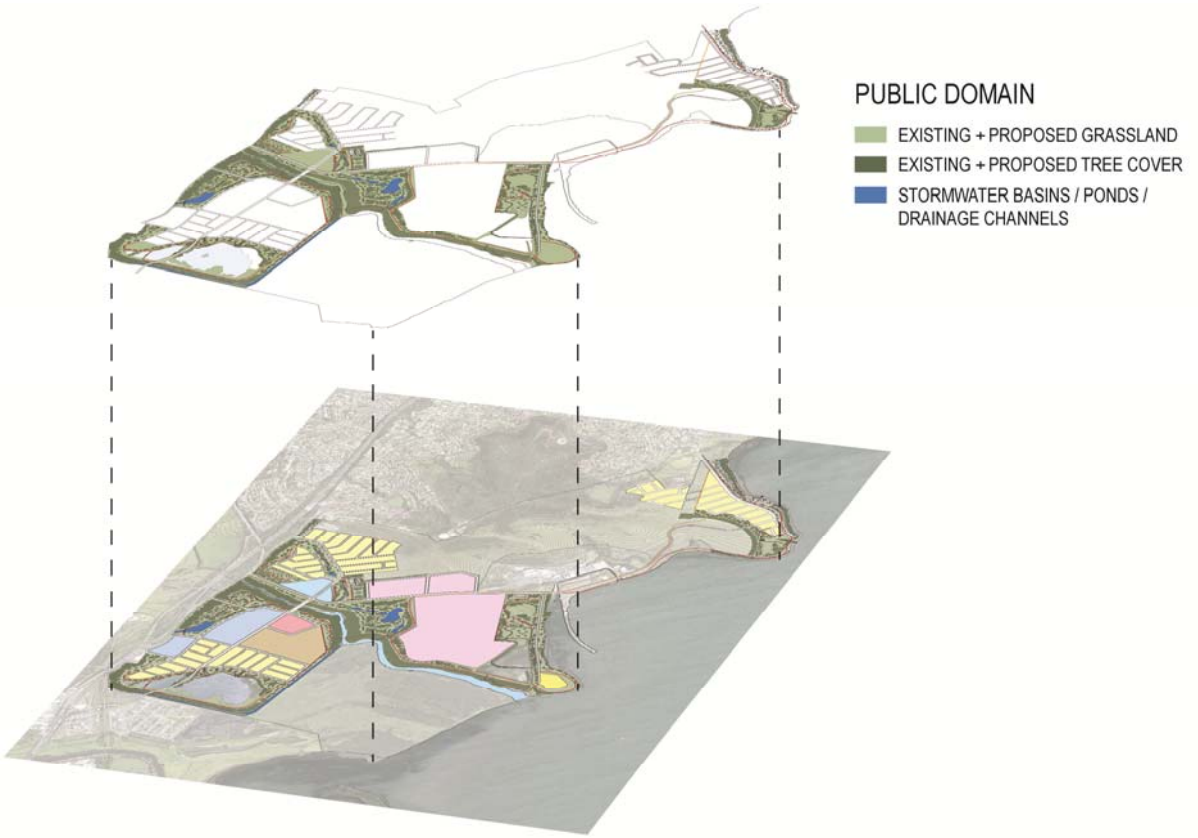


FIGURE 5 – THE PUBLIC DOMAIN NETWORK

1.4 LANDSCAPE PLAN VISION

The Vision of this Landscape Plan is to create an open space network that is strategically planned to function at the regional and local scale. The Vision aims to preserve and enhance the existing landscape character of the Tallawarra Lands as a distinguishing feature of the proposed new community. This Vision is underpinned by landscape design that will create an engaging, delightful, safe and enjoyable public domain incorporating the principles of sustainability through water sensitive urban design, crime prevention through environmental design and enhancement of biodiversity.

The Landscape Plan adopts a comprehensive and integrated approach to planning and design of the Public Domain that responds to the Masterplan, prepared by Warren Lee Urban Design.

Key components of the Landscape Plan, which are illustrated on Figure 6, include:

- An integrated network of open space and recreation opportunities incorporating foreshore parks, a playing field and other sports facilities.
- A network of pedestrian paths, shared use ways and cycle lanes.
- A hierarchy of streetscapes that incorporate street trees and other planting with water conservation measures.
- A local centre with public spaces.
- A school with recreation facilities.
- Rehabilitated environmental conservation areas.
- Stormwater treatment ponds and constructed wetlands.

Details of the various components of the Landscape Plan are explained in following sections of this Report, together with the site analysis that forms a basis for the Plan.

LANDSCAPE PLAN SUMMARY KEY (REFER FIGURE 6)

No.	Title	Report Reference
1	Main Entry	-
2	Secondary Entries (West)	-
3	Secondary Entry (North)	-
4	Entry Avenue	Section 5.2, 5.3
5	Lake-edge Drive	Section 5.2, 5.3
6	Residential on slopes of Mount Brown	Section 5.2, 5.3, 6.2
7	Open Space Drainage Corridor	Section 3.5.1
8	Commercial Centre	Section 6.4
9	Sports Facilities	Section 3.5.1
10	Riparian Open Space	Section 3.5.1
11	Duck Ck. Riparian Conservation Corridor	Section 3.5.1
12	Woodland Conservation Zone	Section 3.5.1
13	Open Space Buffer Zone	Section 3.5.1, 3.5.3
14	Employment, School & Retirement Living on ash disposal area	Section 5.2, 5.3, 6.3
15	Residential on flat ash disposal area	Section 5.2, 5.3, 6.2
16	Bird habitat ponds & open space	Section 3.5.3
17	Environmental conservation area	-
18	Tourism facility	-
19	Lake Foreshore Open Space	Section 3.5.2
20	Settling ponds (saltmarsh)	Section 3.5.2
21	Cycling facilities on ash disposal area	Section 3.5.2
22	Employment on ash disposal area	Section 6.3
23	Employment on lower slopes of Mount Brown	Section 5.2, 5.3, 6.3
24	Open space on headland	Section 3.5.4
25	Woodland planting buffer zone	Section 3.5.4
26	Residential on northern slopes	Section 5.2, 5.3, 6.2
27	Foreshore open space (L.I.A)	Section 3.5.4

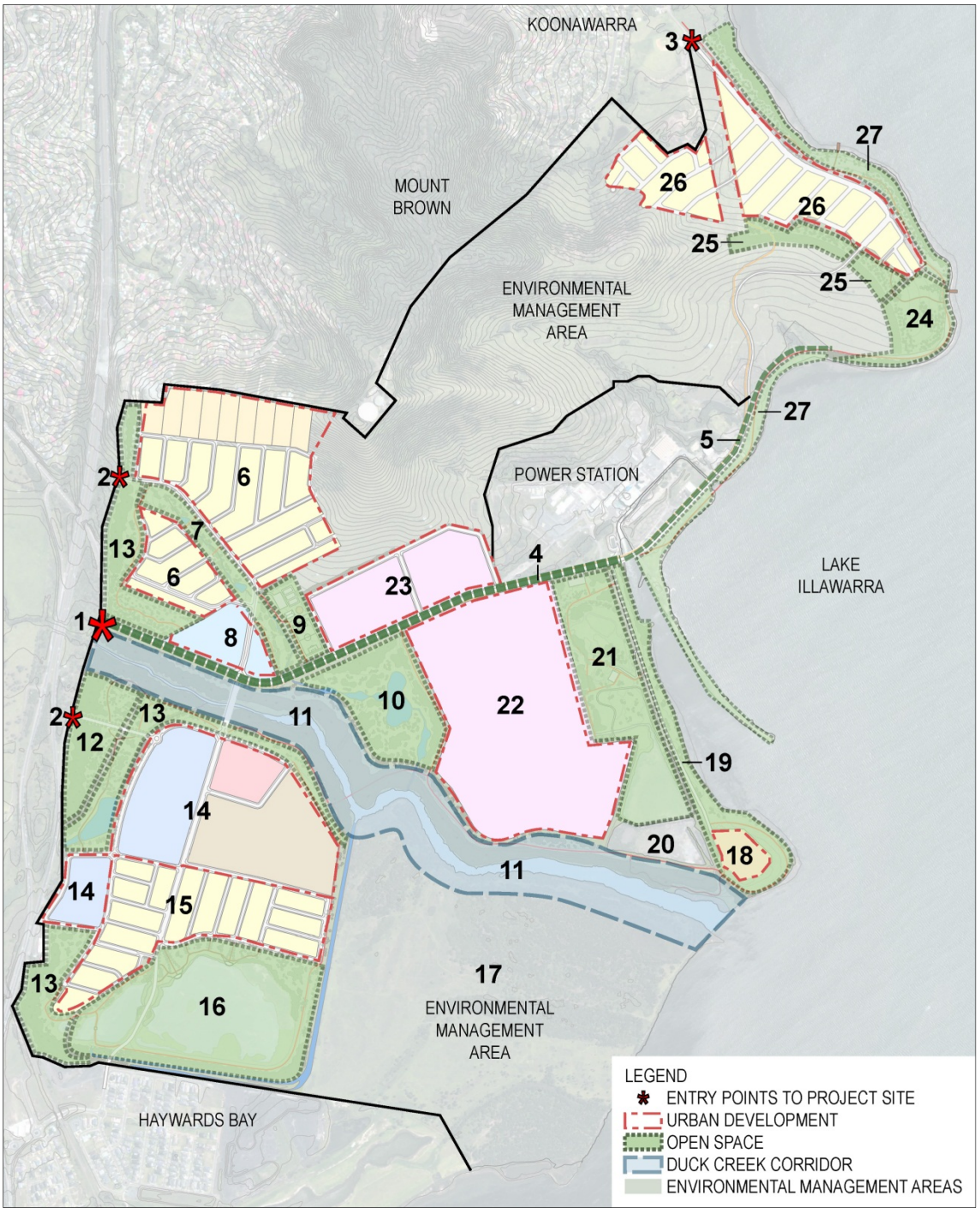


FIGURE 6 – LANDSCAPE PLAN SUMMARY

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2.0 Context and Analysis

2.1 RELEVANT STUDIES

The Tallawarra Lands site has been the subject of a series of studies and reports associated with various development proposals. This Landscape Plan has taken account of the findings of all relevant reports and plans, including:

- *Tallawarra Lands Ecological Assessment,* Eco Logical Australia, 2010
- *Tallawarra Lands Vegetation Management Plan,* Eco Logical Australia, 2010
- *Tallawarra Lands Bushfire Planning Assessment,* Eco Logical Australia, 2010
- *Tallawarra Lands: Part 3A Concept Plan – Aboriginal Archaeological Assessment*, Biosis Research, July 2010
- *Tallawarra Lands Traffic Impact Assessment,* Gabites Porter, 2010
- *Visual, landscape and scenic resource management consideration*, Richard Lamb & Associates, 2010
- *Tallawarra Lands Structure Plan Report,* Cox Richardson, June 2009

Key Principles presented in the Structure Plan Report are illustrated on the following diagram.

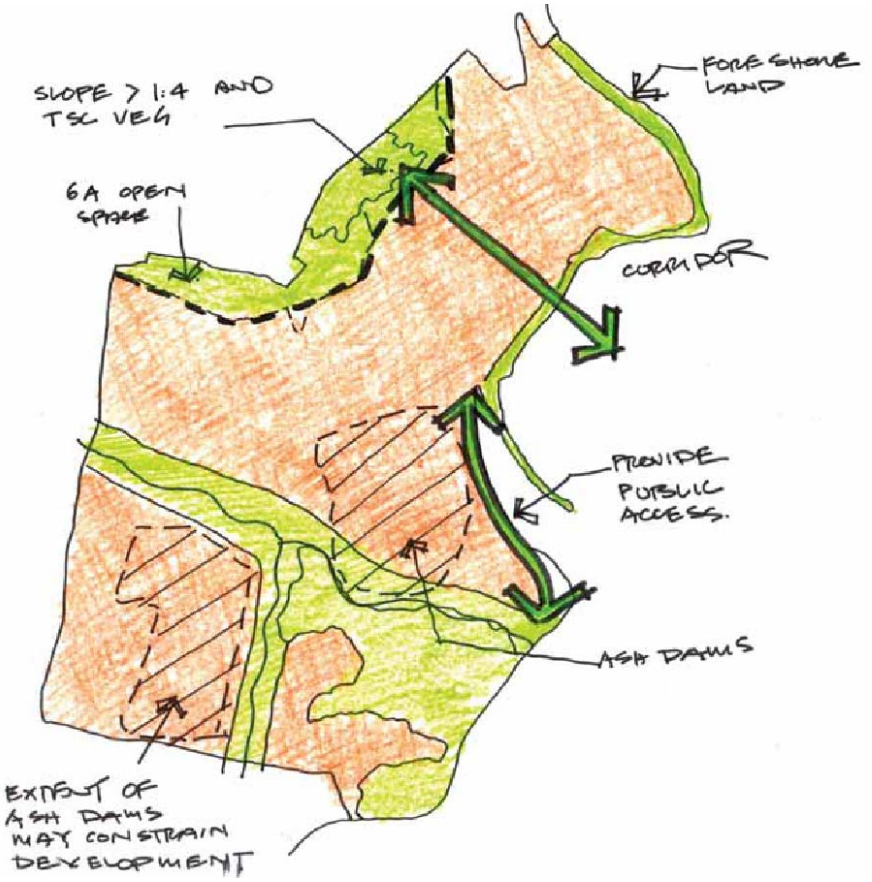

FIGURE 7 – PRINCIPLES PRESENTED IN THE 2009 STRUCTURE PLAN
(Source: Cox Richardson/Context, 2009)

2.2 LOCAL CONTEXT

Located on the western foreshore of Lake Illawarra within the Wollongong Local Government Area (Figure 8) the Tallawarra Lands cover approximately 572ha. and include the gas-fired power station developed by TRUenergy. A 6km long section of lake foreshore located along the northern edge of the Tallawarra Lands is owned and managed by the Lake Illawarra Authority. Adjoining suburbs include Koonawarra and Dapto to the north and Haywards Bay to the south.

The various aspects of site context that have influenced the planning and design of the Public Domain Network are identified in the following table.

CONTEXT	GENERAL DESCRIPTION	INFLUENCE UPON PUBLIC DOMAIN PLANNING AND DESIGN
Lake Illawarra	The Lake abuts the eastern boundary of the Tallawarra Lands. This shallow coastal lagoon has approximately 39km of shoreline and is considered a significant resource for its recreational and habitat value. (Context 2009)	The lake foreshore provides pedestrian and cycle connectivity opportunities that have the potential to be integrated into the wider pedestrian and cycle network of the Tallawarra Lands development
Haywards Bay Urban Development	Haywards Bay is a new residential development that adjoins the southern boundary of the Tallawarra Lands.	There is an opportunity for a pedestrian / cycle connection between Haywards Bay Drive and open space within the southern portion of the Tallawarra Lands.
Dapto Urban Development	Dapto is an established urban area that adjoins the north-western boundary of the Tallawarra Lands.	Connection to the Dapto town centre, which is located approximately 3km to the north, is via the Princes Highway. This connection has the potential to become an integrated part of the regional road and cycle network.
Koonawarra Urban Development	Koonawarra is an established residential area that adjoins the north-eastern boundary of the Tallawarra Lands.	Mount Brown Reserve adjoins the north-western edge of the Tallawarra Lands and vegetation extends from the Reserve into the elevated portion of the Site.

FIGURE 8 – LOCAL CONTEXT

2.3 DESIGN FRAMEWORK

The Landscape Plan incorporates principles of sustainable design and development, which include protection and management of ecological values, applying water sensitive urban design and crime prevention through environmental design. These components of the design framework are discussed in the following sections.

2.3.1 ECOLOGICAL VALUES

Ecological values identified within the Tallawarra Lands Site present both opportunities and constraints for the planning and design of the Public Domain. In addressing these values the following characteristics were considered:

- Significance of existing vegetation communities.
- The structural condition of vegetation remnants.
- Type and severity of disturbance and resulting recovery potential.
- Connectivity between remnants on and off the site.
- The value of the remnant vegetation as threatened species habitat.

The ecological assessment carried out by Eco Logical Australia identifies a wide range of vegetation communities, seven (7) of which are classified as Endangered Ecological Communities (ECCs). The vegetation communities include:

- Alluvial Swamp Mahogany Forest (part of the EEC - Swamp Sclerophyll Forest on Coastal Floodplains on the NSW North Coast, Sydney Basin and South East Corner Bioregions).
- Coastal Grassy Red Gum Forest (part of the EEC – Illawarra Lowlands Grassy Woodland of the Sydney Basin Bioregion).
- Coastal Swamp Oak Forest (part of the EEC – Swamp Oak Floodplain Forest on the NSW North Coast, Sydney Basin and South East Corner Bioregions).
- Estuarine Alluvial Wetland.
- Floodplain Wetland (part of the EEC - Freshwater wetlands on Coastal Floodplains on the NSW North Coast, Sydney Basin and South East Corner Bioregions).
- Lowland Dry-subtropical Rainforest (part of the EEC - Illawarra Subtropical Rainforest in the Sydney Basin Bioregion).
- Lowland Woollybutt-Melaleuca Forest (part of the EEC – Illawarra Lowlands Grassy Woodland of the Sydney Basin Bioregion).
- Moist Box-Red Gum Foothills Forest.
- Saltmarsh (part of the EEC – Coastal Saltmarsh of the Sydney Basin Bioregion).
- Artificial Wetlands.
- Acacia Scrub.

(Eco Logical Australia, 2010).

Habitat and biodiversity protection is required by State and Federal legislation, which includes the NSW Threaten Species Conservation Act 1995 and the Environmental Protection and Biodiversity Conservation Act 1999. Management of the Endangered Ecological Communities and the Duck Creek corridor is also required by this legislation.

This Landscape Plan incorporates the existing vegetation communities and takes account of the potential impact that urban development may have upon the integrity of these communities. Details of how the planning and design of the Public Domain has preserved and enhanced the site's existing vegetation are presented in later sections of this Report.

2.3.2 WATER SENSITIVE URBAN DESIGN

The Water Sensitive Urban Design (WSUD) principles have been adopted in the Landscape Plan with the aim of achieving a more sustainable approach to water resources management throughout the Public Domain. The aim is to maintain or replicate as much as possible the hydrology of the pre-development landscape and avoid impacts that can result from:

- Intensification of flows in watercourses potentially creating in-stream bank erosion and sedimentation.
- Increased contamination of runoff from urban development into aquatic environments resulting in generally adverse impacts on aquatic ecosystems.
- Increased use of water resources for domestic, commercial and industrial uses as well as irrigation of gardens and open space areas.
- The occurrence of more severe flooding events and increased extent of flooding.

More detailed information about the application of WSUD initiatives to the planning and design of the Public Domain is presented in later sections of this Report.

2.3.3 CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN

Crime Prevention Through Environmental Design (CPTED) involves a multi-disciplinary approach to deter criminal behaviour through the design of urban environments. CPTED strategies rely upon the ability of good design to influence the decisions of potential criminals that precede their intended criminal acts, aiming to deter them by ensuring that the situations in which crime is most often committed are reduced and/or removed through design. CPTED aims to create environments that are safer and ultimately more sustainable.

The Landscape Plan responds to the potential impacts of crime upon the viability of urban development and the best practice principles that can mitigate such impacts. Further details of how CPTED initiatives have been included within the public domain planning and design process are presented in later sections of this Report.

2.4 LANDSCAPE ANALYSIS

The Tallawarra Lands Site is located within a coastal plain that extends from Lake Illawarra to the Illawarra Escarpment. Widening of the coastal plain in the vicinity of the Tallawarra Lands is the result of watercourses such as Duck Creek and Wollingurry Creek carving into the Escarpment (Biosis Research, 2010). Over an extended period of time, the process of erosion and deposition associated with these watercourses has resulted in the current site conditions.

The variation in landscape conditions throughout the Site itself is the result of the volcanic outcrop of Mount Brown and erosion of its slopes. Depositional processes associated with the low-lying riparian areas adjoining Duck Creek and Lake Illawarra have been major factors influencing the existing landscape of the Site. These landscape formation processes of erosion and deposition are illustrated on Figure 9.

The resulting variations in landform, drainage, vegetation and soil structure are discussed in the following pages and detailed further within *Appendix 1 – Tallawarra Lands Landscape Assessment*.

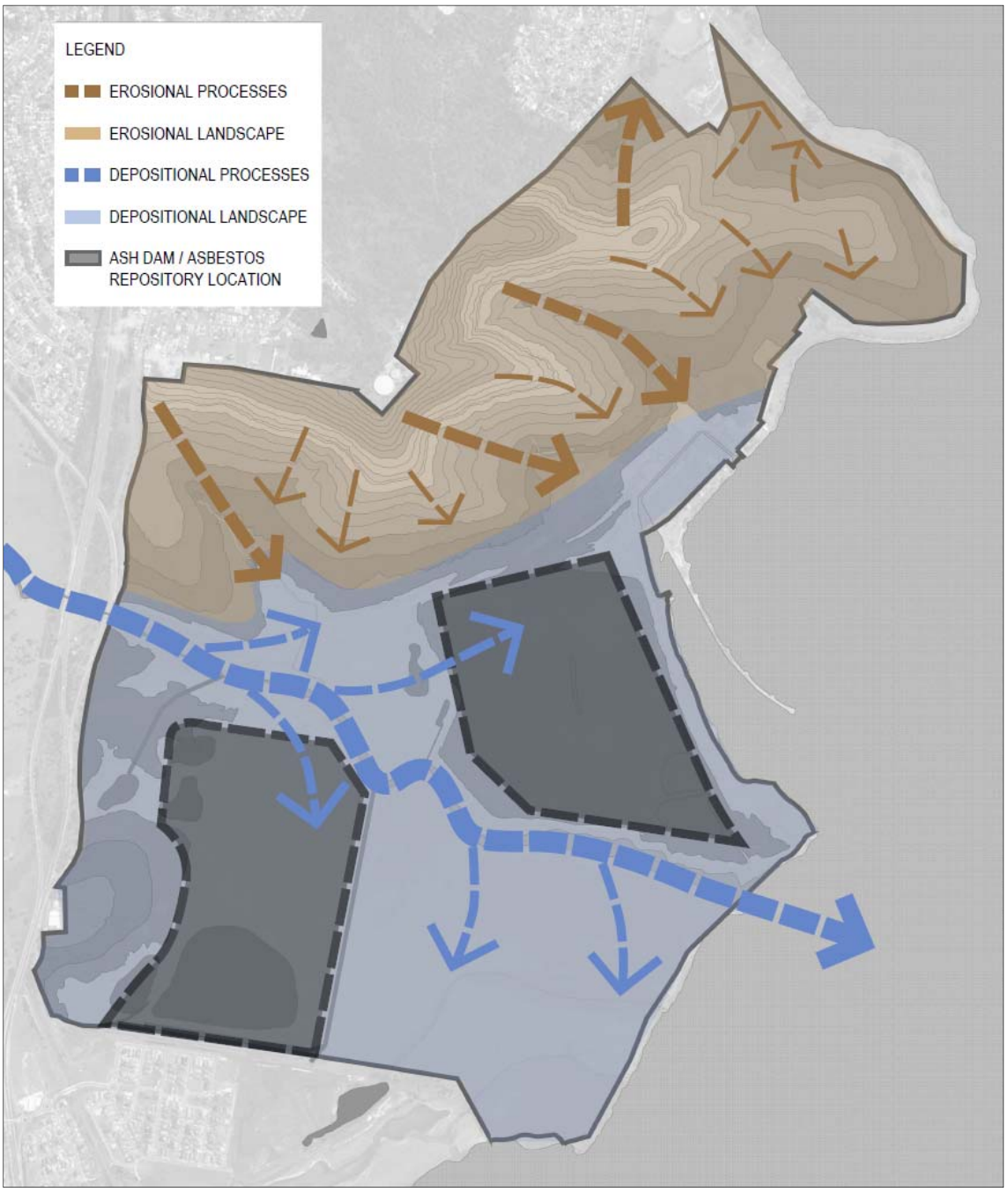

FIGURE 9 – EROSIANAL AND DEPOSITIONAL PROCESSES

2.4.1 LANDFORM AND DRAINAGE

The Tallawarra Lands contain dramatic variations in landform over a relatively short distance. The high elevation and steep slopes of Mount Brown contrast strongly with the extensive areas of flat low elevation land, including former ash disposal dams, that occur in the southern portion of the Site, with Duck Creek forming a distinctive riparian corridor extending through the centre (Figure 10).

Drainage throughout the Site has been modified by previous land uses. Where extensive clearing and grazing has occurred, many of the natural drainage lines have been altered by the installation of stormwater culverts and construction of levee embankments. These areas include the mid-slopes of Mount Brown and the drainage canal south of Duck Creek located in the southern portion of the Site. A number of water storage dams have been constructed to provide water for stock. Artificial ponds have also resulted from ash disposal activities associated with the former coal-fired Tallawarra power station. Duck Creek and adjoining wetlands to the south are largely in their original condition.

The character of the existing landform and drainage has been taken into account in the landscape planning and design process throughout the Public Domain.

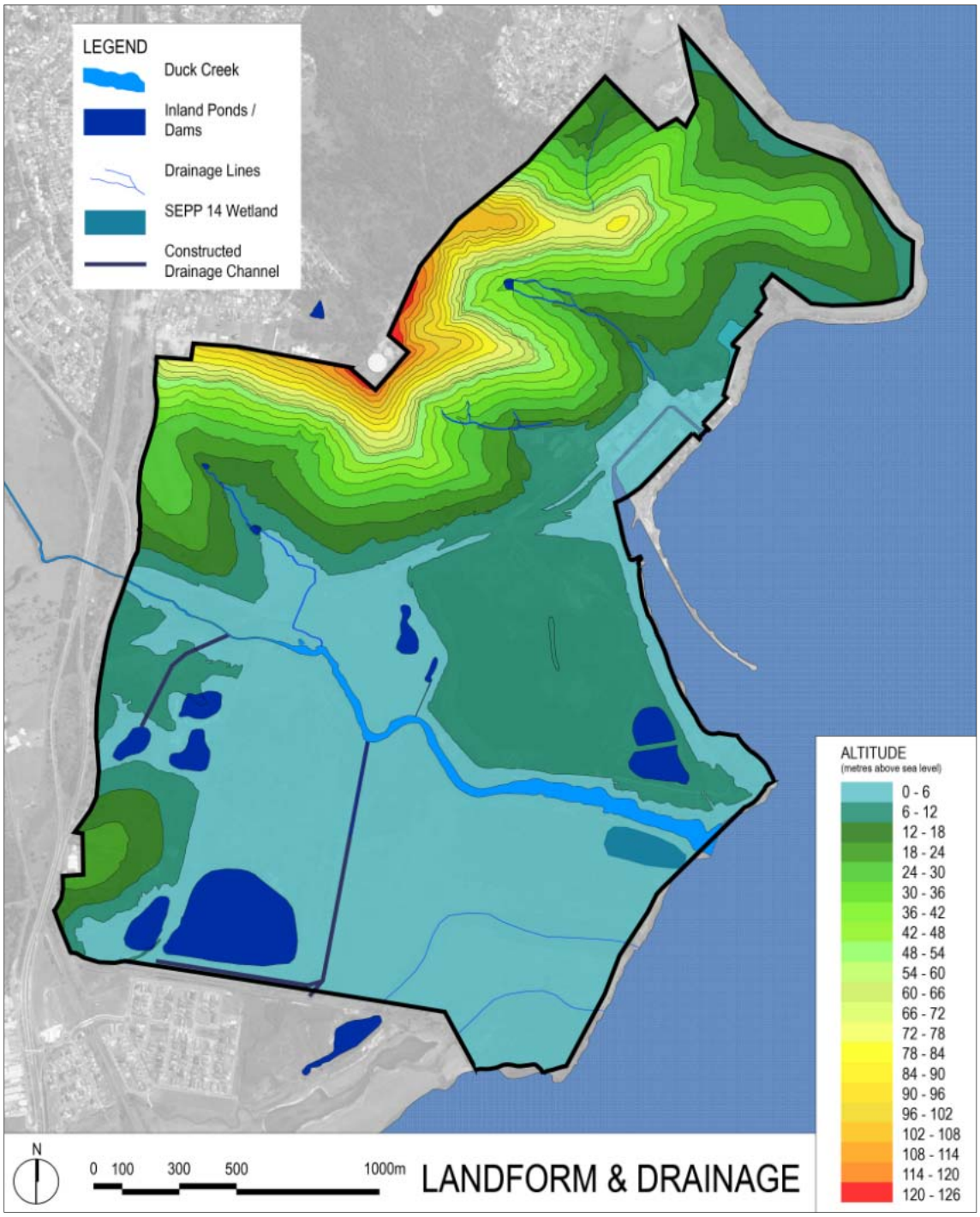

FIGURE 10 – LANDFORM AND DRAINAGE

2.4.2 VEGETATION

While much of the Site has been cleared and extensive areas are currently used for grazing, there are significant areas of remnant vegetation. A large proportion of this remnant vegetation has been impacted by weed invasion and grazing. Lantana and other weed vegetation form much of the understory in the areas of remnant vegetation (Eco Logical, 2006).

Patches of Endangered Ecological Communities (ECC) are located on the Site, although these are generally small, an exception occurs in the south east corner of the Site (Figure 11), where an extensive ECC is located.

The character and significance of the existing vegetation communities across the Site, and their diversity, have been addressed in the planning and design process for the public domain within this Landscape Plan.

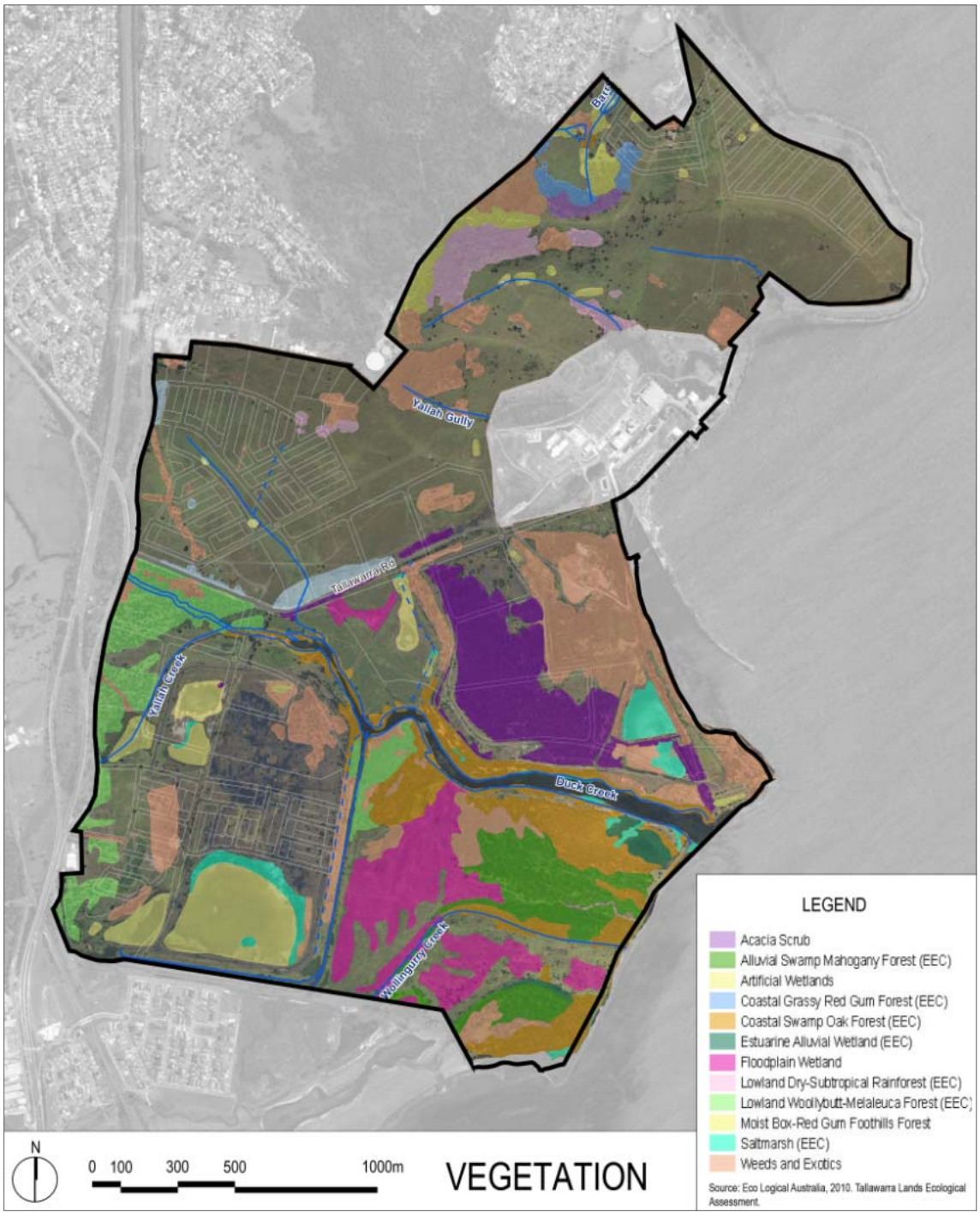

FIGURE 11 – VEGETATION COMMUNITIES

(Source: Eco Logical Australia, 2010)

2.4.3 LANDSCAPE CHARACTER ZONES

A detailed analysis of the existing landscape of the Site was carried out to provide a major input to the Landscape Plan. Details of the analysis are presented in Appendix 1 and key aspects summarised in this section of the Report.

The analysis identified a series of Landscape Character Zones (LCZ's) throughout the Site. The LCZ's are areas with a distinct visual character that results from a particular combination of landform, drainage and vegetation (Figure 12).

In preparing landscape concepts for each of the public open spaces, the distinct characteristics of the LCZ in which they occur have been carefully considered.

The relationship between the various LCZ's and the variation in landscape character throughout the Tallawarra Lands are illustrated in the oblique aerial photos presented on the following pages (Figures 13 to 17).

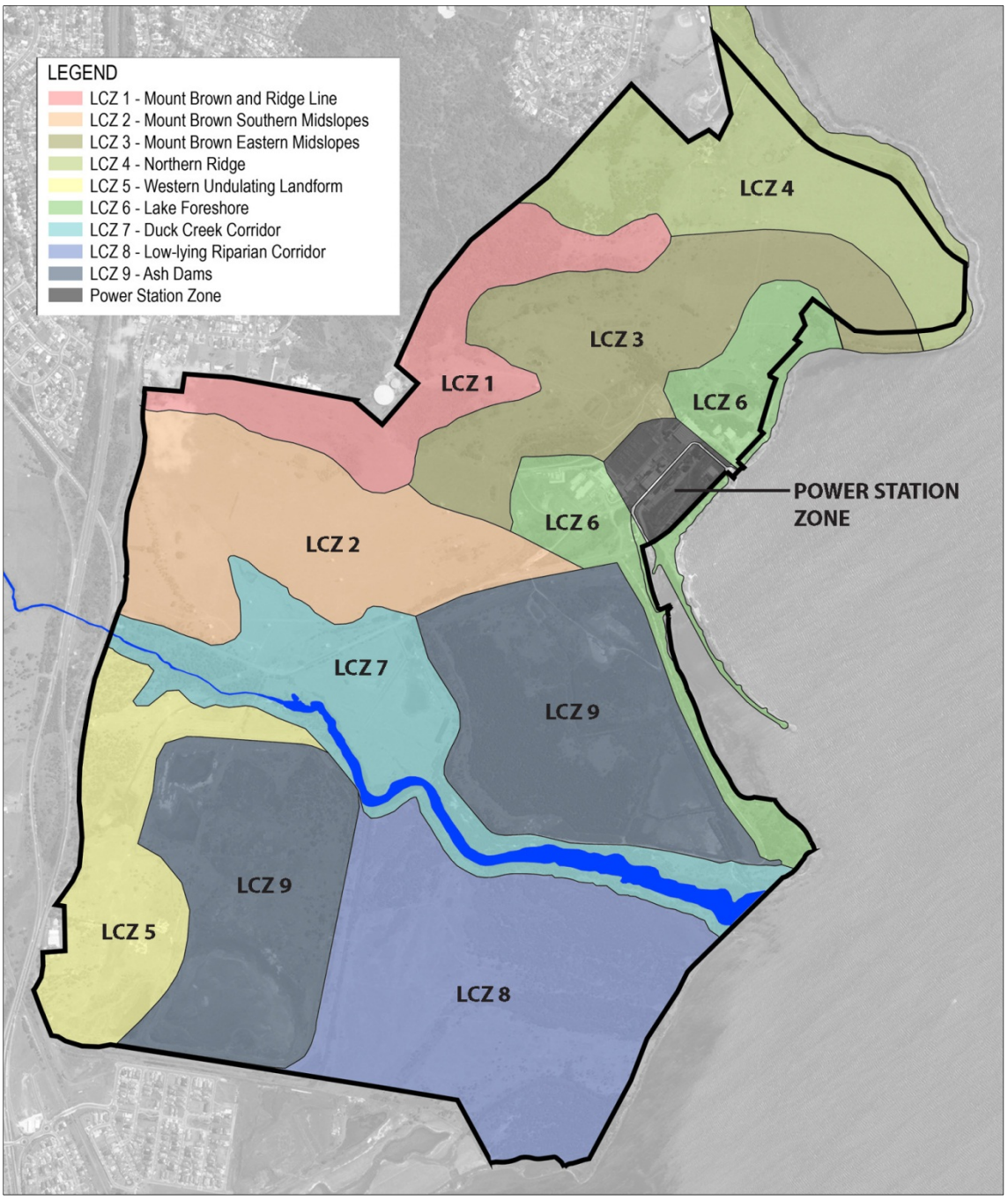

FIGURE 12 – LANDSCAPE CHARACTER ZONES

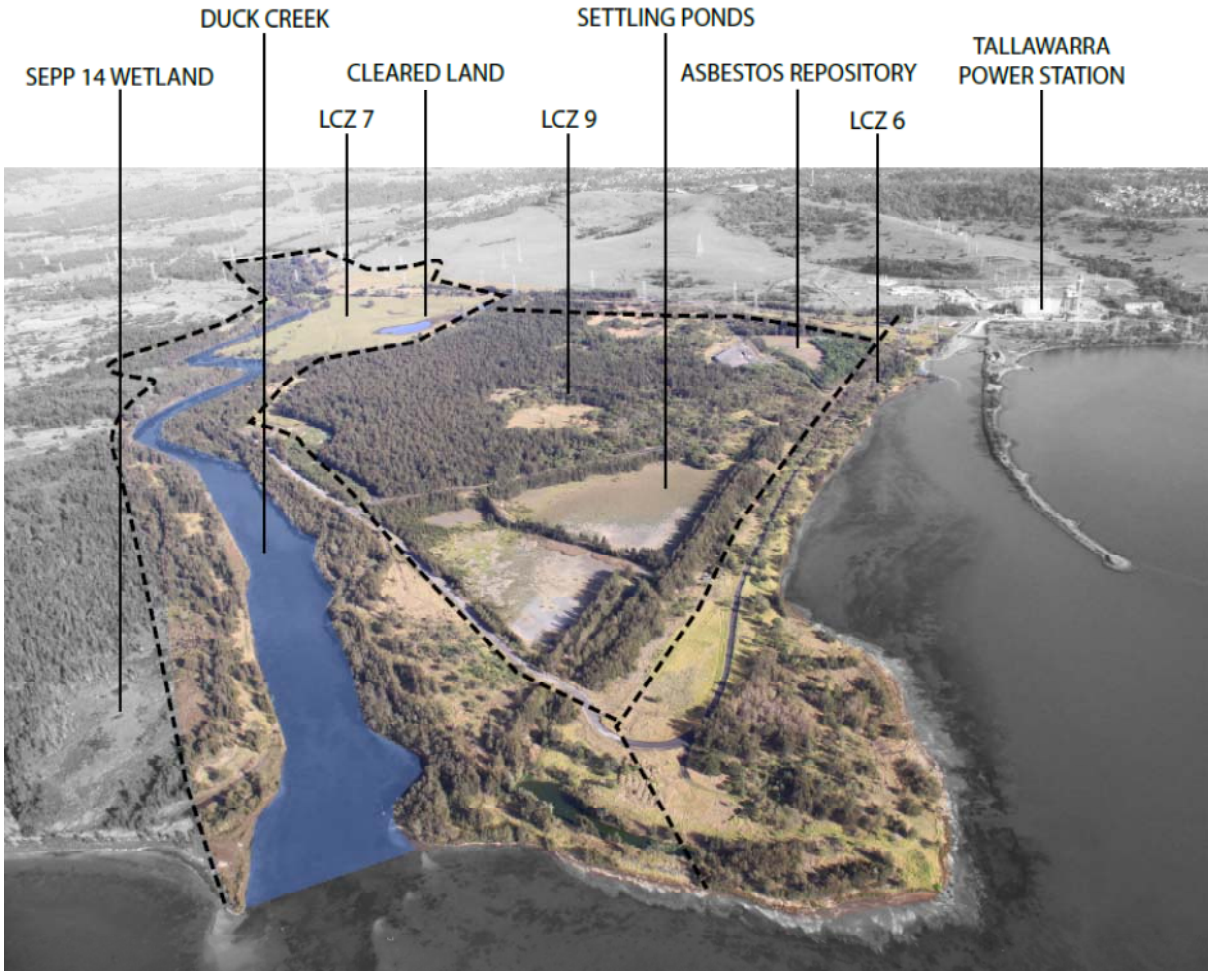

FIGURE 13 – AERIAL OBLIQUE VIEW OF DUCK CREEK CORRIDOR AND ADJOINING LANDS

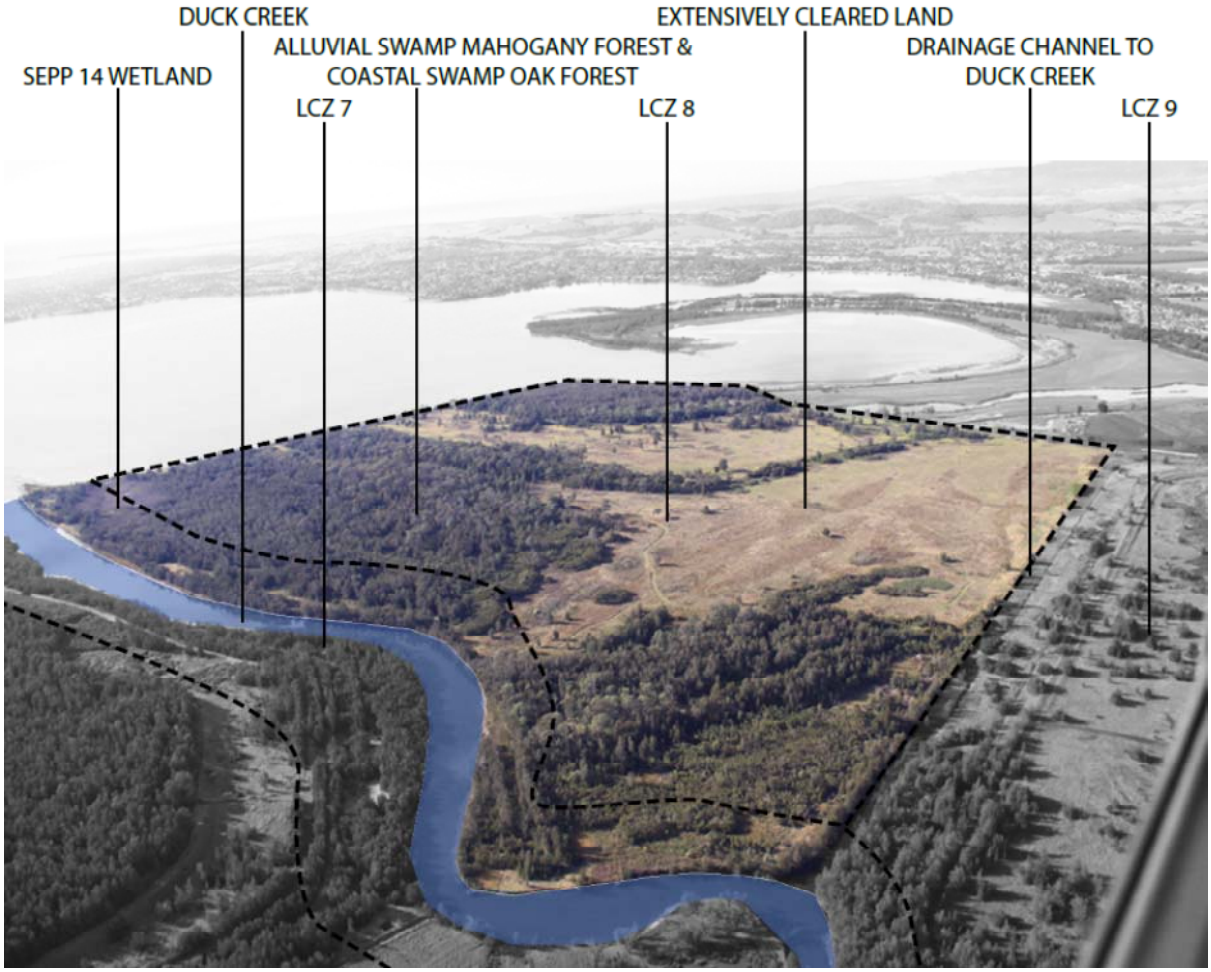

FIGURE 14 – AERIAL OBLIQUE VIEW OF DUCK CREEK CORRIDOR AND SOUTHERN PORTION OF THE SITE

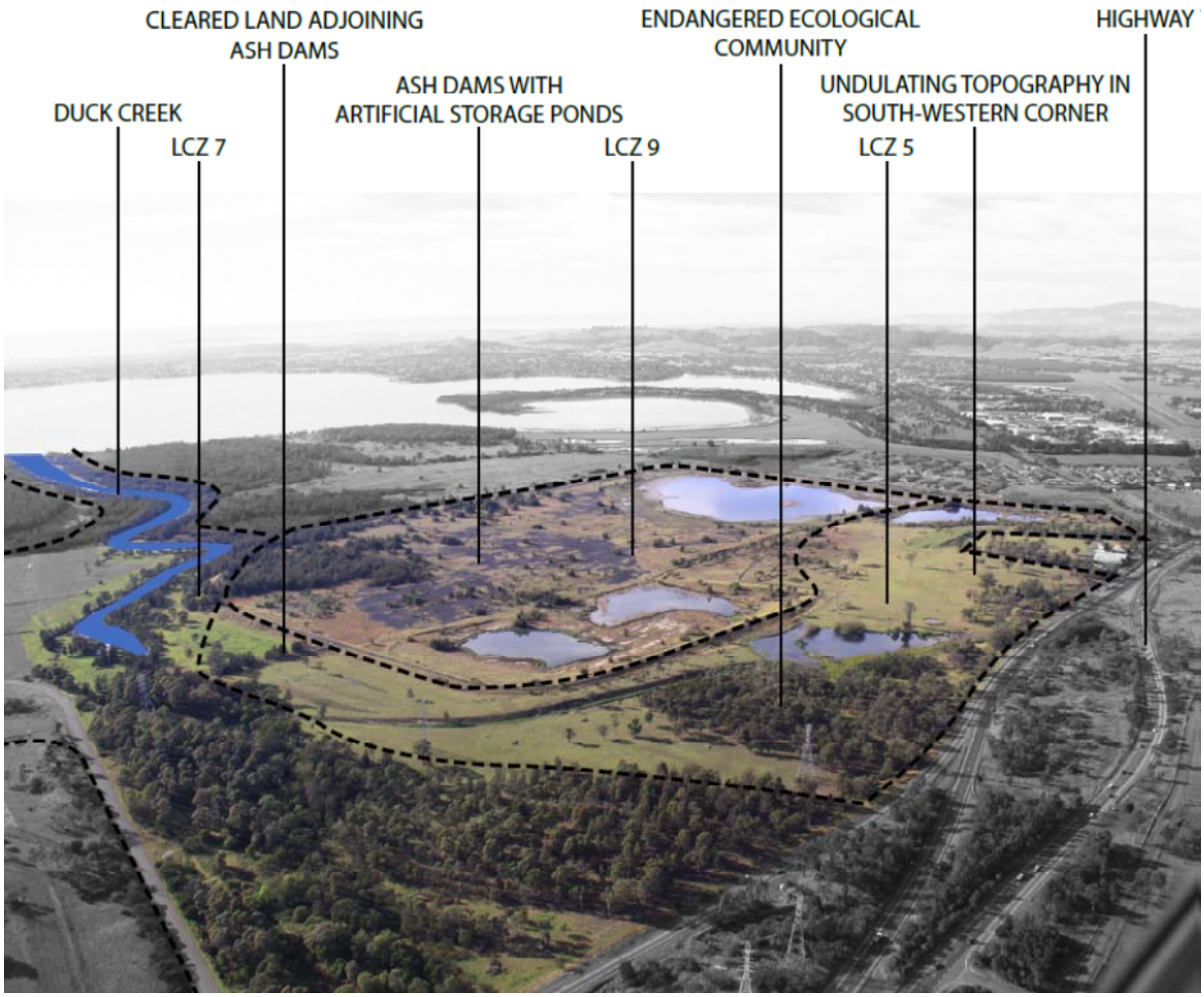

FIGURE 15 – AERIAL OBLIQUE VIEW OF SOUTHERN PORTION OF THE SITE

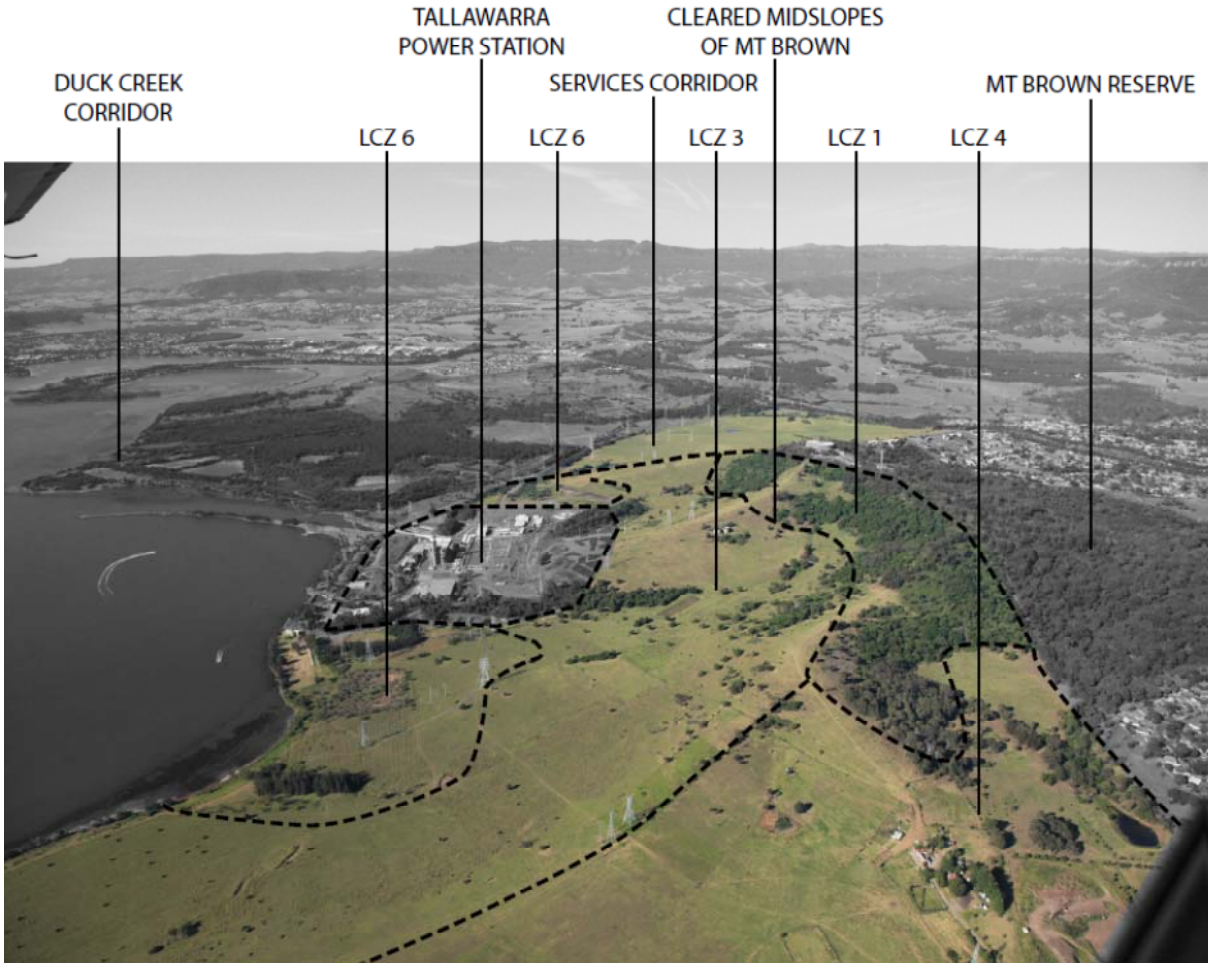

FIGURE 16 – AERIAL OBLIQUE VIEW OF THE NORTHERN PORTION OF THE SITE

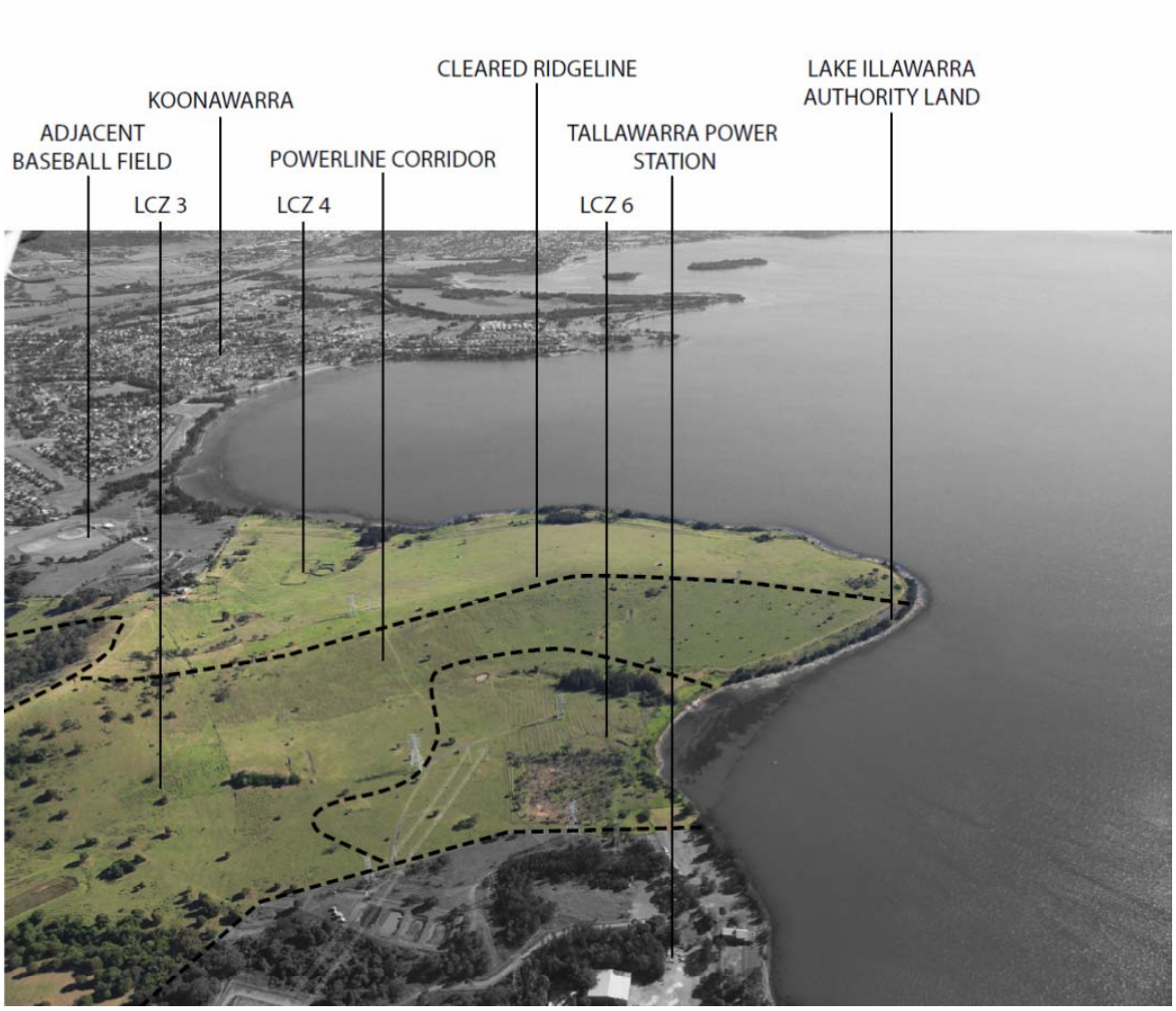

FIGURE 17 – AERIAL OBLIQUE VIEW OF NORTHERN PORTION OF THE SITE

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2.5 LANDSCAPE STRATEGY

The Landscape Plan presented in this Report provides the basis for the planning and design of the Public Domain Network throughout the Tallawarra Lands.

The Master Plan prepared by Warren Lee Urban Design identifies four planning Precincts that include:

- Central Precinct – incorporating residential development, industrial employment, the Neighbourhood Centre and areas of open space.
- Lake Illawarra Foreshore Precinct – areas of open space and industrial development along the foreshore of Lake Illawarra.
- Southern Precinct – incorporating a combination of residential development, commercial employment, a primary school and areas of open space.
- Northern Precinct – proposed residential development and areas of open space along the foreshore of Lake Illawarra.

The Master Plan was overlaid on the Landscape Character Zones Plan to provide the basis for the Landscape Plan. The relationship between each of the four Master Plan Precincts and the Landscape Character Zones is illustrated on Figure 18.

The distinctive characteristics of each of Landscape Character Zone and their relationship to the Precincts of the Master Plan have been taken into account in planning and design of the open space network throughout the Site. These relationships are described on the following sections of the Report.

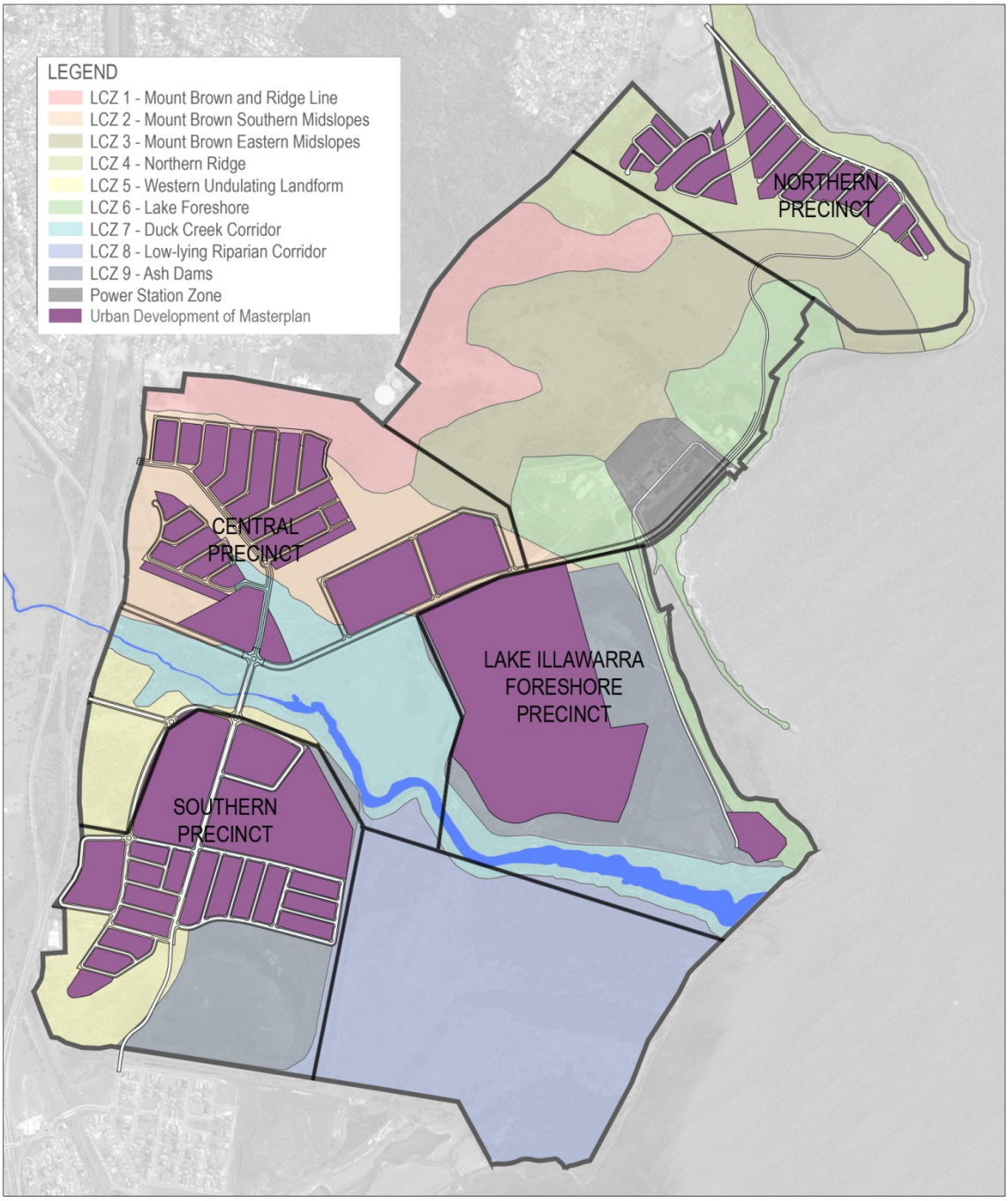

FIGURE 18 – MASTER PLAN PRECINCTS OVERLAID ON THE LANDSCAPE CHARACTER ZONES.

CENTRAL PRECINCT

The Central Precinct is located on the middle and lower slopes of Mt Brown, which have been extensively cleared for grazing, with some scattered remnant vegetation remaining. A single drainage line with constructed water storage ponds is located on the mid-slopes.

The Landscape Character Zones associated with this Precinct are summarised in the following table.

LANDSCAPE CHARACTER ZONE	GENERAL DESCRIPTION
LCZ 1 – Mount Brown and Ridge Line	- Mount Brown and ridge line which vary in aspect but generally to east and south. - Vegetation includes an endangered ecological community (ECC), exotics and weeds. - High elevation land with a high wind exposure, steep slopes and loamy fertile soils.
LCZ 2 – Mount Brown Southern Mid-slopes	- Slopes of Mount Brown, adjacent to Princes Highway that are predominantly southern aspect. - Vegetation includes exotics, weeds and extensive grazing land. - Mid elevation land with moderate wind exposure, moderate to gentle slopes and fertile clay soils.
LCZ 7 – Duck Creek Corridor	- Low elevation generally flat riparian zone adjoining Duck Creek. - Vegetation includes an endangered ecological community (ECC), exotics, weeds and some areas of grazing. - Generally protected from winds by trees, flat alluvial soils with high water table and restricted drainage.

The ecological assessment identified several vegetation communities within this Precinct, including:

- Acacia Scrub.
- Artificial Wetlands.
- Coastal Swamp Oak Forest (part of the EEC – Swamp Oak Floodplain Forest on the NSW North Coast, Sydney Basin and South East Corner Bioregions).
- Lowland Woollybutt-Melaleuca Forest (part of the EEC – Illawarra Lowlands Grassy Woodland of the Sydney Basin Bioregion).
- Weeds and Exotics.

Soil conditions within this Precinct include:

- *Mount Brown Loams* – slowly permeable with impeded drainage, posing a very high erosion hazard in their present condition with no free water or signs of salinity observed. No significant organic matter in the A_0 layer. Potential for high soil loss with high rainfall if de-vegetated.
- *Heavy Brown Clays* – moderately permeable with medium drainage, posing a slight erosion hazard under their present use. No organic matter in the A_0 layer. Potential for moderate soil loss if de-vegetated.
- *Light Yellow Brown Clays* – moderately permeable with free drainage, posing a moderate erosion hazard in their present condition. Contains no organic A_0 layer. Potential for high soil loss with high rainfall if de-vegetated.
- *Duck Creek Alluvium* – moderately permeable and moderately drained, posing a low erosion hazard under their present use. Contains no organic A_0 layer. Potential for continued soil loss by creek bank erosion.

LAKE ILLAWARRA FORESHORE PRECINCT

This Precinct is located within the low-lying depositional lands associated with Lake Illawarra and the Duck Creek. Much of the area is either cleared or contains weeds and exotics growth, associated with ash disposal areas and asbestos repository mound located in the Precinct.

The Landscape Character Zones associated with this precinct are summarised in the table below.

LANDSCAPE CHARACTER ZONE	GENERAL DESCRIPTION
LCZ 6 – Lake Foreshore	- Foreshore extending north from Duck Creek to a prominent ridge north of the Power Station; flat to gentle slopes with predominantly eastern aspect. - Vegetation includes an endangered ecological community (ECC), exotic species and weeds. - Low elevation land with a moderate to high exposure to wind along Lake edge, extensive alluvial soils with high water table and restricted drainage.
LCZ 7 – Duck Creek Corridor	- Low elevation flat riparian zone adjoining Duck Creek. - Vegetation includes native endangered ecological communities (ECC), exotics, weeds and some areas of grazing. - Generally protected from winds by trees, flat alluvial soils with high water table and restricted drainage.
LCZ 9 – Ash Dams	- Ash Dams 1 & 2 north of Duck Creek and adjacent Lake Illawarra. - Vegetation includes a native endangered ecological community (ECC), exotics and weeds. - Low elevation flat land generally protected from wind by tree cover - Ash deposits have thin or no topsoil cover.

The ecological assessment identified several vegetation communities within this Precinct, which include:

- Artificial Wetlands.
- Coastal Swamp Oak Forest (part of the EEC – Swamp Oak Floodplain Forest on the NSW North Coast, Sydney Basin and South East Corner Bioregions).
- Estuarine Alluvial Wetland.
- Floodplain Wetland (part of the EEC - Freshwater wetlands on Coastal Floodplains on the NSW North Coast, Sydney Basin and South East Corner Bioregions).
- Saltmarsh (part of the EEC – Coastal Saltmarsh of the Sydney Basin Bioregion).
- Weeds and Exotics.

Soil conditions within this precinct include:

- *Light Yellow Brown Clays* – moderately permeable with free drainage, posing a moderate erosion hazard in their present condition. It contains no organic A_0 layer and has high potential for soil loss during high rainfall events if de-vegetated.
- *Duck Creek Alluvium* – moderately permeable and moderately drained, posing a low erosion hazard under the current use. Contains no organic A_0 layer and has potential for continued soil loss by creek bank erosion.
- *Ash Dam Deposits.*

SOUTHERN PRECINCT

This Precinct is located within the low-lying riparian zone and flood plain associated with Duck Creek. The Haywards Bay residential development is located to the south. Creation of Ash Dam No. 3 has resulted in much of the area being cleared, although some regrowth is occurring. A number of artificial ponds are located within the Precinct.

The Landscape Character Zones associated with this Precinct are summarised in the table below.

LANDSCAPE CHARACTER ZONE	GENERAL DESCRIPTION
LCZ 5 – Western Undulating Landform	- Gently undulating landform adjacent to Princes Highway along western edge of the Site with predominantly eastern aspect. - Vegetation includes an endangered ecological community (ECC), exotics and weeds. - Low elevation, low wind exposure, moderate to gentle slopes and sandy clay soils.
LCZ 9 – Ash Dams	- Ash Dam 3 located inland south of Duck Creek. - Vegetation includes an endangered ecological community (ECC), exotics and weeds. - Low elevation flat land generally protected from wind by tree cover - Ash deposits have thin or no topsoil cover.

The ecological assessment identified several vegetation communities within this Precinct, which include:

- Acacia Scrub.
- Artificial Wetlands.
- Coastal Swamp Oak Forest (part of the EEC – Swamp Oak Floodplain Forest on the NSW North Coast, Sydney Basin and South East Corner Bioregions).
- Lowland Woollybutt-Melaleuca Forest (part of the EEC – Illawarra Lowlands Grassy Woodland of the Sydney Basin Bioregion).
- Saltmarsh (part of the EEC – Coastal Saltmarsh of the Sydney Basin Bioregion).
- Weeds and Exotics.

Soil conditions within this Precinct include:

- *Mottled Sandy Clays* – very low permeability with impeded drainage, posing a very low erosion hazard under their present use. Contains a shallow A_0 layer with a very low potential for soil loss.
- *Ash Dam Deposits* – very thin layer of organic soil over fly ash.

NORTHERN PRECINCT

This Precinct is located on the lower slopes of Mt Brown, which have been extensively cleared for grazing. Only scattered clumps of trees and shrubs remain. Two drainage lines with artificial water storage ponds are located on the slopes of this Precinct.

The Landscape Character Zone associated with this Precinct is summarised in the following table.

LANDSCAPE CHARACTER ZONE	GENERAL DESCRIPTION
LCZ 4 – Northern Ridge	- Upper and mid-slopes of Mount Brown, adjacent Koonawarra and Lake Illawarra; predominantly north-eastern aspect. - Vegetation includes endangered ecological communities (ECC), exotics, weeds and extensively grazed land. - Moderate to low elevation land with a moderate to high exposure to wind. - Gentle slopes and fertile clay soils.

The ecological assessment identified several vegetation communities within this Precinct, which include:

- Artificial Wetlands.
- Coastal Grassy Red Gum Forest (part of the EEC – Illawarra Lowlands Grassy Woodland of the Sydney Basin Bioregion).
- Coastal Swamp Oak Forest (part of the EEC – Swamp Oak Floodplain Forest on the NSW North Coast, Sydney Basin and South East Corner Bioregions).
- Moist Box-Red Gum Foothills Forest.
- Weeds and Exotics.

Soil conditions within this Precinct include:

- *Heavy Brown Clays* – moderately permeable with medium drainage, posing a slight erosion hazard under their present use. No organic matter in the A_0 layer. Potential for moderate soil loss if de-vegetated.
- *Light Yellow Brown Clays* – moderately permeable with free drainage, posing a moderate erosion hazard in their present condition. Contains no organic A_0 layer. Potential for high soil loss with high rainfall if de-vegetated.

3.0 Open Space Network

3.1 INTRODUCTION

An integrated network of public open spaces forms a key component of the Tallawarra Lands Mater Plan and includes:

- A central park adjoining the Neighbourhood centre that incorporates a playing field, other sports facilities, playground, amenities building and car parking.
- A regional cycling facility in open space adjoining the lake foreshore south of the power station.
- Other park areas within open spaces adjoining the proposed residential and employment development.
- Lake foreshore open space with recreation facilities.
- A network of pedestrian and cycle paths connecting the open space areas and providing circulation within them.
- Remnant vegetation conservation areas and riparian corridors with limited public access.

The Landscape Plan incorporates these open spaces and presents preliminary concept for each of them. The purpose of these individual open space plans is to illustrate the design intent and provide the basis for the more detailed design development that will follow.

The Open Space Concept Plans respond to the following Design Principles:

- Create a distinct sense of place – by using a combination of landform, view opportunities, existing vegetation, proposed planting, urban elements, signage and public art where appropriate.

- Promote a diversity of uses within the Open Space – to ensure the open space facilities are able to adapt over time to future changes in recreation demand and to ensure that a wide variety of user groups are catered for.

- Encourage social interaction – by using landscape elements to provide opportunities for both intentional and incidental social contact and interaction.

- Promote accessibility and connectivity – to ensure that open space resources can be easily accessed and moved through by all potential user groups. Refer to Section 4.0 – Circulation.

- Promote a healthy lifestyle – by ensuring that open space resources, such as pedestrian and cycle paths, are integrated into the urban environment and readily accessible to all sectors of the community.

- Aim for sustainability – by addressing environmental sustainability through WSUD and ecological principles, social sustainability with CPTED initiatives and economic sustainability throughout the Tallawarra Lands.

These Design Principles will also guide the future detailed design of individual open space areas through the implementation stage.

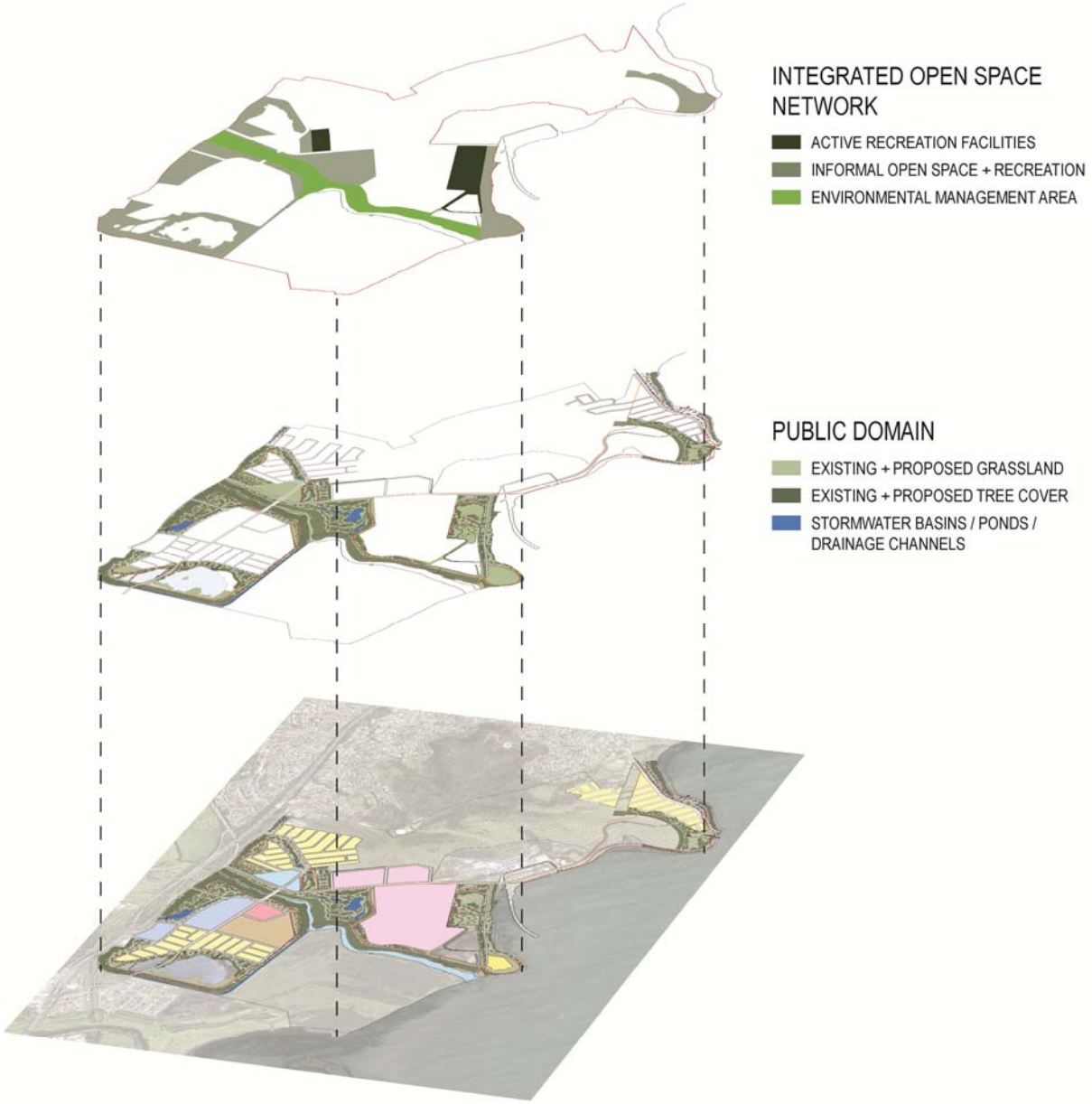

FIGURE 19 – OPEN SPACE NETWORK

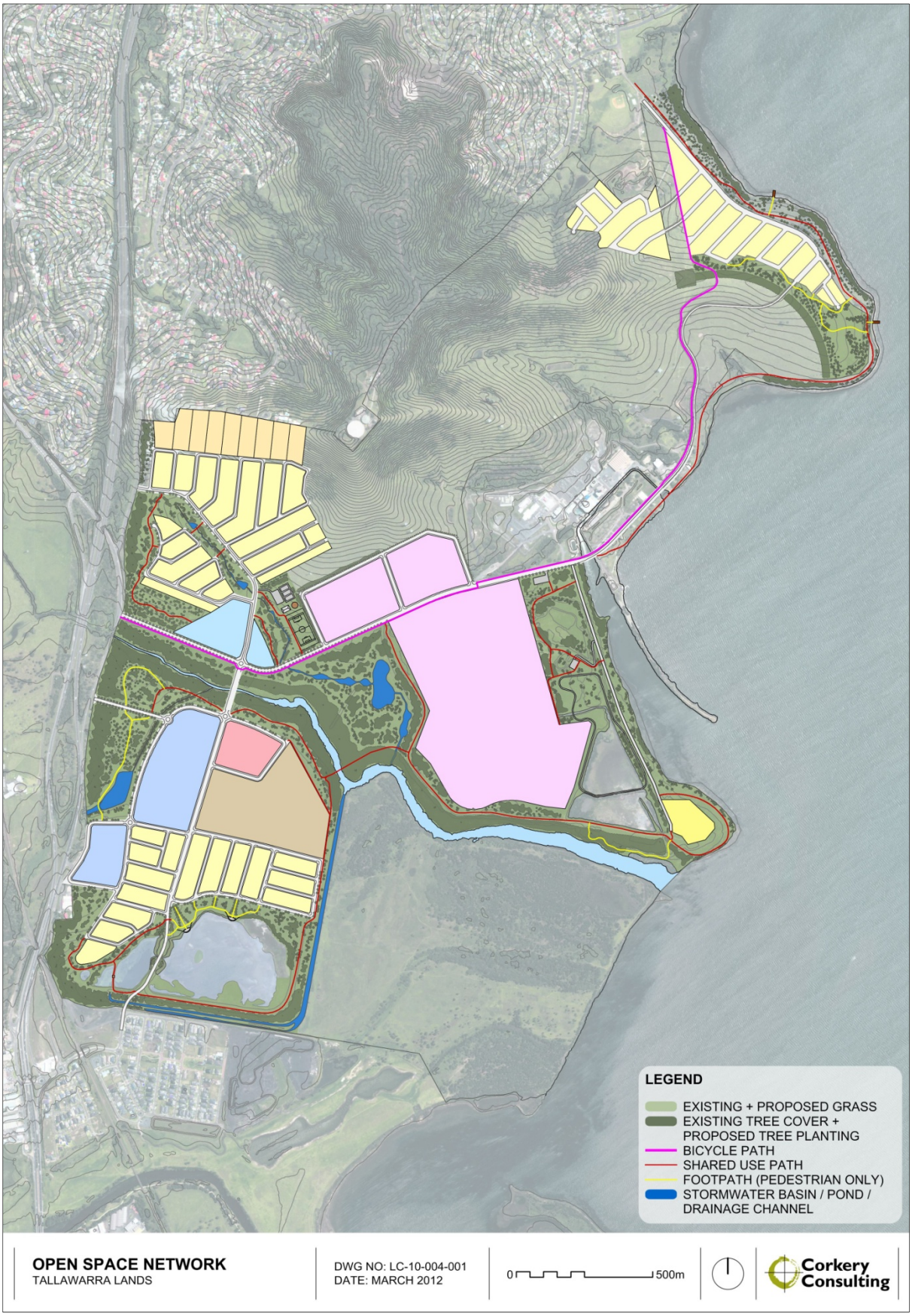

FIGURE 20 – THE OPEN SPACE NETWORK

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3.2 ECOLOGICAL VALUES

The ecological values identified within the open space network have been taken into account in preparing the landscape concepts for each individual open space area while keeping in mind their relation to the overall ecological values of the Tallawarra Lands.

The Vegetation Management Plan prepared by Eco Logical Australia provides the basis for management and restoration of remnant vegetation, including the Endangered Ecological Communities and Duck Creek corridor. As a result, the following management principles have been adopted in the planning and design of Open Spaces:

- Ecological Restoration of Duck Creek Corridor – revegetation works to protect, enhance and preserve creek corridor.
- Conservation of ponds located on the Site – either in current form or as a close resemblance.
- Revegetation works – edge treatments to waterways and site boundaries.
- Recreational activities – in open space along the interface within residential and employment lands while maintaining and enhancing ecological values.
- Control of noxious and environmental weeds – to prevent further degradation of vegetation communities.
- Water quality management – through infiltration and treatment systems to improve water quality within the ponds and along drainage lines flowing to Duck Creek.

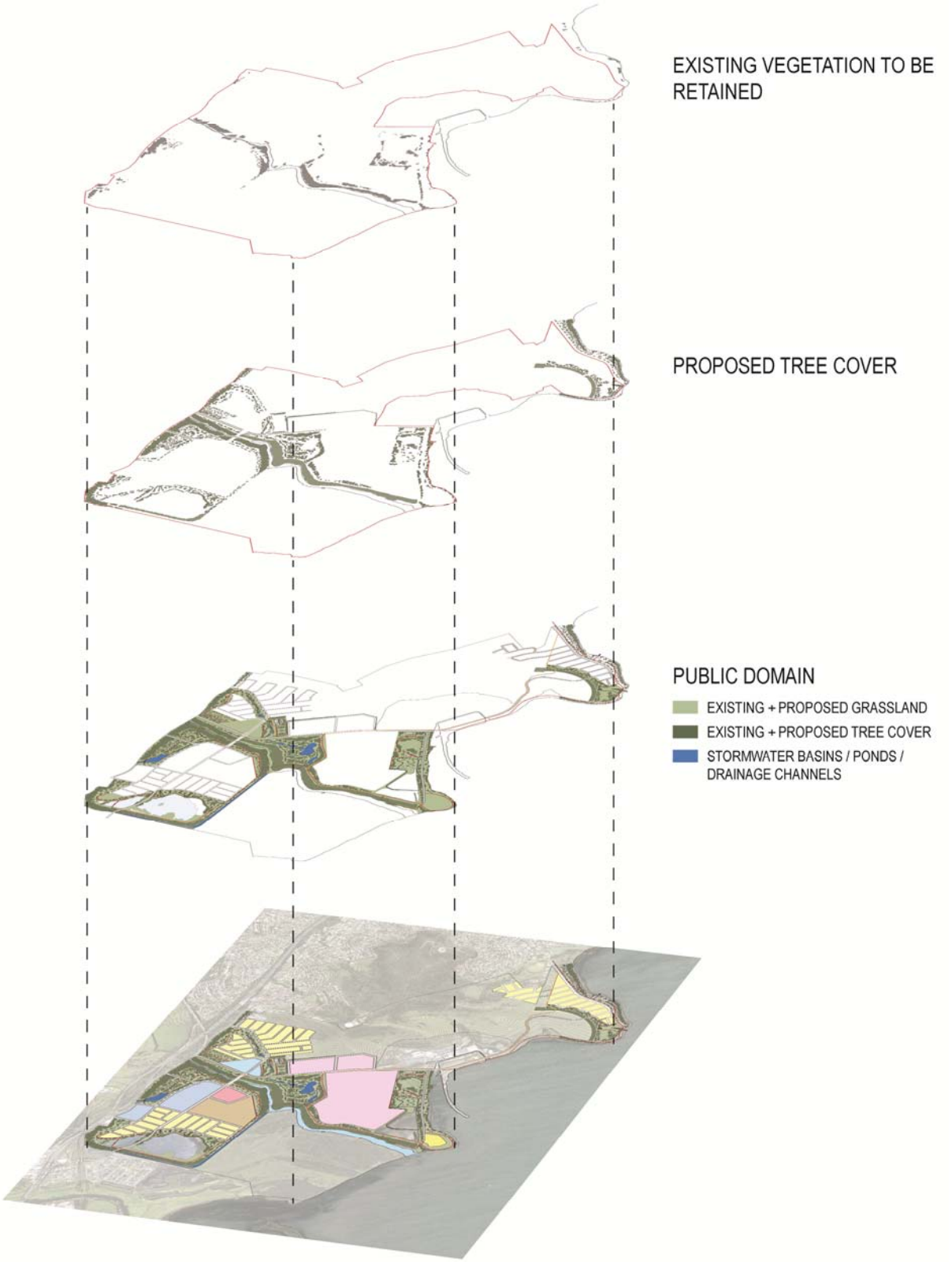


FIGURE 21 – EXISTING AND PROPOSED VEGETATION STRUCTURE

3.3 WATER SENSITIVE URBAN DESIGN

Water Sensitive Urban Design (WSUD) principles have been applied in preparing the Landscape Plan with the aim of achieving more sustainable stormwater management. The Landscape Plan aims to reduce flow rates and levels of pollution reaching natural watercourses and proposes the reuse of stormwater within the urban environment.

The following principles, which are reproduced from *Urban Stormwater: Best Practice Environmental Management Guidelines* (Victorian Stormwater Committee, 1999), have been applied to the Landscape Plan:

- Protecting natural systems (creeks, rivers and wetlands) within the catchments of urban proposed development.

- Improving the quality of stormwater runoff from urban development.

- Integrating stormwater treatment into the landscape by using systems that provide multiple benefits including water quality treatment, wildlife habitat, public open space, recreational and visual amenity.

- Reducing peak flows from development by on-site temporary storage measures (with potential for reuse) and minimising impervious areas.

- Reducing potable water demand by using stormwater as a resource through capture and reuse for non-potable purposes.

WSUD measures applied within the open space network include the installation of:

- Vegetated swales and filter strips.
- Bio-retention systems.
- Permeable pavements.
- Infiltration trenches and basins.
- Rainwater tanks.
- Landscape works that minimise irrigation water requirements.

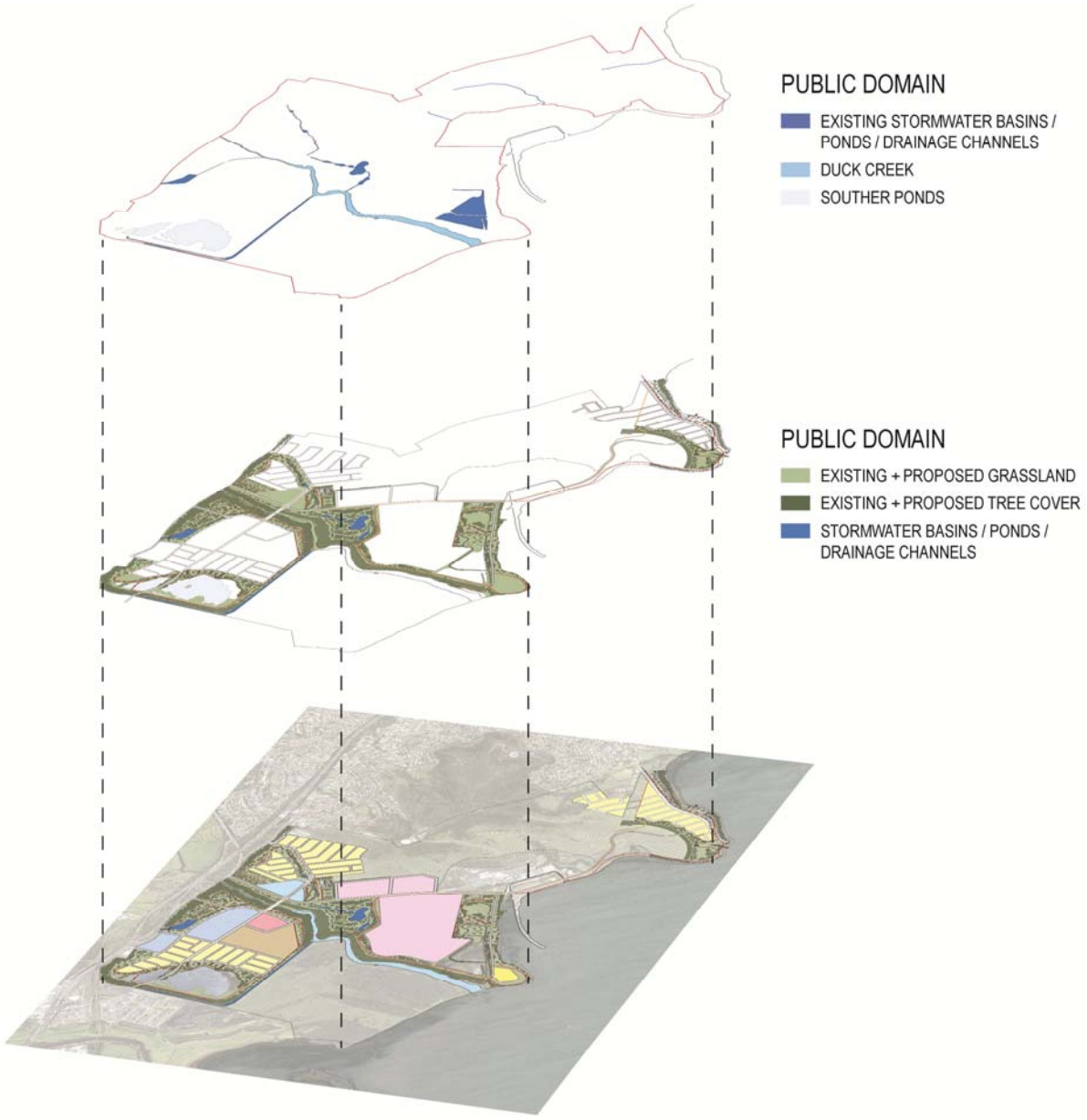


FIGURE 22 – EXISTING AND PROPOSED WATER RESOUCES MANAGEMENT

3.4 CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN

The following CPTED strategies, which have been adapted from The *Crime Prevention Through Environmental Design Guidelines* produced by the Queensland Government, are to be applied to the design of open spaces throughout the Tallawarra Lands.

CPTED STRATEGY	INITIATIVES FOR IMPLEMENTATION WITHIN OPEN SPACE
Surveillance	- Landscape treatment designed to maximise passive surveillance, increasing the opportunities to see and be seen. - Incorporate a compatible mix of spaces that attract a wide variety of people from the community, prolong the hours of use both day and night, and encourage movement between uses. - Locate active public uses to maximise the passive surveillance that such activity can provide. - Design public spaces to facilitate and encourage a range of community and individual activities. - Planting design to avoid 'blind spots' where the ability to see or be seen is reduced. - Lighting of paths and dwelling spaces to be designed to ensure appropriate surveillance and avoid glare and large shadows.
Legibility	- Open space resources to be designed to ensure they are easy to understand and navigate within. - Advantage to be taken of existing natural and man-made features to create landmarks that aid in navigation and way-finding. - A variety of open space to be designed so that each is individually recognisable. - Signage, maps, etc to be used to aid in way-finding, with signage located thoughtfully and logically, and that the signage itself is legible.
Territoriality	- Clearly convey boundaries between public open space and private property. - Encourage creative use of built and landscape features to define boundary lines, such as planting and material changes. - Ensure that the design of territorial features does not inhibit passive surveillance. - Avoid creating too many entrances / exits to and from open space resources.
Ownership	- Design to promote a sense of pride and ownership of open space resources within the local community. - Design for opportunities for social contact and interaction within open space resources. - Design for the needs and desires of as many community groups as possible to encourage a sense of shared ownership. - Involve the community in future management and enhancement works.
Management	- Design with high quality materials to ensure longevity in product life. - Implement management systems that cover such things as rubbish removal and regular maintenance. - Design with materials that have resistant finishes to minimise graffiti and/or vandalism. - Engage a variety of community and business groups for cooperative action in regards to maintenance and management issues.
Vulnerability	- Ensure that surveillance take places within potentially vulnerable places, such bus stops, etc. - Provide well-lit, active places for pedestrians and cyclists and avoid 'hidden' or distant spaces. - A variety of routes to and through spaces are to be provided where possible. - Design to minimise blind spots or places of concealment. - Design lighting to ensure appropriate surveillance and avoid glare and large shadows. - Utilise mechanical or active surveillance techniques when required.

3.5 OPEN SPACE LANDSCAPE CONCEPTS

The landscape concepts prepared for each open space provide for a variety of active and passive recreation opportunities that form an integrated network.

The selection of plant species within open space areas has focused on promoting biodiversity at both a regional and local scale as well as strengthening remnant vegetation communities.

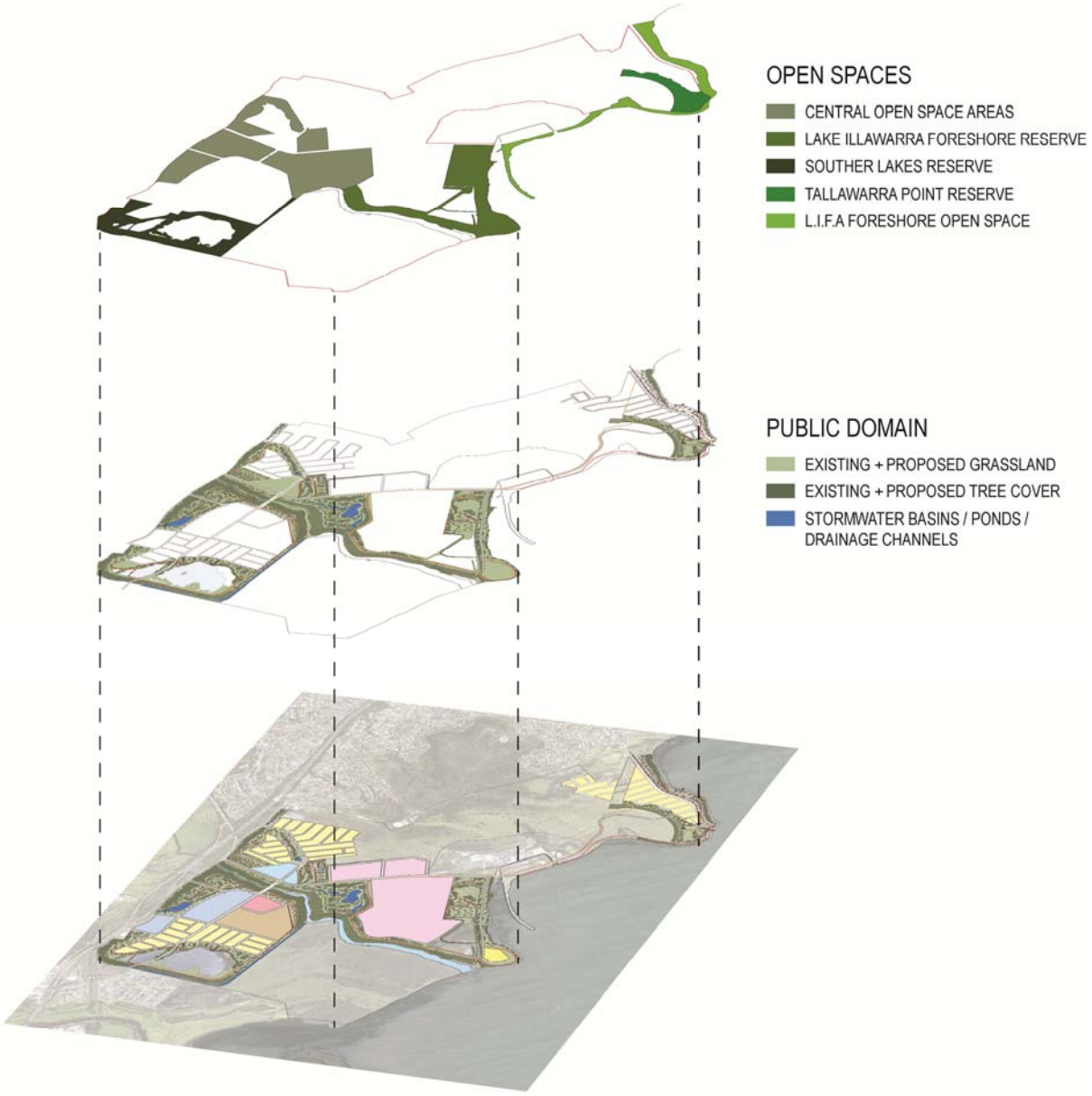


FIGURE 23 – OPEN SPACE COMPONENTS

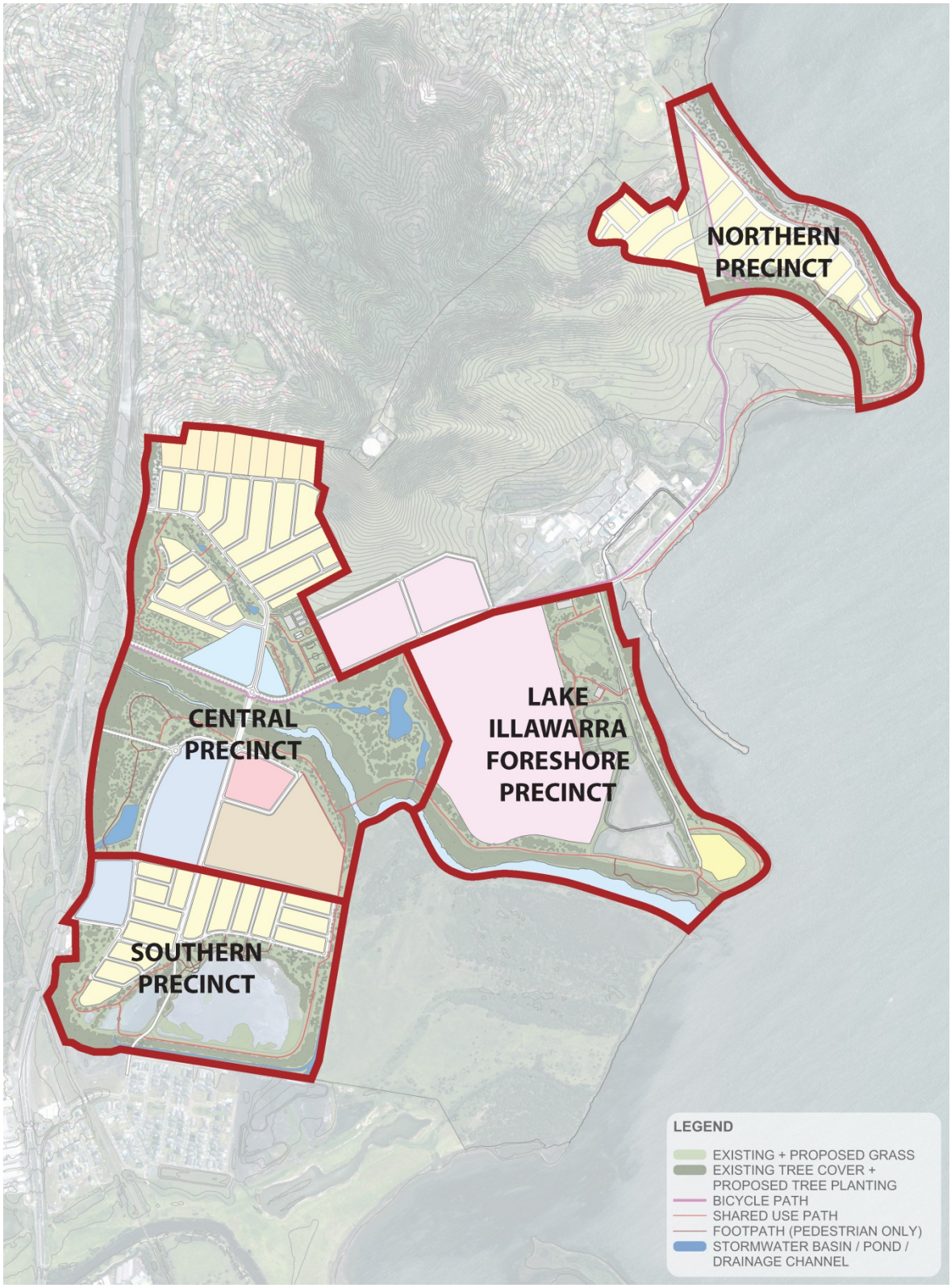
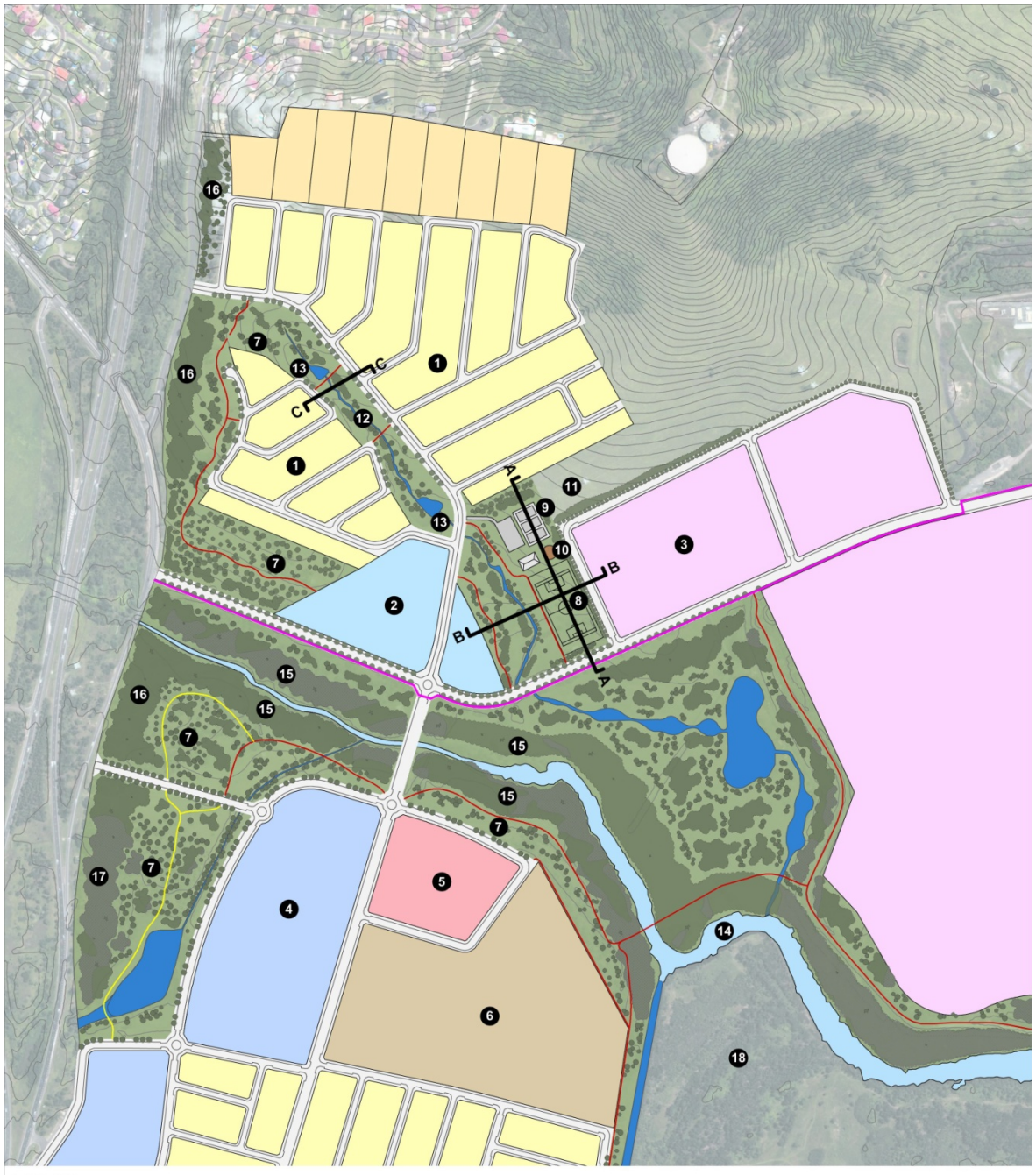


FIGURE 24 – THE OPEN SPACE PRECINCTS

3.5.1 CENTRAL PRECINCT OPEN SPACE AREAS



LEGEND

- EXISTING + PROPOSED GRASS
- EXISTING TREE COVER RETAINED
- PROPOSED TREE PLANTING
- BICYCLE PATH
- SHARED USE PATH
- FOOTPATH (PEDESTRIAN ONLY)
- STORMWATER BASIN / POND / DRAINAGE CHANNEL

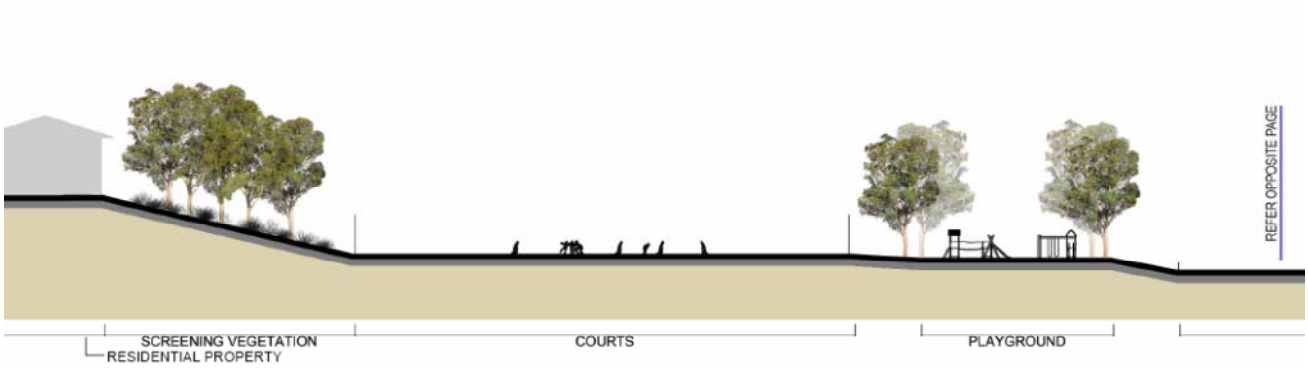
1 Central Residential Precinct
2 Neighbourhood Centre
3 Industrial Employment Precinct
4 Enterprise Employment Precinct
5 Primary School
6 Retirement Living
7 Informal recreation
8 Sports field
9 Netball courts
10 Amenities building and playground
11 Car park
12 Existing drainage line retained
13 Stormwater detention / sedimentation basin
14 Duck Creek
15 Duck Creek riparian corridor
16 Woodland screening vegetation
17 Lowland Woollybutt-Melaleuca Forest (ECC) retained
18 Environmental Management Area
19 Main Entry
20 Spine road

CENTRAL PRECINCT OPEN SPACE
TALLAWARRA LANDS

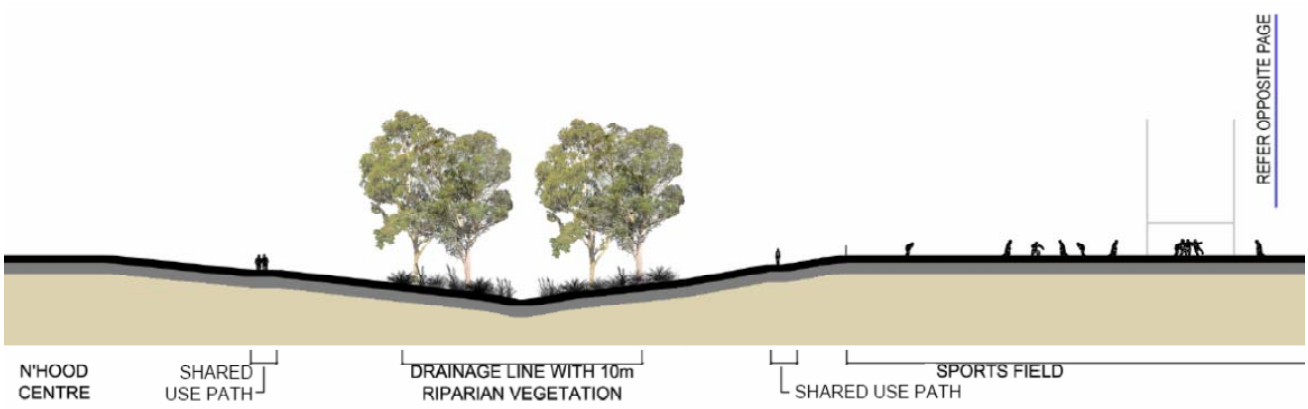
DWG NO: LC-10-004-002
DATE: MARCH 2012

0 250m

Corkery Consulting



SECTION AA



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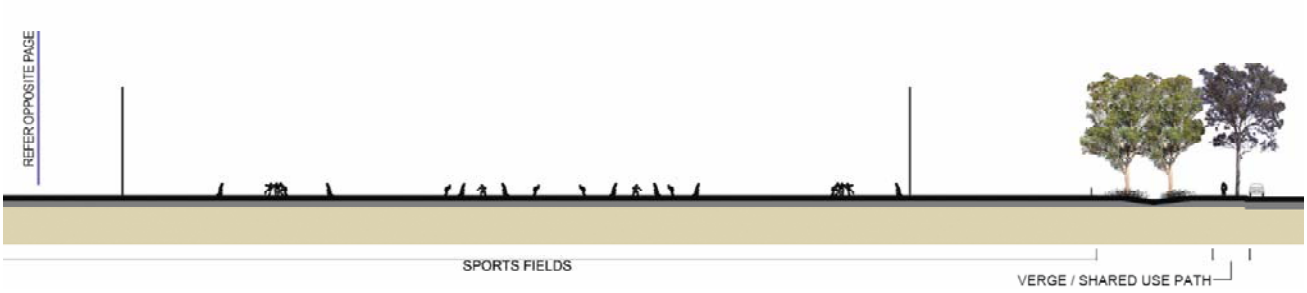
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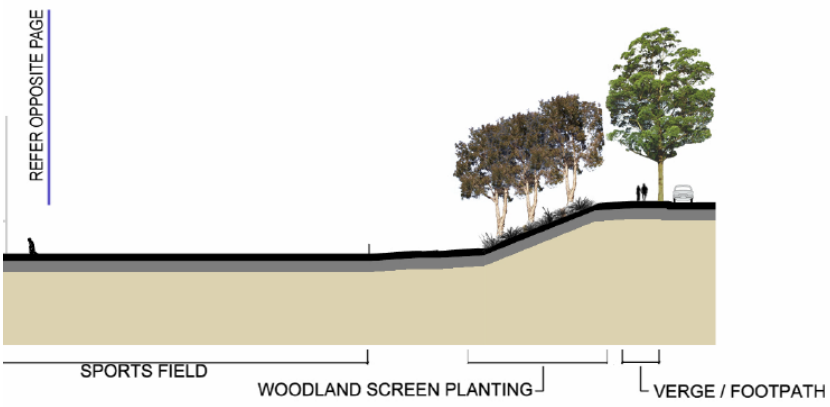
SPORTS FIELDS
VERGE / SHARED USE PATH


REFER OPPOSITE PAGE
SPORTS FIELD
WOODLAND SCREEN PLANTING
VERGE / FOOTPATH


REFER OPPOSITE PAGE
INFORMAL OPEN SPACE AND RECREATION
SHARED USE PATH
DRAINAGE LINE WITH 10m
RIPARIAN VEGETATION

SECTION CC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INFORMAL OPEN SPACE AND RECREATION
SHARED USE PATH

PLANTING STRATEGY

The landscape character within the open spaces and adjoining proposed development areas varies significantly throughout the Central Precinct. In response, the Precinct has been divided into a number of open space 'zones' so that the Planting Strategy can respond to the particular site conditions and the landscape design objectives for each 'zone'. These open space 'zones' are described in the table below and shown on Figure 25, with a schedule of recommended plant species for each zone presented on the subsequent page.

OPEN SPACE ZONE	SUMMARY DESCRIPTION	PLANTING STRATEGY
Zone 1 – North Western Boundary	North western extent of Tallawarra Lands site boundary Located on the lower slopes of Mount Brown Soils range from light and heavy brown clays to Duck Creek alluvium Good drainage	· Tree and understorey planting along boundary to reinforce screening from the adjoining Princes Highway · Planting along the boundary with residential properties is to be designed to create a 'nil hazard' for bushfire management · Encourage establishment of Endangered Ecological Community *Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion*
Zone 2 – Central Drainage Line	Existing drainage line to be retained in current form Located on the lower slopes of Mount Brown Soils range from light and heavy brown clays to Duck Creek alluvium Good drainage	· Provide recreation and amenity value to open space for adjoining residents · Planting along the boundary with residential properties is to be designed to create a 'nil hazard' for bushfire management
Zone 3 – Sports Field and Courts	Located at the base of Mount Brown slopes Connection to adjoining drainage line and Neighbourhood Centre is important Cut and fill required to construct the playing field	· Provide recreation and amenity value to open space for adjoining residents · Tree and understorey planting along eastern boundary to reinforce screening from the industrial commercial zone · Planting along the boundary with residential properties is to be designed to create a 'nil hazard' for bushfire management
Zone 4 – Stormwater Quality Ponds	Low-lying flood prone riparian land Duck Creek alluvium soils Restricted drainage	· Species selection to enhance ecological diversity adjoining Duck Creek corridor · Wetland planting to stormwater quality ponds · Tree planting is clumps
Zone 5 – Central Western Boundary	Central area of Tallawarra Lands project site boundary Remnant Lowland Woollybutt-Melaleuca Forest Light yellow brown clay soil Generally good drainage	· Remnant Lowland Woollybutt-Melaleuca Forest requires conservation and management of natural regeneration · Tree and understorey planting along boundary to reinforce screening from the adjoining Princes Highway
Zone 6 – Duck Creek Corridor	Adjoins revegetation of Duck Creek Corridor in accordance with Vegetation Management Plan recommendations (Eco Logical Australia 2010) Duck Creek alluvium soils Restricted drainage	· Tree planting to increase diversity within corridor

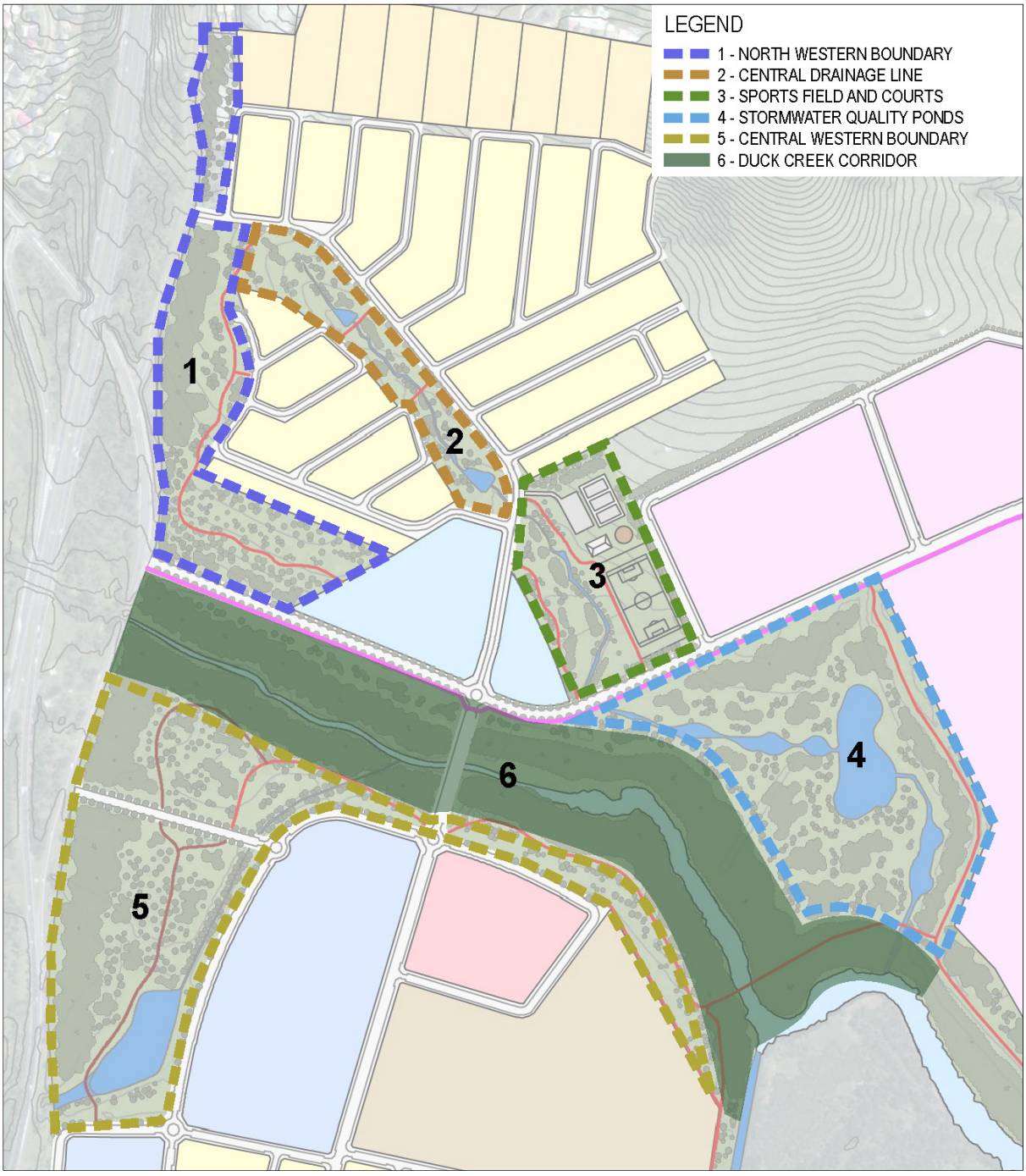


FIGURE 25 – OPEN SPACE ZONES WITHIN THE CENTRAL PRECINCT

PLANT SCHEDULE

BOTANICAL NAME	COMMON NAME	MATURE HEIGHT x WIDTH	ZONE					
			1	2	3	4	5	6
LARGE TREES								
Angophora floribunda	Rough-Barked Apple	20 x 9m	■			■		
Brachychiton acerifolium	Illawarra Flame Tree	20 x 8m	■		■		■	
Brachychiton populuneus	Kurrajong	15 x 8m	■		■		■	
Casuarina glauca	Swamp Oak	15 x 6m				■		
Corymbia maculata	Spotted Gum	25 x 9m	■	■	■		■	
Eucalyptus amplifolia	Cabbage Gum	25 x 9m	■				■	
Eucalyptus bosistoana	Coastal Grey Box	25 x 9m	■	■				
Eucalyptus botryoides	Bangalay	25 x 9m	■			■	■	
Eucalyptus eugenioides	Thin-leaved Stringybark	25 x 9m	■	■	■			
Eucalyptus longifolia	Woollybutt	20 x 9m	■	■	■		■	
Eucalyptus tereticornis	Forest Red Gum	20 x 9m	■	■	■	■	■	
Ficus macrophylla	Moreton Bay Fig	20 x 15m	■	■	■			
Glochidion sumatranum	Umbrella Cheese Tree	12 x 4m				■		
Livistona australis	Cabbage Tree Palm	15 x 3m		■				
Melia azederach	White Cedar	12 x 6m		■				
SMALL – MEDIUM TREES								
Acacia implexa	Hickory Wattle	10 x 4m	■					
Acacia mearnsii	Black Wattle	10 x 5m	■			■	■	
Acmena smithii	Lilly Pilly	10 x 5m	■	■	■	■	■	
Allocasuarina littoralis	Black She-Oak	8 x 5m	■	■				
Callistemon salignus	Willow Bottlebrush	6 x 4m	■	■	■		■	
Elaeocarpus reticulatis	Blueberry Ash	8 x 4m	■	■	■			
Glochidion ferdinandi	Cheese Tree	8 x 6m		■	■			
Melaleuca alternifolia	Tea Tree	6 x 4m		■		■	■	
Melaleuca decora	Feather Honey-Myrtle	6 x 4m	■	■	■	■	■	
Melaleuca ericifolia	Swamp Paperbark	4 x 3m		■		■	■	
Melaleuca quinquenervia	Broad-leaved Paperbark	8 x 4m		■		■	■	
Melaleuca styphellioides	Prickly-leafed Tea Tree	8 x 4m	■	■	■	■	■	
Rapanea variabilis	Muttonwood	8 x 4m	■	■	■			
Streblus brunonianus	Whalebone Tree	10 x 4m	■	■				
SHRUBS								
Acacia falcata	Falcate Wattle	3 x 2m	■	■	■	■	■	
Acacia stricta	Straight Wattle	3 x 2m		■	■			
Bursaria spinosa	Black Thorn	4 x 3m	■					
Daviesia ulicifolia	Bitter Pea	2 x 2m	■			■	■	
Dodonaea viscosa subsp. *angustifolia*	Sticky Hop-bush	3 x 2m	■				■	
Kunzea ambigua	Tick Bush	3 x 2m	■			■	■	
Ozothamnus diosmifolius	Rice Flower	2 x 2m	■				■	
Pultenaea retusa	Bush Pea	2 x 2m		■	■			
Pultenaea villosa	Bush Pea	2 x 2m		■	■			
GRASSES & GROUNDCOVERS								
Aristida vagans	Three Awn Grass	1 x 1m	■			■	■	
Carex appressa	Tall Sedge	1 x 1m		■	■			
Commelina cyanea	Native Wondering Jew	Prostrate	■			■	■	
Dianella longifolia	Flax-Lily	1 x 1m	■			■	■	
Dianella revoluta	Blue Flax-Lily	1 x 1m	■	■	■	■	■	
Dichondra repens	Kidney Weed	Prostrate	■			■	■	
Gahnia clarkei	Tall Saw-sedge	2 x 1m		■	■			
Goodenia hederacea subsp hederacea	Forest Goodenia	1 x 1m	■			■	■	
Imperata cylindrica	Blady Grass	1 x 1m	■			■	■	
Lomandra longifolia	Spiny-headed Mat Rush	1 x 1m		■	■			
Microlaena stipoides	Weeping Grass	0.7 x 0.7m	■				■	
Oplismenus imbecillis	Basket Grass	0.3 x 0.3m	■			■	■	
Paspalidium distans		0.7 x 0.7m	■				■	
Poa labillardieri	Large Tussock Grass	1 x 1m		■	■			
Themeda australis	Kangaroo Grass	1 x 1m	■	■	■	■	■	
SEDGES & RUSHES								
Baumea juncea	Twig-rush	1 x 1m		■		■	■	
Eleocharis sphacelata	Tall Spike-rush	2 x 2m		■		■		
Juncus kraussii	Sea Rush	1.5 x 1.5m		■		■	■	
Ficinia nodosa	Knobby Club-rush	1 x 1m		■		■		
Phragmites australis	Common Reed	5 x 2m		■		■	■	
Schoenoplectus validus	River Club-rush	3 x 2m		■		■		
Selliera radicans	Swamp Weed	Prostrate		■		■	■	

3.5.2 LAKE ILLAWARRA FORESHORE PRECINCT OPEN SPACE

LEGEND

- EXISTING + PROPOSED GRASS
- EXISTING TREE COVER RETAINED
- PROPOSED TREE PLANTING
- BICYCLE PATH
- SHARED USE PATH
- FOOTPATH (PEDESTRIAN ONLY)
- STORMWATER BASIN / POND / DRAINAGE CHANNEL

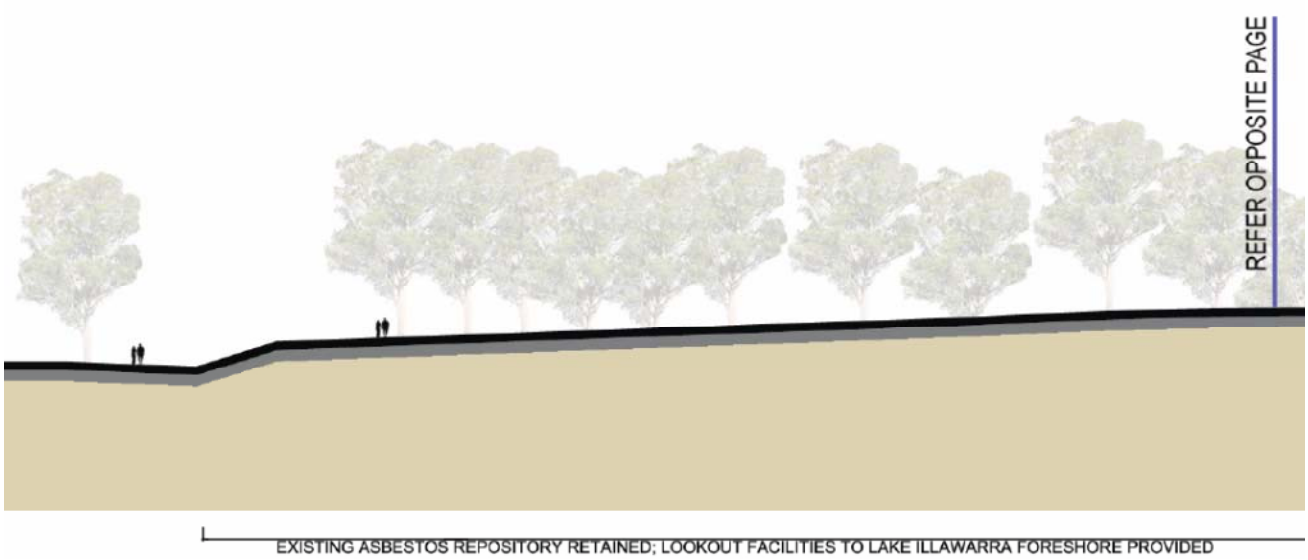
1 Industrial Employment Precinct
2 Tourism - TBC
3 Informal recreation
4 Criterium cycle track
5 Car park
6 Shared use path along existing access track
7 Existing settling ponds retained
8 Spectator mound for Criterium track
9 Lookout
10 Foreshore open space
11 Pedestrian trail with midden interpretive signage
12 Midden site
13 Spine road
14 Duck Creek

LAKE ILLAWARRA OPEN SPACE
TALLAWARRA LANDS

DWG NO: LC-10-004-003
DATE: MARCH 2012

0 200m

Corkery Consulting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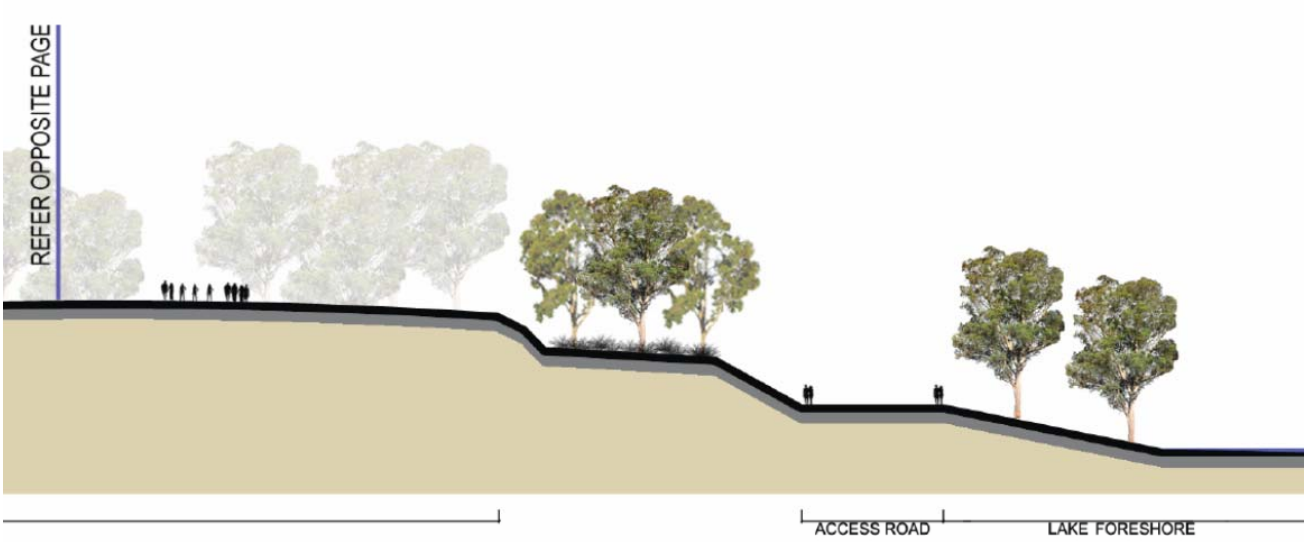
EXISTING ASBESTOS REPOSITORY RETAINED; LOOKOUT FACILITIES TO LAKE ILLAWARRA FORESHORE PROVIDED

SECTION AA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ACCESS ROAD
LAKE FORESHORE

PLANTING STRATEGY

The Lake Illawarra Foreshore Precinct stretches from Yallah Bay Road to the mouth of Duck Creek and includes both natural soil conditions and areas of ash disposal. As a result, a number of open space 'zones' have been identify to reflect the variation in growing conditions and proposed open space uses. These 'zones' are described below and illustrated on the following page. A schedule of species considered suitable for use in each 'zone' is presented on the subsequent page.

OPEN SPACE ZONE	SUMMARY DESCRIPTION	PLANTING STRATEGY
Zone 1 – Criterium Circuit and Surrounding Open Space	- Located on former ash dams - Asbestos repository mound in north west corner - Currently supports a high density of noxious weeds - Swamp Oak regrowth covers substantial areas - Drainage varies from fair to poor	- Provide recreation and amenity value to proposed criterium cycle circuit and surrounding open space areas - Enhance ecological diversity values
Zone 2 – Foreshore Open Space	- Currently supports a high density of noxious weeds - Contains small area of the Endangered Ecological Community *Coastal Saltmarsh* - Duck Creek alluvium soils - Drainage variable	- Provide recreation and amenity value to foreshore open space areas - Conservation and management of remnant *Coastal Saltmarsh* - Enhance ecological diversity values
Zone 3 – Duck Creek Corridor	- Adjoins revegetation of Duck Creek Corridor in accordance with Vegetation Management Plan recommendations (Eco Logical Australia 2010) - Subject to periodic flooding	- Tree planting to increase ecological diversity within corridor

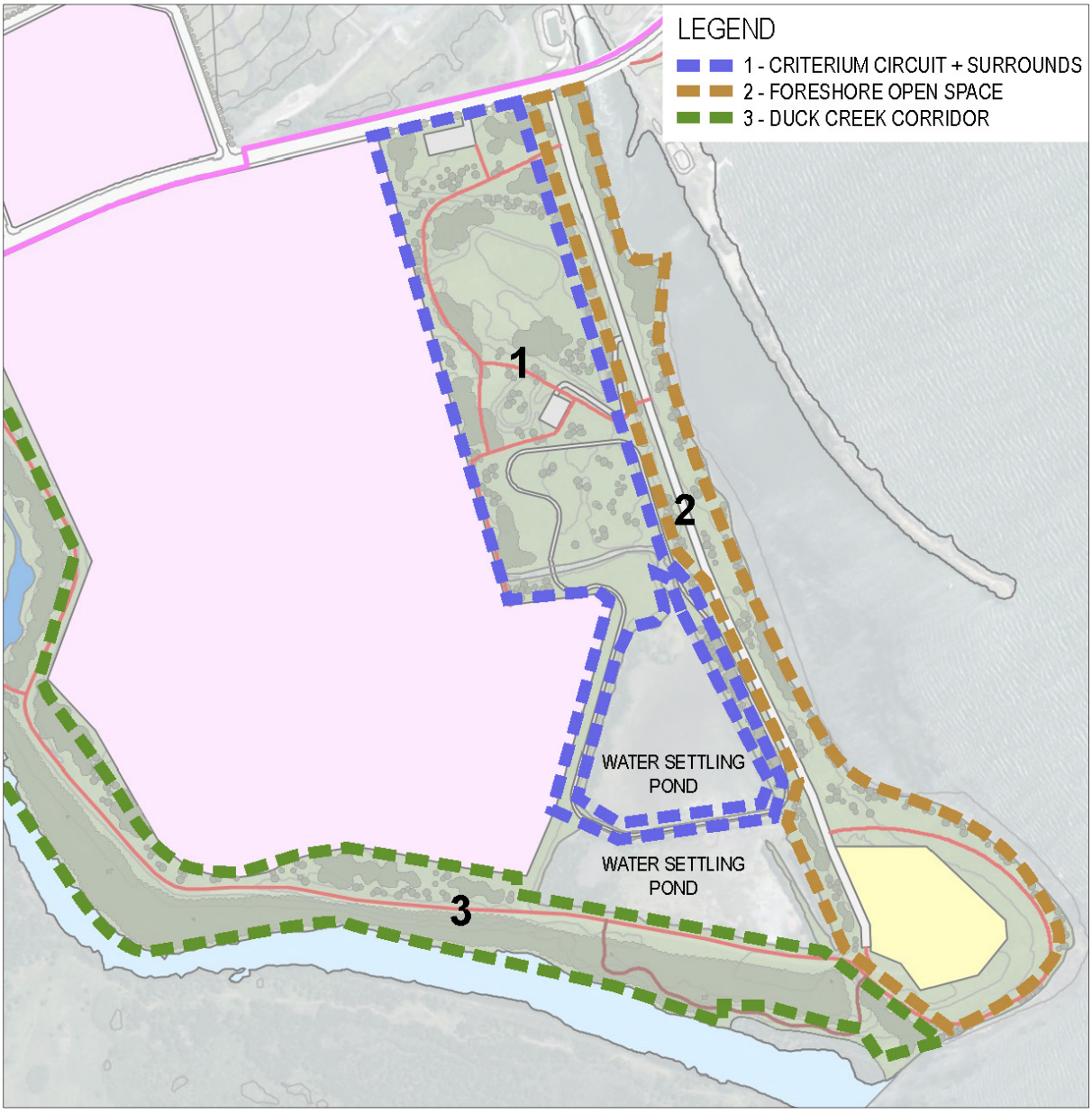


FIGURE 26 – OPEN SPACE ZONES WITHN THE LAKE ILLAWARRA FORESHORE PRECINCT

PLANT SCHEDULE

BOTANICAL NAME	COMMON NAME	MATURE HEIGHT x WIDTH	ZONE		
			1	2	3
LARGE TREES					
Acacia maidenii	Maiden's Wattle	14 x 6m		■	
Casuarina glauca	Swamp Oak	15 x 6m	■	■	
Corymbia maculata	Spotted Gum	25 x 9m	■	■	
Eucalyptus amplifolia	Cabbage Gum	25 x 9m		■	■
Eucalyptus botryoides	Bangalay	25 x 9m		■	■
Eucalyptus longifolia	Woollybutt	20 x 9m	■		
Eucalyptus resinifera subsp. *hemilampra*	Red Mahogany	20 x 9m	■		
Eucalyptus robusta	Swamp Mahogany	20 x 9m	■	■	■
Eucalyptus tereticornis	Forest Red Gum	20 x 9m	■	■	■
Livistona australis	Cabbage Palm	15 x 3m	■		
Lophostemon suaveolens	Swamp Turpentine	16 x 6m	■		■
SMALL – MEDIUM TREES					
Acacia irrorata	Green Wattle	10 x 5m	■		
Acmena smithii	Lilly Pilly	10 x 5m	■		■
Callistemon salignus	Sweet Willow Bottlebrush	6 x 4m	■	■	
Elaeocarpus reticulatus	Blueberry Ash	8 x 4m	■		■
Melaleuca alternifolia	Tea Tree	6 x 4m		■	
Melaleuca decora	Feather Honey-Myrtle	6 x 4m	■	■	■
Melaleuca ericifolia	Swamp Paperbark	4 x 3m	■	■	
Melaleuca quinquenervia	Broad-leaved Paperbark	8 x 4m			■
Melaleuca styphellioides	Prickly-leafed Tea Tree	8 x 4m	■		■
Rapanea variabilis	Mutton Wood	8 x 4m		■	
Streblus brunonianus	Whalebone Tree	10 x 4m		■	
SHRUBS					
Acacia falcata	Falcate Wattle	3 x 2m	■		■
Acacia longifolia	Golden Wattle	3 x 2m	■	■	
Daviesia ulicifolia	Bitter Pea	2 x 2m	■		■
Dodonaea triquetra	Large-leaf Hop-bush	2 x 2m	■	■	
Kunzea ambigua	Tick Bush	3 x 2m	■		■
Leptospermum polygalifolium	Tantoon	3 x 2m		■	
Melaleuca sieberi	Sieber's Paperbark	4 x 3m			■
Myoporum acuminatum	Boobialla	4 x 3m		■	
Ozothamnus diosmifolius	Rice Flower	2 x 2m			■
GRASSES & GROUNDCOVERS					
Aristida vagans	Three Awn Grass	1 x 1m	■		■
Carex appressa	Tall Sedge	1 x 1m	■		
Commelina cyanea	Native Wondering Jew	Prostrate			■
Dianella longifolia	Flax-Lily	1 x 1m	■	■	
Dianella revoluta	Blue Flax-Lily	1 x 1m		■	■
Dichondra repens	Kidney Weed	Prostrate	■		■
Entolasia marginata	Bordered Panic	1 x 1m	■		
Gahnia clarkei	Tall Saw-sedge	2 x 1m	■	■	■
Goodenia hederacea subsp hederacea	Forest Goodenia	1 x 1m			■
Hypolepis muelleri	Harsh Ground Fern	1 x 1m	■		
Imperata cylindrica	Blady Grass	1 x 1m	■		
Lomandra longifolia	Spiny-headed Mat Rush	1 x 1m	■	■	
Microlaena stipoides	Weeping Grass	0.7 x 0.7m		■	
Oplismenus imbecillis	Basket Grass	0.3 x 0.3m			■
Paspalidium distans		0.7 x 0.7m	■		
Poa labillardieri	Large Tussock Grass	1 x 1m	■	■	
Pteridium esculentum	Common Bracken	1 x 1m	■		
Themeda australis	Kangaroo Grass	1 x 1m	■	■	
Viola hederacea	Ivy-leafed Violet	Prostrate	■		
SEDGES & RUSHES					
Juncus kraussii	Sea Rush	1.5 x 1.5m	■		■
Selliera radicans	Swamp Weed	Prostrate	■		■

3.5.3 SOUTHERN PRECINCT OPEN SPACE

LEGEND

- EXISTING + PROPOSED GRASS
- EXISTING TREE COVER RETAINED
- PROPOSED TREE PLANTING
- BICYCLE PATH
- SHARED USE PATH
- FOOTPATH (PEDESTRIAN ONLY)
- STORMWATER BASIN / POND / DRAINAGE CHANNEL

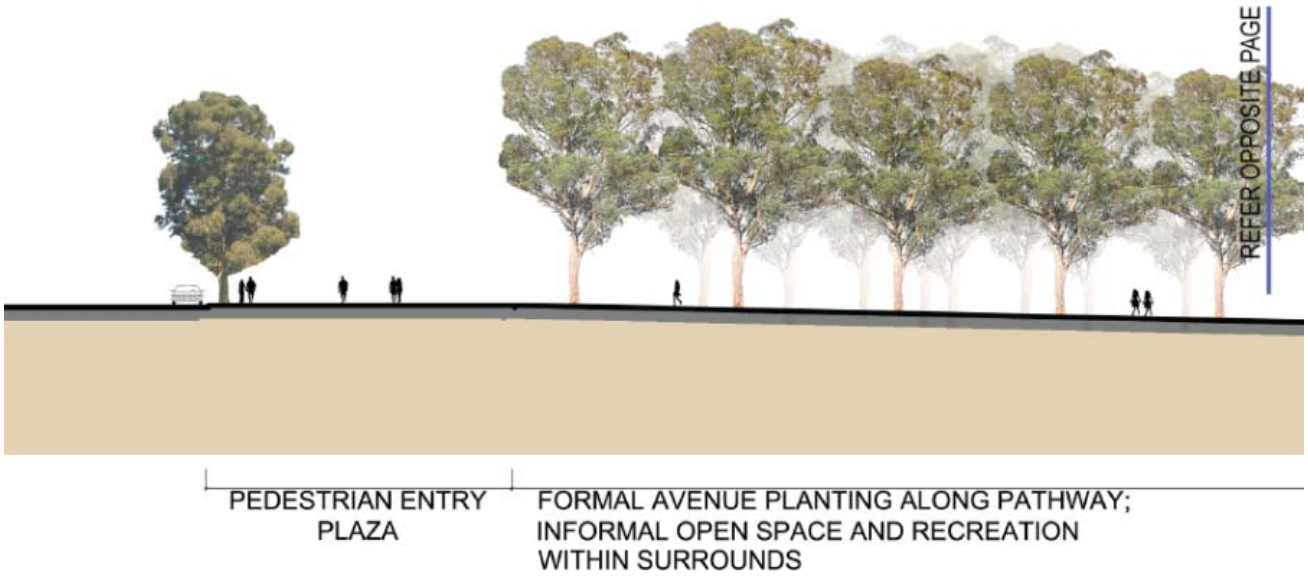
1 Southern Residential Precinct
2 Enterprise Employment Zone
3 Pedestrian entry plaza to open space
4 Informal recreation
5 Observation points
6 Ponds retained in current form
7 Saltmarsh retained
8 Environmental management area
9 Pond fringe planting
10 Vehicular, pedestrian and cycle access to Haywards Bay
11 Woodland screening vegetation
12 Viewing deck
13 Shared use path along top of existing levee
14 Haywards Bay

SOUTHERN PRECINCT OPEN SPACE
TALLAWARRA LANDS

DWG NO: LC-10-004-004
DATE: MARCH 2012

0 200m

Corkery Consulting



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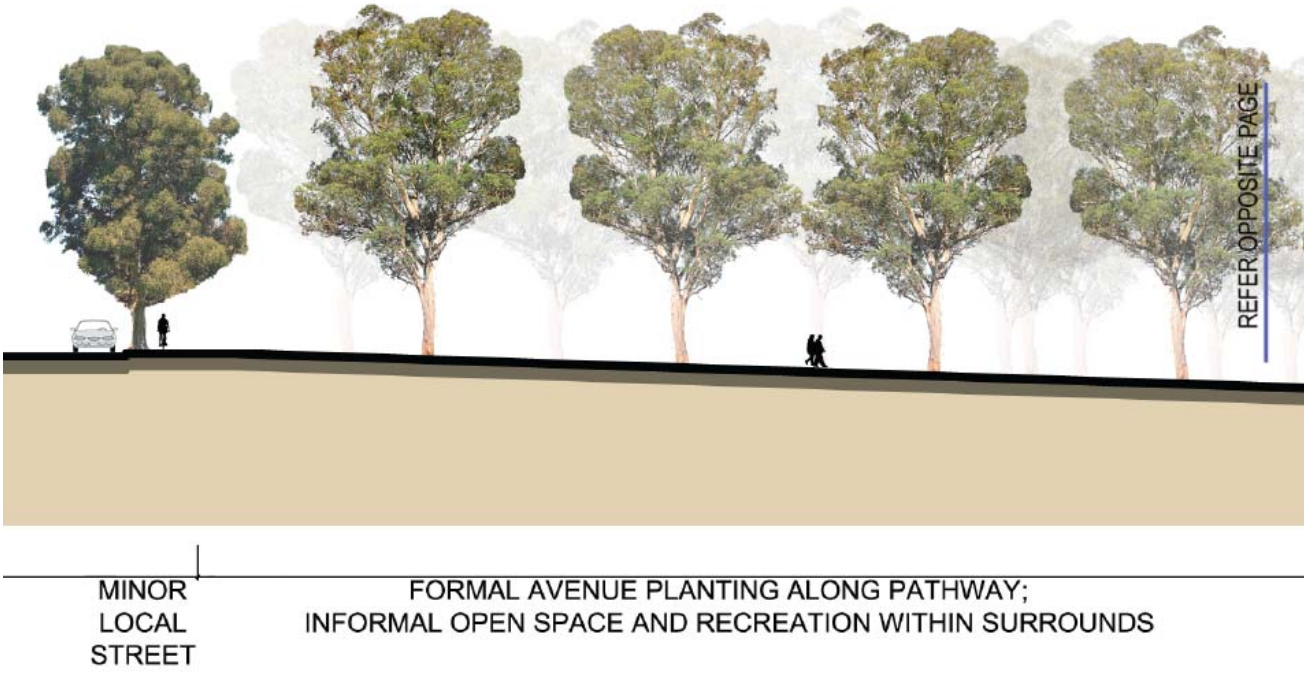

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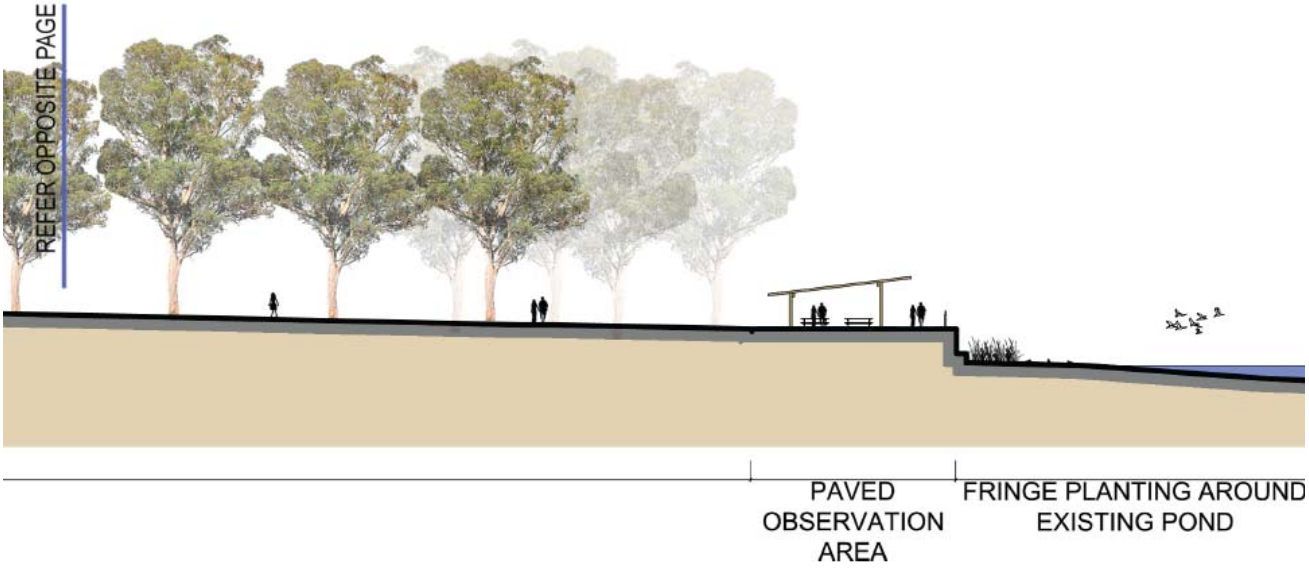
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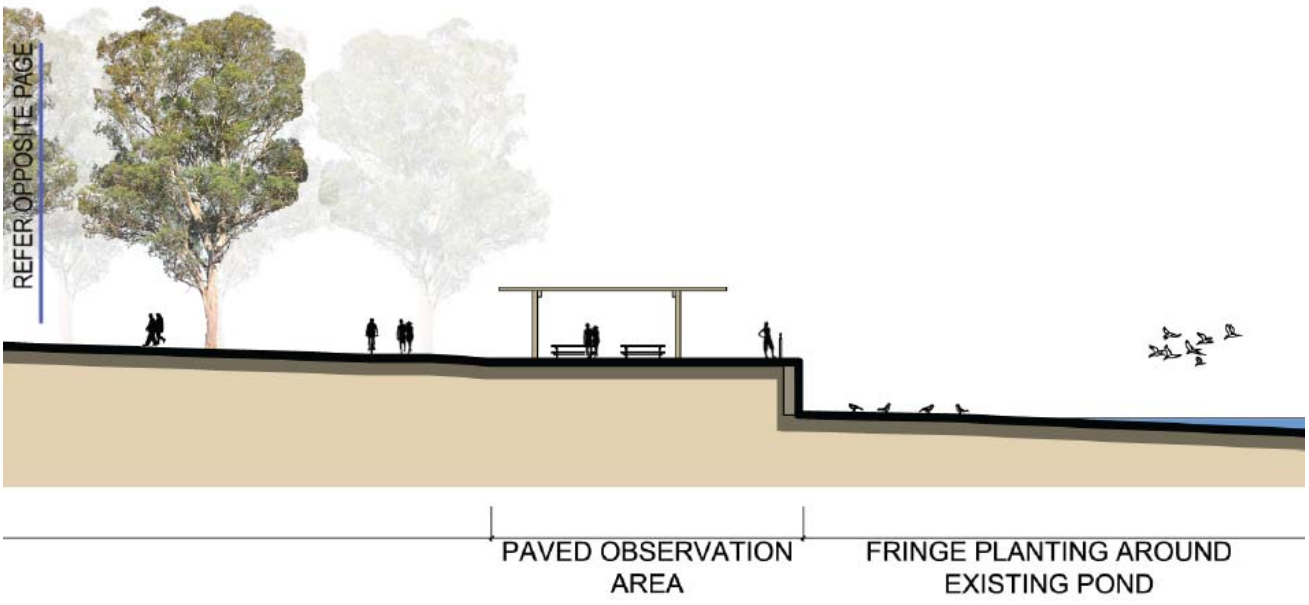
PAVED OBSERVATION AREA
FRINGE PLANTING AROUND EXISTING POND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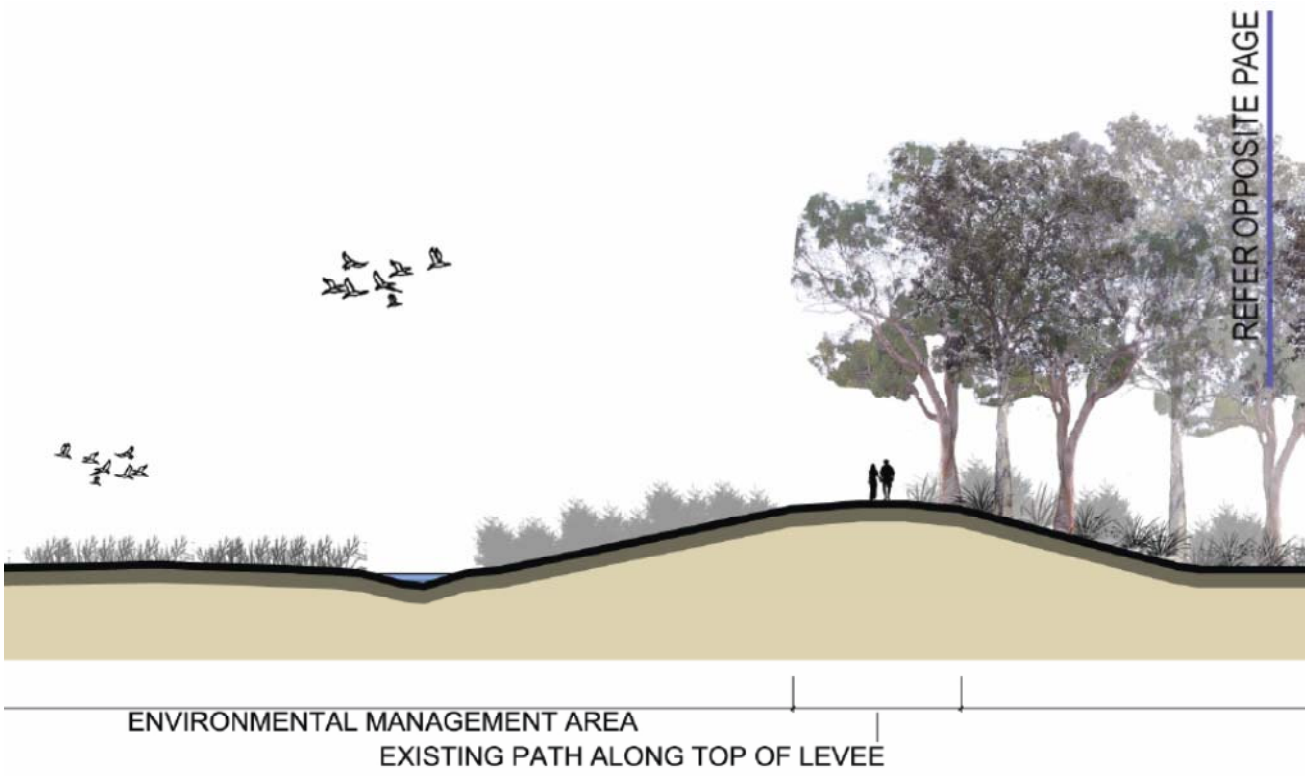
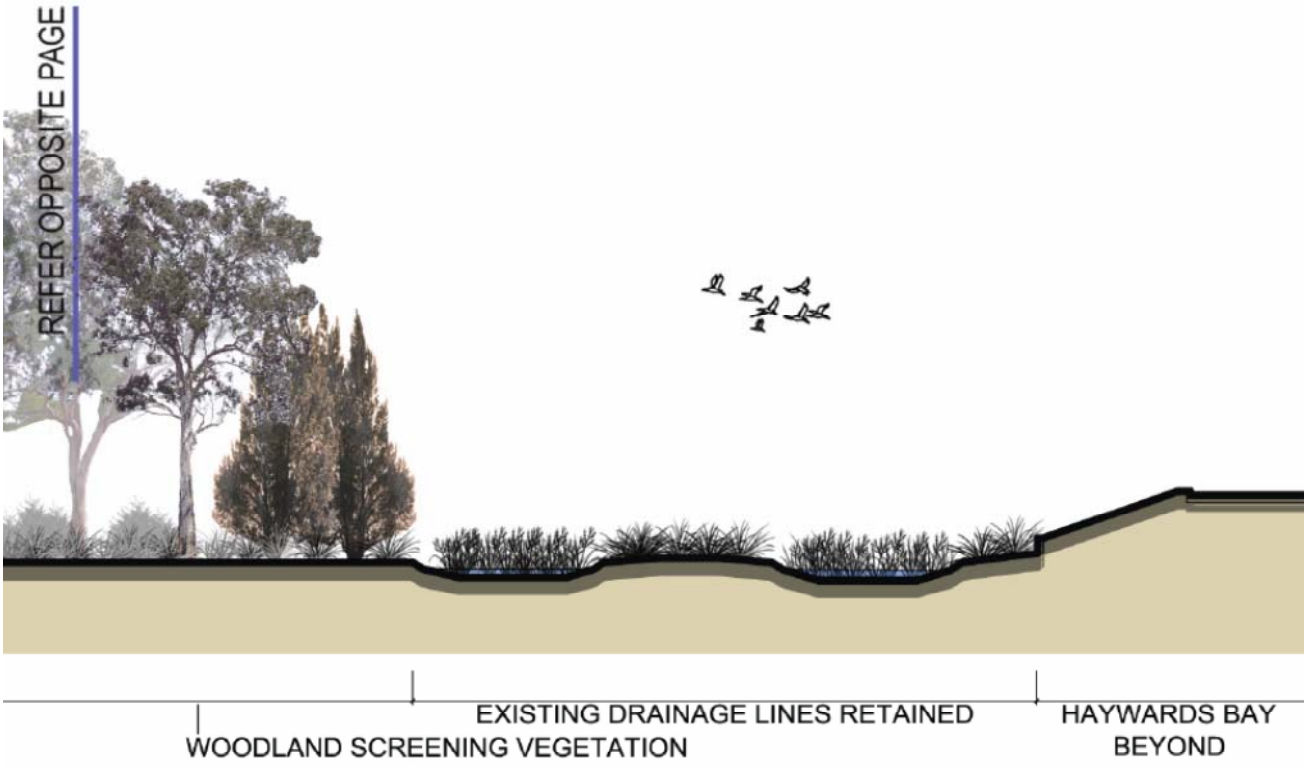
PAVED OBSERVATION AREA
FRINGE PLANTING AROUND EXISTING POND


REFER OPPOSITE PAGE
ENVIRONMENTAL MANAGEMENT AREA
EXISTING PATH ALONG TOP OF LEVEE

SECTION CC


REFER OPPOSITE PAGE
EXISTING DRAINAGE LINES RETAINED
HAYWARDS BAY
BEYOND
WOODLAND SCREENING VEGETATION

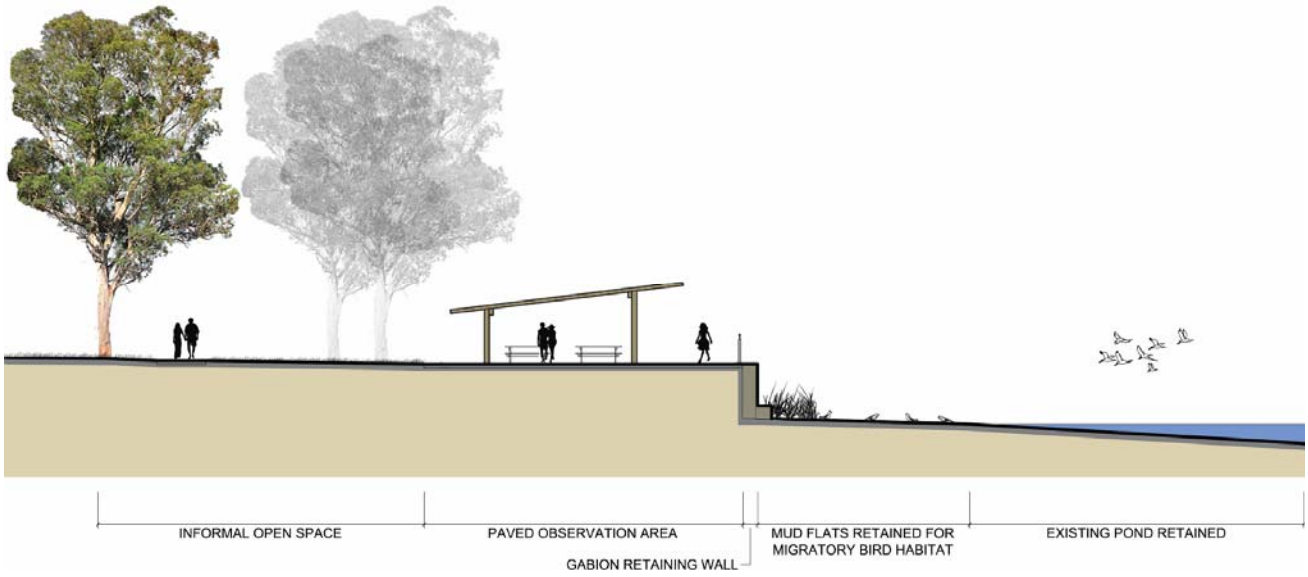
In order to minimise the potential disturbance of migratory birds using the lake as habitat the landscape concept provides for the creation of a range of edge treatments. The design objective is to allow limited public access to designated points from which the lake and birds can be observed from an elevated lookout area while precluding public access to other sections of lake edge.

Development of the three lake edger treatments will allow the ecological values of the existing lake to be protected while providing a distinctive experience in the adjoining open space and recreation areas. The lake edge treatments include:

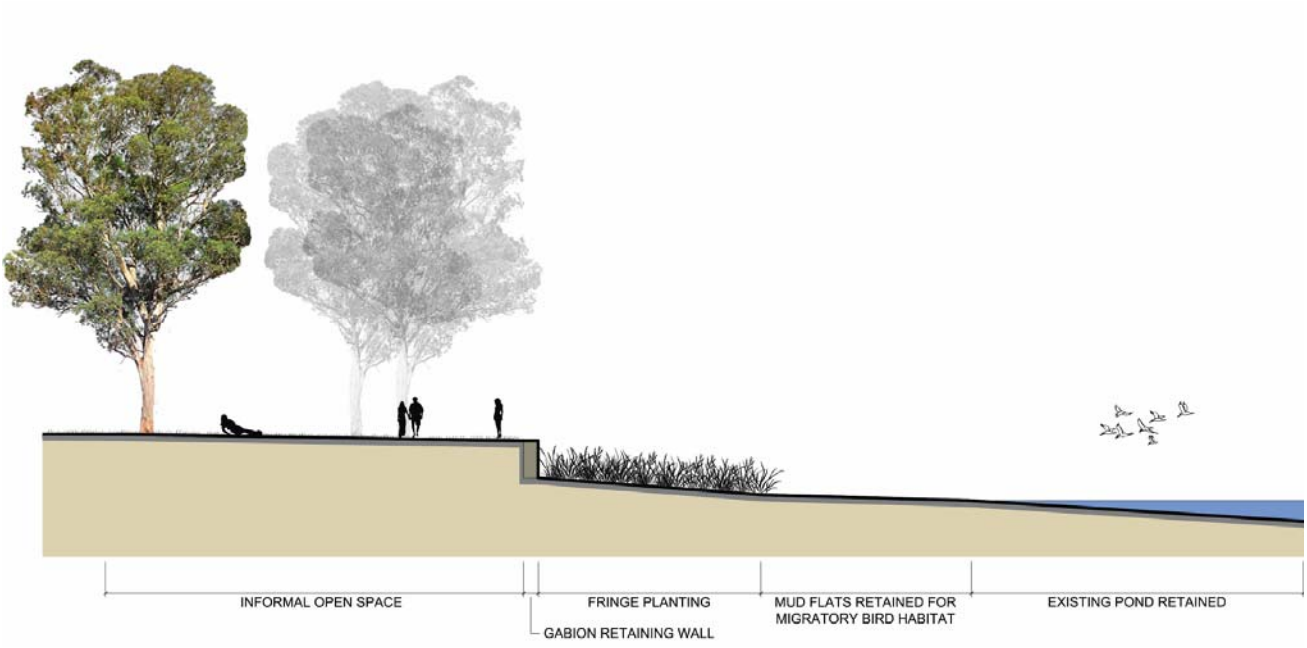
Edge Treatment 1 provides for the development of lookout points from which the water surface and mudflats of the lake can be observed. A gabion retaining wall will elevate viewers above the level of the mudflats will allow views of the lakes while minimising potential disturbance of the migratory birds.

Edge Treatment 2 provides for the creation of areas of turf above a strip of macrophyte planting around the lake edge. A gabion retaining wall will provide the necessary separation between the turf recreation areas and the mudflat habitat.

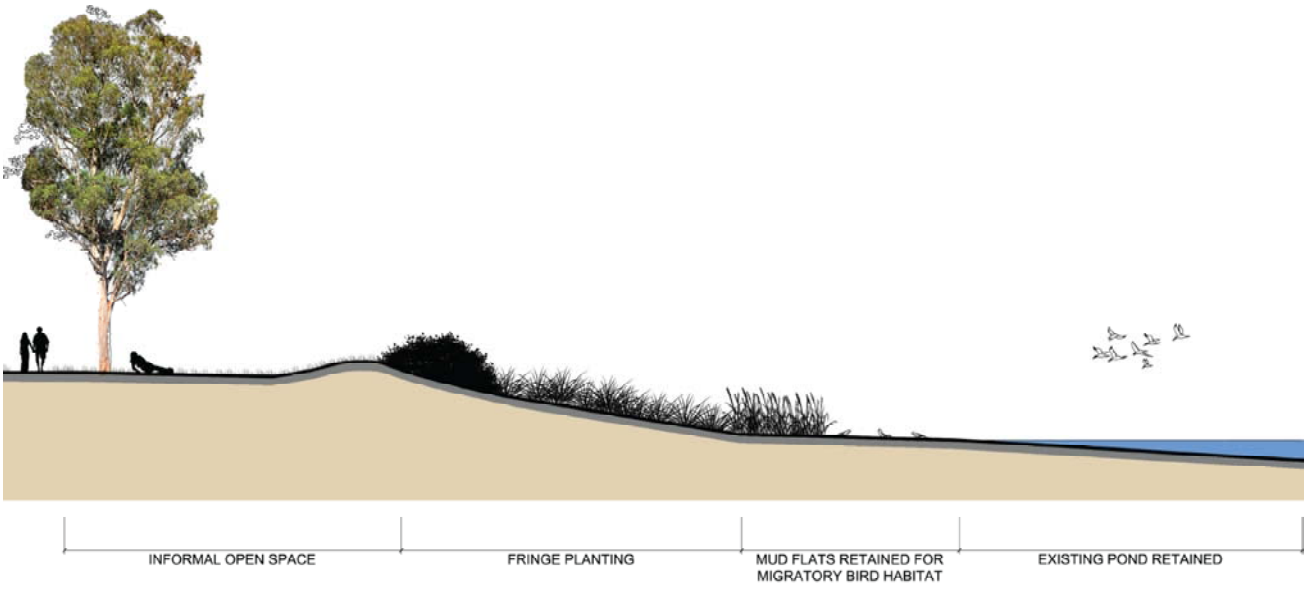
Edge Treatment 3 provides clear separation of recreation areas from ecological habitat values associated with the lake and mudflats. In this edge treatment planting will include shrubs along the top a mound to prevent pedestrian access to the mudflats along the lake edge and potential disturbance of the migratory birds.



EDGE TREATMENT 1



EDGE TREATMENT 2



EDGE TREATMENT 3

PLANTING STRATEGY

The Southern Precinct Open Space includes both natural soil conditions and extensive areas of ash deposition. As a result, a number of open space 'zones' have been identify within the Precinct that reflect particular site conditions and proposed land uses to ensure the planting strategy responds to particular site conditions. These 'zones' are described below and shown on Figure 27. A schedule of species suitable for use in each zone is presented on the subsequent page.

OPEN SPACE ZONE	SUMMARY DESCRIPTION	PLANTING STRATEGY
Zone 1 – South Western Boundary	- Undulating topography along western boundary of the Tallawarra project site - Sandy clay soils - Generally well drained	- Provide recreation and amenity value to open space areas - Tree and understorey planting along boundary to reinforce screening from the adjoining Princes Highway - Planting along the boundary with residential properties to be designed to create a 'nil hazard' for bushfire management
Zone 2 – Open Space Adjoining Ponds	- Located on former ash dams with moderately steep embankments adjoining the ponds	- Ponds in western portion to be retained for amenity and habitat value - Provide recreation and amenity value to open space areas - Planting along the boundary with residential properties to be designed to create a 'nil hazard' for bushfire management
Zone 3 – Drainage Line / Boundary Planting	- Levee embankment created as part of former ash dams - Existing drainage lines on outside of the levee to be retained	- Tree and understorey planting along southern boundary to screen drainage line and adjoining residential development
Zone 4 – Environmental Management Area	- Water body with adjoining mudflats and *Coastal Saltmarsh* - Designated revegetation zone	- Revegetation of pond fringe in accordance with Vegetation Management Plan recommendations (Eco Logical Australia 2010)

FIGURE 27 – OPEN SPACE ZONES OF THE SOUTHERN PRECINCT

PLANT SCHEDULE

BOTANICAL NAME	COMMON NAME	MATURE HEIGHT x WIDTH	ZONE			
			1	2	3	4
LARGE TREES						
Angophora floribunda	Rough-Barked Apple	20 x 9m	■	■	■	
Bracychiton populneus	Kurrajong	15 x 8m	■			
Casuarina glauca	Swamp Oak	15 x 6m		■	■	
Corymbia maculata	Spotted Gum	25 x 9m	■	■		
Eucalyptus amplifolia	Cabbage Gum	25 x 9m	■			
Eucalyptus bosistoana	Coastal Grey Box	25 x 9m	■	■	■	
Eucalyptus botryoides	Bangalay	25 x 9m	■	■	■	
Eucalyptus eugenioides	Thin-leaved Stringybark	25 x 9m	■		■	
Eucalyptus longifolia	Woollybutt	20 x 9m	■	■	■	
Eucalyptus robusta	Swamp Mahogany	20 x 9m		■	■	
Eucalyptus pilularis	Blackbutt	20 x 9m	■			
Eucalyptus tereticornis	Forest Red Gum	20 x 9m	■	■	■	
Glochidion sumatranum	Umbrella Cheese Tree	12 x 4m	■	■		
Livistona australis	Cabbage Tree Palm	15 x 3m	■			
SMALL – MEDIUM TREES						
Acacia implexa	Hickory Wattle	10 x 4m	■		■	
Acacia mearnsii	Black Wattle	10 x 5m	■			
Allocasuarina littoralis	Black She-Oak	8 x 5m	■	■		
Callistemon salignus	Willow Bottlebrush	6 x 4m	■	■		
Melaleuca decora	Feather Honey-Myrtle	6 x 4m	■	■	■	
Melaleuca ericifolia	Swamp Paperbark	4 x 3m			■	
Melaleuca quinquenervia	Broad-leaved Paperbark	8 x 4m			■	
Melaleuca styphellioides	Prickly-leafed Tea Tree	8 x 4m	■	■		
SHRUBS						
Acacia falcata	Falcate Wattle	3 x 2m	■	■	■	
Acacia stricta	Straight Wattle	3 x 2m		■	■	
Bursaria spinosa	Black Thorn	4 x 3m	■			
Daviesia ulicifolia	Bitter Pea	2 x 2m	■	■		
Dodonaea viscosa subsp. *angustifolia*	Sticky Hop-bush	3 x 2m	■	■		
Kunzea ambigua	Tick Bush	3 x 2m	■			
Ozothamnus diosmifolius	Rice Flower	2 x 2m	■	■		
GRASSES & GROUNDCOVERS						
Aristida vagans	Three Awn Grass	1 x 1m	■	■		
Carex appressa	Tall Sedge	1 x 1m		■	■	
Commelina cyanea	Native Wandering Jew	Prostrate	■			
Dianella longifolia	Flax-Lily	1 x 1m	■	■		
Dianella revoluta	Blue Flax-Lily	1 x 1m	■	■	■	
Dichondra repens	Kidney Weed	Prostrate	■			
Gahnia clarkei	Tall Saw-sedge	2 x 1m		■	■	
Goodenia hederacea subsp hederacea	Forest Goodenia	1 x 1m	■			
Hardenbergia violacea	False Sarsaparilla	0.5 x 0.5m		■		
Hypolepis muelleri	Harsh Ground Fern	0.5 x 0.5m		■		
Imperata cylindrica	Blady Grass	1 x 1m	■			
Lomandra longifolia	Spiny-headed Mat Rush	1 x 1m	■	■	■	
Microlaena stipoides	Weeping Grass	0.7 x 0.7m	■			
Oplismenus imbecillis	Basket Grass	0.3 x 0.3m	■			
Paspalidium distans		0.7 x 0.7m	■	■		
Persicaria decipiens	Slender knotweed	1 x 1m		■		
Poa labillardieri	Large Tussock Grass	1 x 1m	■	■	■	
Themeda australis	Kangaroo Grass	1 x 1m	■	■	■	

3.5.4 NORTHERN PRECINCT OPEN SPACE

LEGEND

- EXISTING + PROPOSED GRASS
- EXISTING TREE COVER RETAINED
- PROPOSED TREE PLANTING
- BICYCLE PATH
- SHARED USE PATH
- FOOTPATH (PEDESTRIAN ONLY)
- STORMWATER BASIN / POND / DRAINAGE CHANNEL

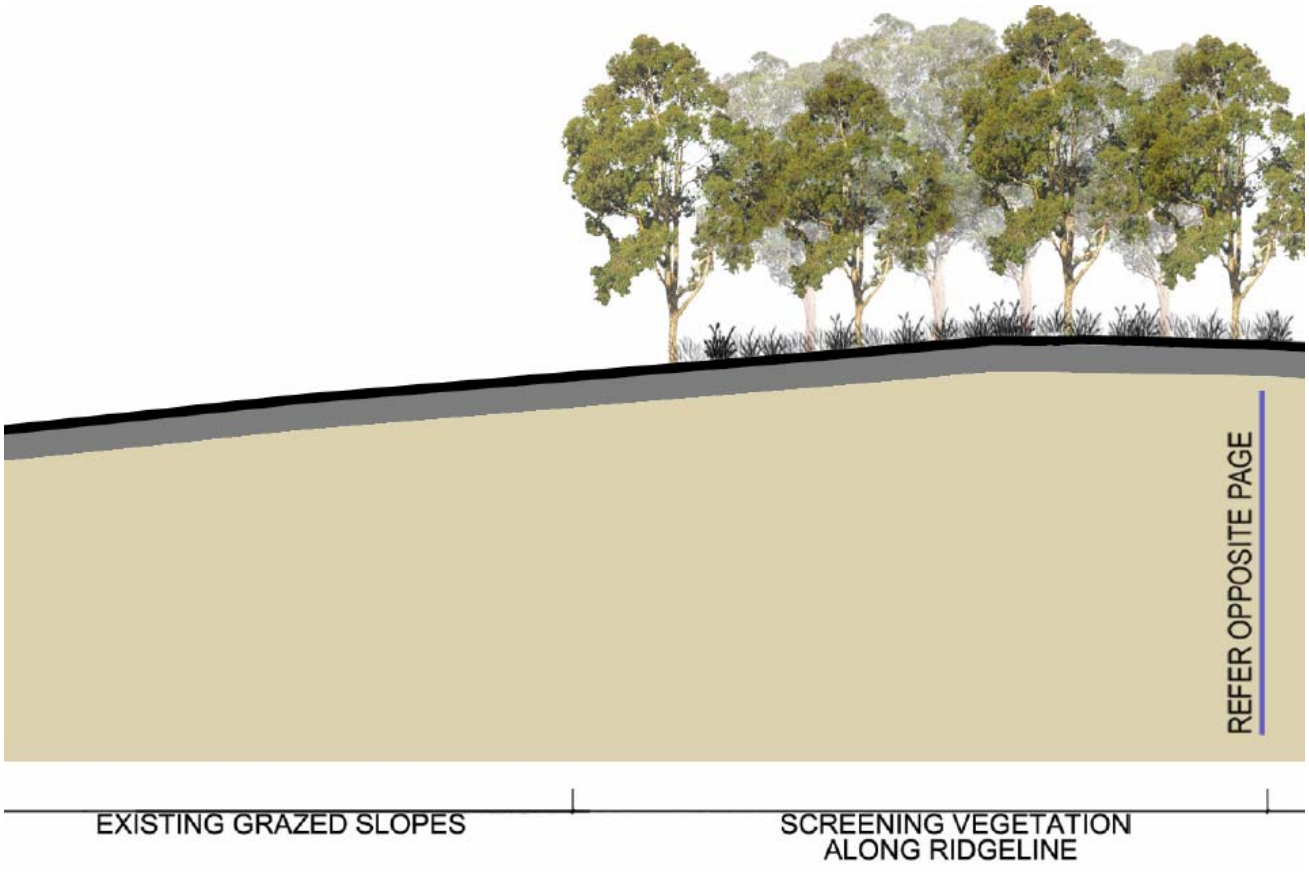
1 Northern Residential Precinct
2 Lookout with BBQ / picnic facilities
3 Foreshore open space with scattered planting
4 Jetty proposed by Foreshore Masterplan
5 Woodland habitat + screening planting
6 Shared pedestrian/cycle path along foreshore
7 Connection to Koonawarra and beyond
8 Existing Gilba Road Reserve retained
9 High voltage power line easement
10 Dense tree planting by Lake Illawarra Foreshore Authority Masterplan
11 Northern Access Road
12 Cycle path

NORTHERN PRECINCT OPEN SPACE
TALLAWARRA LANDS

DWG NO: LC-10-004-005
DATE: MARCH 2012

0 200m

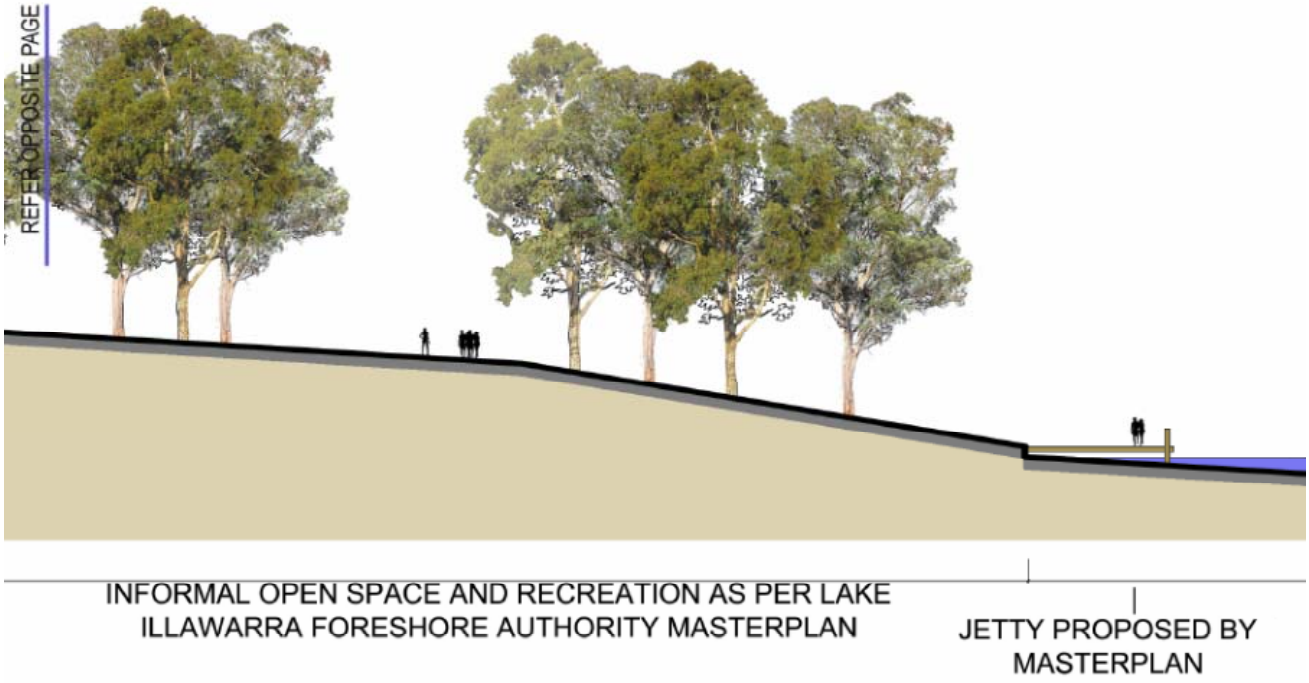
Corkery Consulting



SECTION AA

SECTION BB


REFER OPPOSITE PAGE
SHARED PATH THROUGH OPEN SPACE
RESIDENTIAL PROPERTY


REFER OPPOSITE PAGE
INFORMAL OPEN SPACE AND RECREATION AS PER LAKE ILLAWARRA FORESHORE AUTHORITY MASTERPLAN
JETTY PROPOSED BY MASTERPLAN


REFER OPPOSITE PAGE
LOOKOUT AREA WITH BBQ & PICNIC FACILITIES

SECTION CC


REFER OPPOSITE PAGE
INFORMAL OPEN SPACE & RECREATION WITH SHARED USE PATH ALONG FORESHORE
LAKE
ILLAWARRA

PLANTING STRATEGY

The Northern Precinct includes predominantly natural soil conditions with minimal fill material present. A number of open space 'zones' have been identify to reflect particular growing conditions and proposed open space uses. These 'zones' are described below and shown on Figure 28 on the following page. A schedule of species recommended for use in each zone is presented on the subsequent page.

OPEN SPACE ZONE	SUMMARY DESCRIPTION	PLANTING STRATEGY
Zone 1 – Northern Ridgeline	- Predominantly cleared grazing land - Exposed midslopes of Mt Brown - Heavy brown clay soils - Well drained	- Tree and understorey planting along ridgeline adjoining residential property to provide a wildlife habitat corridor and visual screening of Tallawarra Power Station - Planting along the boundary with residential properties to be designed to create a 'nil hazard' for bushfire management and provide parkland open space
Zone 2 – Tallawarra Point Open Space	- Predominantly cleared grazing land - Exposed lower slopes of Mt Brown - Light brown clay soils	- Provide recreation and amenity value to open space areas including planting for shade and wind protection - Tree and understorey planting along ridgeline adjoining residential property to provide a wildlife habitat corridor and visual screening of Tallawarra Power Station
Zone 3 – L.I.F.A Foreshore Masterplan	- Sloping ground along lake foreshore with scattered remnant vegetation and recent planting by the Lake Illawarra Authority	- Provide recreation and amenity value to open space areas including planting for shade and wind protection - Conservation and management of remnant *Coastal Saltmarsh* - Planting along the boundary with residential properties to be designed to create a 'nil hazard' for bushfire management

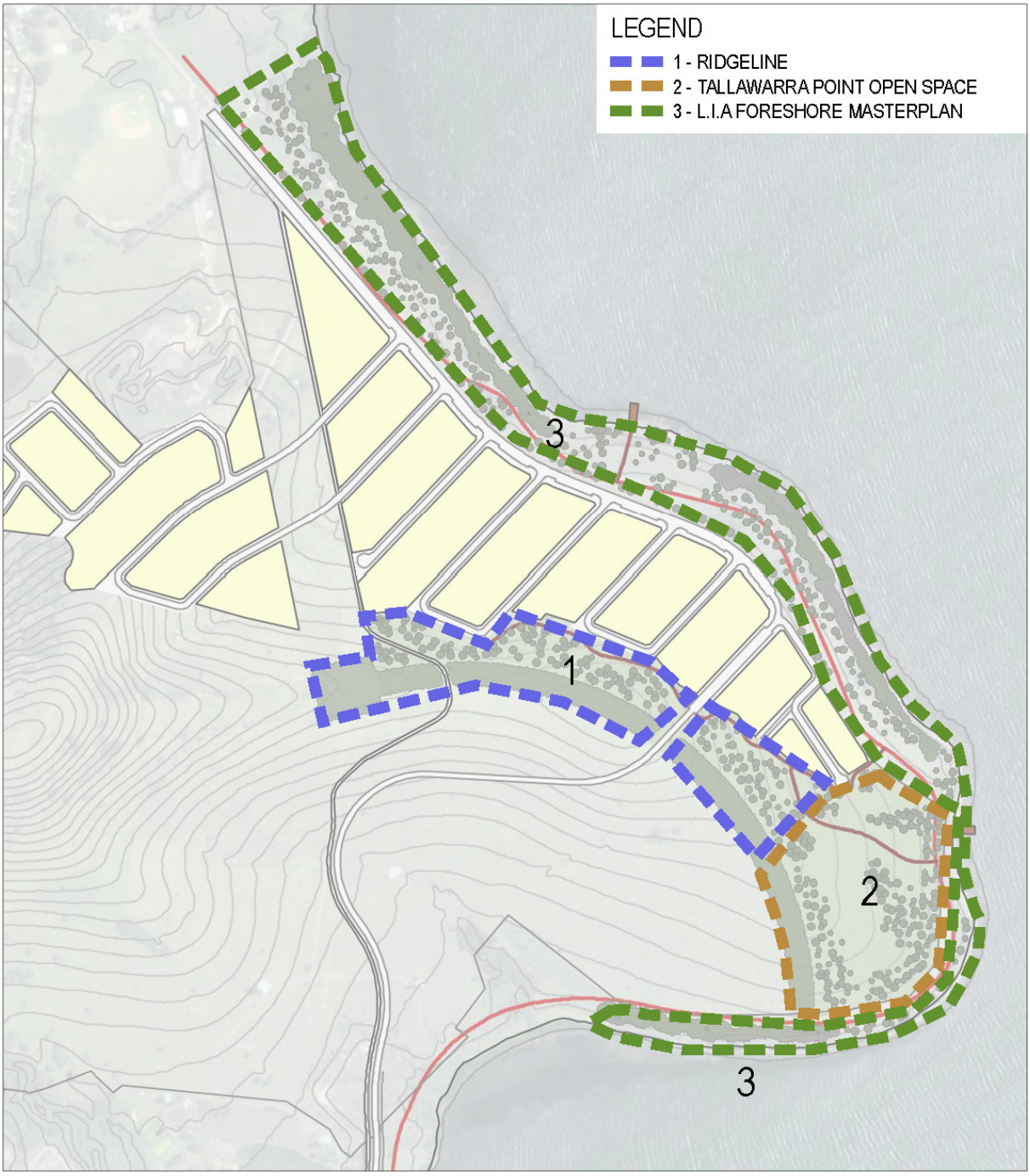


FIGURE 28 – OPEN SPACE ZONES OF THE NORTH FORESHORE RESERVE

PLANT SCHEDULE

BOTANICAL NAME	COMMON NAME	MATURE HEIGHT x WIDTH	ZONE		
			1	2	3
LARGE TREES					
Acacia maidenii	Maiden's Wattle	14 x 6m	■	■	■
Alphitonia excelsa	Red Ash	15 x8m		■	
Angophora floribunda	Rough-Barked Apple	20 x 9m	■	■	
Casuarina glauca	Swamp Oak	15 x 6m			■
Emmenosperma alphitonioides	Yellow Ash	14 x 6m		■	
Eucalyptus ampifolia	Cabbage Gum	25 x 9m			■
Eucalyptus bosistoana	Coastal Grey Box	25 x 9m	■	■	
Eucalyptus botryoides	Bangalay	25 x 9m			■
Eucalyptus botryoides x saligna	Blue Gum x Bangalay	25 9m	■	■	
Eucalyptus eugenioides	Thin-leaved Stringybark	25 x 9m	■	■	
Eucalyptus longifolia	Woollybutt	20 x 9m		■	
Eucalyptus saligna	Sydney Blue Gum	20 x 9m			■
Eucalyptus tereticornis	Forest Red Gum	20 x 9m	■	■	
Euroschinus falcata	Ribbonwood	14 x 6m		■	
Ficus macrophylla	Moreton Bay Fig	20 x 15m	■	■	
SMALL – MEDIUM TREES					
Acacia implexa	Lightwood	10 x 5m	■	■	
Acacia mearnsii	Black Wattle	10 x 5m		■	
Acmena smithii	Lilly Pilly	10 x 5m		■	
Allocasuarina littoralis	Black She-Oak	8 x 5m	■	■	
Callistemon salignus	Willow Bottlebrush	6 x 4m		■	■
Melaleuca decora	Feather Honey-Myrtle	6 x 4m	■	■	
Melaleuca ericifolia	Swamp Paperbark	4 x 3m		■	■
Melaleuca styphellioides	Prickly-leafed Tea Tree	8 x 4m	■	■	■
Myoporum acuminatum	Boobialla				■
Rapanea variabilis	Mutton Wood	8 x 4m			■
Streblus brunonianus	Whalebone Tree	10 x 4m			■
SHRUBS					
Acacia falcata	Falcate Wattle	3 x 2m		■	■
Acacia stricta	Straight Wattle	3 x 2m			■
Bursaria spinosa	Black Thorn	4 x 3m	■	■	
Daviesia ulicifolia	Bitter Pea	2 x 2m		■	
Dodonaea viscosa subsp. *angustifolia*	Sticky Hop-bush	3 x 2m	■		
Kunzea ambigua	Tick Bush	3 x 2m	■		
Ozothamnus diosmifolius	Rice Flower	2 x 2m		■	
CLIMBERS					
Maclura cochinchinensis	Cockspur Thorn	-		■	
Pandorea pandorana	Wonga Wonga Vine	-		■	
GRASSES & GROUNDCOVERS					
Alternanthera denticulata	Common Joy Weed	0.4 x 0.4m			■
Aristida vagans	Three Awn Grass	1 x 1m	■	■	
Atriplex australasica	Green Softbush	0.4 x 0.4m			■
Carex appressa	Tall Sedge	1 x 1m			■
Carex longebrachiata	Bergalia Tussock	1 x 1m	■		
Crinum pendunculatum	Swamp Lily	2 x 2m			■
Dianella longifolia	Flax-Lily	1 x 1m		■	
Dianella revoluta	Blue Flax-Lily	1 x 1m		■	
Dichondra repens	Kidney Weed	Prostrate	■		
Entolasia marginata		1 x 1m	■	■	■
Gahnia clarkei	Tall Saw-sedge	2 x 1m			■
Gietonoplesium cymosum	Scrambling Lilly	1 x 1m			■
Hardenbergia violacea	False Sarsaparilla	0.5 x 0.5m		■	
Lomandra longifolia	Spiny-headed Mat Rush	1 x 1m		■	■
Microlaena stipoides	Weeping Grass	0.7 x 0.7m	■	■	■
Oplismenus imbecillis	Basket Grass	0.3 x 0.3m	■	■	■
Poa labillardieri	Large Tussock Grass	1 x 1m		■	■
Themeda australis	Kangaroo Grass	1 x 1m	■	■	■
SEDGES & RUSHES					
Baumea juncea		1 x 1m			■
Juncus kraussii	Sea Rush	1.5 x 1.5m			■
Phragmites australis	Common Reed	5 x 2m			■
Selliera radicans	Swamp Weed	Prostrate			■

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4.0 Circulation

4.1 CIRCULATION PRINCIPLES

The Landscape Plan aims to provide an effective, safe and enjoyable pedestrian and cycle path network throughout the Tallawarra Lands development. The RTA's *NSW Bicycle Guidelines 2003* have been applied in planning the network, which include the following principles:

Coherence –

- The pedestrian/cycle path network is coherent and links popular destinations via both the open space and road network;
- The path network is continuous and clearly marked;
- Pedestrian and cycle movements are prioritised where the path network crosses roadways; and
- The quality and character of materials are to be consistent throughout the entire pedestrian/cycle path network.

Directness –

- The pedestrian/cycle path network is as direct and safe as possible, avoiding long detours;
- Routes avoid topographic constraints, such as steep climbs or descents, and avoid delays caused by long crossing times.

Safety –

- Intersections are designed to include the safe movement of pedestrians and cyclists;
- Design of paths as they pass destinations such as bus stops or the Neighbourhood Centre is to allow for the safe movement of users;
- Crime Prevention Through Environmental Design initiatives are to be implemented wherever possible.

Attractiveness –

- The pedestrian/cycle path network is integrated with its surrounding environment to enhance the experience of those using it;
- Clear signage is to mark routes and destination points; and
- Routes are to be well lit and remain open-to-view.

Comfort –

- A smooth surface is to be maintained; and
- Effective intersection design is to ensure convenient use of the pedestrian/cycle path network.

4.2 PEDESTRIAN / CYCLE NETWORK

The pedestrian and cycle network will provide a healthy, low cost and environmentally friendly form of movement and recreation throughout the Tallawarra Lands development. It will offer a flexible and low-impact alternative to motor vehicles, linking major destinations with residential and employment zones, and providing for the growing demand of recreational cycling.

A range of pedestrian and cycle paths will be provided that include:

- Bicycle Path – dedicated bicycle path 3m wide physically that is separated from the vehicular carriageway by means of a vegetated verge or swale.

- Shared Use Path – pedestrian and cycle shared use pathways that are 2.5m wide and either provided along the edge of the road reserve or within adjoining open space and recreation areas.

- Footpaths – pedestrian paths 1.5m wide that are provided along the edge of the road reserve as well as within open space and recreation areas.

The location and nature of these alternative pedestrian and cycle pathways are addressed in the following sections.

4.2.1 BICYCLE PATH

The term 'bicycle path' refers to a dedicated path, for cyclists only, physically separated from the vehicular carriageway by means of a vegetated verge or swale.

The purpose of the bicycle path is to provide a designated route for cycle transport that enables quick and efficient travel that is separate from the recreational cycling associated with shared use paths.

An example of a bicycle path is shown below. The proposed location of the bicycle path within the Tallawarra Lands is shown of Figure 29.

EXAMPLE OF A BICYCLE PATH IN STOCKHOLM, SWEDEN
(Source: http://greenasathistle.com/tag/stockholm/)

4.2.2 SHARED USE PATHS

'Shared use paths' are paths, which are typically 2.5m wide, are used by both pedestrians and cyclists. They are to be located along the edge of the road reserve or within open space and recreation areas.

The purpose of the shared use path is essentially to combine footpaths and cycle paths into off-road pathways that provide an interconnected network for walking and recreational cycling.

Examples of shared use paths are shown below. Figure 30 on the following page illustrates the proposed alignment of these pathways throughout the Tallawarra Lands, as well as the alignment of the Lake Illawarra foreshore shared use path that is shown in the Lake Illawarra Authority Foreshore Masterplan.

EXAMPLES OF SHARED USE PATHS IN OPEN SPACE AREAS

(Source: Corkery Consulting Image Library)

EXAMPLE OF SHARED USE PATHS ALONG A ROAD RESERVE

(Source: Landcom, 2006)

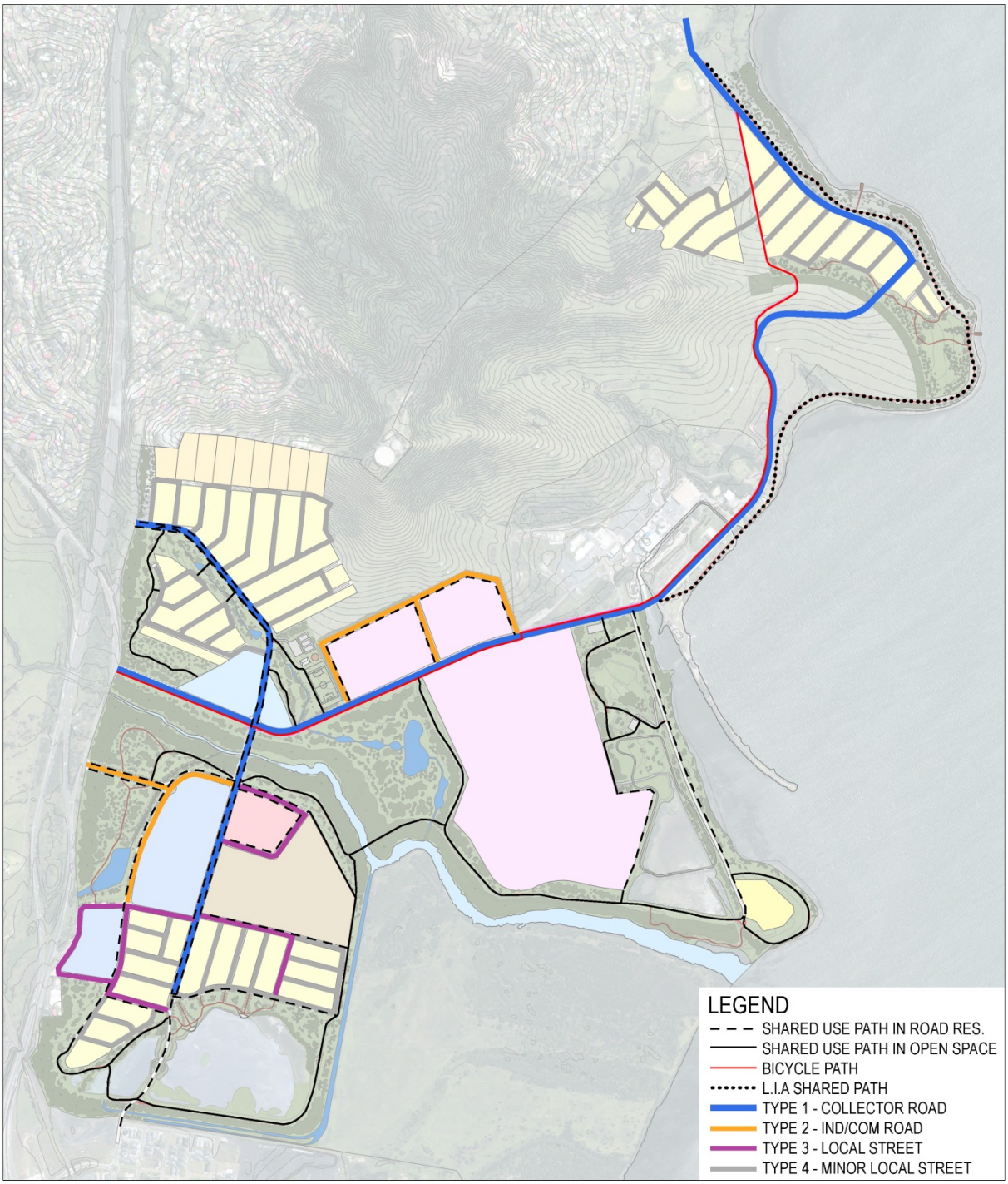

FIGURE 29 – BICYCLE LANE AND SHARED USE PATH ALIGNMENT

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5.0 Streetscapes

5.1 INTRODUCTION

The role of streets can extend beyond their simple function as thoroughfares they influence the form and aesthetic quality of the public domain associated with streets. The size, arrangement and orientation of the street network influences how residents and visitors perceive the urban environment in which they live, work and recreate.

The planning and design of streets throughout the Tallawarra Lands aims to create a coordinated landscape character that aids orientation, provides physical comfort (shade and wind protection) together with visual delight. An integrated strategy of street tree planting has been prepared that responds to the results of the analysis of existing landscape character of the site and seeks to create a clear identity and sense of place.

Water sensitive urban design initiatives and crime prevention through environmental design principles are also integrated into the planning and design of streetscapes, as illustrated on the following pages.

5.2 STREET HIERARCHY

The street hierarchy is designed to create a network that is connected, legible, easy to use and responds to existing and proposed landscape features. The components of the street hierarchy are listed in the following table and illustrated on Figure 31.

ROAD TYPE	APPROPRIATE USE
ROAD TYPE 1 – Collector Road	Collector streets link neighbourhoods together. They usually include bus routes within as well as between neighbourhoods. Neighbourhood and local centres are usually located along these routes at intersections.
ROAD TYPE 2 – Industrial / Commercial Road	Industrial / commercial roads typically have a wider carriageway than local streets to provide thoroughfares for vehicles associated with industrial and commercial employment areas.
ROAD TYPE 3 – Local Street	Local streets provide access from collector streets to minor local streets. With a wider carriageway than minor local streets, Local Streets allow for bus routes and other vehicular thoroughfare.
ROAD TYPE 4 – Minor Local Street	Minor local streets are the predominant street type within the development. Minor local streets are used only where: - traffic volumes are low, and - there is low parking demand.

The following design principles, which are based on the Landcom *Street Design Guidelines*, have been adopted for the Tallawarra Lands Project:

- Developing a hierarchy by classifying streets according to their function to maximise accessibility and connectivity within the network.
- Ensuring safe intersections by prioritising pedestrians to ensure a safe and convenient passage for all users.
- Maximising landscape treatment in all streets by planting trees in all streets and retaining existing trees where it is viable to do so, ensuring the landscape of each street is a reflection of its local context.
- Implementing Water Sensitive Urban Design such as bio-swales and bio-retention tree pits to treat stormwater and maximise the visual and recreational amenity of the development.

The proposed landscape treatments for each type of road or street in the Hierarchy are presented on the following pages.

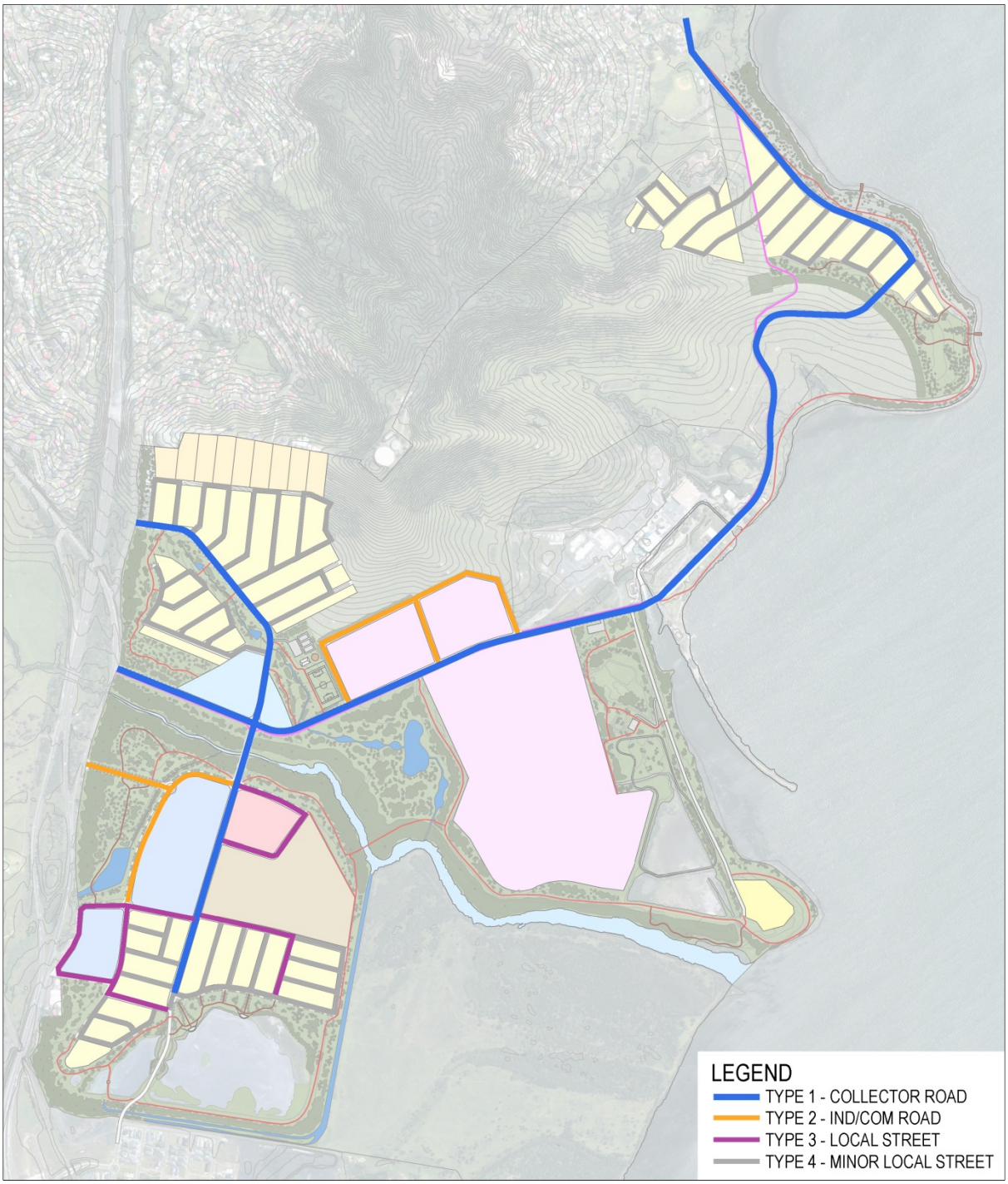


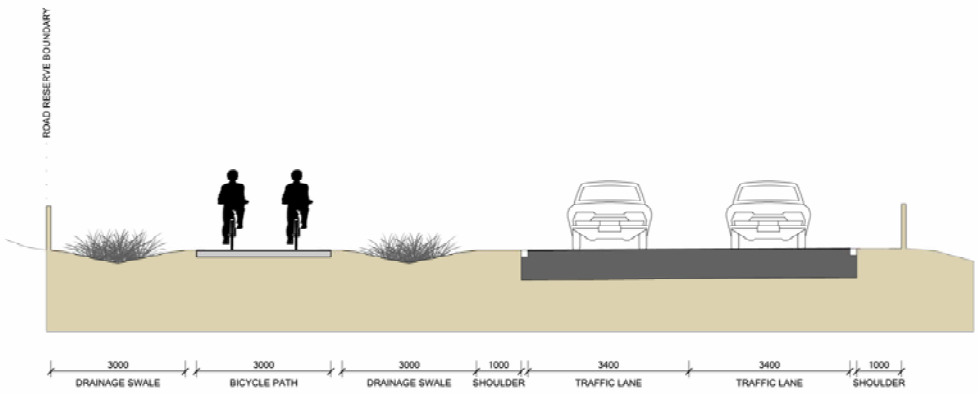
FIGURE 30 – THE STREET HIERARCHY

ROAD TYPE 1 – COLLECTOR ROADS

SECTION – COLLECTOR ROAD AT ENTRY TO TALLAWARRA LANDS FROM THE PACIFIC HIGHWAY

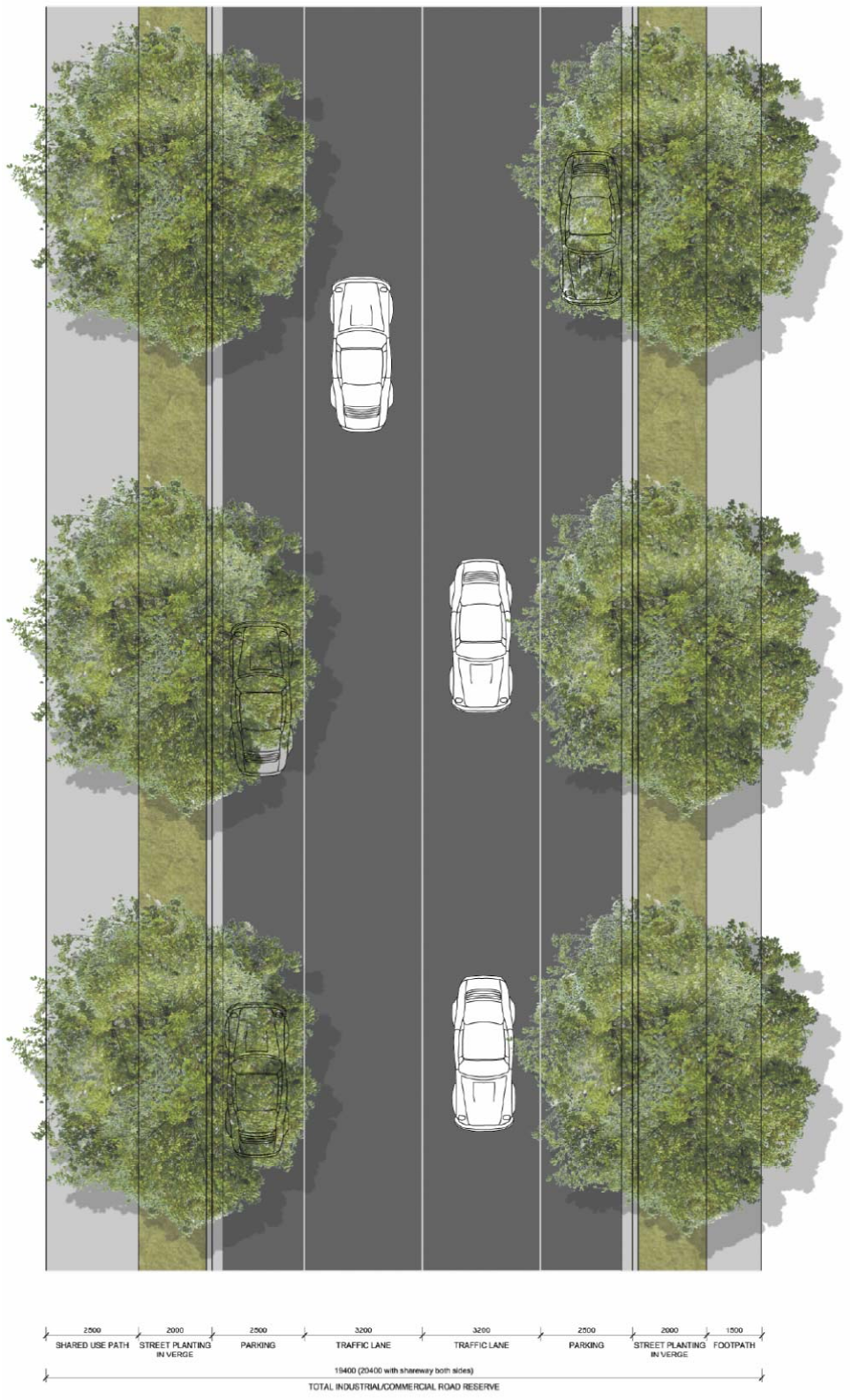
SECTION – COLLECTOR ROAD ADJOINING INDUSTRIAL LAND AND OPEN SPACE IN THE CENTRAL PRECINCT

SECTION – COLLECTOR ROAD IN FRONT OF POWER STATION

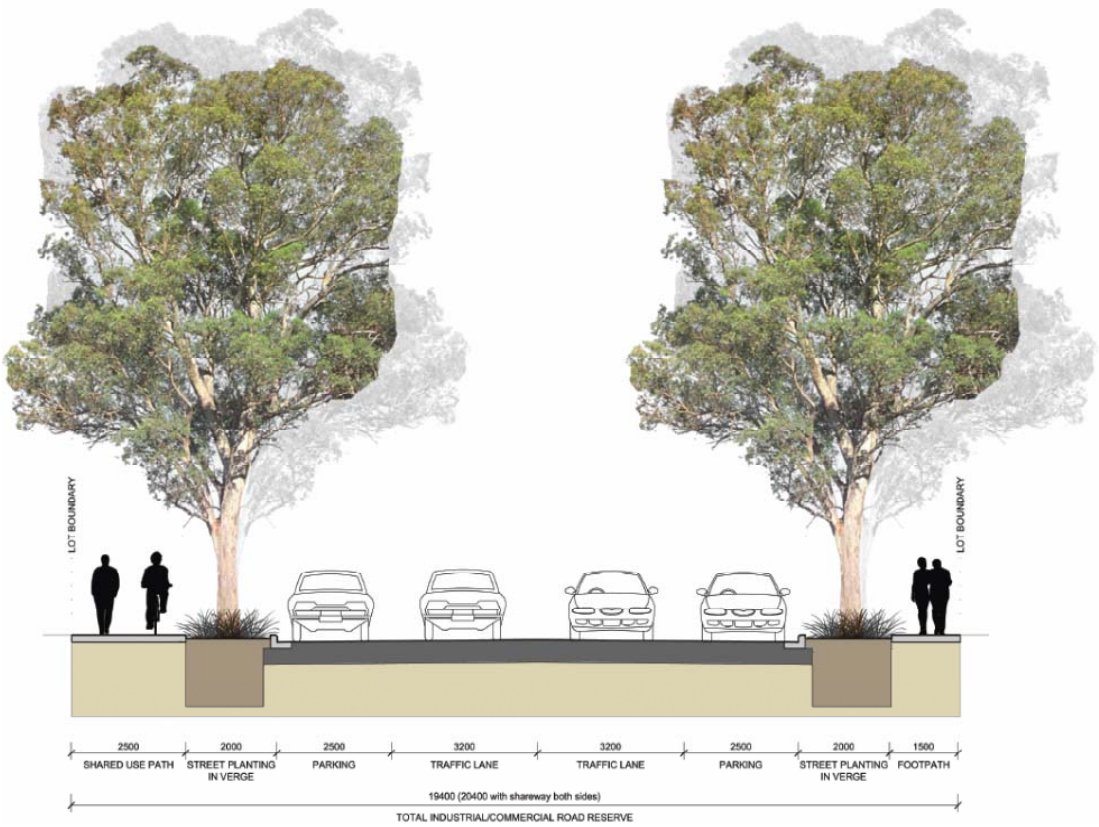


SECTION – COLLECTOR ROAD BETWEEN POWER STATION AND NORTHERN RESIDENTIAL PRECINCT

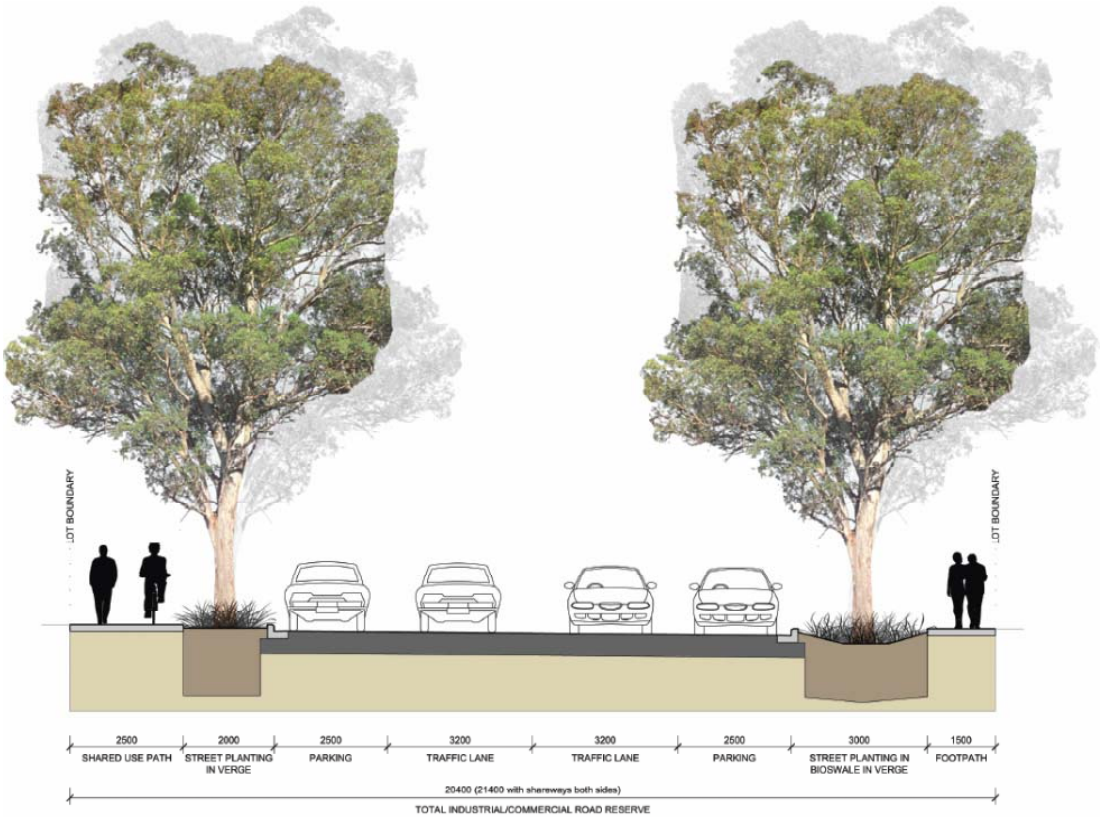
ROAD TYPE 2 – INDUSTRIAL / COMMERCIAL ROADS



PLAN – INDUSTRIAL / COMMERCIAL ROAD

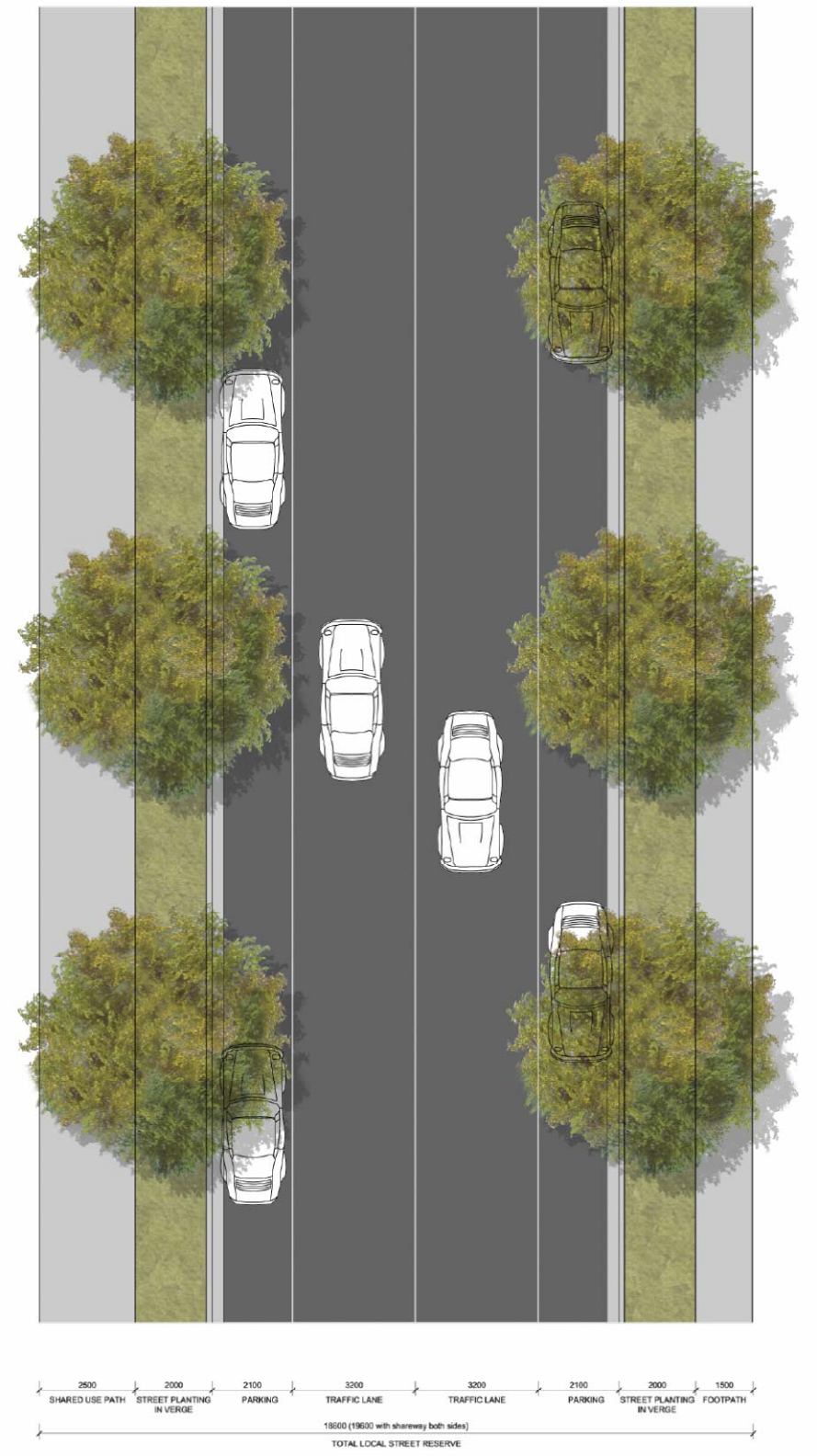


SECTION – INDUSTRIAL / COMMERCIAL ROAD (OPTION 1)

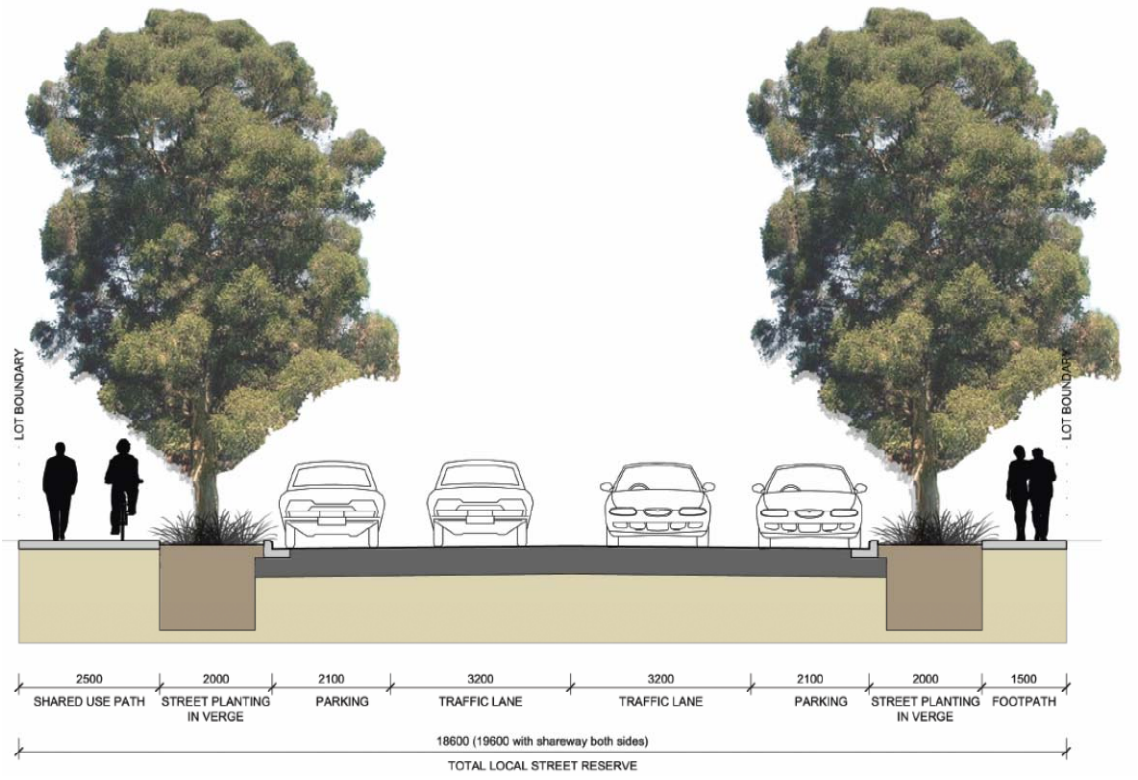


SECTION – INDUSTRIAL / COMMERCIAL ROAD WITH BIOSWALE (OPTION 2)

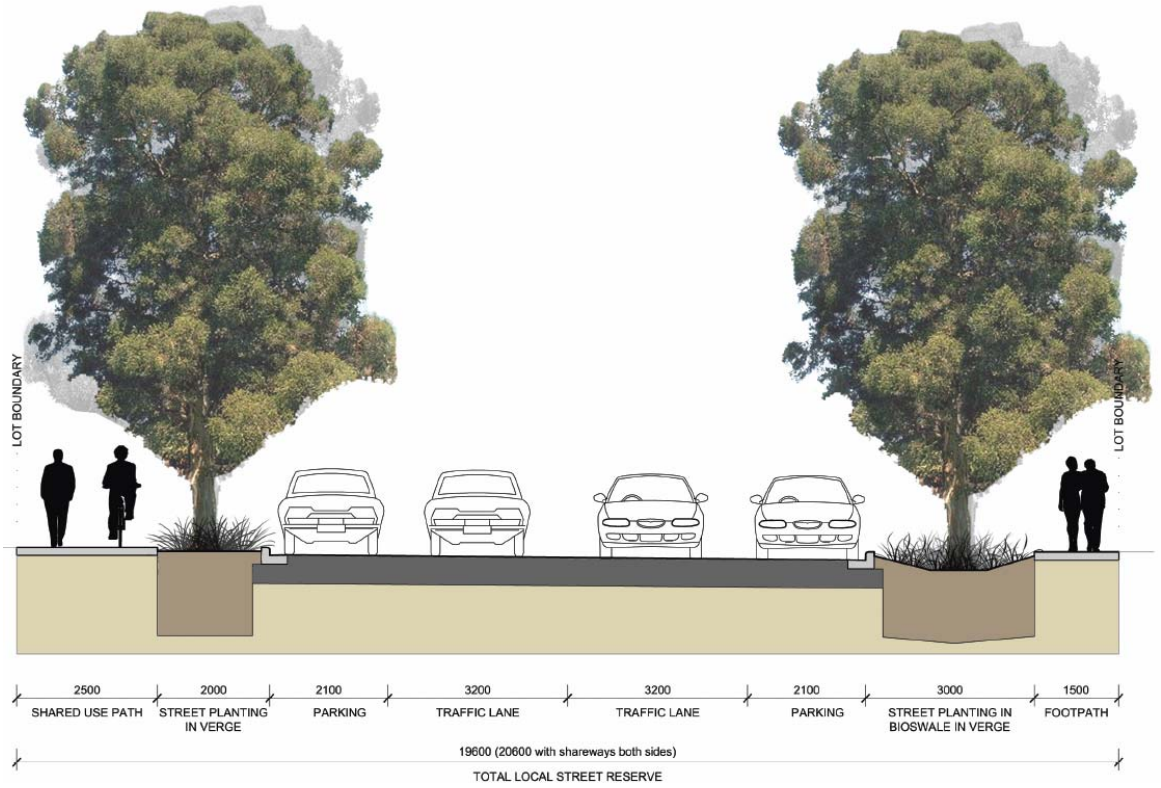
ROAD TYPE 3 – LOCAL STREETS



PLAN – LOCAL STREET

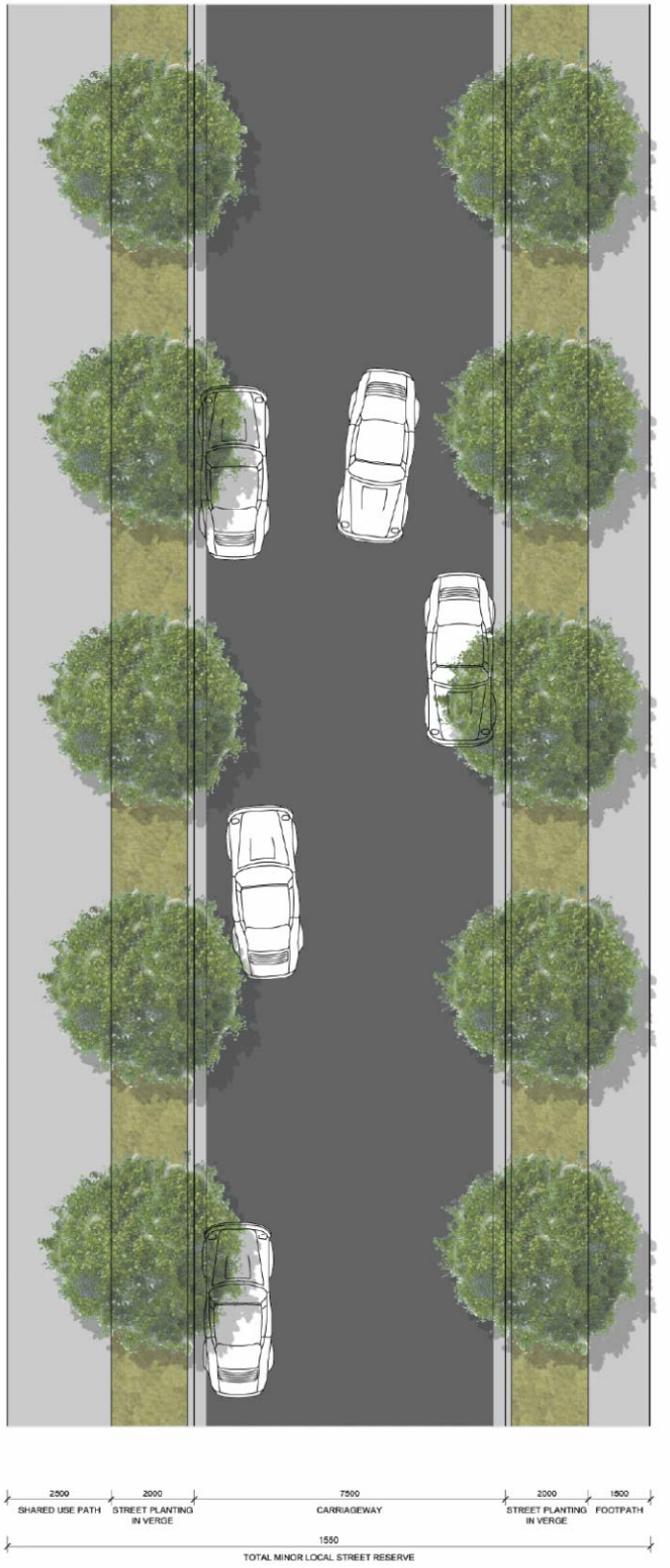


SECTION – LOCAL STREET (OPTION 1)

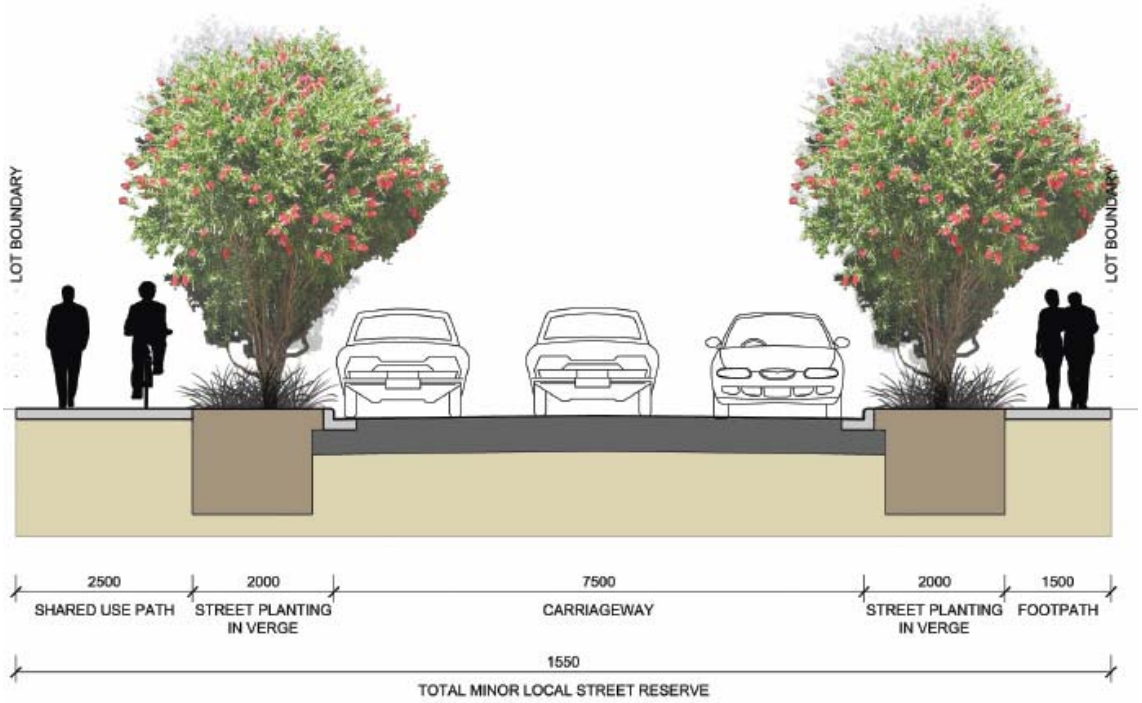


SECTION – LOCAL STREET WITH BIOSWALE (OPTION 2)

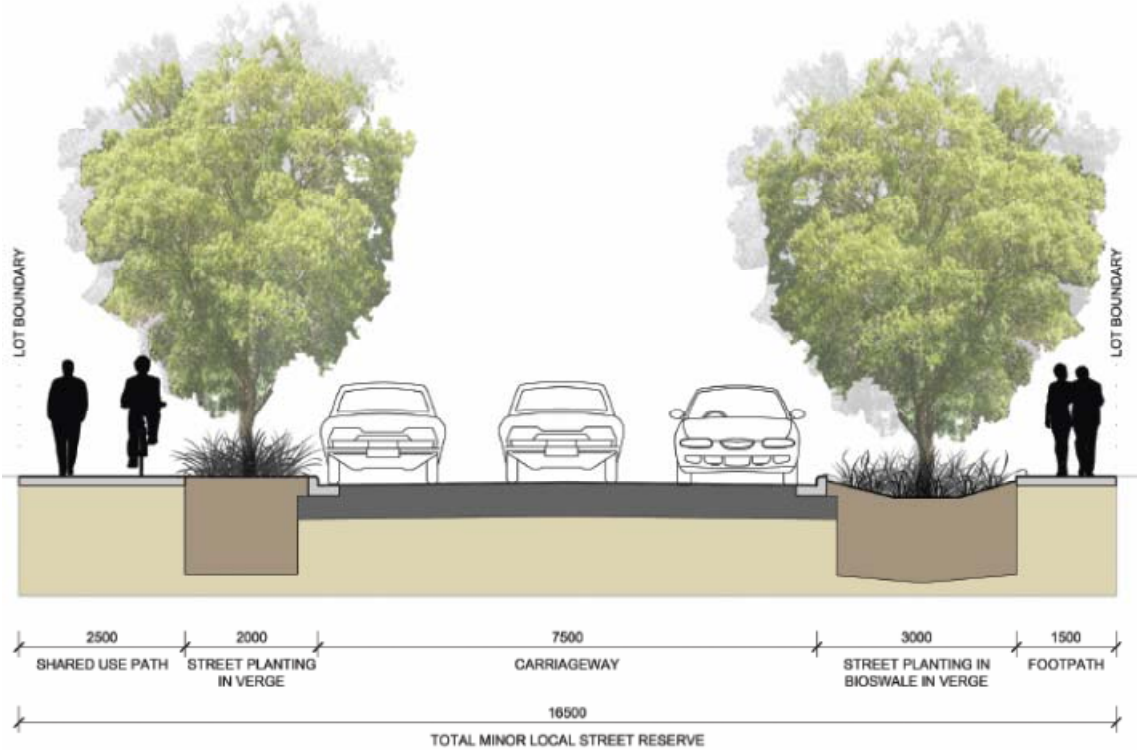
ROAD TYPE 4 – MINOR LOCAL STREETS



PLAN – MINOR LOCAL STREET



SECTION – MINOR LOCAL STREET (OPTION 1)



SECTION – MINOR LOCAL STREET WITH BIOSWALE (OPTION 2)

5.3 STREET TREE PLANTING STRATEGY

The selection of street trees suitable for use within the street network takes account of several key principles that are consistent with Landcom's *Street Tree Design Guidelines*, which include:

- Drawing from the existing vegetation species that occurs on the site to create an individual character for each Precinct.
- Designing the street tree planting to unify individual streetscapes and street networks, through the layout, scale and character to create visual cohesion to the street corridor.
- Selecting tree species to achieve the overall design intent and take account of the site specific physical conditions.
- Optimising passive watering of plants as much as possible through the location and planting detail of street trees.
- Minimising conflicts between street trees and infrastructure, including underground and above ground services.
- Apply Water Sensitive Urban Design initiatives where appropriate, such as bio-swales and bio-retention tree pits that are integrated with the street tree plantings.

Images in Figure 31, which are from Landcom's web site, illustrate how street tree planting can significantly improve the visual and physical amenity of streets.

Street Tree Schedules for each of the Master Plan Precincts are presented on following pages. Species suitable for use in each road type are listed in the Street Tree Schedules, which are intended to guide the process of more detailed urban landscape design that will be carried out in the next stage of the Tallawarra Lands Project.

NO TREES

TREES AT PLANTING

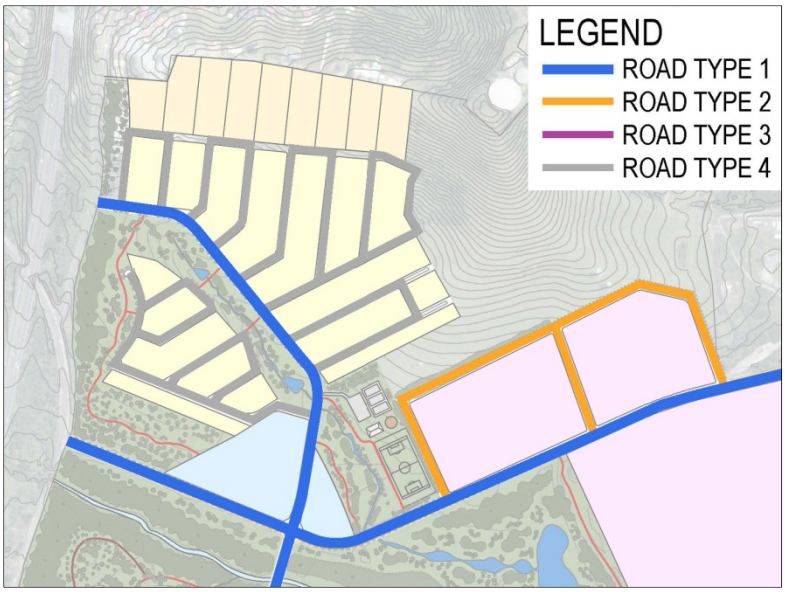
TREES AT 5 YEARS

TREES AT 10 YEARS

FIGURE 31 – EXAMPLE OF TREE GROWTH OVER 10 YEARS

(Source: Landcom Corporate Website, 2010)

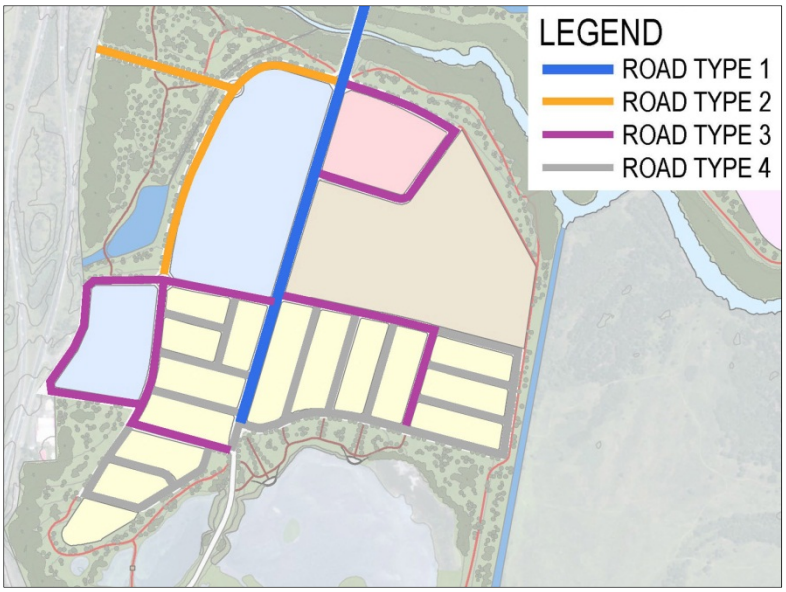
CENTRAL PRECINCT



STREET TREE SCHEDULE

BOTANICAL NAME	COMMON NAME	MATURE HEIGHT x WIDTH	ROAD TYPE 1	ROAD TYPE 2	ROAD TYPE 3	ROAD TYPE 4
LARGE TREES						
Alphitonia excelsa	Red Ash	18 x 5m				
Brachychiton acerifolium	Illawarra Flame Tree	20 x 8m				
Brachychiton populneus	Kurrajong	15 x 8m				
Corymbia maculata	Spotted Gum	25 x 9m				
Dipploglottis australis	Native Tamarind	18 x 6m				
Eucalyptus eugenioides	Thin-leaved Stringybark	25 x 9m				
Eucalyptus longifolia	Woollybutt	20 x 9m				
Eucalyptus punctata	Grey Gum	20 x 9m				
Eucalyptus tereticornis	Forest Red Gum	20 x 9m				
Livistona australis	Cabbage Tree Palm	20 x 9m				
Lophostemon confertus	Brushbox	12 x 7m				
SMALL – MEDIUM TREES to 10m						
Acmena smithii	Lilly Pilly	10 x 5m				
Backhousia myrtifolia	Grey Myrtle	3 x 2.5m				
Callistemon salignus	Willow Bottlebrush	6 x 4m				
Callistemon viminalis 'Hannah Ray'	Weeping Bottlebrush	5 x 4m				
Cupaniopsis anacardioides	Tuckeroo	8 x 5m				
Elaeocarpus reticulatus	Blueberry Ash	8 x 4m				
Glochidion ferdinandi	Cheese Tree	8 x 6m				
Melaleuca decora	Feather Honey-Myrtle	6 x 4m				
Melaleuca ericifolia	Swamp Paperbark	4 x 3m				
Melaleuca styphelioides	Prickly-leafed Tea Tree	8 x 4m				
Pittosporum rhombifolium	White Holly	8 x 5m				
Podocarpus elatus	Brown pine	9 x 5m				
Stenocarpus sinuatus	Firewheel Tree	8 x 3m				
Syzygium luemannii		8 x 4m				
Tristaniopsis laurina	Water Gum	10 x 6m				

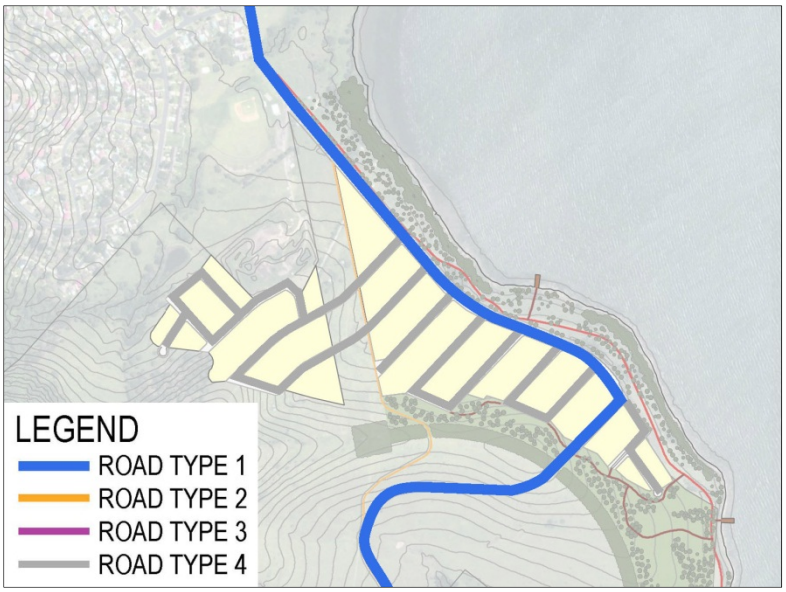
SOUTHERN PRECINCT



STREET TREE SCHEDULE

BOTANICAL NAME	COMMON NAME	MATURE HEIGHT x WIDTH	ROAD TYPE 1	ROAD TYPE 2	ROAD TYPE 3	ROAD TYPE 4
LARGE TREES						
Alphitonia excelsa	Red Ash	18 x 5m				
Corymbia maculata	Spotted Gum	25 x 9m				
Eucalyptus bosistoana	Coastal Grey Box	25 x 9m				
Eucalyptus eugenioides	Thin-leaved Stringybark	25 x 9m				
Eucalyptus longifolia	Woollybutt	20 x 9m				
Eucalyptus robusta	Swamp Mahogany	15 x 7m				
Eucalyptus tereticornis	Forest Red Gum	20 x 9m				
SMALL – MEDIUM TREES to 10m						
Callistemon salignus	Willow Bottlebrush	6 x 4m				
Lophostemon suaveolens	Swamp Turpentine	8 x 3m				
Melaleuca decora	Feather Honey-Myrtle	6 x 4m				
Melaleuca ericifolia	Swamp Paperbark	4 x 3m				
Melaleuca linariifolia	Snow in Summer	8 x 4m				
Melaleuca styphelioides	Prickly-leafed Tea Tree	8 x 4m				

NORTHERN PRECINCT



STREET TREE SCHEDULE

BOTANICAL NAME	COMMON NAME	MATURE HEIGHT x WIDTH	ROAD TYPE 1	ROAD TYPE 4
LARGE TREES				
Acacia maidenii	Maiden's Wattle	12 x 7m		
Alphitonia excelsa	Red Ash	18 x 5m		
Brachychiton acerifolium	Illawarra Flame Tree	20 x 8m		
Brachychiton populneus	Kurrajong	15 x 8m		
Eucalyptus amplifolia	Cabbage Gum	18 x 9m		
SMALL – MEDIUM TREES				
Acmena smithii	Lilly Pilly	10 x 5m		
Backhousia citriodora	Lemon-scented Myrtle	6 x 3m		
Callistemon salignus	Willow Bottlebrush	6 x 4m		
Callistemon viminalis 'Hannah Ray'	Weeping Bottlebrush	5 x 4m		
Cupaniopsis anacardioides	Tuckeroo	8 x 5m		
Elaeocarpus reticulatus	Blueberry Ash	8 x 4m		
Glochidion ferdinandi	Cheese Tree	8 x 6m		
Melaleuca styphelioides	Prickly-leafed Tea Tree	8 x 4m		
Streblus brunonianus	Whalebone Tree	6 x 4m		
Syzygium luemannii	Riberry	8 x 4m		
Tristaniopsis laurina	Water Gum	10 x 6m		

5.4 WSUD APPLICATION TO STREET NETWORK

Water Sensitive Urban Design (WSUD) initiatives incorporated in the Landscape Plan are aimed at minimising potable water consumption as well as stormwater runoff and pollution. As the roads and paths will form large impervious areas within the urban development, WSUD initiatives will be implemented in the street network to minimise the potential impact on water resources (Figure 32).

The following principles have been adopted:

- Stormwater treatment swales and ponds are to be utilised for their aesthetic contribution as well as ecological and environmental benefits.

- The scale of WSUD elements is to take account of the extent of impervious surfaces.

- WSUD elements within the streetscape will only be used where slopes are less than 2% grade. In those portions of the Central and Northern Precincts, where slopes exceed a grade of 2%, it is proposed to use end-of-line bio-filtration basins located within open space areas.

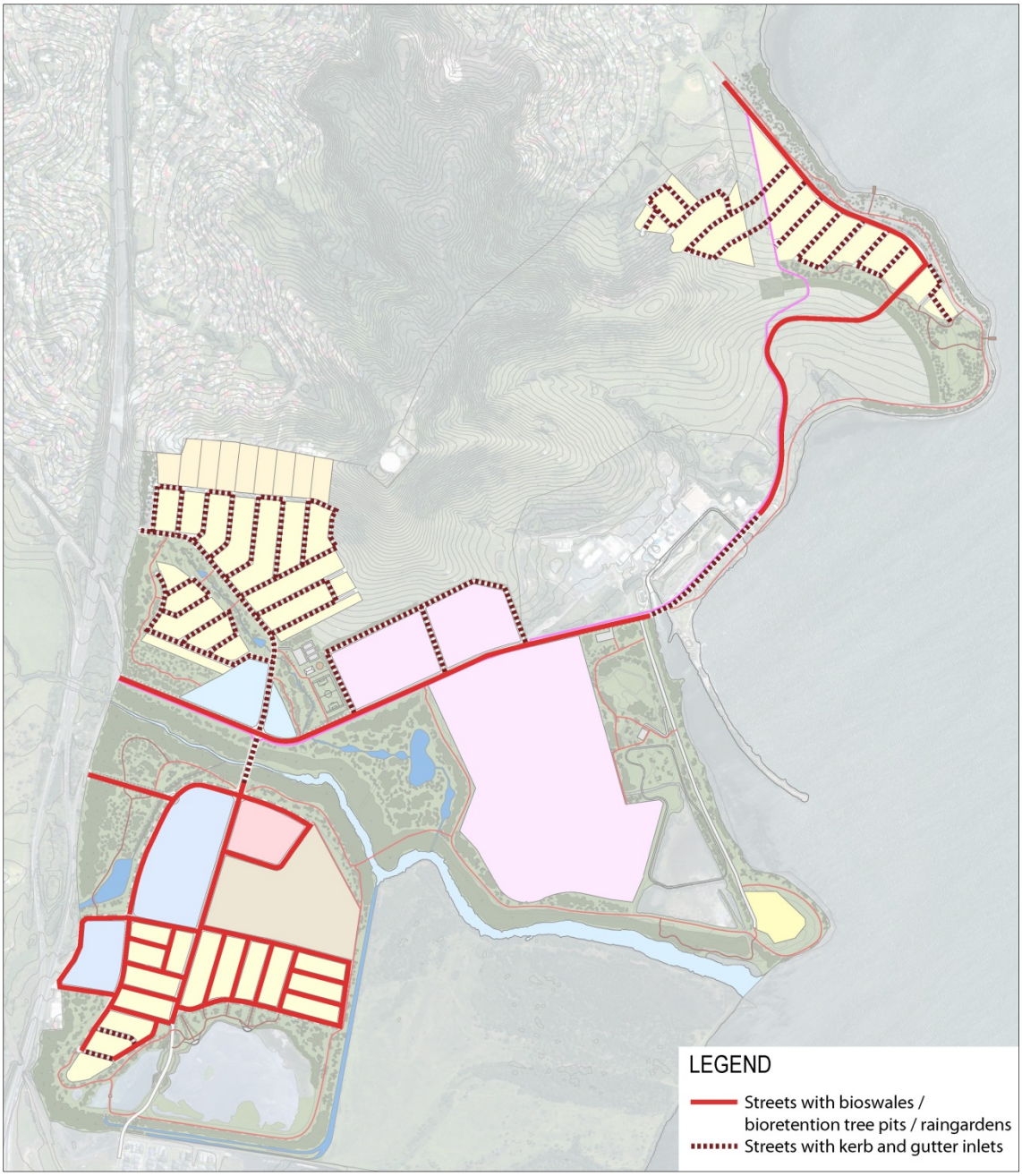


FIGURE 32 – WATER SENSTIVE URBAN DESIGN RELATED TO STREET NETWORK

DESIGN FOR PASSIVE WATERING

Passive watering of street trees and other planting will be achieved where possible through the installation of bio-swales and rain gardens (Figure 33). These elements allow stormwater runoff to be redirected into the planting bed for treatment prior and to assist plant growth. The treated water can then enter be discharged into the natural drainage system. (Landcom, 2006)

Benefits of this approach include reduced stormwater volumes and slower flow rates; a greater capacity to deal with high flow events and the treatment of stormwater runoff to reduce pollution of natural watercourses. In addition the volume of natural rainfall available to assist the growth of street trees and other plants is significantly increased.

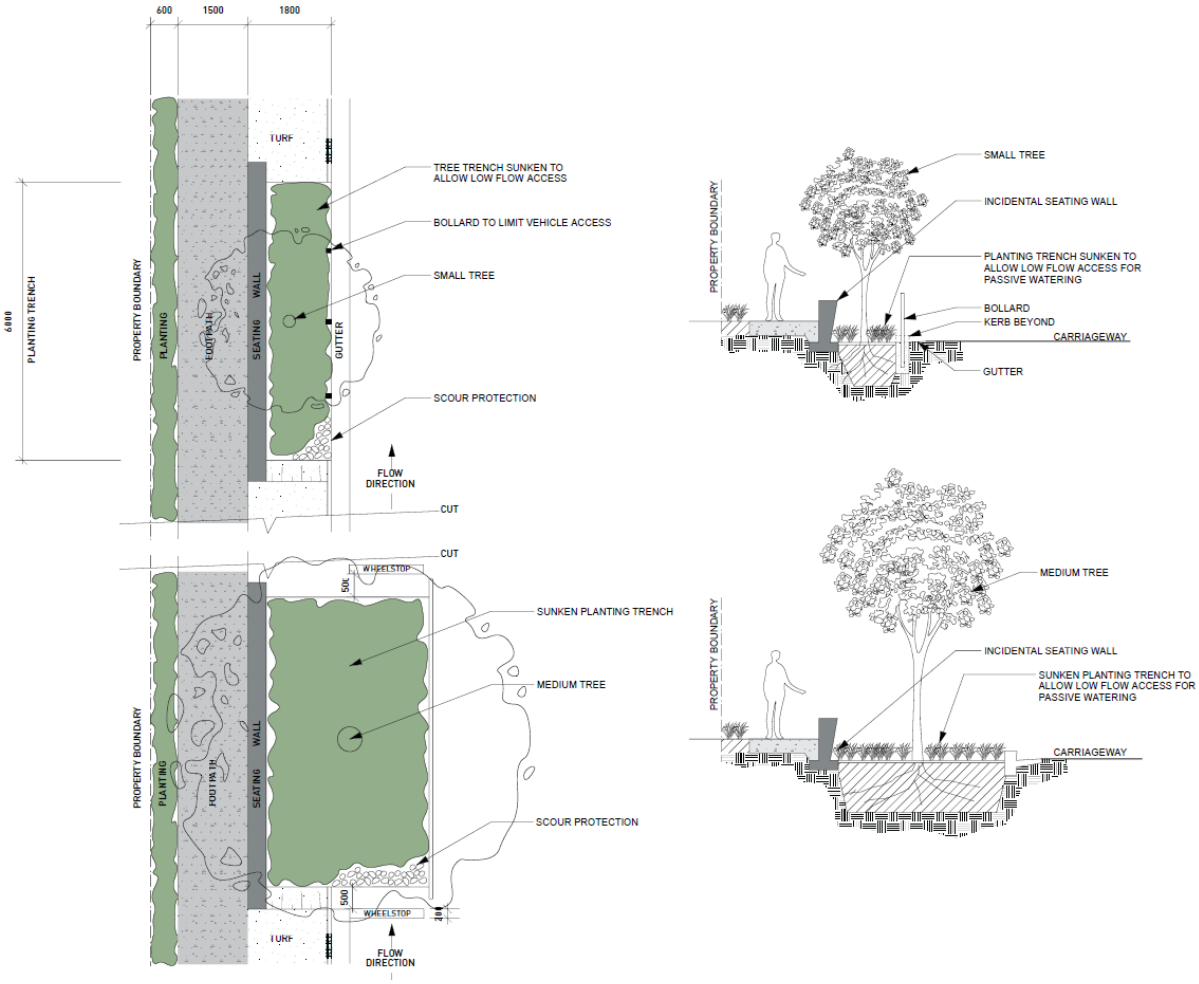
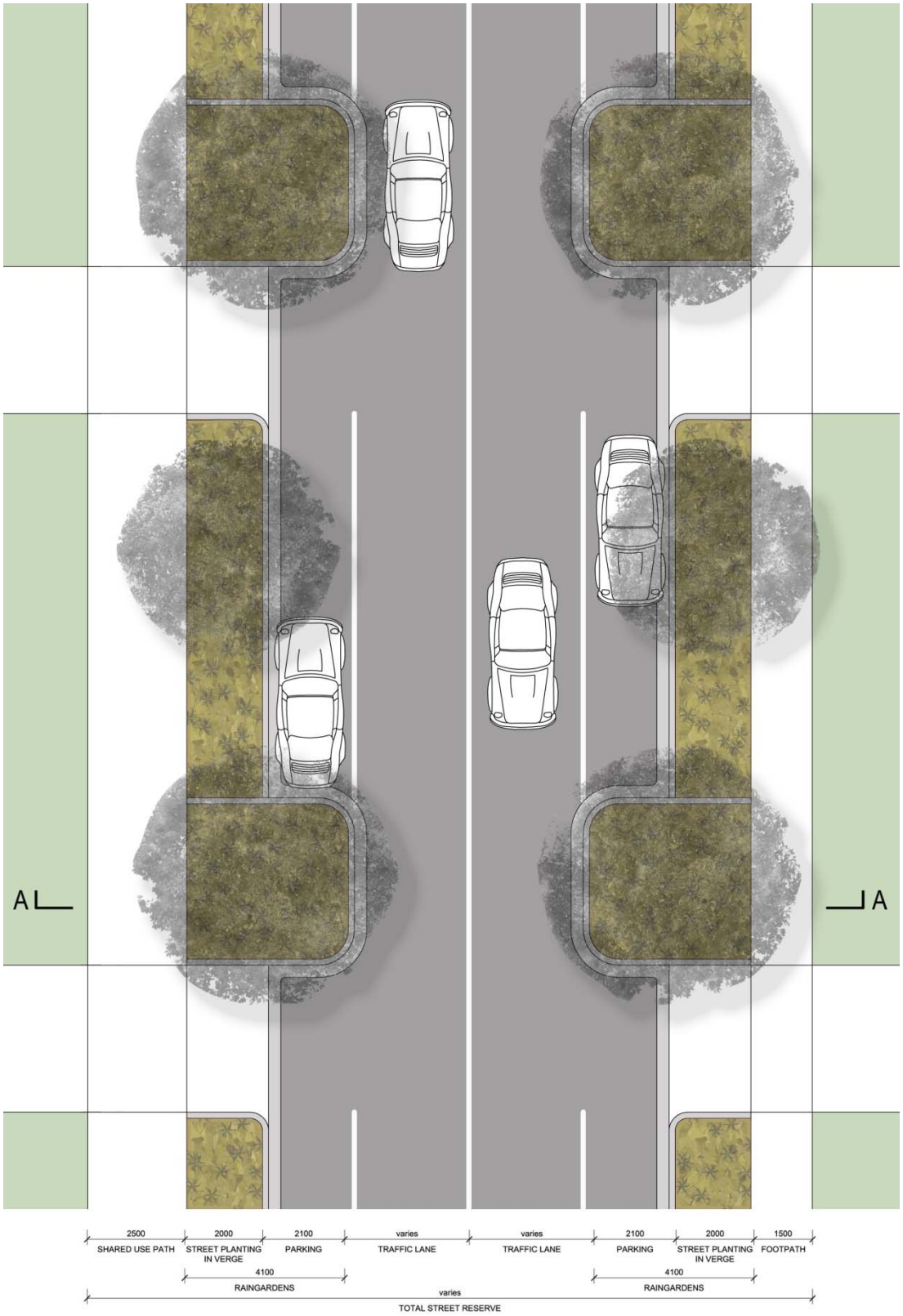
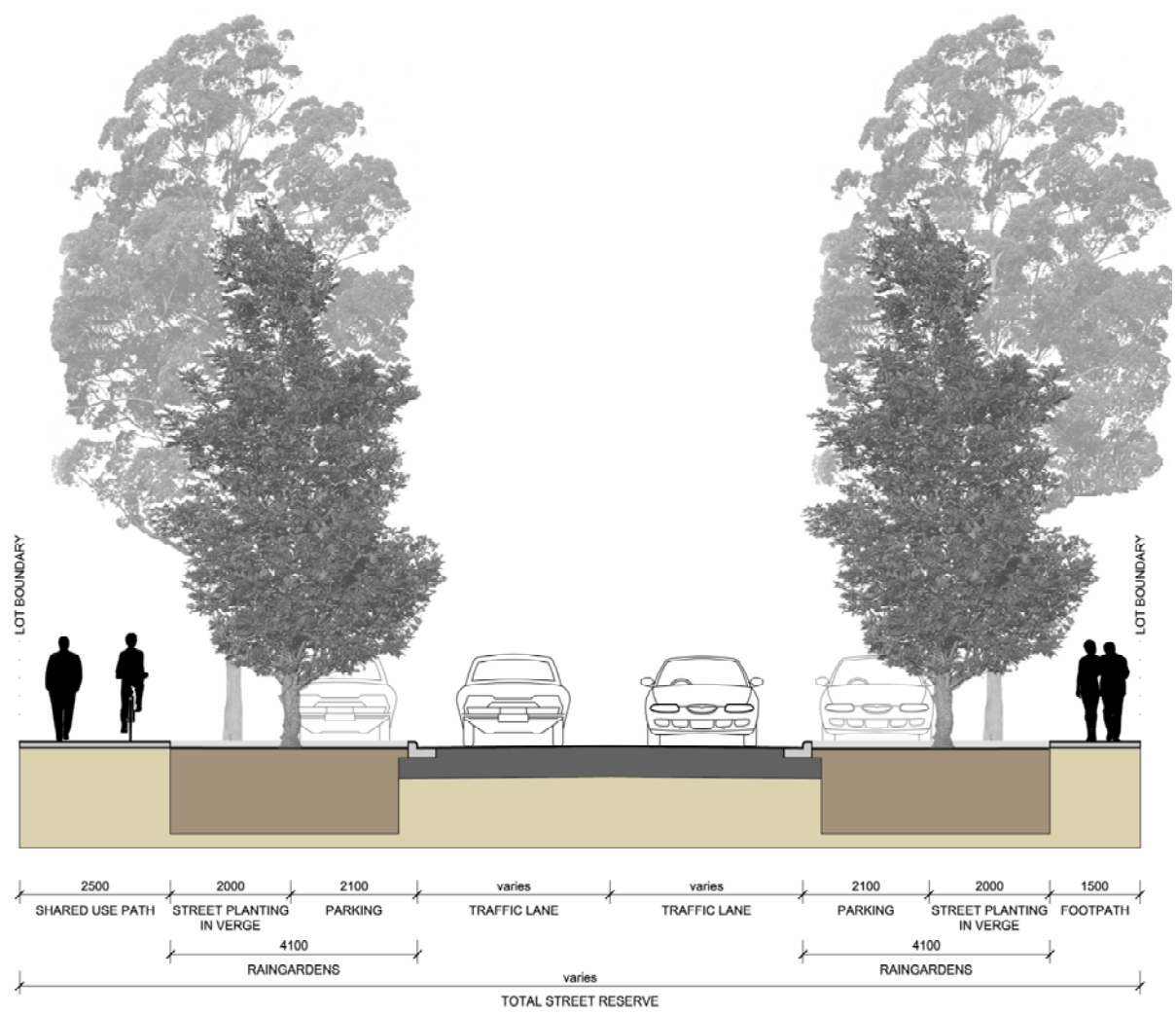


FIGURE 33 – TYPICAL BIO-SWALES AND RAIN GARDENS WITHIN THE STREETSCAPE
(Source: Landcom, 2006)



PLAN: RAINGARDENS WITHIN THE ROAD RESERVE



SECTION AA: RAINGARDENS WITHIN THE ROAD RESERVE

Bio-retention tree pits are designed to direct stormwater runoff from adjacent impervious surfaces into the tree pit to provide additional water for the tree. It also improves the quality of water entering the drainage system after passing through soil in the tree pit. Stormwater enters the pit through gaps in the road kerb and is filtered through the soil of the tree pit. Water that is not taken up by the tree roots is carried by sub-soil drainage to the conventional stormwater drainage system.

The use of street trees in this way provides shade and visual amenity in the street environment while treating stormwater prior to entering natural waterways. This form of passive irrigation has the additional benefit of reducing the use of irrigation water from other sources such as mains supplies. (Landcom, 2006)

5.5 CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN

The principles for Crime Prevention Through Environmental Design (CPTED) that have been applied to streetscapes are similar to those presented in Section 3.4 in relation to open space, although the implementation methods are varied to some extent. CPTED principles that are particularly relevant to streetscape design include:

- Planting design should not create 'blind spots' where the ability to see or be seen is reduced, in particular avoiding dense tall shrubs adjoining footpaths and shared use paths.
- Street tree planting should take account of lighting to ensure appropriate surveillance and avoid large shadow areas.
- Design of street tree planting should be coordinated with signage to avoid potential visual conflicts.

6.0 Landscape Principles within Urban Development

6.1 INTRODUCTION

This section describes the Design Principles to be applied to landscape planning and design within the urban environment. They cover both public and private spaces, and include the following land use categories:

- Residential
- Employment Lands
- Neighbourhood Centre

The Principles presented are intended to guide the more detailed design of open spaces that will follow at a later stage in the design process.

6.2 RESIDENTIAL LANDSCAPE PRINCIPLES

The importance of landscape within the residential environment extends beyond the vegetation of the streetscape to include landscape elements within private residential lots that are visible from street and contributes to its visual quality.

The following Residential Landscape Principles are intended to guide the design of landscape works to be carried out within private residential properties.

Visual Amenity –

- Trees planted in backyards should, where possible, be large enough to be seen from the street and offer a backdrop to the buildings.
- Medium size trees and shrubs should be utilised in the front of residential properties to enhance the visual quality of the streetscape.

FIGURE 34 – PLANTING USED TO ENHANCE VISUAL QUALITY OF URBAN FORM

(Source: Landcom Corporate Website, 2010)

Ecologically Sustainable Design –

- Ensure access to daylight for relevant portions of buildings, such as living rooms, and outdoor use areas is not compromised by locating trees incorrectly.
- Utilise landscape elements and planting works for wind mitigation as well as natural ventilation.
- Provide shade to buildings in summer to minimise the consumption of energy for cooling
- Allow solar access to buildings in winter to minimise energy consumption for heating

Biodiversity –

- Where possible select plant species that contribute positively to biodiversity.
- Avoid the use of species that are classified as environmental weeds.

Incorrect placement of trees within backyards can hinder neighbouring properties' access to daylight.

Correct placement of trees does not hinder access to daylight.

FIGURE 35 – PLANTING TO ENSURE ACCESS TO DAYLIGHT

(Source: Landcom Corporate Website, 2010)

FIGURE 36 – VERGE PLANTING (TOP) AND RAIN GARDEN/TREE PIT PLANTING (BOTTOM)
(Source: Landcom Corporate Website, 2010)

6.3 EMPLOYMENT LANDS LANDSCAPE PRINCIPLES

Landscape treatment throughout the employment lands will play a major role in mitigating the potential visual impact of large scale industrial buildings and offices. While the landscape principles defined below are focused on the streetscape, similar principles should be extended to individual lots to achieve an integrated urban landscape outcome throughout the employment lands.

Visual Amenity

- Where possible, plant large trees that are in scale with adjoining buildings to mitigate the visual impact of roof lines when seen from external viewpoints, including streets, open spaces and proposed residential development on higher elevation areas in the Central Precinct.
- Utilise medium size trees and shrubs planting within property frontages to reduce the visual scale of buildings and create an attractive streetscape.

Function

- Ensure the use of landscape elements and plantings is practical and does not conflict with commercial or industrial land uses, such as the operation of large machinery / vehicles.

Ecologically Sustainable Design

- Where appropriate, incorporate bio-retention and water reticulation elements into commercial and industrial development.
- Utilise landscape elements and planting works for wind mitigation and natural ventilation.

Biodiversity

- Select plant species that are not classified as environmental weeds.
- Where possible, select plant species that contribute positively to the biodiversity of the area.

6.4 NEIGHBOURHOOD CENTRE LANDSCAPE PRINCIPLES

Landscape design throughout the Neighbourhood Centre will play a key role in creating an attractive, functional and safe urban environment. The Landscape Principles presented below will guide future detailed design within the Neighbourhood Centre.

Visual Amenity

- Utilise planting and landscape treatments to strengthen the local landscape character and create a distinctive Neighbourhood Centre.
- Use planting and/or landscape design elements to frame entrances and identify destinations.
- Utilise medium size trees and shrubs planting throughout the Neighbourhood Centre to soften the visual impact on public spaces and adjoining streetscapes.

Function

- Provide structured landscape spaces that support a variety of activities in close proximity to buildings, courtyards and entrances.
- Provide summer shade and winter sun to public plazas and pathways.
- Ensure WSUD and CPTED principles are incorporated into the landscape design within the Neighbourhood Centre.

Ecologically Sustainable Design

- Develop a Neighbourhood Centre landscape that minimises irrigation water requirements, protects the adjacent natural environment, enhances biodiversity, utilises native flora and minimises consumption of energy and non-renewable resources.
- Where possible, incorporate bio-retention and water reticulation elements into the public domain of the Neighbourhood Centre.
- Utilise landscape planting to provide shade, mitigate wind and assist natural ventilation of public spaces with the Neighbourhood Centre.

Biodiversity

- Select plant species that contribute positively to biodiversity in the area.
- Avoid planting species classified as environmental weeds.

7.0 Conclusion

The Landscape Plan provides a vision and framework for the development of the Open Space Network, Streetscapes and Urban Environments throughout the Tallawarra Lands. It also explains the planning and design principles to be adopted. The Landscape Plan describes how these principles are to be applied to the future detailed landscape design across the full range of public open space situations throughout the urban environment.

More detailed urban and landscape design will be required within the framework of this Landscape Plan as the Tallawarra Lands project moves forward.

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APPENDIX 1 –

TALLAWARRA LANDS LANDSCAPE ASSESSMENT

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