

Appendix J

Urban Design and Landscape Report



Transport
Roads & Maritime
Services

A wide-angle photograph of Memorial Avenue in Kellyville, showing a multi-lane road with trees, utility poles, and a clear sky. The road curves to the right in the foreground.

Urban Design Report

Draft (80%)
Memorial Avenue Upgrade Kellyville.

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MEMORIAL AVENUE, KELLYVILLE

Urban Design Report

August 2014

Prepared for



Transport
Roads & Maritime
Services

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I. INTRODUCTION

I.1 PURPOSE

This Urban Design Report has been prepared for Roads and Maritime Services (Roads and Maritime), by Spackman Mossop Michaels (SMM) as part of the Review of Environmental Factors (REF) for the proposed upgrading of Memorial Avenue, between Old Windsor Road and Windsor Road at Kellyville (the proposal) in The Hills Shire Council Local Government Area (LGA). This document is a Technical Paper that supports the REF Reports being prepared by Hyder Consulting (Hyder). SMM has worked on this project in conjunction with Roads and Maritime Centre for Urban Design, other Roads and Maritime specialist advisors, and road and bridge designers from Hyder.

The report documents the landscape character and visual impacts of the proposal and has been prepared as part of the planning approval process. It aims to facilitate an integrated urban design and engineering design outcome for the proposal, through the utilisation of visual impact assessment to identify and summarise the visual and landscape character opportunities and issues within the study area. This, in turn, has guided the development of the road concept design process by avoiding or mitigating potential impacts wherever possible.

I.2 BACKGROUND

Memorial Avenue is an arterial road located in Sydney's North West Region. The study area comprises the 2.2 kilometre length of Memorial Avenue, linking Old Windsor Road and Windsor Road. It provides the east-west access to Blacktown, Glenwood, Stanhope Gardens, Parklea, Baulkham Hills, Castle Hill and Kellyville. It bisects the new Balmoral Road release area precinct, part of the North West Growth Centre which, together with the South West Growth Centre, is earmarked to accommodate the majority of Sydney's urban growth over the next 25 years.

To accommodate the future traffic growth expected due to the increased residential and commercial growth in the area, Roads and Maritime proposes to upgrade Memorial Avenue from a two lane undivided carriageway, initially to a four lane divided carriageway, with the potential for further widening to six lanes.

I.3 STUDY METHOD

The method used to undertake this study follows the '*Guideline for Landscape Character and Visual Impact Assessment*' (Roads and Maritime, 2013) and is summarised as follows:

- Undertaking an initial site visit and field investigation, reviewing relevant literature, analysing aerial photographs and topographic maps to understand the study area.
- Reviewing the engineering concept design on a regular basis, and other supporting material to gain an appreciation of the project.
- Developing an Urban Design Strategy comprising objectives and principles to guide the development of the concept design
- Defining landscape character through a study area analysis, including a detailed site investigation.
- Identifying and describing landscape character zones and evaluating the proposal's impact on them.
- Evaluating the impact of the project on these landscape character zones by combining the sensitivity of the zone and the magnitude of the works to provide an overall impact rating as indicated by the Impact Assessment Grading Matrix (Figure 1.1).
- Identifying the visual catchment of the proposed works for the visual impact assessment.
- Selecting viewpoints within the visual catchment representing a range of different land uses.
- Evaluating the visual impact of the project by comparing the sensitivity of viewpoints and the magnitude of the impact of the project upon them to provide an overall impact rating as indicated by the Impact Assessment Grading Matrix.
- Developing the Urban and Landscape Concept Design, described in plans, sections/ elevations, precedent photographs and other drawings as appropriate.

INTRODUCTION

- Identifying urban design and landscape opportunities and methods of mitigating adverse visual impacts, both within and outside of the project scope to assist the ongoing development of the Concept Design and for consideration in the detail design phase of the project.

The method used to assess landscape character impact is described in Chapter 4 and visual impact is described in Chapter 5. The impact assessment grading matrix, adopted from *Guideline for Landscape Character and Visual Impact Assessment* (Roads and Maritime 2013), shown in Table 1.1, is used in both the landscape character and visual impact assessments. The matrix is applied based on specific criteria relevant to each type of assessment. These criteria are described at the beginning of each assessment chapter:

		MAGNITUDE			
		High	Moderate	Low	Negligible
SENSITIVITY	High	High Impact	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible
		Negligible	Negligible	Negligible	Negligible

Table 1.1: Impact Assessment Grading Matrix

2. CONTEXTUAL ANALYSIS

2.1 LOCATION

The study area for this Urban Design Report is for the 2.2 kilometre section of Memorial Avenue, located about 35 kilometres to the north-west of Sydney at Kellyville within the Hills Shire Council LGA. Memorial Avenue is a State arterial road, which runs in an east-west direction connecting Old Windsor Road in the west to Windsor Road in the east. It links the Blacktown LGA and some of its suburbs such as Glenwood, Stanhope Gardens and Parklea with the Hills Shire Council LGA and some of its suburbs such as Castle Hill and Kellyville.



Figure 2.1: Memorial Avenue shown within the context of the Sydney Metropolitan Region

CONTEXTUAL ANALYSIS

2.2 EXISTING SITE CONDITIONS

2.2.1 Landform & Topography

Memorial Avenue has been constructed to follow the undulating topography of the local area. The road corridor is characterised by the crossing over of a ridgeline and the gentle fall into Elizabeth Macarthur Creek to the west and Strangers Creek to the east that both feed into Caddies Creek in the north. The terrain of the wider landscape surrounding the study area is predominantly characterised by rolling hills and small valleys that are typical of the Cumberland Plain Woodland Forest.

2.2.2 Vegetation

The vegetation within the study area generally consists of Cumberland Plain Endangered Ecological Community (CPEEC) which is highly modified as a result of past and current land uses, particularly clearing for agriculture. The most extensive stands are located on the northern side of the road corridor at the intersection of Old Windsor Road and Memorial Avenue. Other smaller groupings occur at various locations next to the road. The remainder of the corridor is a mixture of pasture grasses in the paddocks and exotic tree plantings associated with the residences. Deciduous avenue plantings occur between Windsor Road and Kellyville Memorial Park, although their habit has been substantially altered due to pruning.

2.2.3 Hydrology

There are two main waterways that intersect Memorial Avenue: Elizabeth Macarthur Creek and Strangers Creek that form part of the Cattai Creek catchment that flows into the Hawkesbury River. Both creeks are quite degraded and are ephemeral in nature. Culvert structures are currently being used as crossings for the two creeks.

2.2.4 Heritage

There are three non-indigenous heritage listed items within 100 metres of the study area, these being parts of Windsor Road and Old Windsor Road and a house at 9 & 11 Windsor Road (Roads and Maritime, August 2006).

There are also a number of identified Aboriginal objects and places located within 200 metres of the study area (Roads and Maritime, August 2006), however, these are unlikely to be impacted by the proposal.

2.2.5 Cultural & Scenic Values

Defining the experience of the drive along Memorial Avenue, are a number of factors which combine to give the road its character.

Overall, the visual character of the Memorial Avenue corridor is characterised by a mix of rural/agricultural and remnant indigenous landscapes, with the ever increasing residential developments being constructed as part of the Balmoral Road Release Area. The existing roadside vegetation augments the visually pleasant driving experience of the two lane road over the rolling topography.



Plate 2.1: Rolling Topography typical of the Cumberland Plain landscape



Plate 2.2: Poor quality avenue planting at the eastern end of Memorial Avenue



Figure 2.2: Contextual analysis plan

CONTEXTUAL ANALYSIS

Much of the motorist's experience when travelling along Memorial Avenue, relies on the 'borrowed' landscape outside the road corridor, particularly over the nearby paddocks and further afield to the vegetated ridgelines and the Blue Mountains.

For much of its length, Memorial Avenue currently consists of a two lane road (one for each direction), which in its current configuration, adds to its rural residential character:

2.2.6 Land Use

A number of different landuses occur along the length of Memorial Avenue. The western end consists of vegetated open space and road infrastructure associated with the T-way bus lanes. To the east, there are a number of rural residential properties either side of Elizabeth Macarthur Creek. Around the Arnold Avenue/ Free Settlers Drive intersection, there is some new residential dwellings and a new retirement community.

The central section of the study area, east to Arnold Avenue and Hector Court, is predominately rural residential. Two masterplanned mixed residential developments, one recently completed and the other under construction, are located on the southern side of Memorial Avenue between Rocks Street and Hector Court. The Hills Clinic is located opposite, on the corner of Arnold Avenue.

The western section is dominated by Kellyville Memorial Park which consists of a number of playing fields, two tennis courts, netball courts, amenities building and carparking. Opposite the park, on the northern side, suburban residences have recently been constructed or are under construction.

2.2.7 Transport Network

Memorial Avenue is an important arterial road linking Baulkham Hills, Blacktown, Castle Hill, Glenwood, Kellyville, Parklea and Stanhope Gardens. The existing transport infrastructure in the area is a bus service that operates along the T-Way and Sunnyholt Road, linking Rouse Hill and Beaumont Hills/ Kellyville to Parramatta and the City/ North Sydney and Blacktown, and the local 619 service that travels along Memorial Avenue between Rouse Hill town centre and Macquarie Park station.

The existing pedestrian path and regional cycle is located on the eastern side of Old Windsor Road south from the intersection with Memorial Avenue and west along Sunnyholt Road. Pedestrian crossings are provided at the Old Windsor Road/ Memorial Avenue/ Sunnyholt Road intersection, the northern side of the intersection of Old Windsor Road/ Miami Avenue and across the T-Way at Memorial Avenue and Balmoral Road. It is proposed to provide a bridge over Memorial Avenue to facilitate a shared path system linking Rouse Hill and Castle Hill.



Plate 2.3: New residential development in the central section of Memorial Avenue

3. THE PROPOSED UPGRADE

3.1 PROJECT SUMMARY

The proposal is to upgrade a 2.2 kilometre length of Memorial Avenue, between and including some widening and intersection upgrades on Windsor Road and Old Windsor Road. The proposal would involve the following key features:

- Widening along the existing alignment on both sides of Memorial Avenue. This would upgrade the road to a four lane divided road, with provision for future widening to six lanes within the median. The width of the upgraded Memorial Avenue would vary from about 38 metres to 45 metres. Widening would consist of the following:
 - > Widening of Memorial Avenue generally to the north of the existing road between Windsor Road and Hector Court. At this location, Memorial Avenue would be widened XX metres on the northern side and XX metres on the southern side
 - > Widening of Memorial Avenue generally to the south of the existing road between Hector Court and Old Windsor Road. At this location, Memorial Avenue would be widened about XX metres on the northern side and XX metres on the southern side
 - > Widening along the existing alignment of Windsor Road generally to the west of the existing road between President Road and Wrights Road. At this location, Windsor Road would be widened about XX metres on the eastern side and XX metres on the western side
 - > Slight widening along the existing alignment of Old Windsor Road. At this location Old Windsor Road would be widened about XX metres on the eastern side and XX metres on the western side
- A central median along the length of Memorial Avenue of varying widths, ranging from about nine metres up to about 12 metres, with the exception of the approach to Old Windsor Road, near the proposed NWRL, where the median narrows to 2.9 metres
- The existing median along Windsor Road and Old Windsor Road at this location would be maintained
- A verge of variable width running along both sides of Memorial Avenue, Windsor Road, Old Windsor Road and Sunnyholt Road within the proposal area. A three metre wide shared path would be accommodated within the verge on both sides of Memorial Avenue within the proposal area
- Bus priority capability at traffic lights and indented bus bays on both sides of Memorial Avenue to allow buses a head start in the east-west direction.
- Upgrade of three existing intersections with Memorial Avenue, including:
 - > Windsor Road, Windsor Road would have additional through lane in both directions, and additional right and left turning lanes into Memorial Avenue. Memorial Avenue would have an additional left slip lane onto Windsor Road (northbound) and an additional westbound lane on Memorial Avenue
 - > Arnold Avenue (west), upgrade to a signalised four-way intersection with an additional through lane and dedicated left and right turning bays in each direction along Memorial Avenue, two additional right turning lanes from Arnold Avenue (west) and a new approach on Free Settlers Drive
 - > Old Windsor Road and Sunnyholt Road, an additional through lane in both directions along Old Windsor Road, an additional lane turning right from the Old Windsor Road into Memorial Avenue and additional left turn slip lane onto Old Windsor Road from Memorial Avenue
- Closure of three existing intersections with Memorial Avenue, including:
 - > Hector Court, which will revert into a cul-de-sac as part of the development of the Balmoral Road Release Area

THE PROPOSED UPGRADE

- > Rutherford Avenue, closure of current slip lane out of Rutherford Avenue onto Memorial Avenue
- > Arnold Avenue (east), which will revert into a cul-de-sac as part of the development of the Balmoral Road Release Area.
- Construction of one new intersection with Memorial Avenue at Severn Vale Drive and a realigned Arnold Avenue (east) (about 100 metres east of current alignment)
- Replacement of existing pipe culvert with a bridge over Strangers Creek, 18 metres span concrete plank bridge with vertical abutments
- Upgrade the existing multi-cell box culverts at Elizabeth Macarthur Creek with a reinforced concrete box culvert, as well as upgrade of pipe culverts at two additional low points along Memorial Avenue
- 1:4 landscaped earthen batters along the alignment adjacent to publicly owned land. 1:2 batters would be provided adjacent to private land to minimise property impact
- Safety barriers would be provided alongside fill retaining walls and at the culvert and bridge locations along Memorial Avenue
- Relocation and/or temporary diversion of existing underground utilities, including water, telecommunications, electricity and gas within the verges.

The start and end points of the proposal as indicated on the concept design includes the tie-ins to the existing alignment of both Windsor and Old Windsor Road. Activities to tie the proposal into the existing alignment would be determined during detailed design and may include milling and resheeting to create consistent levels between existing and new pavements.

As a result of the road design parameters and the physical manifestation of that design, it can be expected that there will be an impact on landscape character and views. The impacts that can be expected are summarised in the following sections.

4. LANDSCAPE CHARACTER ASSESSMENT

4.1 LANDSCAPE CHARACTER ASSESSMENT METHODOLOGY

4.1.1 Introduction

Roads and Maritime's 'Guideline for Landscape Character and Visual Impact Assessment' (Roads and Maritime, 2013) provides the following definition of landscape character:

'The combined quality of built, natural and cultural aspects that make up an area and provide its unique sense of place.'

Applying this definition to the specific conditions within the study area, and the features of the proposal, the landscape character assessment also considers how the area is used and how it functions as a part of the overall North-West Growth Centre.

4.1.2 Landscape Character Zones

The study area has been divided into seven Landscape Character Zones (LCZ) as illustrated in Figure 4.1. The zones correspond to landscape character types in the area and allow for a more detailed discussion of the character of each zone, of the proposal within it, and of the likely impact on the landscape character to be experienced as a result of the proposal. Each zone has been defined through the development of an understanding of land use, topography, and vegetation in combination with other factors.

The seven Landscape Character Zones are:

- > LCZ 1. Old Windsor Road intersection and NWRL Corridor
- > LCZ 2. Arnold Avenue (west) residential
- > LCZ 3. Rural residential
- > LCZ 4. Pellizzer Boulevard residential
- > LCZ 5. Strangers Creek
- > LCZ 6. Kellyville Memorial Park
- > LCZ 7. Burns Road residential

Generally, the existing landscape character of Memorial Avenue is a mixture of low-medium density residential housing established between larger semi-rural lots. However, the character of the area is rapidly changing with the construction of housing to the north and south of Memorial Avenue, associated with the Balmoral Road Release Area. Three main water courses intersect Memorial Avenue: Elizabeth Macarthur Creek, Strangers Creek (western tributary) and Strangers Creek. There are also a number of remnant vegetation areas, in particular, along the creek corridors.

4.1.3 Landscape Character Assessment

The landscape character zones facilitate detailed assessment of the character of the study area, of the proposal within it, and of the magnitude, sensitivity and impact likely on the landscape character of each zone to be experienced as a result of the proposal.

Magnitude

In landscape character assessment, magnitude refers to the type of proposal and its compatibility with the existing landscape character. All anticipated elements of the proposal, including the alignment, road infrastructure, planting, lighting, etc, are considered. The scale of elements (height, length), as well as its location or setting (within woodland, rural land, or over creek crossings), all have a bearing on the magnitude of the physical presence of the proposal.

A high magnitude results if the proposal is a major development or piece of road infrastructure and contrasts highly with the surrounding landscape, or entails heavy modification of the existing landscape, for example, the large scale removal of existing vegetation. A moderate magnitude rating would result if the proposal is moderately integrated into the landscape. A low magnitude rating would occur if the proposal is of a small scale and integrates well into the landscape.

LANDSCAPE CHARACTER ASSESSMENT

The magnitude impact rating also considers whether the proposal has a positive or negative impact on the landscape character of the zone. For example, a proposal may be of a large scale but may provide beneficial outcomes such as increased open space, enhancement of the areas 'sense of place', better connectivity and a safer road environment.

Sensitivity

Sensitivity refers to how sensitive the character of the setting is to the proposed change. A judgement has been made as to the quality of the landscape, its cultural and historical importance to the community, scenic quality, and overall composition of the place and its inhabitants. The following sensitivity judgements have been used as the basis for this assessment:

- Places with high social, recreational, and historical significance to local residents have higher sensitivity.
- Generally, water and natural environments are more highly valued than modified areas, though views over rolling farmland are still highly valued.
- Areas of unique scenic quality have higher sensitivity.
- A pristine environment would have greater sensitivity with less ability to absorb new elements in the landscape than modified landscapes or those areas with contrast and variety of landscape types.

Impact

Impact is the combination of the magnitude and sensitivity rating in accordance with the Impact Assessment Grading Matrix (refer to Figure 1.1).

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LANDSCAPE CHARACTER ASSESSMENT

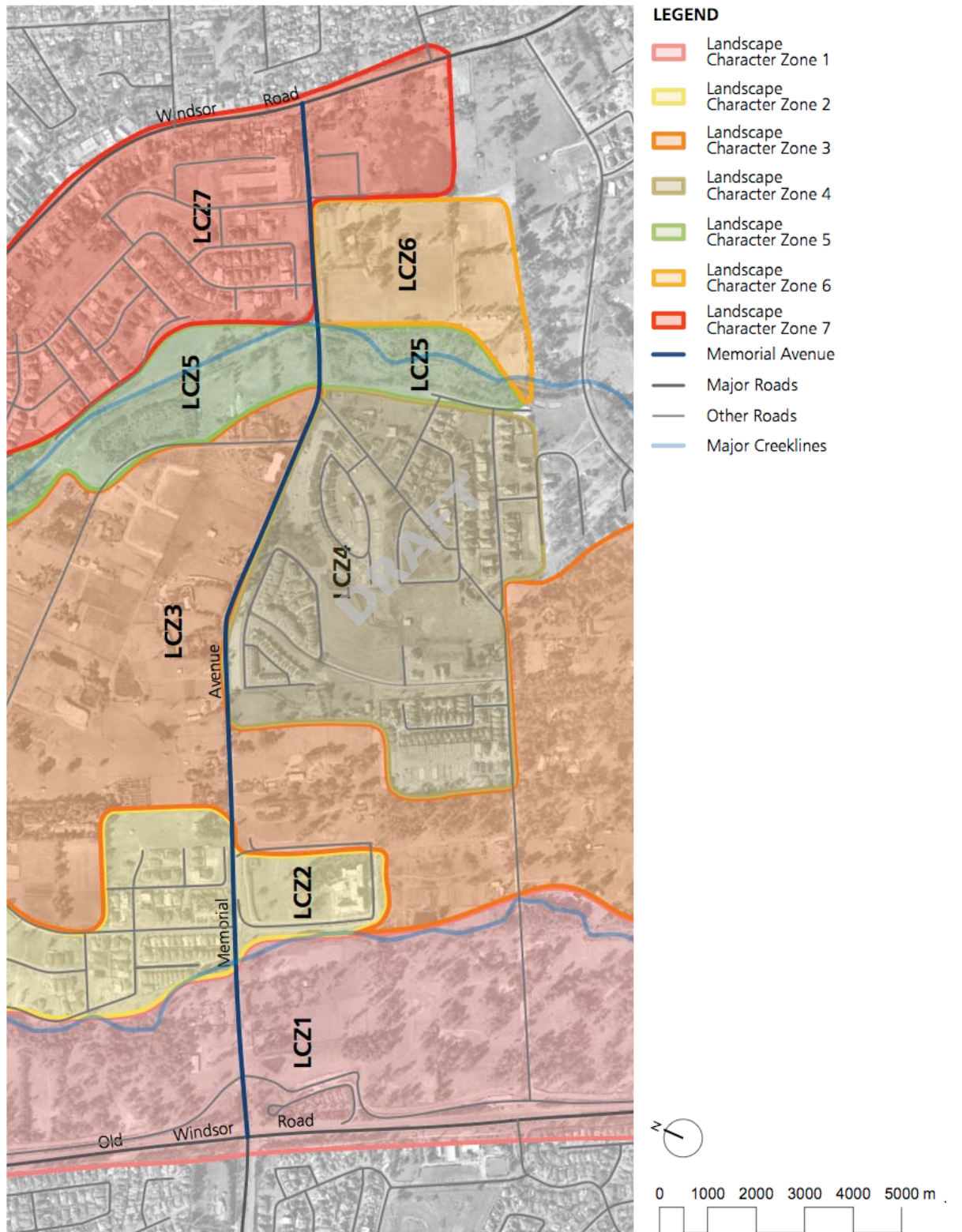


Figure 4.1: The seven Landscape Character Zones (LCZs)

LANDSCAPE CHARACTER ASSESSMENT

4.2 LCZ 1: OLD WINDSOR ROAD INTERSECTION & NWRL CORRIDOR

4.2.1 Existing Landscape Character

The western end of the LCZ consists of transport infrastructure including Memorial Avenue, Old Windsor Road and dedicated T-way bus slip lanes, bus stops and a large carpark south of Memorial Avenue. However, this area is generally well vegetated and screened from the road by low mounding.

To the east, there are a few small rural residential properties and the Elizabeth Macarthur Creek corridor.

Attribute	Description
Landform	Generally flat with a gentle slope to Elizabeth Macarthur Creek.
Vegetation	The LCZ is modified with exotic and native roadside vegetation and planting around residential properties and the T-way infrastructure. There is a stand of Cumberland Plain Endangered Ecological Community either side of Memorial Avenue, near Old Windsor Road.
Hydrology	Elizabeth Macarthur Creek crosses Memorial Avenue.
Land Use	The landuses include trunk drainage (Elizabeth Macarthur Creek corridor), transport infrastructure for the T-way, including land reserved for the North West Rail Link, and rural residential.
Built Form	A few single storey rural residential houses next to the road corridor and a large farm shed located north of Memorial Avenue.
Spatial Quality	Generally open with some screening provided by remnant woodland and other roadside vegetation.

4.2.2 The Proposed Works

Memorial Avenue would be widened to two lanes in each direction with an additional left turn lane into the T-way bus lane. A 12 metre wide median would separate the carriageways. There would be slight modification of the Old Windsor Road intersection and modification to the southern T-way bus lane intersection. A 3.0 metre wide pedestrian and cycle path would be provided on both sides of Memorial Avenue. A fill retaining wall, up to 1.8 metres high with a handrail to the top, would be constructed on the northern side of Memorial Avenue for about 120 metres west of Elizabeth Macarthur Creek.

4.2.3 Landscape Character Assessment

Sensitivity **Low**

- Extensive transport infrastructure, three rural residential properties, trunk drainage land and some remnant woodland.

Magnitude **Moderate**

- Doubling of the road surface to half of the LCZ, including property adjustments and the removal of some roadside vegetation.

Landscape Character Impact

Moderate-Low



LANDSCAPE CHARACTER ASSESSMENT

4.3 LCZ 2: ARNOLD AVENUE (WEST) RESIDENTIAL

4.3.1 Existing Landscape Character

Memorial Avenue rises slightly out of Elizabeth Macarthur Creek and is a two lane road with wide verges. New residential development and a childcare centre are located on the northern side and a new five storey retirement and aged care centre ('The Gracewood Community') is located on the southern side. This building is setback about 180 metres from the road and the Memorial Avenue frontage is bounded by a noise wall with an up to 15 metre wide native garden bed.

Attribute	Description
Landform	Gently sloping to Elizabeth Macarthur Creek.
Vegetation	Mixed native and exotic trees to the roadside. A large garden bed of new native tree, shrub and groundcover planting in front of 'The Gracewood Community'.
Hydrology	No creeklines are located in this zone.
Land Use	New residential housing and a childcare centre on the northern side and a retirement and aged care centre ('The Gracewood Community'), setback from the road, on the southern side, on the block between Free Settlers Drive and Rutherford Avenue.
Built Form	Single and double storey residential dwellings and the five storey 'The Gracewood Community'. The 110 metre long dark grey noise wall is a dominant built element in the LCZ.
Spatial Quality	Generally open road corridor due to the building setbacks with foreground views.

4.3.2 The Proposed Works

Memorial Avenue would be widened to the south of the existing road, to become a four lane road with a 12 metres wide median. The Arnold Avenue and Free Settlers Drive intersection would become signalised. The existing access from Rutherford Avenue would be closed. A 3.0 metre wide pedestrian and cycle path would be provided on both sides of Memorial Avenue.

4.3.3 Landscape Character Assessment

Sensitivity **Moderate**

- Modified LCZ, however the new and existing tree plantings provide some coherence to the landscape.
- The proximity of the residential dwellings and The Gracewood Community gives the LCZ a moderate sensitivity.

Magnitude **Moderate**

- Doubling of the road surface, upgraded intersection and removal of existing vegetation.

Landscape Character Impact

Moderate



LANDSCAPE CHARACTER ASSESSMENT

4.4 LCZ 3: RURAL RESIDENTIAL

4.4.1 Existing Landscape Character

The central section consists of rolling rural residential pastures, with scattered residencies and associated farm buildings, particularly on the northern side. There are good views over the pastures, terminated by remnant woodland in the foreground, to the Blue Mountains.

Memorial Avenue is a two lane road, and with its adjoining landuses, creates a distinct 'country road' character within this zone.

Attribute	Description
Landform	Rolling hills.
Vegetation	Generally exotic roadside vegetation associated with residences with some small stands of remnant woodland.
Hydrology	A small tributary of Strangers Creek crosses Memorial Avenue west of 'The Hills Clinic'.
Land Use	Generally five acre rural residential lots consisting of grazing paddocks and crops. 'The Hills Clinic' is located between Strangers Creek and its tributary to the west which is zoned for stormwater management system infrastructure.
Built Form	Single storey rural residential buildings close to Memorial Avenue with associated farm buildings further away from the road. 'The Hills Clinic' is a larger two storey building.
Spatial Quality	Expansive long distance views to the north and west. Some minor localised enclosure due to roadside trees.

4.4.2 The Proposed Works

Memorial Avenue would be widened to the south of the existing road to become a four lane road with a 12 metre wide median. A 3.0 metre wide pedestrian and cycle path would be provided on both sides of the road. There would be extensive retaining walls including a 180 metre long cut wall, up to 1.6 metres high on the southern side, and two fill walls on the northern side, the first about 220 metres long and up to 2.8 metres high, the second about 130 metres long and up to 0.8 metres high, both with a handrail to the top. A number of existing roadside trees would be removed.



4.4.3 Landscape Character Assessment

Sensitivity **Moderate**

- Despite being modified, the existing character is a generally cohesive landscape of rural residential properties.

Magnitude **Moderate**

- Doubling of the road surface, extensive retaining walls and removal of existing vegetation.

Landscape Character Impact

Moderate



LANDSCAPE CHARACTER ASSESSMENT

4.5 LCZ 4: PELLIZZER BOULEVARD RESIDENTIAL

4.5.1 Existing Landscape Character

The existing landscape character is undergoing extensive modification. The previous rural residential acreage now contains residential estates of different housing stock and separated from Memorial Avenue by internal access roads.

Attribute	Description
Landform	Rolling hills.
Vegetation	Some native and exotic roadside trees and new streetscape planting associated with the residential developments.
Hydrology	A small tributary of Strangers Creek crosses Memorial Avenue, separating the two new housing developments.
Land Use	Medium density housing with a small amount of dedicated open space on land through which the small tributary flows.
Built Form	New two storey mixed residential consisting of free-standing and terrace homes.
Spatial Quality	Enclosure where roadside trees are present, however; generally open as the housing development is setback at least 25 metres from Memorial Avenue.

4.5.2 The Proposed Works

Memorial Avenue would be widened to the south of the existing road to become a four lane road with a 12 metre wide median. A 3.0 metre wide pedestrian and cycle path would be provided on both sides of the road. A 320 metre long cut retaining wall, up to 2.6 metres high and with a handrail to the top, would be constructed on the southern side of the road. The existing Hector Court be closed, and a signalised intersection with the proposed Severn Vale Drive would be provided.

4.5.3 Landscape Character Assessment

Sensitivity **Low**

- Highly modified by new residential development.

Magnitude **Moderate**

- Doubling of the road surface, extensive retaining walls, new signalised intersection and removal of existing vegetation.

Landscape Character Impact

Moderate-Low



LANDSCAPE CHARACTER ASSESSMENT

4.6 LCZ 5: STRANGERS CREEK

4.6.1 Existing Landscape Character

This small, flat LCZ is a dedicated trunk drainage corridor through which Strangers Creek flows. Despite previous clearing, it is now generally well vegetated with woodland, particularly to the road edges. Memorial Avenue continues as a two lane road through this zone.

Attribute	Description
Landform	Generally flat.
Vegetation	Cumberland Plain Endangered Ecological Community on both sides of Memorial Avenue including extensive regrowth on the southern side.
Hydrology	Strangers Creek crosses Memorial Avenue.
Land Use	The land is zoned for stormwater management system infrastructure.
Built Form	A gabion erosion control structure is located south of Memorial Avenue.
Spatial Quality	Enclosed by dense roadside vegetation.

4.6.2 The Proposed Works

Memorial Avenue would be widened to the north of the existing road to become a four lane road with a right turn lane for Severn Vale Drive and a 7.5 metre wide median. A new 18 metres span concrete plank bridge with vertical abutment would be constructed over Strangers Creek. A 3.0 metre wide pedestrian and cycle path would be provided on both sides of the road. Large 1 in 4 fill batters would be formed on both sides of Memorial Avenue. A number of existing roadside trees would be removed.

4.6.3 Landscape Character Assessment

Sensitivity **Moderate**

- Coherent landscape of regenerated riparian and woodland plantings.

Magnitude **Moderate**

- Doubling of the road surface, new bridge structure and removal of existing vegetation

Landscape Character Impact

Moderate



LANDSCAPE CHARACTER ASSESSMENT

4.7 LCZ 6: KELLYVILLE MEMORIAL PARK

4.7.1 Existing Landscape Character

This zone is located on the southern side of Memorial Avenue and consists of a sporting complex containing a number of fields, cricket pitches, tennis courts and a large amenities building. An informal gravel carpark, delineated by telegraph poles, is located next to the road. A heavily pruned row of deciduous trees is located along the park frontage.

Attribute	Description
Landform	Gently sloping from the east to a flat area where the sporting fields are located.
Vegetation	Avenue planting of deciduous trees, many of which have been heavily pruned as they are under powerlines. Mainly native trees have been planted around the amenities building and the edge of the sporting fields.
Hydrology	No creeklines are located in this zone.
Land Use	The land is zoned public recreation and contains a numbers of sporting facilities including a small soccer field, three football fields, a baseball field, two tee ball fields, two tennis courts, two netball courts, playground, amenities building , and car parking facilities.
Built Form	Two storey amenities building is set down half a storey below ground level when viewed from Memorial Avenue and is surrounded by trees, obscuring it from the street.
Spatial Quality	Generally open due to the stunted nature of the avenue of trees.

4.7.2 The Proposed Works

Memorial Avenue would be widened to the north of the existing road to become a four lane road with a left turn in and out at Stone Mason Drive and a 12 metre wide median. A 3.0 metre wide pedestrian and cycle path would be provided on both sides of the road. A number of existing roadside trees would be removed.

4.7.3 Landscape Character Assessment

Sensitivity **Moderate**

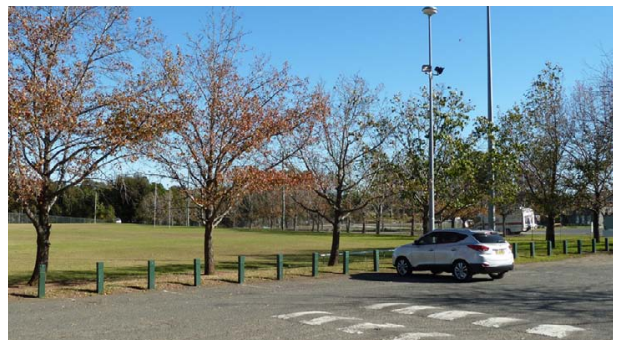
- Coherent landscape character tied together by avenue planting.

Magnitude **Moderate**

- Doubling of the road surface, upgraded intersection and removal of existing vegetation.

Landscape Character Impact

Moderate



LANDSCAPE CHARACTER ASSESSMENT

4.8 LCZ 7: BURNS ROAD RESIDENTIAL

4.8.1 Existing Landscape Character

Memorial Avenue is quite steep in this zone and increases in width from a two lane road to four lanes as it approaches Windsor Road. The land either side of Memorial Avenue is zoned residential with new houses and houses under construction on the northern side. The southern side consists of open grassed areas with road infrastructure in place for future residential development.

Attribute	Description
Landform	Memorial Avenue rises steeply towards Windsor Road and provides extensive foreground views and views beyond to the Blue Mountains.
Vegetation	Avenue planting of <i>Lophostemon confertus</i> on the eastern side of Memorial Avenue with deciduous avenue planting and mixed native and exotic tree and shrub planting to residential properties on the western side.
Hydrology	No creeklines are located in this zone.
Land Use	Residential to the western side of Memorial Avenue with open space planned for future residential on the eastern side. Kellyville Rotary Park is located at the intersection of Windsor Road on the northern side.
Built Form	New and existing one and two storey houses are located on the northern side of Memorial Avenue.
Spatial Quality	Generally open due to the 20 metre wide setback of houses on the western side which allows extensive views to the north and west.

4.8.2 The Proposed Works

Memorial Avenue would be widened to the north of the existing road to become a four lane road. At the intersection with Windsor Road, an additional two left turn lanes would be provided. The median would narrow to 7.5 metres. A 3.0 metre wide pedestrian and cycle path would be provided on both sides of the road. A number of existing roadside trees, including those in Kellyville Rotary Park, would be removed.

4.8.3 Landscape Character Assessment

Sensitivity **Low**

- Highly modified landscape undergoing further change with new residential development.

Magnitude **Moderate**

- Doubling of the road surface, upgraded signalised intersection and removal of existing vegetation.

Landscape Character Impact

Moderate-Low



LANDSCAPE CHARACTER ASSESSMENT

4.9 SUMMARY OF LANDSCAPE CHARACTER IMPACT

The landscape character impact assessment of the proposal described above, represents a qualitative assessment based on the seven Landscape Character Zones (LCZ). The results of these assessments range from **Moderate-Low** to **Moderate** and are summarised in the following table.

Landscape Character Zone	Sensitivity	Magnitude	Impact
LCZ 1: Old Windsor Road Intersection and NWRL Corridor	Low	Moderate	Moderate-Low
LCZ 2: Arnold Avenue (West) Residential	Moderate	Moderate	Moderate
LCZ 3: Rural Residential	Moderate	Moderate	Moderate
LCZ 4: Pellizzer Boulevard Residential	Low	Moderate	Moderate-Low
LCZ 5: Strangers Creek	Moderate	Moderate	Moderate
LCZ 6: Kellyville Memorial Park	Moderate	Moderate	Moderate
LCZ 7: Burns Road Residential	Low	Moderate	Moderate-Low

The study area generally consists of cleared rolling hills, dotted with housing on five acre lots. Remnant woodland can be found along the Elizabeth Macarthur Creek and Strangers Creek corridors, along the North-West Rail Link (NWRL) corridor, and scattered along the roadside and within the pastures. However, the area is rapidly changing, and it is estimated that about 90% of the study area, part of the Balmoral Road Release Area, will be occupied with housing by 2020. There are already new housing developments located along Memorial Avenue, around Arnold Avenue (west), Pellizzer Boulevard, and Burns Road. The NWRL, running parallel to Old Windsor Road, will also change the existing of the area.

Overall, the proposal would have an adverse impact on landscape character. While the proposal, for the most part, is to take place in an established road corridor, it would impact on all Landscape Character Zones to some degree, due to the removal of trees, increase in road pavement width, and intersection upgrades. As the magnitude of the works is similar across all LCZs, the greatest impacts are found within the zones that have the most modification, for example, the new and developing residential areas at Arnold Avenue (west), Pellizzer Boulevard, and Burns Road.

LANDSCAPE CHARACTER ASSESSMENT

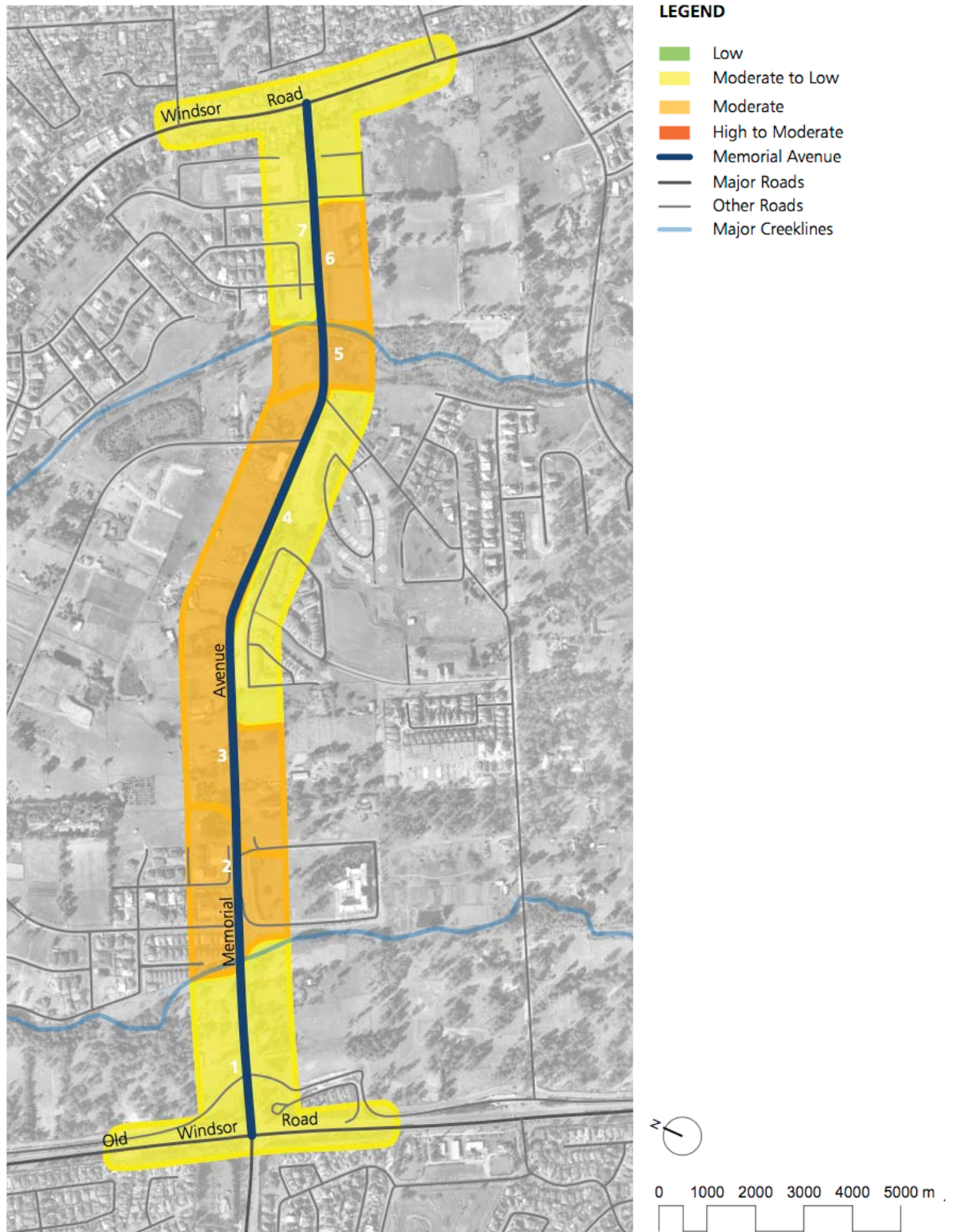


Figure 4.2: Landscape Character Impacts summary

5. VISUAL IMPACT ASSESSMENT

5.1 VISUAL IMPACT METHODOLOGY

5.1.1 Overview

The potential visual impact of the proposal has been assessed in relation to a number of key viewpoints. It is based on the existing pattern of land use and development adjoining the road corridor. The method of assessment involved:

- Defining the scale or size, form and type of proposal within the context of the study area.
- Establishing an estimated visual catchment, through desktop analysis and groundtruthing on site.
- Identifying key viewpoints from where the proposal would be visible.
- Assessing the level of potential visual impact on viewers at these viewpoints from the proposal.

5.1.2 The Proposal

All elements associated with the proposal are assessed as part of this visual impact assessment. These are described in Chapter 3.

5.1.3 Visual Catchment

The extent from which the proposal would be visible from adjoining areas varies along the length of the study area. It is influenced by topography, vegetation, rural properties and associated buildings. A detailed field and desktop assessment was undertaken to determine the area from where the proposal would be visible, defined as the Visual Envelope Map (VEM), as illustrated in Figure 5.1.

Views to the proposal are generally constrained by the low ridgelines associated with the rolling landscape of the valley, and large stands of native vegetation.

The visual receivers of the proposal include residents, tourists, pedestrians and motorists.

5.1.4 Viewpoint Locations

Within the VEM, key viewpoints have been identified along the road corridor and at public domain areas. This involved the analysis of views from the road to identify the extent to which houses and other buildings were visible. This provided an indication of the likely level of visibility from these buildings, as it was not feasible to inspect private residences to check potential views from these properties. Locations and directions of chosen viewpoints are representative of the range of viewpoints both within and beyond the road corridor, and are indicated in Figure 5.1.

5.1.5 Visual Impact Assessment

The magnitude of change to existing views and the sensitivity of the viewer has been assessed for each of the chosen viewpoints.

Magnitude

Magnitude of change to existing views refers to the nature and scale of the proposal, and the extent and proximity of the view to it. Magnitude represents the contrast in scale, form and type of proposal to the location and context to which it is to be placed. A high magnitude results if the proposal is of a major scale and is considered out of scale or uncharacteristic of the existing visual character, or if there is considerable modification to the existing landscape. A moderate magnitude would result if the proposal is prominent but not considered to be substantially uncharacteristic with the existing visual character. A low magnitude results if there is minimal alteration to the existing view and the proposal is of a scale and nature that is consistent with the existing visual character.

VISUAL IMPACT ASSESSMENT

Sensitivity

Sensitivity is the measure of the visual importance of the view and is dependent on:

- Distance between viewer and the proposal.
- The category of viewer; for example, residence, workplace, shops, open space.
- The elements of the proposal that are visible.
- Importance of the view, for example, identified in tourist guides, do people deliberately seek the view.

Visual sensitivity includes the consideration of the perceived cultural and historical values of the visual environment and the elements within it.

Generally, viewers with the highest sensitivity include:

- Residents who have existing attractive views that will be affected by the proposal.
- Users of public open space where their attention is focused on the visual landscape, for example, lookouts or other scenic natural areas.
- Communities that place high cultural and historical significance on the visual landscape.

Viewers with the lowest sensitivity are most likely to be:

- Employees focused on their work.
- Motorists whose attention is focused on driving.

Impact

Impact is the combination of the magnitude and sensitivity rating in accordance with the Impact Assessment Grading Matrix (refer to Figure 1.1).

The following pages contain a table quantifying the visual impact at each viewpoint. The gradings are measured on their impact relative to each other within the scope of the proposal rather than to an absolute scale covering all potential forms of impact.

5.1.6 Key viewpoints

A total of 12 viewpoints have been identified on the basis of the criteria outlined above. Each viewpoint is comprised of the following summary information:

- Location.
- Existing site description.
- Viewpoint selection rationale.
- Visual impact based on assessment of magnitude of change and sensitivity.
- Mitigation measures that have been incorporated into the landscape and engineering designs.

The viewpoints are as indicated in Figure 5.1 and are listed from west to east.

VISUAL IMPACT ASSESSMENT

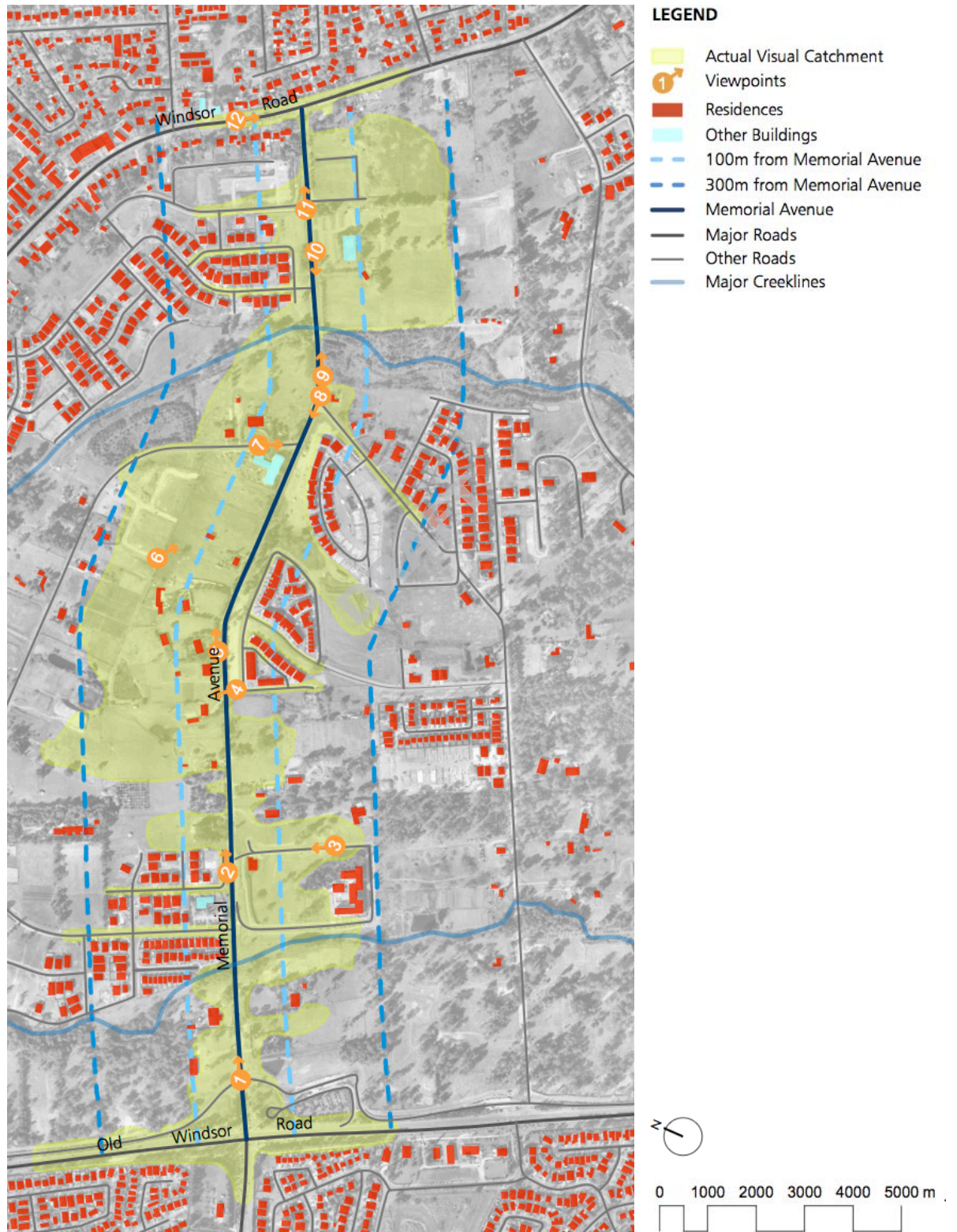


Figure 5.1: Visual Envelope Map (VEM) illustrating the location of key viewpoints

VISUAL IMPACT ASSESSMENT

Viewpoint 1

Location: Memorial Avenue, near the T-way bus lane intersection, looking east.

Elements of the proposal visible:

- The existing kerbline beyond the intersection would move slightly to the right
- Widening of the median
- New 3.0 metre wide pedestrian and cycle path
- New planting to the verge and median.



Sensitivity	Magnitude	Impact
Low	Low	Low
<ul style="list-style-type: none"> • Highly modified with transport infrastructure dominating including T-way bus lanes and NWRL corridor (behind viewer). 	<ul style="list-style-type: none"> • Widening of the road pavement and median • Minimal tree loss • New planting to the verge and median reduces the rating. 	

Viewpoint 2

Location: Memorial Avenue, next to Thomas Boulton Circuit, looking east.

Elements of the proposal visible:

- Widened road pavement to five lanes including a right turn lane into Arnold Avenue for westbound traffic
- New 12 metre wide median
- New 3.0 metre wide pedestrian and cycle path on both sides of the road
- New retaining walls above the road on both sides
- New planting to the verge and median.



Sensitivity	Magnitude	Impact
Moderate	Moderate	Moderate
<ul style="list-style-type: none"> • Existing rural residential with new residential being built. 	<ul style="list-style-type: none"> • Widening of the road pavement and median • Removal of existing trees. 	

VISUAL IMPACT ASSESSMENT

Viewpoint 3

Location: Rutherford Avenue, near 'The Greenwood Community', looking north.

Elements of the proposal visible:

- Closure of Rutherford Avenue at Memorial Avenue
- New avenue tree planting to new median.



Sensitivity	Magnitude	Impact
Moderate	Low	Moderate-Low
<ul style="list-style-type: none"> • Next to retirement and aged care centre • Attractive avenue planting to Rutherford Avenue. 	<ul style="list-style-type: none"> • Removal of existing slip lane • Vehicles closer to the viewer due to widening of the road.. 	

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Viewpoint 4

Location: Verge between Memorial Avenue and Rutherford Avenue near Rocks Street intersection.

Elements of the proposal visible:

- Widening of the road pavement to include two lanes in each direction
- New 12 metre wide median with avenue tree planting
- New 3.0 metre wide pedestrian and cycle path on both sides of the road
- Removal of existing trees on both sides of the road.



Sensitivity	Magnitude	Impact
Moderate	Moderate	Moderate
<ul style="list-style-type: none"> • Attractive rural residential views • High degree of modification due to new residential development behind viewer. 	<ul style="list-style-type: none"> • Widening of the road pavement and median • Removal of existing trees. 	

VISUAL IMPACT ASSESSMENT

Viewpoint 5

Location: Memorial Avenue, at bus stop about 650 metres east of Arnold Avenue (west), looking east.

Elements of the proposal visible:

- Widening of the road pavement to include two lanes in each direction
- New 12 metre wide median with avenue tree planting
- New 3.0 metre wide pedestrian and cycle path on both sides of the road
- New retaining wall, up to 2.6 metres high to the right of the view
- Removal of existing trees on both sides of the road.



Sensitivity	Magnitude	Impact
Moderate	High	High-Moderate
<ul style="list-style-type: none"> • Attractive rural residential landscape to the north • Pedestrians and bus users affected by the changed view • High degree of modification due to new residential development to the south reduces the rating. 	<ul style="list-style-type: none"> • Widening of the road pavement and median • New retaining wall • Removal of existing trees reduces the buffer between the road and new housing. 	

Viewpoint 6

Location: Butler Avenue, looking south east.

Elements of the proposal visible:

- Low fill retaining wall
- Removal of some existing trees.



Sensitivity	Magnitude	Impact
Low	Negligible	Negligible
<ul style="list-style-type: none"> • View over open paddocks to new housing • High degree of modification due to new residential development under construction behind viewer • Distance from the works reduces rating. 	<ul style="list-style-type: none"> • Removal of some existing trees to the right of the view may expose more of the new housing. 	

VISUAL IMPACT ASSESSMENT

Viewpoint 7

Location: Arnold Avenue, at the entrance to The Hills Clinic, looking south.

Elements of the proposal visible:

- Closure of Arnold Avenue at Memorial Avenue
- Widening of the road pavement to include two new eastbound right turn lanes into new Severn Vale Drive intersection and two new westbound lanes
- New 12 metre wide median with avenue tree planting
- New 3.0 metre wide pedestrian and cycle path on both sides of the road
- New retaining wall, up to 1.6 metres high in front of new housing.



Sensitivity	Magnitude	Impact
Low	Low	Low
<ul style="list-style-type: none"> • High degree of modification due to new residential development under construction. 	<ul style="list-style-type: none"> • Widening of the road pavement and median • New retaining wall • Existing buildings and vegetation obscure most of the works. 	

Viewpoint 8

Location: Memorial Avenue, 40 metres east of Hector Court, looking west.

Elements of the proposal visible:

- Widening of the road pavement
- New signalised intersection at Severn Vale Drive accommodating two right turn lanes and one left turn in each direction
- New 7.5 metre wide median
- Closure of Hector Court at Memorial Avenue
- New 3.0 metre wide pedestrian and cycle path on both sides of the road
- Removal of existing trees to the right of the view.



Sensitivity	Magnitude	Impact
Low	Moderate	Moderate-Low
<ul style="list-style-type: none"> • High degree of modification due to new residential development to the south. 	<ul style="list-style-type: none"> • Creation of new eight lane intersection • Removal of existing trees. 	

VISUAL IMPACT ASSESSMENT

Viewpoint 9

Location: Memorial Avenue, 40 metres east of Hector Court, looking east.

Elements of the proposal visible:

- Widening of the road pavement to include two lanes in each direction with two westbound right turn lanes into the new Severn Vale Drive intersection
- New 7.5 metre wide median widening to 12 metres
- New bridge over Strangers Creek
- New 3.0 metre wide pedestrian and cycle path on both sides of the road
- Removal of existing trees in the foreground to the left of the view.



Sensitivity	Magnitude	Impact
Moderate	High	High-Moderate
<ul style="list-style-type: none"> • Attractive view along tree lined road • High degree of modification due to new residential development under construction behind viewer. 	<ul style="list-style-type: none"> • Widening of the road pavement and median • New bridge • Removal of existing trees. 	

Viewpoint 10

Location: Kellyville Memorial Park car park, looking west along Memorial Avenue.

Elements of the proposal visible:

- Widening of the road pavement to include two lanes in each direction
- New 12 metre wide median
- New 3.0 metre wide pedestrian and cycle path on both sides of the road
- Closure of Hartigan Avenue at Memorial Avenue
- Removal of existing roadside trees on both sides of the road.



Sensitivity	Magnitude	Impact
High	Moderate	High-Moderate
<ul style="list-style-type: none"> • Attractive tree lined road next to sporting fields and recreation area • Some modification due to new residential development to the right of the view. 	<ul style="list-style-type: none"> • Widening of the road pavement and median • Removal of existing trees. 	

VISUAL IMPACT ASSESSMENT

Viewpoint 11

Location: Memorial Avenue, 25 metres west of Burns Road, looking east.

Elements of the proposal visible:

- Widening of the road pavement to include two lanes in each direction, widening to include an additional two left turn lanes onto Windsor Road
- New 12 metre wide median narrowing to 7.5 metres
- Upgrade of the intersection of Memorial Avenue with Burns Road and Stone Masons Drive
- New 3.0 metre wide pedestrian and cycle path on both sides of the road.



Sensitivity	Magnitude	Impact
Moderate	Moderate	Moderate
<ul style="list-style-type: none"> • Modification due to new residential development to the left of the view • Reasonably attractive tree lined street. 	<ul style="list-style-type: none"> • Widening of the road pavement and median • Removal of existing trees. 	

Viewpoint 12

Location: Windsor Road, 100 metres north of Memorial Avenue, looking south.

Elements of the proposal visible:

- Slight widening of the road pavement to the west of Windsor Road (to the right of the view)
- Upgrade of the intersection of Windsor Road and Memorial Avenue
- Removal of existing trees and house at the corner of Memorial Avenue.



Sensitivity	Magnitude	Impact
Low	Low	Low
<ul style="list-style-type: none"> • Busy arterial road with motorists focussing their attention on driving. 	<ul style="list-style-type: none"> • Slight widening of the road pavement • Removal of existing trees. 	

VISUAL IMPACT ASSESSMENT

5.2 VISUAL IMPACT SUMMARY

A total of 12 viewpoints form the basis of the visual impact assessment. The viewpoints are focused across the range of anticipated magnitudes and sensitivities including residents and motorists, providing a more even ratings outcome. A summary of the assessment results are presented in the following table:

Viewpoint	Sensitivity	Magnitude	Impact
Viewpoint 1	Low	Low	Low
Viewpoint 2	Moderate	Moderate	Moderate
Viewpoint 3	Moderate	Low	Moderate-Low
Viewpoint 4	Moderate	Moderate	Moderate
Viewpoint 5	Moderate	High	High-Moderate
Viewpoint 6	Low	Negligible	Negligible
Viewpoint 7	Low	Low	Low
Viewpoint 8	Low	Moderate	Moderate-Low
Viewpoint 9	Moderate	High	High-Moderate
Viewpoint 10	High	Moderate	High-Moderate
Viewpoint 11	Moderate	Moderate	Moderate
Viewpoint 12	Low	Low	Low

Ratings of **High-Moderate** impact occur where the magnitude of the works is the greatest, for example, a large number of trees would need to be removed at the slight bend in Memorial Avenue near Pellizzer Boulevard where there is limited space to provide replacement trees due to the corridor width, and at Strangers Creek, where the removal of trees would open up the road corridor, where some enclosure currently exists. It also occurs where the sensitivity is high for viewers at Kellyville Memorial Park.

Landscape and urban design mitigation strategies have been developed from the outcomes of the landscape character and visual assessments, as a way of mitigating the potential impacts, and have been incorporated into the Urban Design and Landscape Concept which follows in Chapter 7. These mitigation measures, as well as those to be further considered in the detailed design stage of the project are discussed in the following Chapter 8.

6. URBAN DESIGN STRATEGY

6.1 OVERVIEW

A central component of the design process is the identification of urban design objectives. These objectives cover the full range of components associated with the road design including alignment, adjoining property access, road corridor character, and road infrastructure elements. These elements include cut and fill batters, walling, drainage structures, fences and barriers, planting and landscaped surfaces.

The objectives reflect an essential goal to achieve a project outcome which is sensitively integrated, taking into account not only the corridor itself but also its relationship with surrounding areas. These would be implemented in accordance with the Roads and Maritime policy *Beyond the Pavement* (2009) performance themes of safety, cost effectiveness and sustainability.

An integrated design approach has been adopted for the Memorial Avenue Upgrade in order to ensure that the best possible outcomes are achieved. As part of the integrated design approach, a landscape and urban design strategy has been developed to provide landscape and urban design input to the overall road concept design for the works.

The purpose of the strategy is to articulate how urban design can contribute to the successful achievement of the overall project objectives. The development of the strategy has directly influenced key engineering aspects of the concept road design to date, including road alignment, typical cross sections and retaining walls. The intention is that this urban design strategy would influence the development of the upgrade when it proceeds to detailed design and construction.

6.2 URBAN DESIGN VISION FOR MEMORIAL AVENUE

The following vision statement articulates the desired outcome for Memorial. The future character and quality of the motorist's and adjoining residents' experience of the road will be determined not only by the planning and design of future upgrades of the road within its reservation, but substantially by the planning, design and development of the land adjoining the corridor.

Memorial Avenue will continue to function as a major east-west link for existing residents and the future North West Growth Centre community. The planning and design of the road will respond to the existing context, whilst recognising the future planning and development of the land adjoining the road corridor.

6.3 URBAN DESIGN OBJECTIVES AND PRINCIPLES

The following urban design objectives and principles have been devised to guide the development of the concept design outcome for the project.

Objective: Improve the quality of the public domain throughout the corridor.

Design principles:

- Improve pedestrian and cyclist amenity along and across the corridor; especially by providing connecting paths from bus stops to residential areas and along open space corridors.
- Provide planting to screen views from/ to residences.
- Ensure planting reinforces the landscape character zones described within this report within an overall structure.
- Utilise a combination of trees and understory treatments which respond to the existing adjacent context.
- Utilise a similar palette of roadside elements as for recent road upgrade projects undertaken in the North West Growth Centres.

URBAN DESIGN STRATEGY

Objective: Facilitate the provision of good urban design outcomes to future residential areas adjoining the road.

Design principles:

- Work with appropriate authorities to develop a visual, urban design and landscape character of the road corridor by promoting planning/ design strategies that achieve a high quality environment and amenity at the interface between Memorial Avenue and future residential areas.
- Ensure the provision of safe, convenient and enjoyable pedestrian and cycle connections in the most appropriate/ accessible location within the locality in the context of future growth and urban development patterns.
- Provide more formal structured planting to the major intersections at Old Windsor Road and Windsor Road where possible, and along the frontage of Kellyville Memorial Park to define the entry and approach to these intersections and recreational destination.
- Avoid the need for noise walls by advocating the provision of appropriate development controls such as adequate development setbacks, building orientation, layout and building height controls.
- Avoid residential boundary fencing along the road corridor by promoting an active street address with a character consistent with the desired outcomes for the road corridor.

Objective: Provide a flowing road alignment that is responsive to, and integrated with the natural and built landscape.

Design principles:

- Physically, and where possible, visually separate carriageways to reduce horizontal scale and perceived road corridor width: utilise medians and verges to maximise existing tree retention, revegetation potential and break up wide pavement surfaces.
- Devise a planting/ revegetation strategy that takes into account the long-term visual quality and functional changes within the road corridor.
- Protect creeks and creek banks by maximising tree retention and planting at creek crossings and aligning shared paths alongside the carriageway.

Objective: Protect and enhance existing views, character and cultural values of the corridor.

Design principles:

- Retain and reinforce the diverse character of the route, including the distinctive character of the urban areas and the distinction between urban and non-urban areas.
- Recognise and incorporate existing cultural sites along the route.
- Retain existing view corridors, particularly at elevated points, to establish a sense along Memorial Avenue.
- Maximise tree planting opportunities.

Objective: Develop a simple and unified palette of roadside elements and details that are attractive and easily maintained.

Design principles:

- Standard roadside elements may include road furniture (safety barriers, pedestrian and shared path fencing, bus stops, street lighting, signage) retaining walls, shared paths, bridges and noise mitigation. In particular, some principles have been developed for the following:

Shared Paths

- > Provide a 0.5 metre area from the back of kerb, differentiated by colour, to provide a visual separation between the path and the road carriageway.
- > Maximise the visibility of the shared path to adjoining areas for good surveillance and orientation sight lines.

URBAN DESIGN STRATEGY

- > Concrete to be broom finished. Consider a mid grey colour to reduce glare. Consider exposed aggregate thresholds with adequate tonal variation to alert cyclists to upcoming intersections.
- > Provide adequate and visible connections to new residential and recreation areas.
- > Minimise conflict points where the path is constrained by walls or railings by providing linemarkings designating locations for cyclists and pedestrians.

Fencing

- > Maintain a consistent scale and rhythmic use of fencing elements, using similar fencing to that used in nearby road upgrade projects.
- > Provide a cyclist rail on bridges and other areas as required.

Bus Stops

- > Ensure the bus stop areas are well lit for orientation and safety.
- > Provide textured ground surface finishes to differentiate the bus shelter zone, for example exposed aggregate concrete. Provide enough space to allow the shared path to continue behind the bus stop.

Lighting Fixtures

- > Lights are to be of the standard adopted for other areas of the North West Growth Centre.

Retaining Walls

- > Minimise the use of retaining walls if practical. Only use walls if there is insufficient land, where geological instability restricts the use of natural cuttings, or if the provision of walling allows the retention of existing trees.
- > For retaining walls below the road, facing the surrounding landscape, utilise smooth faced blockwork in a recessive colour.
- > For more visible retaining walls facing Memorial Avenue, utilise materials appropriate to the context, whilst considering future landuses:
 - For residential areas, utilise patterned concrete panels or a combination of split-faced and smooth-faced concrete blockwork.
 - For rural residential areas consider gabions as an alternative.
- > Avoid the use of shotcrete.

Bridges and Culverts

- > Provide simple and elegant structures designed in accordance with the *Roads and Maritime Bridge Aesthetics Guidelines*.
- > Consider the existing environment: minimise disturbance to the creek bed and riparian vegetation zone; maximise natural light levels beneath the bridge; and locate bridge superstructure away from the creek.
- > Separate the shared path from the vehicular bridge.
- > Ensure that a neat and simple transition is provided between the bridge rail and the road safety barrier.

URBAN DESIGN STRATEGY

Noise mitigation

- > Use passive methods to achieve noise mitigation in accordance with NSW Department of Planning and Infrastructure interim guidelines.
- > If noise attenuation is required, consider mounding or a combination of wall and mounding.
- > If walls are necessary, utilise a lightweight concrete panel, of a plain and simple design, and use a colour that blends into the existing setting.
- > Maximise planting in front of walls as much as possible.

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7. URBAN DESIGN AND LANDSCAPE CONCEPT PLAN

7.1 URBAN DESIGN AND LANDSCAPE CONCEPT PLAN

The Draft Urban Design and Landscape Concept Plan for Memorial Avenue Upgrade comprises an overall Corridor Concept Design diagram which describes generally the urban and landscape design approach by landscape character zone. This will be supplemented by a series of plans and sections at a larger scale to further demonstrate the application of the urban and landscape design principles developed in Chapter 6.

It is understood that the main roadworks will be constructed in phases over time. It is expected that the Urban and Landscape Concept Design will be developed in stages and implemented during each construction phase.

7.2 CORRIDOR CONCEPT DESIGN

The Corridor Concept Design is illustrated in Figure 7.1 - 7.2. The plan identifies the Landscape Character Zones (LCZ) across the study area. Following this, a number of key plans and sections illustrate the Urban Design and Landscape Concept at specific locations along Memorial Avenue.

The following key design concepts are described for each LCZ as observed travelling west to east:

Old Windsor Road Intersection and NWRL Corridor

- Retain and enhance existing gateway planting to signify transition of road type
- Undertake planting that enables ease of visibility for motorists, cyclists and pedestrian
- Provide adequate signage for shared paths on both the northern and southern sides
- Provide a continuous shared path along the southern and northern verge of Memorial Avenue; including connections to Old Windsor Road and access to bus stops
- Re-instate bus shelters on both the north and south of Memorial Avenue, with the provision of disability access
- Enhance remnant Cumberland Plain Woodland through endemic planting
- Provide noise masking to the creek habitat through infill planting west of creek. This will also allow future mitigation of unwanted views from the North-West Rail Viaduct
- Enhance Elizabeth Macarthur Creek ecology through endemic plantings
- Remove weed species within water course corridor
- Design appropriate culvert details to reflect creek crossing.

Arnold Avenue (West) Residential

- Enhance sight lines around Arnold Avenue intersection by providing low gateway planting
- Provide screening to existing rural character to the north and south of Memorial Avenue by providing medium shrub planting with scattered native trees
- Maintain panoramic views for westbound motorists, cyclists and pedestrians to the Blue Mountains by providing low grasses and groundcovers and scattered native trees
- Maintain sight lines for pedestrians, cyclists and motorists surrounding proposed Council pedestrian bridge by providing low gateway planting
- Provide a continuous shared path along the southern and northern verge of Memorial Avenue; including access to bus stops and connections to Arnold Avenue and Free Settlers Drive.

URBAN DESIGN AND LANDSCAPE CONCEPT PLAN

Rural Residential

- Retain existing tree planting that is either located within the median or verge where possible. This would be subject to future survey accurately identifying existing tree locations
- Utilise verge width to re-establish native grass and shrub plantings
- Provide scattered native tree plantings where the distance from travel lanes permit, and where there is sufficient space between the shared path and property boundary
- Maintain views to the Blue Mountains by utilising grasses and groundcovers in north-eastern section of the character zone
- Provide a continuous shared path along the southern and northern verge of Memorial Avenue; including access to bus stops and connections to the proposed pedestrian footbridge.
- Enhance creek ecology of the Strangers Creek tributary through endemic plantings.
- Provide planted buffer to northern and southern sides of Memorial Avenue to mitigate noise penetration into creek areas.
- Remove weed species within water course corridor.

Pellizzer Boulevard Residential

- Provide avenue planting to signify change in landscape character
- Utilise informal avenue planting (native) on the southern side of Memorial Avenue to enhance residential/street characteristics
- Undertake exotic avenue planting on the northern side of Memorial Avenue to articulate hospital frontage
- Provide a continuous shared path along the southern and northern verge of Memorial Avenue; including access to bus stops and connections to Arnold Avenue.

Strangers Creek

- Enhance creek ecology through endemic plantings
- Provide planted buffer to northern and southern sides of Memorial Avenue to mask noise penetration into creek areas
- Remove weed species within water course corridor
- Design appropriate bridge details to reflect creek crossing
- Provide a continuous shared path along the southern and northern verge of Memorial Avenue; providing consistent fencing along creek edge.

Kellyville Memorial Park:

- > Provide avenue planting to signify change in landscape character
- > Utilise informal avenue planting (native) on the northern side of Memorial Avenue to enhance residential/street characteristics
- > Undertake exotic avenue planting on the southern side of Memorial Avenue to articulate Kellyville Memorial Park
- > Provide a continuous shared path along the southern and northern verge of Memorial Avenue; including access to bus stops and connections to Kellyville Memorial Park.

URBAN DESIGN AND LANDSCAPE CONCEPT PLAN

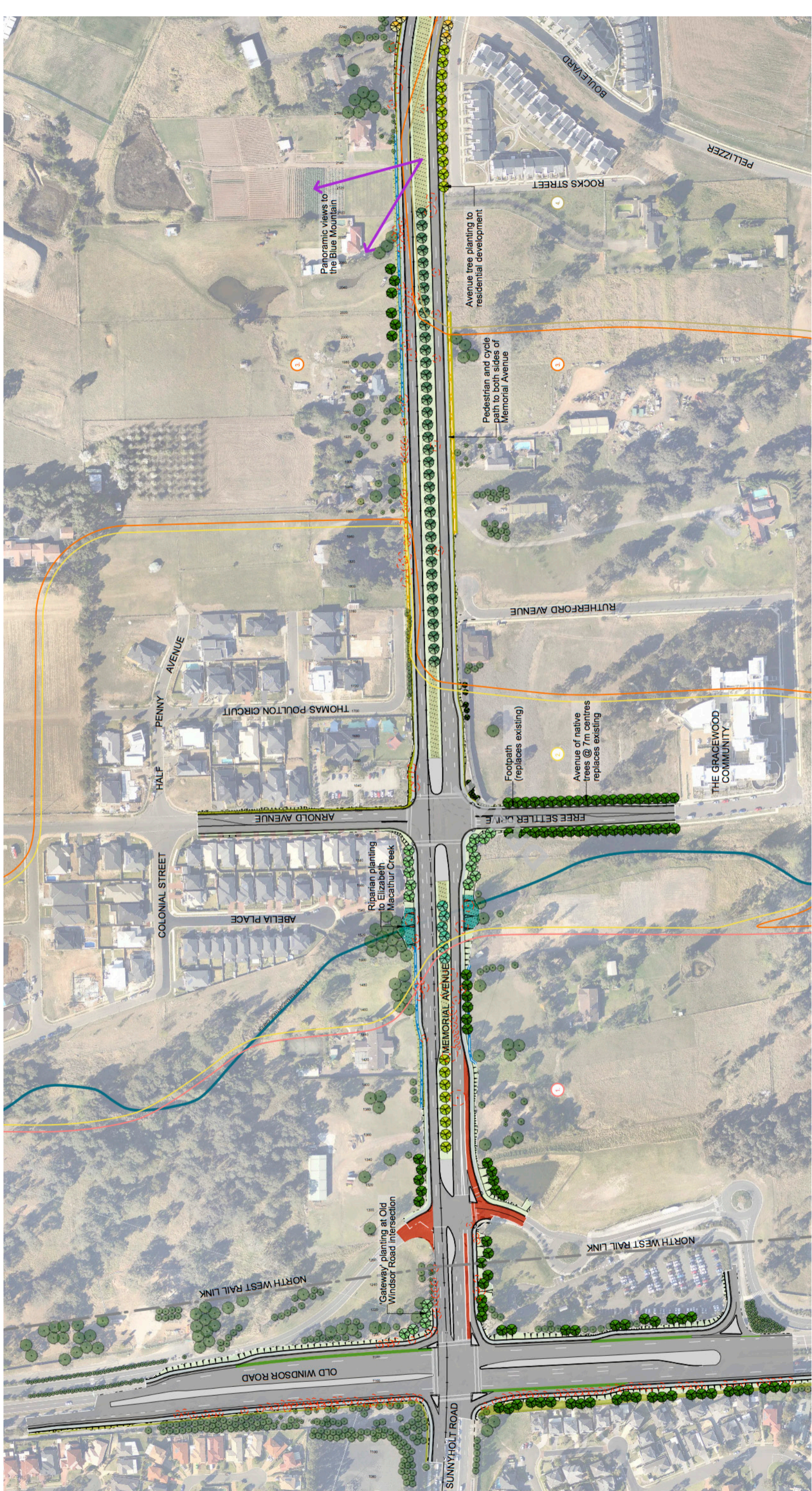
Burns Road Residential

- Provide informal avenue planting (native) on the northern and southern sides of Memorial Avenue
- Maintain panoramic views for westbound motorists, cyclists and pedestrians to the Blue Mountains by providing low grasses and groundcovers and scattered native trees. Utilise grasses and groundcovers to maintain panoramic views to the Blue Mountains
- Undertake exotic avenue planting on the southern side of Memorial Avenue to articulate recreational facility
- Retain and enhance existing gateway planting to connect transition of road type. Provide additional planting to connect existing corner block park
- Provide a continuous shared path along the southern and northern verge of Memorial Avenue; including access to bus stops, connections to Burns Road and through the corner block park to Windsor Road.

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URBAN DESIGN AND LANDSCAPE CONCEPT PLAN

DRAFT



LEGEND

- BOUNDARY LINE
- CONCRETE MEDIAN
- 3.0M WIDE SHARED PATH
- BUS LANE
- BICYCLE LANE
- RETAINING WALL TYPE 1
- RETAINING WALL TYPE 2

PLANT MIX 1 - NATIVE GRASSES

PLANT MIX 2 - NATIVE GRASSES, LOW SHRUBS

PLANT MIX 3 - RIPARIAN

TURF

EXISTING TREES TO BE RETAINED

EXISTING TREES TO BE REMOVED

PROPOSED SPECIMEN TREE PLANTING

PROPOSED AVENUE TREE PLANTING

PROPOSED RIPARIAN TREE PLANTING

PROPOSED MEDIAN TREE PLANTING

PROPOSED GATEWAY TREE PLANTING

PROPOSED NATIVE TREE PLANTING

LANDSCAPE CHARACTER ZONES

1. OLD WINDSOR ROAD INTERSECTION & NWRL CORRIDOR
2. ARNOLD AVENUE (WEST) RESIDENTIAL
3. RURAL RESIDENTIAL
4. PELLIZZER BOULEVARD RESIDENTIAL
5. STRANGERS CREEK
6. KELLYVILLE MEMORIAL PARK
8. BURNS ROAD RESIDENTIAL

VEWS

VIEW

CREEK BRIDGE

0 25 75 m

Figure 7.1: Corridor Concept Design - Sheet 1



LEGEND

- BOUNDARY LINE
- CONCRETE MEDIAN
- 3.0M WIDE SHARED PATH
- BUS LANE
- BICYCLE LANE
- RETAINING WALL TYPE 1
- RETAINING WALL TYPE 2

PLANT MIX 1 - NATIVE GRASSES

PLANT MIX 2 - NATIVE GRASSES, LOW SHRUBS

PLANT MIX 3 - RIPARIAN

TURF

EXISTING TREES TO BE RETAINED

EXISTING TREES TO BE REMOVED

PROPOSED SPECIMEN TREE PLANTING

PROPOSED AVENUE TREE PLANTING

PROPOSED RIPARIAN TREE PLANTING

PROPOSED MEDIAN TREE PLANTING

PROPOSED GATEWAY TREE PLANTING

PROPOSED NATIVE TREE PLANTING

LANDSCAPE CHARACTER ZONES

1. OLD WINDSOR ROAD INTERSECTION & NWRL CORRIDOR
2. ARNOLD AVENUE (WEST) RESIDENTIAL
3. RURAL RESIDENTIAL
4. PELLIZZER BOULEVARD RESIDENTIAL
5. STRANGERS CREEK
6. KELLYVILLE MEMORIAL PARK
7. BURNS ROAD RESIDENTIAL

VEWS

CREEK BRIDGE

0 25 75 m

North arrow pointing up.

Figure 7.2: Corridor Concept Design - Sheet 2

URBAN DESIGN AND LANDSCAPE CONCEPT PLAN

7.3 CONCEPT DESIGNS AT SPECIFIC LOCATIONS

The following plans and sections illustrate the proposed Urban Design and Landscape Concept at specific locations along Memorial Avenue and are related to the Landscape Character Zones previously assessed. Key Plan locations are shown on Figure 7.3.

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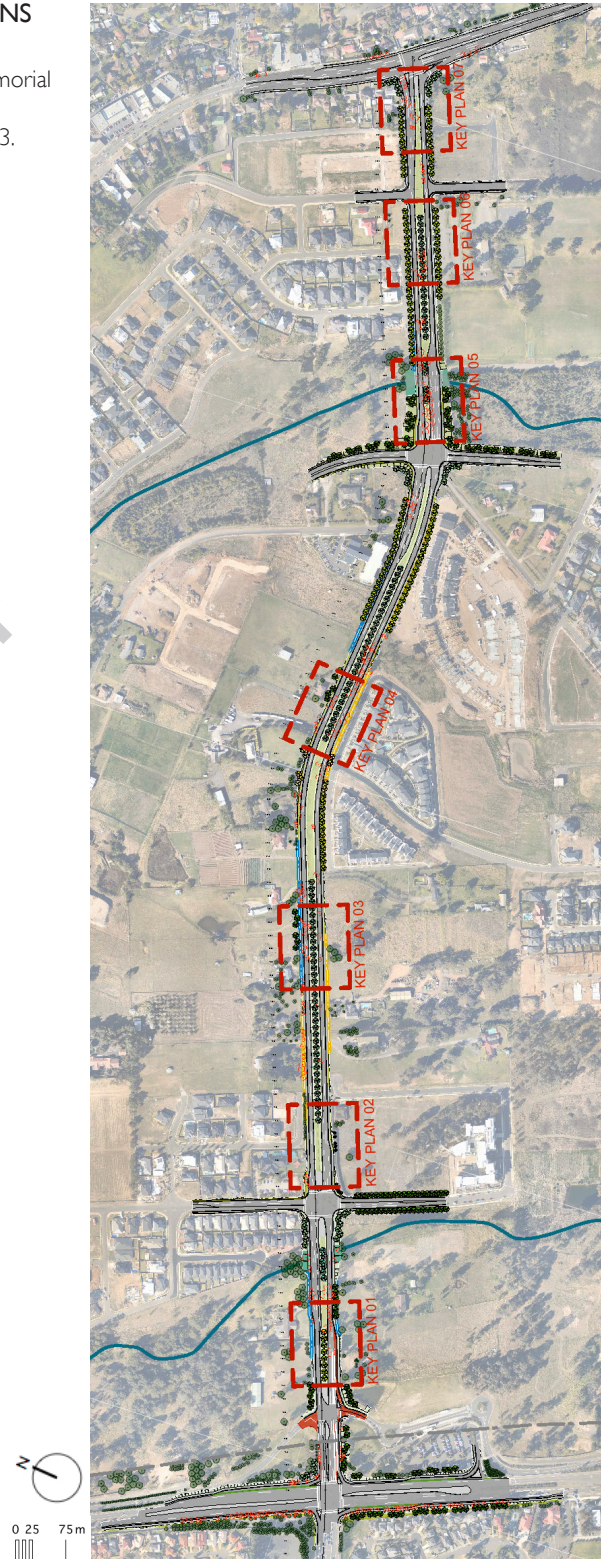
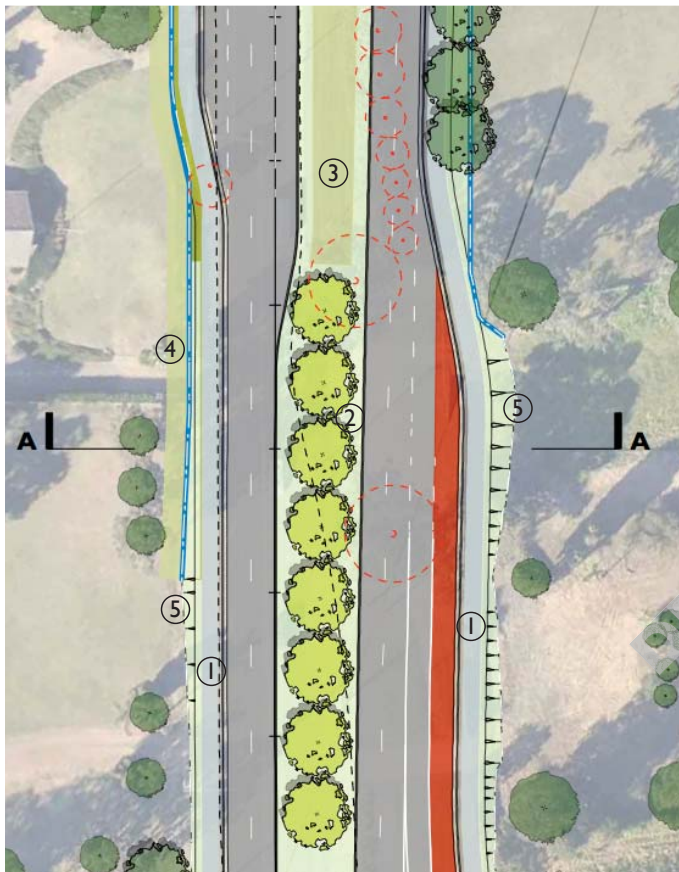


Figure 7.3: Key Plan locations

URBAN DESIGN AND LANDSCAPE CONCEPT PLAN

7.3.1 KEY PLAN I - OLD WINDSOR ROAD AND NWRL CORRIDOR LCZ



LEGEND

- BOUNDARY LINE
- CONCRETE MEDIAN/TRAFFIC ISLAND
- 3.0M WIDE PEDESTRIAN AND CYCLE PATH
- BUS LANE
- ON-ROAD BICYCLE LANE
- RETAINING WALL TYPE 1 (CUT)
- RETAINING WALL TYPE 2 (FILL)
- PLANT MIX 1 - NATIVE GRASSES
- PLANT MIX 2 - NATIVE GRASSES, LOW SHRUBS
- PLANT MIX 3 - RIPARIAN
- TURF
- EXISTING CREEK
- EXISTING ROAD ALIGNMENT
- EXISTING TREES TO BE RETAINED
- PROPOSED TREES
- TREES TO BE REMOVED

Concept Design Description

1. Provide new pedestrian and cycle path to both sides of Memorial Avenue.
2. Provide a row of exotic trees in grass to the median to announce the approach to Old Windsor Road intersection.
3. Provide low shrub and groundcover planting to medians wider than two metres.
4. Provide low shrub and groundcover planting to the base of fill retaining wall to reduce their visibility from the surrounding landscape.
5. Provide infill shrub and groundcover planting to batter slopes.

Figure 7.4: Urban Design and Landscape Key Plan I

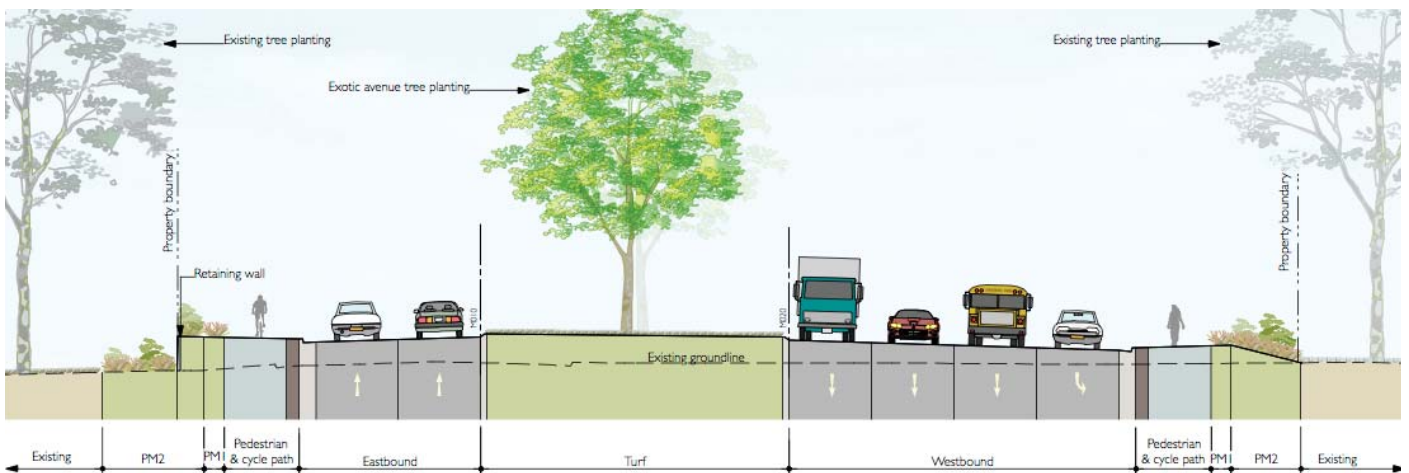
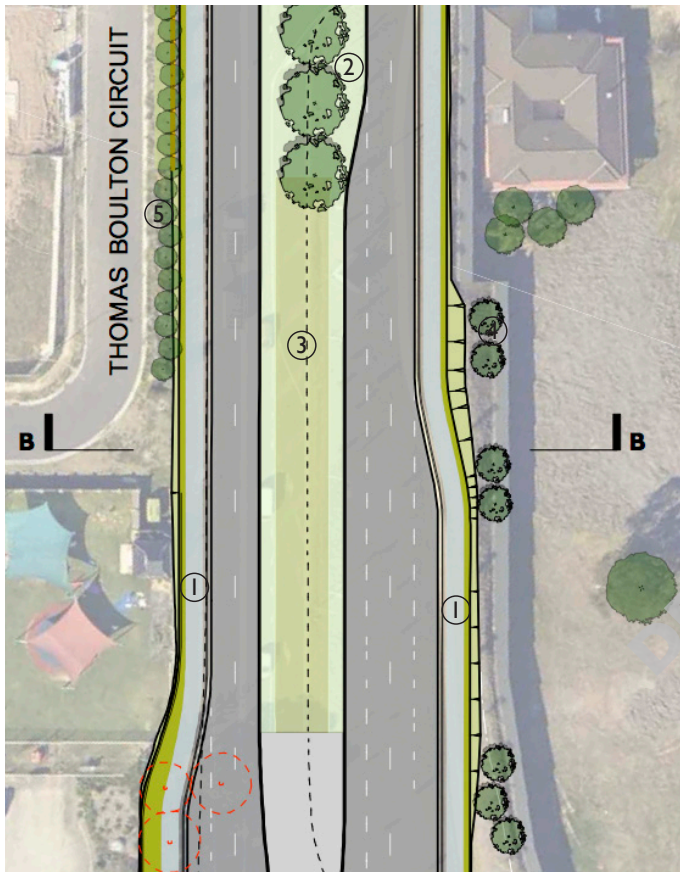


Figure 75: Section A-A at chainage 1400

URBAN DESIGN AND LANDSCAPE CONCEPT PLAN

7.3.2 KEY PLAN 2 - ARNOLD AVENUE (WEST) RESIDENTIAL LCZ



LEGEND

- BOUNDARY LINE
- CONCRETE MEDIAN/TRAFFIC ISLAND
- 3.0M WIDE PEDESTRIAN AND CYCLE PATH
- BUS LANE
- ON-ROAD BICYCLE LANE
- RETAINING WALL TYPE 1 (CUT)
- RETAINING WALL TYPE 2 (FILL)
- PLANT MIX 1 - NATIVE GRASSES
- PLANT MIX 2 - NATIVE GRASSES, LOW SHRUBS
- PLANT MIX 3 - RIPARIAN
- TURF
- EXISTING CREEK
- EXISTING ROAD ALIGNMENT
- EXISTING TREES TO BE RETAINED
- PROPOSED TREES
- TREES TO BE REMOVED

Concept Design Description

1. Provide new pedestrian and cycle path to both sides of Memorial Avenue.
2. Provide a row of trees in grass to the median to reduce the visual scale of the road.
3. Provide low shrub and groundcover planting to medians wider than two metres.
4. Reinststate tree, shrub and groundcover planting to replace existing planting and screen noise wall.
5. Retain and enhance existing planting to area between path and Thomas Boulton Circuit.

Figure 7.6: Urban Design and Landscape Key Plan 2

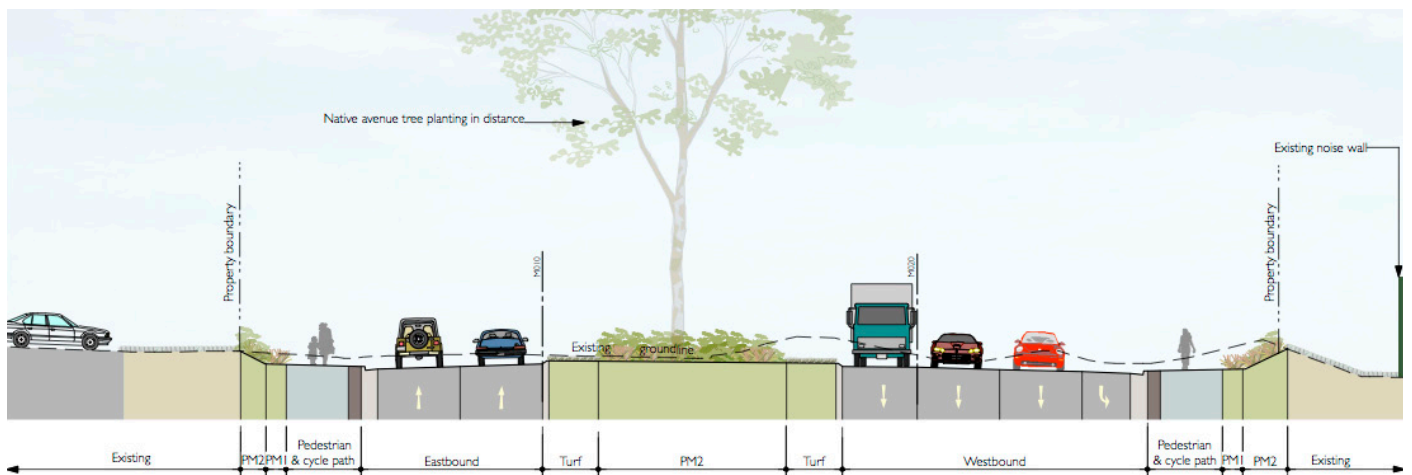
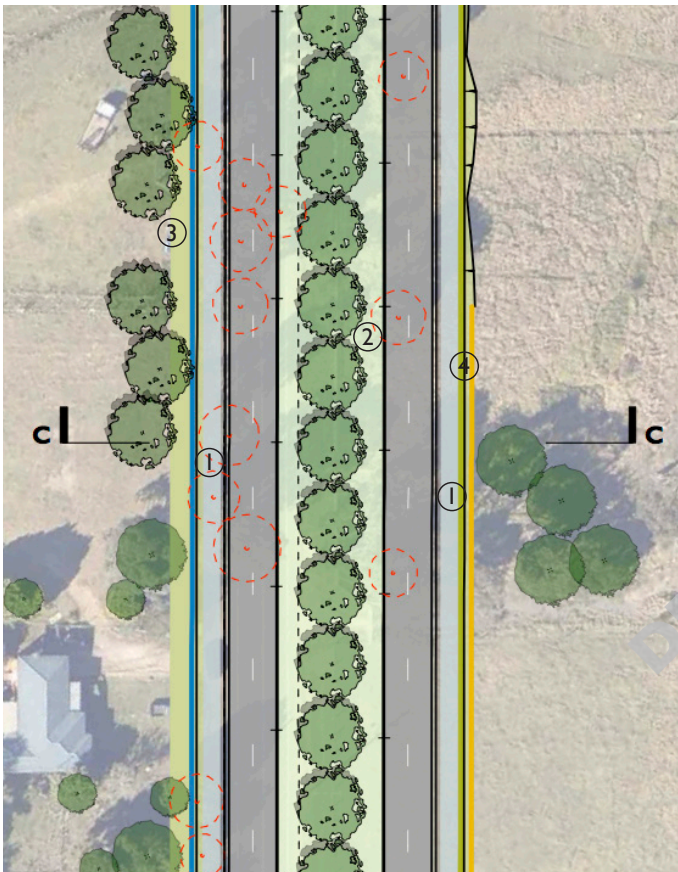


Figure 7.7: Section B-B at chainage 1700

URBAN DESIGN AND LANDSCAPE CONCEPT PLAN

7.3.3 KEY PLAN 3 - RURAL RESIDENTIAL LCZ



LEGEND

- BOUNDARY LINE
- CONCRETE MEDIAN/TRAFFIC ISLAND
- 3.0M WIDE PEDESTRIAN AND CYCLE PATH
- BUS LANE
- ON-ROAD BICYCLE LANE
- RETAINING WALL TYPE 1 (CUT)
- RETAINING WALL TYPE 2 (FILL)
- PLANT MIX 1 - NATIVE GRASSES
- PLANT MIX 2 - NATIVE GRASSES, LOW SHRUBS
- PLANT MIX 3 - RIPARIAN
- TURF
- EXISTING CREEK
- EXISTING ROAD ALIGNMENT
- EXISTING TREES TO BE RETAINED
- PROPOSED TREES
- TREES TO BE REMOVED

Concept Design Description

1. Provide new pedestrian and cycle path to both sides of Memorial Avenue.
2. Provide a row of trees in grass to the median to reduce the visual scale of the road.
3. Provide low shrub, groundcover and scattered tree planting to the base of fill retaining wall to reduce their visibility from the surrounding landscape.
4. Provide low shrub and groundcover planting between the path and the cut retaining wall.

Figure 7.8: Urban Design and Landscape Key Plan 3

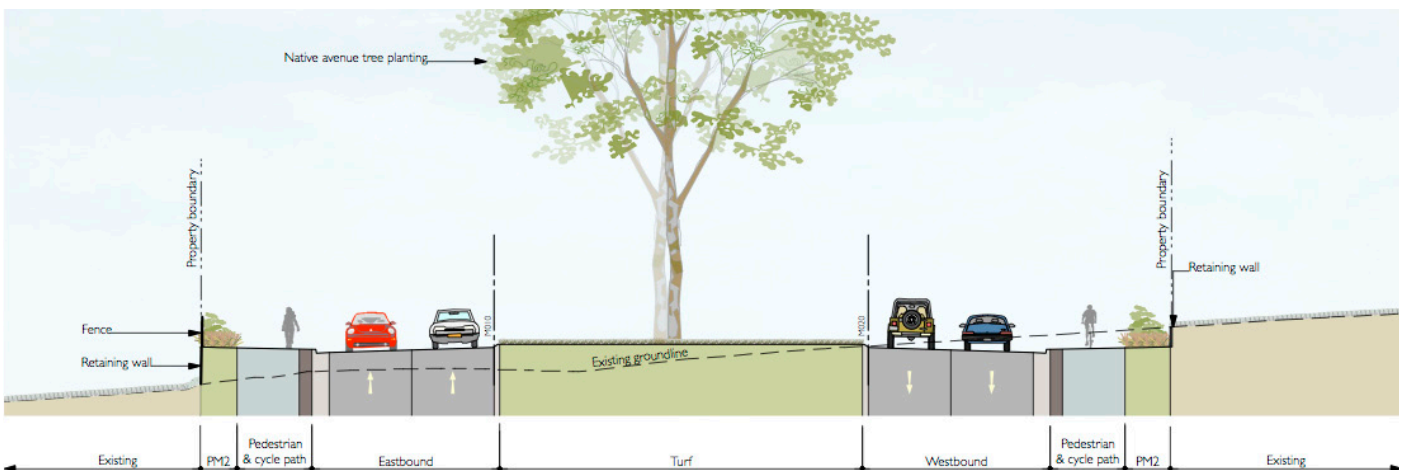
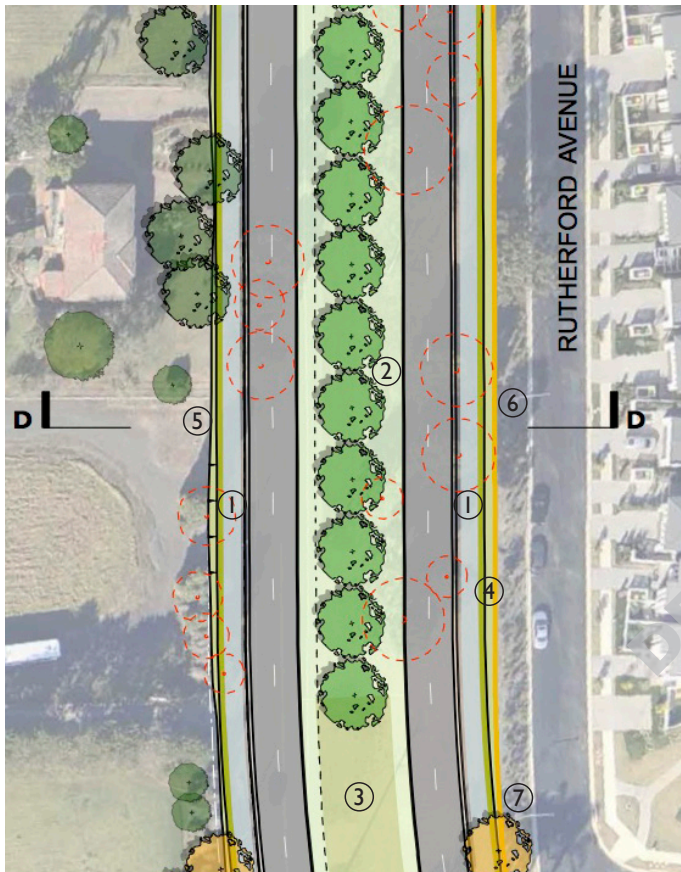


Figure 7.9: Section C-C at chainage 2000

URBAN DESIGN AND LANDSCAPE CONCEPT PLAN

7.3.4 KEY PLAN 4 - PELLIZZER BOULEVARD RESIDENTIAL LCZ



LEGEND

- BOUNDARY LINE
- CONCRETE MEDIAN/TRAFFIC ISLAND
- 3.0M WIDE PEDESTRIAN AND CYCLE PATH
- BUS LANE
- ON-ROAD BICYCLE LANE
- RETAINING WALL TYPE 1 (CUT)
- RETAINING WALL TYPE 2 (FILL)
- PLANT MIX 1 - NATIVE GRASSES
- PLANT MIX 2 - NATIVE GRASSES, LOW SHRUBS
- PLANT MIX 3 - RIPARIAN
- TURF
- EXISTING CREEK
- EXISTING ROAD ALIGNMENT
- EXISTING TREES TO BE RETAINED
- PROPOSED TREES
- TREES TO BE REMOVED

Concept Design Description

1. Provide new pedestrian and cycle path to both sides of Memorial Avenue.
2. Provide a row of trees in grass to the median to reduce the visual scale of the road.
3. Provide low shrub and groundcover planting to medians wider than two metres.
4. Provide low shrub and groundcover planting between the path and the cut retaining wall.
5. Provide infill shrub and groundcover planting to batter slopes.
6. Retain existing planting between cut wall and Rutherford Avenue. Replace with similar species if necessary.
7. Provide tree planting to denote the future pedestrian overbridge.

Figure 7.10: Urban Design and Landscape Key Plan 4

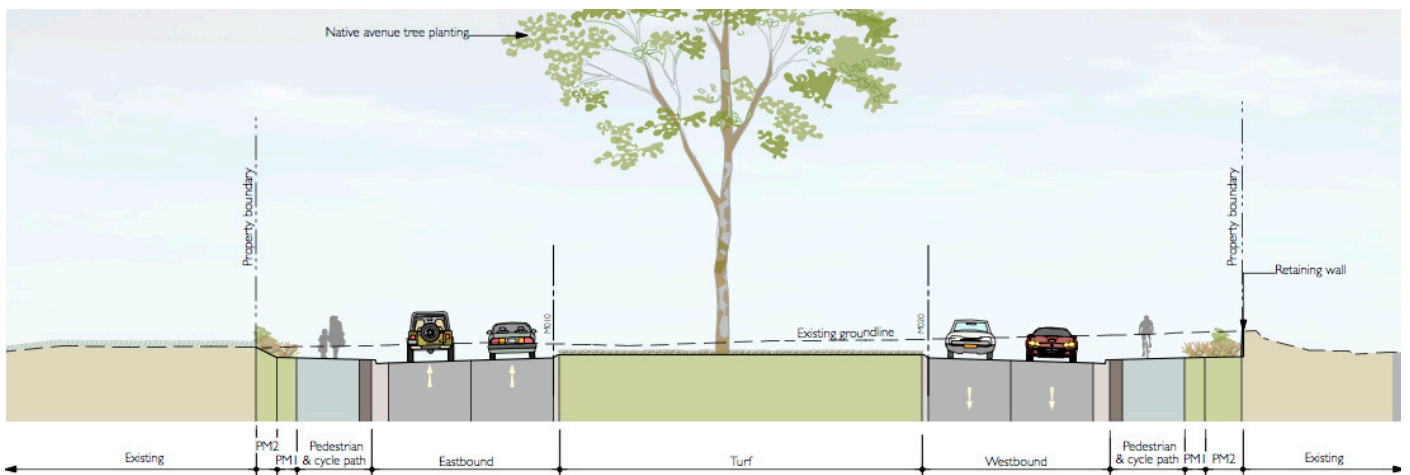
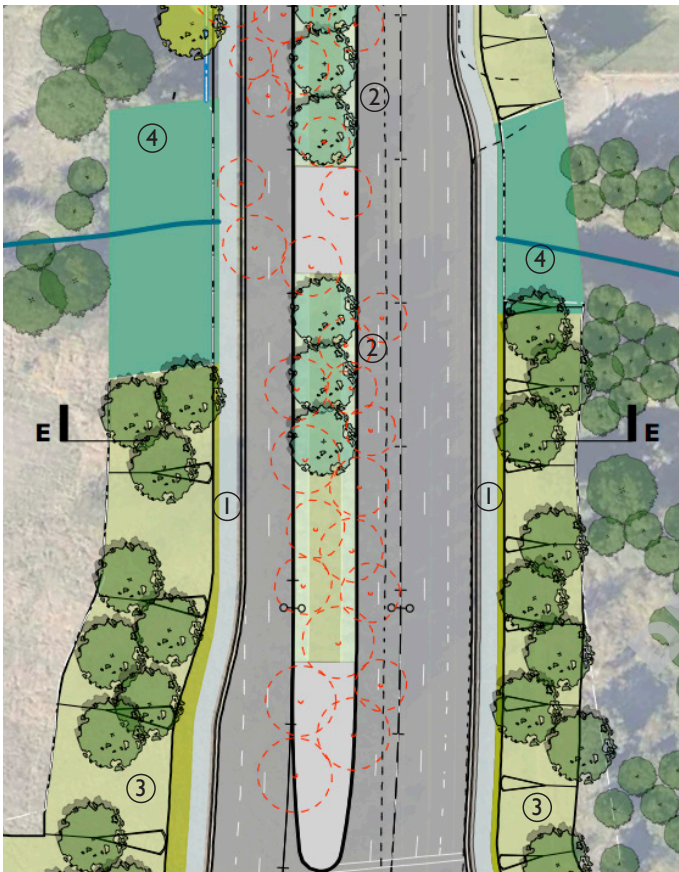


Figure 7.11: Section D-D at chainage 2360

URBAN DESIGN AND LANDSCAPE CONCEPT PLAN

7.3.5 KEY PLAN 5 - STRANGERS CREEK LCZ



LEGEND

- BOUNDARY LINE
- CONCRETE MEDIAN/TRAFFIC ISLAND
- 3.0M WIDE PEDESTRIAN AND CYCLE PATH
- BUS LANE
- ON-ROAD BICYCLE LANE
- RETAINING WALL TYPE 1 (CUT)
- RETAINING WALL TYPE 2 (FILL)
- PLANT MIX 1 - NATIVE GRASSES
- PLANT MIX 2 - NATIVE GRASSES, LOW SHRUBS
- PLANT MIX 3 - RIPARIAN
- TURF
- EXISTING CREEK
- EXISTING ROAD ALIGNMENT
- EXISTING TREES TO BE RETAINED
- PROPOSED TREES
- TREES TO BE REMOVED

Concept Design Description

1. Provide new pedestrian and cycle path to both sides of Memorial Avenue.
2. Provide a change in plant species to denote the Strangers Creek crossing.
3. Provide tree, shrub, and groundcover planting to batter slopes.
4. Provide riparian planting to the banks of Strangers Creek.

Figure 7.12: Urban Design and Landscape Key Plan 5

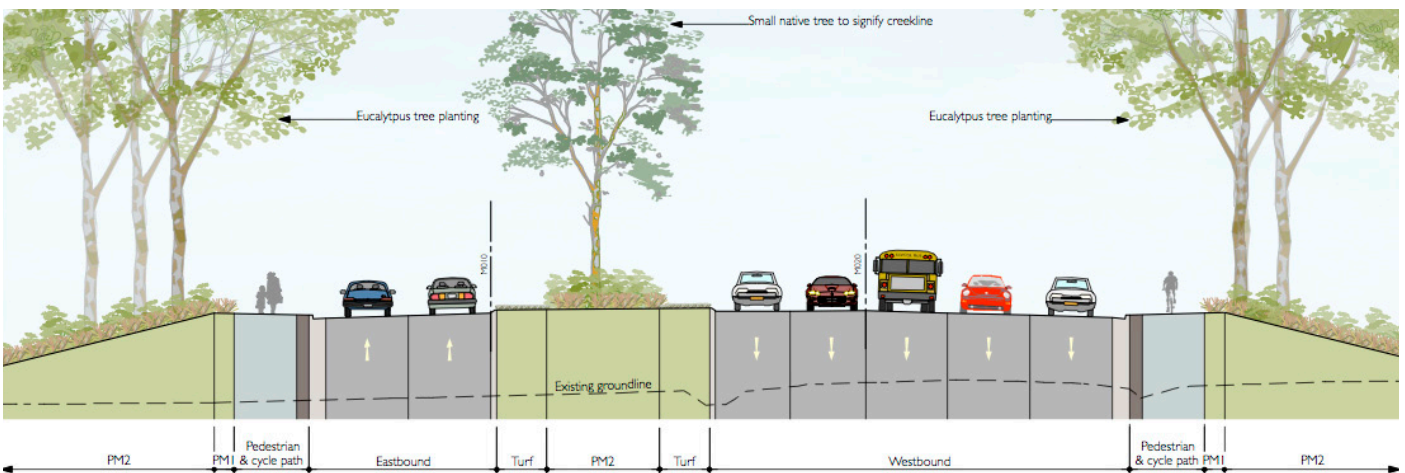


Figure 7.13: Section E-E at chainage 2860

URBAN DESIGN AND LANDSCAPE CONCEPT PLAN

7.3.6 KEY PLAN 6 - KELLYVILLE MEMORIAL PARK LCZ



LEGEND

- BOUNDARY LINE
- CONCRETE MEDIAN/TRAFFIC ISLAND
- 3.0M WIDE PEDESTRIAN AND CYCLE PATH
- BUS LANE
- ON-ROAD BICYCLE LANE
- RETAINING WALL TYPE 1 (CUT)
- RETAINING WALL TYPE 2 (FILL)
- PLANT MIX 1 - NATIVE GRASSES
- PLANT MIX 2 - NATIVE GRASSES, LOW SHRUBS
- PLANT MIX 3 - RIPARIAN
- TURF
- EXISTING CREEK
- EXISTING ROAD ALIGNMENT
- EXISTING TREES TO BE RETAINED
- PROPOSED TREES
- TREES TO BE REMOVED

Concept Design Description

1. Provide new pedestrian and cycle path to both sides of Memorial Avenue.
2. Provide a row of trees in grass to the median to reduce the visual scale of the road.
3. Provide exotic avenue tree planting to replace those removed.
4. Provide low shrub and groundcover planting to medians wider than two metres.

Figure 7.14: Urban Design and Landscape Key Plan 6

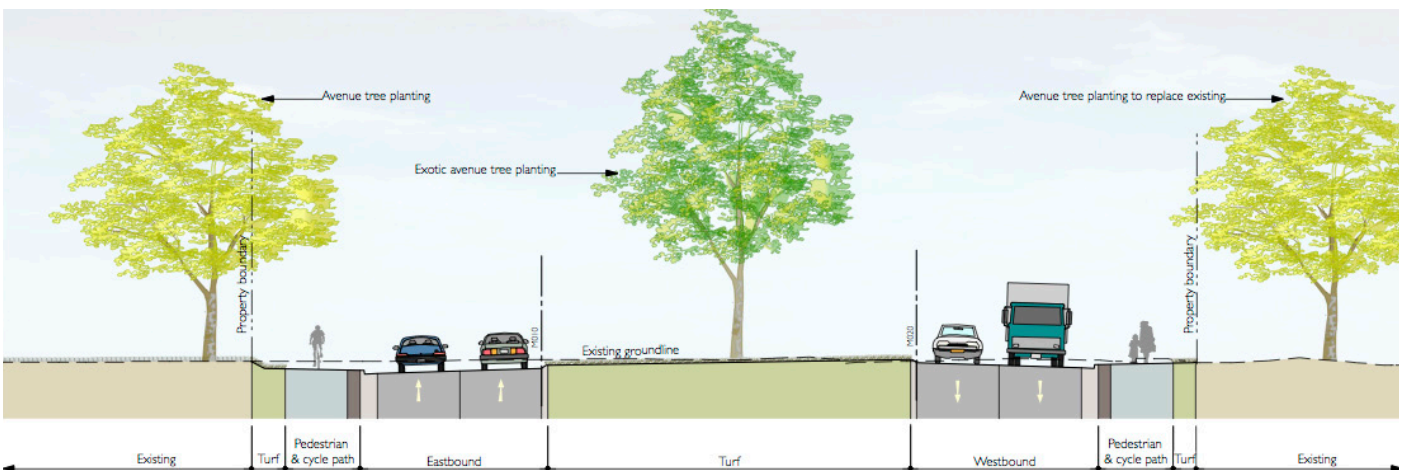
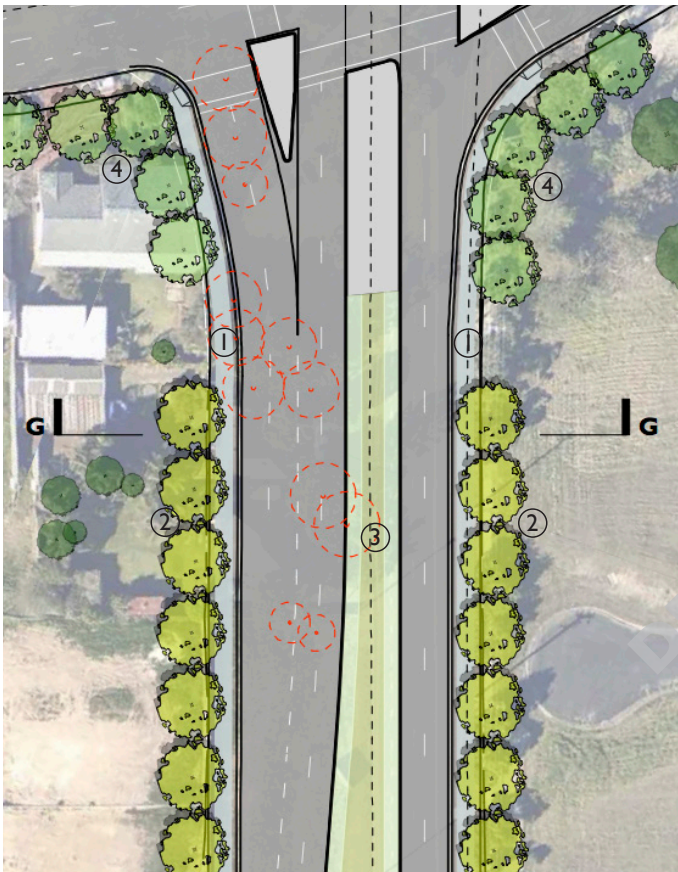


Figure 7.15: Section F-F at chainage 3100

URBAN DESIGN AND LANDSCAPE CONCEPT PLAN

7.3.7 KEY PLAN 7 - BURNS ROAD RESIDENTIAL LCZ



LEGEND

- BOUNDARY LINE
- CONCRETE MEDIAN/TRAFFIC ISLAND
- 3.0M WIDE PEDESTRIAN AND CYCLE PATH
- BUS LANE
- ON-ROAD BICYCLE LANE
- RETAINING WALL TYPE 1 (CUT)
- RETAINING WALL TYPE 2 (FILL)
- PLANT MIX 1 - NATIVE GRASSES
- PLANT MIX 2 - NATIVE GRASSES, LOW SHRUBS
- PLANT MIX 3 - RIPARIAN
- TURF
- EXISTING CREEK
- EXISTING ROAD ALIGNMENT
- EXISTING TREES TO BE RETAINED
- PROPOSED TREES
- TREES TO BE REMOVED

Concept Design Description

1. Provide new pedestrian and cycle path to both sides of Memorial Avenue.
2. Provide exotic avenue tree planting to replace those removed.
3. Provide low shrub and groundcover planting to medians wider than two metres.
4. Provide formal street tree planting to announce the approach to the Windsor Road intersection.

Figure 7.16: Urban Design and Landscape Key Plan 7

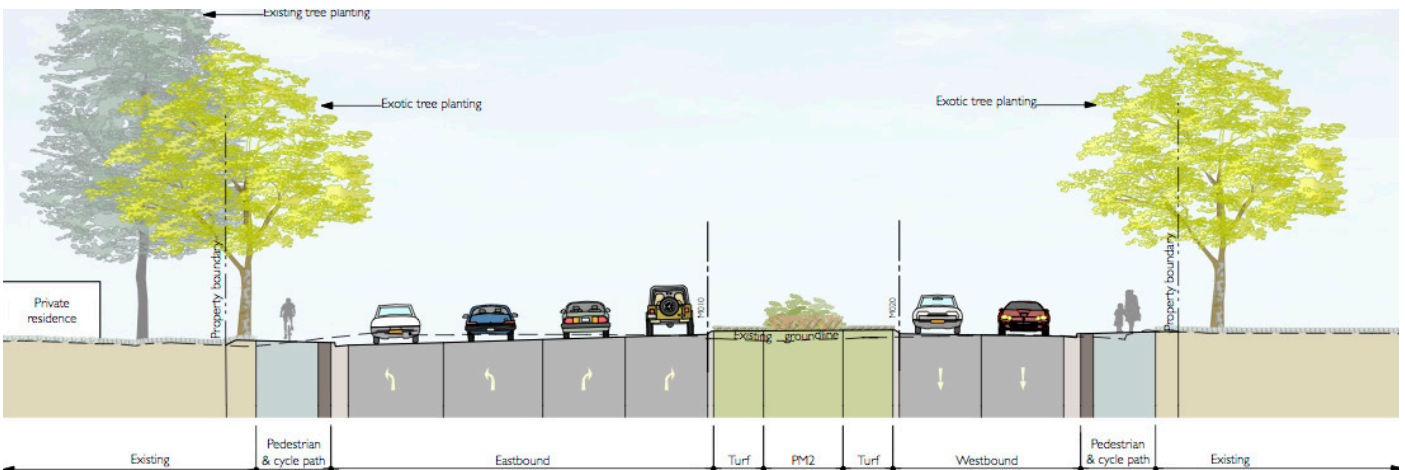


Figure 7.17: Section G-G at chainage 3300

8. MITIGATION STRATEGY

8.1 INTRODUCTION

This chapter describes the mitigation measures that have been included as part of the proposal, described in Chapter 7 of this report and a summary of further mitigation measures to be considered during the detailed design and construction phases of the project. They have been developed in accordance with the urban design and landscape objectives and principles, outlined in Chapter 6.

8.2 MITIGATION INCORPORATED IN THE CONCEPT DESIGN

The integration of the engineering and performance objectives with urban and landscape design objectives for the upgrade of Memorial Avenue aims to produce a design outcome that fits sensitively with the existing qualities and characteristics of the area. In order to achieve this, a range of mitigation measures have been incorporated into the project as the concept has developed. These measures combine to develop a solution that seeks to protect and enhance the existing visual character of this rapidly developing area, where possible.

The mitigation measures that have been undertaken during the development of the urban and landscape design concept are summarised below.

- Roadside trees have been retained where possible. This has been achieved by the provision of retaining walls
- Modifications to the intersections along the road corridor will require a number of trees to be removed for the construction of additional deceleration and acceleration lanes and embankments. Planting to verges, medians and traffic islands will help soften and break up large areas of pavement and reduce perceived intersection width. Any ameliorative measures will need to consider sight distance restrictions
- Due to the narrow road corridor, retaining walls would be provided to minimise encroachment onto adjoining properties
- New 'gateway' planting at the intersections with Old Windsor Road and Windsor Road would be provided as visual landmarks and to enhance visual identity
- The planting strategy considers the retention of the existing views
- Riparian planting would be provided to the Elizabeth Macarthur Creek and Strangers Creek corridors
- New street tree planting would be provided to the Kellyville Memorial Park frontage to replace those that are to be removed and to reinforce the character of this important community asset.*

8.3 MITIGATION INCORPORATED INTO DETAILED DESIGN

Subject to the environmental approval of the project being granted, it is recognised that further work will be required to develop the final urban design and landscape plan for the project.

Whilst development of the concept design has attempted to mitigate the overall impact of the proposal, focussing on the project components, their design and integration within the existing landscape setting, opportunities will arise during detail design to further refine the design of the project to produce enhanced urban design outcomes.

The urban design objectives and principles outlined in Chapter 6, together with the Urban Design and Landscape Concept included in Chapter 7, would be used to further guide the detailed design of the proposed road upgrade.

Below is a summary of the key mitigation and management strategies that would be considered during the detailed design phase of the project.

MITIGATION STRATEGY

- Further consideration is required would be required for the design of and materials to be used for retaining walls. For walls in fill situations, walls should be appropriate to future adjoining landuses. For example, in residential areas, walls would be a combination of split-faced and smooth-faced blockwork in a recessive colour. Gabion walls should be considered for rural or open space areas. It is proposed to plant low shrub and groundcover planting to the base of the walls to reduce the walls visibility when viewed from the surrounding landscape
- Roadside elements such as safety barriers, fencing, bus stops, street lighting, etc, are to be consistent with those used in other road upgrade projects within the North West Growth Centre
- The design and location of the new bridge over Strangers Creek and associated earthworks should be designed to minimise impacts on the creek bed, banks and vegetation
- The number and location of existing trees to be retained within verge areas and median would be confirmed following a detailed survey of the study area
- Investigate alternative types and colours of paved surfaces to minimise visual impact.

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9. CONCLUSION

The study area for this Urban Design Report is for the 2.2 kilometre section of Memorial Avenue, located about 35 kilometres to the north-west of Sydney at Kellyville. The study area generally consists of cleared rolling hills, dotted with housing on five acre lots. Remnant woodland can be found along the Elizabeth Macarthur Creek and Strangers Creek corridors, along the North-West Rail Link (NWRL) corridor, and scattered along the roadside and within the pastures. A number of new housing developments are located along Memorial Avenue, around Arnold Avenue (west), Pellizzer Boulevard, and Burns Road.

Understanding the built, natural and community character of the study area, analysing the impacts that the road upgrade can make, identifying opportunities for mitigation and landscape improvements, and articulating urban design objectives and principles has been an integral part of designing the project. An iterative, inter-disciplinary, process has been adopted to produce a project outcome which is sensitively integrated, taking into account not only the corridor itself but also its relationship with surrounding areas.

The project aims to reduce the congestion on the road related to the proposed urban development associated with the Balmoral Road Release Area and provide improved travel time reliability and, in doing this, would introduce a number of elements into the environment, as described in Chapter 3 of this report, including:

- Widened pavement surface and median, allowing for the provision of an additional two lanes in the future
- The upgrade of three existing intersections, the construction of one new intersection, and the closure of three existing intersections
- A new 18 metre span concrete plank bridge crossing over Strangers Creek
- Construction of a number of retaining walls
- Construction of a new 3.0m wide pedestrian and cycle path to both sides of the road.

These project elements affect the existing character but are consistent with other projects, either completed or under construction, in the North West Growth Centre. The urban design principles developed take into account urban design and visual character not only for the corridor itself, but also reflect its relationship with surrounding areas. The integration of project elements and urban design and landscaping treatments within the corridor helps achieve the desired future character. The urban design and landscaping treatments:

- Include targeted landscaping measures to maintain and enhance the vegetated character of the corridor.
- Provide diversity in landscape treatments at targeted points, including the two major intersections, Strangers Creek and Kellyville Memorial Park, that distinguishes these points for road users.
- Maintain a consistent and distinguishable character for Memorial Avenue within the North West Growth Centre network through consistent treatments for new road elements.
- Incorporate materials and finishes for new road elements that align with those elements already within the North West Growth Centre.

Development of the project during a future detail design phase should consider the further key mitigation strategies outlined in this report to further integrate this project into the existing and developing landscape of Kellyville.

