Northern Link

14. Urban Design and Visual Environment

Northern Link

Phase 2 – Detailed Feasibility Study

CHAPTER 14

URBAN DESIGN AND VISUAL ENVIRONMENT

- September 2008

Contents

14. Urban Design and Visual Environment

This chapter addresses Part B, Section 5.7, Urban Design, Landscape and Visual Amenity of the EIS Terms of Reference (ToR), which require the EIS to identify the existing urban landscape and visual context of the study corridor, in terms of urban design characteristics, key visual elements and values of the built and natural environment, and to develop and urban design, landscape and visual amenity framework for the project.

In respect of the existing environment, the ToR state that the EIS should:

- *identify the existing urban landscape and visual context of study corridor;*
- *describe the urban design characteristics of the study corridor;*
- *describe the visual elements and values of the existing built and natural environment;*
- *describe the urban landscape and characteristics of the existing built and natural environment; and*
- *develop an urban design, landscape and visual amenity framework for the project as a whole and for key locations.*

To assess the urban landscape and visual outcomes of the project, the study should:

- *develop urban landscape and visual concepts, designs and guidelines for any key locations identified, reflecting predicted changes to land use, public amenity, public access and sustainability and place making principles; and*
- *assess the likely visual impacts of the proposed works on the landscape and changes to the landscape.*

Mitigation measures for any potential urban landscape and visual impacts should be recommended. The mitigation measures should relate to the urban landscape and visual goals, objectives and design measures for the project. This should consider a range of treatments on visual elements and urban design opportunities, including surface landscaping, portal design, ramp design and location and design of surface structures, including noise and air quality (eg: ventilation outlets, if proposed) mitigation structures.

Where practicable, consideration of visual elements should also consider design enhancements to improve shade creation, accident prevention and crime prevention.

The issue of lighting impacts, associated with possible night time construction works or with the operational phase (eg: sun in drivers' eyes, headlights at night, lighting for cyclists and pedestrians etc.) should be identified and mitigated to the extent practicable.

14.1 Description of the Existing Environment

A set of evaluation and design principles and definitions have been developed to assist the evaluation of the existing environment as it relates to the urban landscape and visual values of the study corridor and key locations of the Project. A two-layer approach distinguished by scale and detail has been adopted to address the EIS ToR.

For the purpose of satisfying the ToR, the existing urban landscape and visual context of the study corridor has been evaluated at a broad scale.

14.1.1 Urban Context

The study area is diverse and significant from an urban landscape perspective, with distinctive landmarks and built features in an urban environment where the natural features of topography and vegetation vary considerably. The study corridor covers a significant portion in inner suburban and CBD fringe neighbourhoods and contains the following suburbs within its boundaries: (north east to south west):

Herston, Kelvin Grove, Spring Hill, Brisbane CBD and fringes, Red Hill, Normanby, Paddington, Rosalie, Milton, Auchenflower, Toowong, Mt Coot-tha and Taringa.

All of the study area lies on undulating to hilly terrain, providing opportunities for commanding views and vistas for large parts of Brisbane. In most cases the urban fabric and road layouts have responded to the original landform, with roads following ridges in places, and in some cases creating difficult environments for pedestrians and cyclists.

The variety of land uses and activities along and across the study area provides great levels of variety and interest in the different precincts at different times for different users.

The predominant building form is residential. Individual dwellings are mostly freestanding structures with a predominance of vernacular 'tin and timber' architectural typologies. Higher density forms of residential development generally take the form of medium and high rise buildings. The lower rise residential stock is spread evenly along and across the study site area, while medium and high rise buildings are typically concentrated on the city centre fringes and between Coronation Drive and Milton Road.

Commercial and mixed use buildings are also found with concentrations around Suncorp Stadium, Coronation Drive and Kelvin Grove Urban Village with smaller centres scattered throughout.

Open space is spread throughout the Study Corridor and serves a number of purposes such as active and passive recreation, green respite and make a strong contribution to urban identity. The open spaces within this highly urbanised study area are therefore highly valued community assets.

The Study Corridor is in close proximity to the city centre, with good vehicular access on Brisbane's extensive road network and widely served by public transport and by pedestrian and bicycle paths, although the natural topography reduces the level of comfort for pedestrians and cyclists in some areas. In some cases, accessibility is diminished by the barrier effect and limited crossing opportunities associated with major road and rail transport corridors.

The study corridor's overall urban character changes seamlessly from suburb to suburb in a consistent and coherent pattern. The main elements supporting this consistency are the dominant presence of subtropical vernacular architectural typologies and their expression at diverse densities, regularity of topographic features, familiar and recognisable landscape features such as characteristic tree species and local open spaces.

The study corridor's landscape context is largely defined and confined by prominent physical landscape elements of the Brisbane River to the south-east, Mt Coot-tha and the Taylor Range to the west, and a prominent system of ridges extending from Bardon through Paddington to Red Hill and Kelvin Grove.

14.1.2 Terrain

The terrain surrounding the study corridor is the most striking physical element of the landscape. Mt Coot-tha to the south-west of the corridor is the highest point in Brisbane at over 280m above sea level. This is part of the

Taylor Range which comprises a system of hills and ridges to the west of Brisbane that form a backdrop to the study corridor and the city.

Neighbourhoods within the suburbs of Toowong, Bardon, Auchenflower, Ashgrove and Paddington lie on the hilly to undulating terrain of Mt Coot-tha's foothills and consist of elevated areas, valleys and steep gullies. Main ridges extend through these areas generally from west to east, with a major system of ridges extending from Bardon along Stuartholme Road, through Paddington and Red Hill to Kelvin Grove.

Minor ridge systems extend through Toowong and Taringa, from Kelvin Grove State College to Victoria Park Golf Course at the eastern end of the corridor and at Spring Hill to the south-east. Elevated areas south of the Brisbane River, at Highgate Hill and West End, also have visual connections with the corridor.

14.1.3 Watercourses and Water Bodies

The Brisbane River defines a distinct physical boundary to the immediate south-eastern context of the study corridor. Its broad expanse along the Milton Reach provides visual amenity and a significant visual relief to the heavily urbanised landscapes on both banks of the river. Some riparian vegetation exists on both sides of the river, however is more prominent on the southern side with extensive mangroves along that edge.

Other significant watercourses close to or within the study corridor include Ithaca Creek at Ashgrove and Red Hill, and Enoggera Creek at Kelvin Grove. Riparian vegetation exists throughout the course of Enoggera Creek and continues along Breakfast Creek to the east. Minor watercourses occur throughout the study corridor and include Toowong Creek and the Milton Drain. These watercourses contribute to local landscape amenity and environmental values with the exception of the Milton Drain which is an engineered drain with concrete-lined channel.

Of particular note within the study corridor, is the drainage network and water bodies alongside the Inner City Bypass (ICB) at Victoria Park, Herston, which drain into York's Hollow. This locale has significant visual amenity and ecological potential due to detention and retention areas which store water and support riparian vegetation and local fauna.

14.1.4 Vegetation

The type, density and character of vegetation within the study corridor and its surrounds relates to physical elements of the landscape such as terrain, water availability, and land use.

Vegetation is concentrated in reserves, parks and other green spaces such as school grounds, around playing fields and other sites such as Government House in Paddington and Toowong Cemetery. It is also a significant element of the urban landscape, particularly in low density residential areas and streetscapes.

The Mt Coot-tha Reserve and forested hills of the Taylor Range provide a prominent green backdrop to the study corridor and the city. Vegetation in these areas is dense to open Eucalypt forest with wet sclerophyll and rainforest gullies.

There is a transition in vegetation character from Mt Coot-tha to the highly urbanised areas around Toowong and Milton. This reflects a visually continuous mixture of retained and introduced local native vegetation and exotic species. The combination of Eucalypts, Figs, Hoop Pines and exotic species such as Mango and Camphor Laurel, is typical of the older (ie: inner) suburbs of Brisbane. This provides a strong subtropical character that contributes to local image and the identity of Brisbane. This character extends to other suburbs such as Auchenflower, Red Hill and Kelvin Grove, but dissipates towards areas of urban activity and the CBD. In these

areas, vegetation character approaches a more urban character with grouped or individual trees seen more as fragments retained in the face of development.

Significant natural and protected vegetation

Significant landscape trees and vegetation afforded the protection of a Vegetation Protection Order (VPO) under Brisbane City Council's *Natural Assets Local Law 2003* (NALL) are listed and discussed in detail in Chapter 10, and their locations are illustrated in Error! Reference source not found.**A, Figure 10-2B and Figure 10-2C**. Of particular note, given that they would be impacted upon by the proposed surface works for the Toowong and Kelvin Grove Road Connections, are the following individual trees or stands of vegetation that are under a VPO:

- Remnant and non-remnant vegetation in Mt Coot-tha Forest (Brisbane Forest Park);
- Crows Ash (*Flindersia australis*) at 575 Milton Road Toowong (corner of Sylvan Road);
- Weeping Fig, Hoop Pine, Tallowwood, Jacaranda in McCaskie Park, Kelvin Grove Road; and
- Line of fig trees in Marshall Park, Kelvin Grove Road.

In addition to the above, the Study Corridor comprises other areas of significant vegetation which, while not under formal protection, contributes significantly to the visual and landscape values of the area. In particular, the continuous remnant and non-remnant vegetation on either side of the Western Freeway, in the Mt Coot-tha Botanic Gardens, Anzac Park and Toowong Cemetery create an identifiable 'gateway' landmark to the city and the inner western suburbs. There is little significant natural or protected vegetation at the eastern end of the Study Corridor, but Victoria Park is highly valued for the open space, visual, recreation and amenity values it provides for this part of Brisbane. The ecological values of the vegetation throughout the Study Corridor are discussed in detail in Chapter 10, while their visual and landscape values are discussed throughout this chapter.

14.1.5 Visual Context

Extensive hilly terrain to the west and north of the study corridor permit far-reaching views and vistas to the north, east and south, most notably from the top of Mt Coot-tha. These areas are also clearly visible from numerous vantage points across the north, east and south of Brisbane and with their extensive vegetation cover are a prominent natural landmark.

Elevated areas within the study corridor also include extensive residential areas in older suburbs. In Paddington, Red Hill and parts of Auchenflower and Toowong, the combination of terrain, traditional character housing and widespread mature vegetation has been classified as a 'Hillside Character Precinct' by Brisbane City Council (City Plan, 2000). This precinct is a strong visual element viewed throughout the study corridor, particularly from vantage points along ridge top roads where views are not obstructed by buildings; for example, the entrances to side streets. The Hillside Character Precinct conveys a characteristic relationship between buildings and their setting that is representative of its locale in Brisbane and contributes strongly to the image of the city.

14.2 Identification of Key Locations

Key locations have been nominated within the study corridor at:

- the Toowong Roundabouts Precinct - the Toowong end of the Western Freeway extending though to Frederick Street and environs;
- the Kelvin Grove Road Precinct - Kelvin Grove Road and its environs between the Normanby Five ways and Prospect Terrace; and

- Victoria Park Precinct - Victoria Park at Herston and Spring Hill, incorporating the ICB/railway corridor.

Key locations have been analysed with reference to generic experiences of motorists, pedestrians, cyclists and public transport users and in terms of the visual experience of the existing environment, and the physical experience, including elements and characteristics of the urban landscape that contribute to the human experience of existing environment and associated values .

14.3 Goals and Objectives for the Study Corridor as a Whole

The following goals and objectives for the Study Corridor were identified for the purposes of addressing ToR requirements.

Goal:

Retain characteristics of the urban landscape that contribute to positive local image and the identity of Brisbane as a subtropical 'river' city.

Objectives:

- Retain and manage residential character areas as distinctive precincts, particularly elevated areas such as that defined as the Hillside Character Precinct.
- Retain and manage the forested hilly backdrop to the study corridor, that is, Mt Coot-tha Reserve and the Taylor Range.
- Maintain and enhance vitality, activity and access along the Brisbane River for residents and visitors.
- Retain and enhance views and vistas that engage with the urban landscape, including views to the CBD, Mt Coot-tha, local landmarks and other character elements or precincts.

Goal:

Enhance the character and experience of circulation networks for all modes of movement ie: for pedestrians, cyclists, motorists and public transport users.

Objectives:

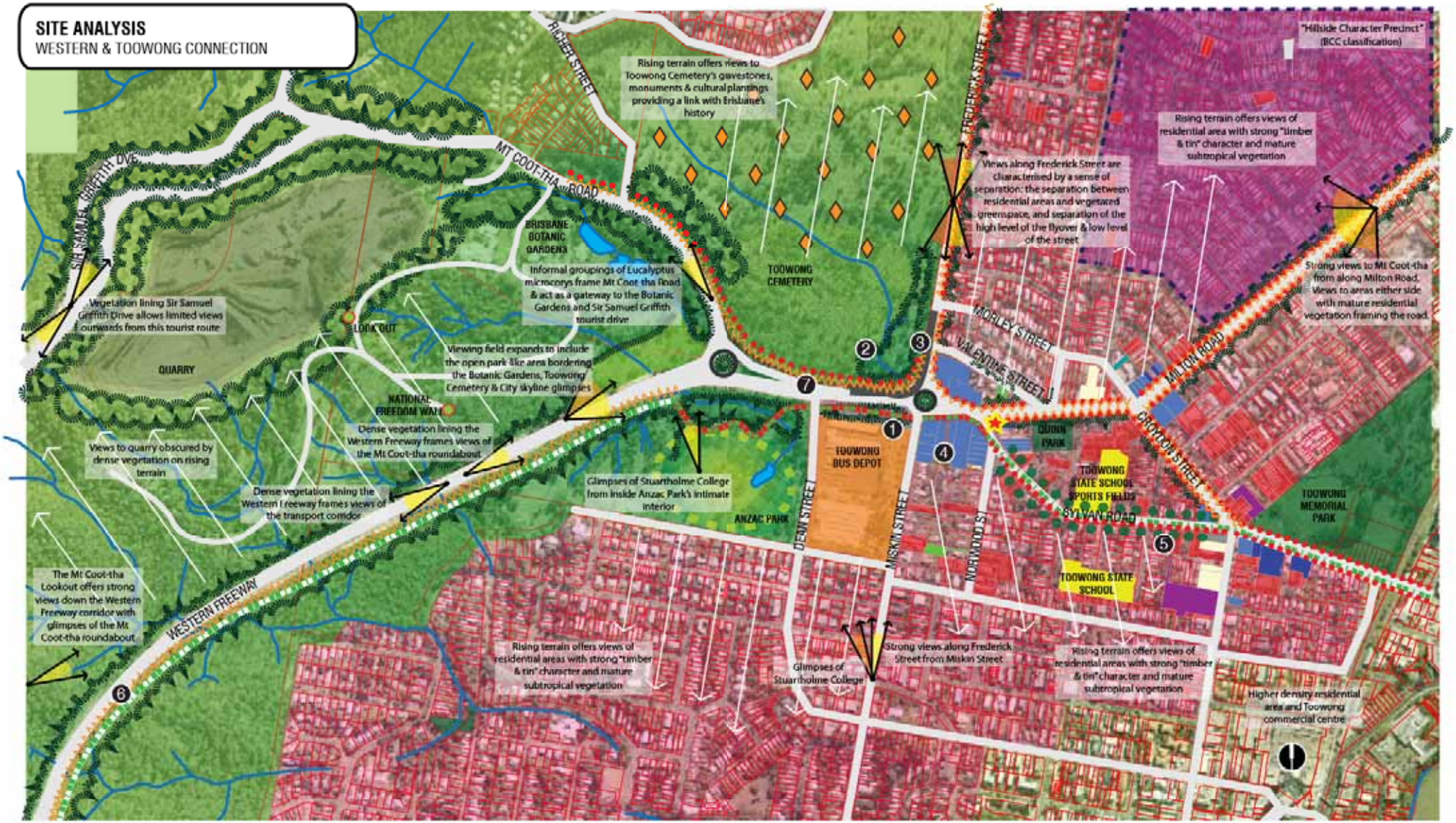
- Enhance the amenity, legibility and safety of connections to local destinations for all modes of transport.
- Design and develop treatments for local connections and new transport infrastructure that complement local character and enhance local image.

14.4 Goals and Objectives for Key Locations

14.4.1 Key Location 1 – Toowong Roundabouts Precinct

The urban landscape in this key location (see **Figure 14-1**) is dominated by undulating terrain with a cover of Queensland vernacular character housing and extensive mature subtropical vegetation in open spaces and within residential allotments, including fig, mango and frangipani trees and pockets of eucalypt and local rainforest trees along drainage lines and undeveloped gullies. This landscape reinforces a local 'sylvan' image and contributes strongly to local identity.

SITE ANALYSIS
WESTERN & TOOWONG CONNECTION



LAND USE

- Multiple Unit Residential
- Residential
- Commercial/Retail
- Accommodation
- Office
- Health Care
- Sport and Recreation
- Community Facility
- Other/special use
- Park
- Education
- Car Park

Land use information supplied by SKM

EXISTING FEATURES

- Drainage line
- Waterbody
- Shared pedestrian/cycle path
- Pedestrian path
- Dedicated cycle path
- Pedestrian/cycle path with low visual & physical amenity
- Street tree plantings
- Frederick Street Flyover
- Screening vegetation
- Locally significant vegetation
- Significant views
- Areas with scattered mature trees with canopies that allow views of a grassy ground plane
- VPD tree (*Flindersia australis*) planted in 1924 on the corner of Milton & Sylvan Roads to commemorate the centenary of the landing of Lieutenant John Oxley

1. Tall eucalypts along the road at Toowong Bus Depot add to the gateway experience of motorists entering the city & cultural plantings of Jacarandas contribute to a favourable microclimate for the carpark
2. Mature vegetation & cultural plantings of Hoop & Bunya Pines form a significant green edge beside the Frederick Street flyover
3. The Frederick Street flyover interrupts the view of roadside vegetation from the Western Freeway past the cemetery
4. Local commercial activity provides limited active frontages & little opportunity for shade or refuge from weather for pedestrians
5. Mature street trees along Sylvan Road provide shade for pedestrians. In contrast, Croydon Street has low pedestrian & cyclist amenity due to a lack of street trees and the pathway's proximity to heavy traffic
6. The dedicated bikeway alongside the Western Freeway offers low physical & visual amenity for users
7. Limited safe and convenient connections for pedestrians & cyclists exist across Mt Coot-tha Road to local destiantions such as Anzac Park, the Botanic Gardens and the Toowong Park & Ride

The roundabouts at Frederick Street and Mt Coot-tha Road lie within a narrow corridor between the Toowong Cemetery to the north and Toowong Bus Depot and Anzac Park to the south. This section of road forms a distinct transition zone in the journey from the Western Freeway to Milton Road, heralding the entrance to the inner city from the west or an egress from the east, and providing an entrance to one of the most popular tourist drives in the city, at Mt Coot-tha.

The physical character of this precinct is defined by the steep terrain of the cemetery and Mt Coot-tha, contrasted with the flatter terrain of Anzac Park and the Toowong Bus Depot. This creates a contrast in scale, and a transition zone in respect of vegetation and urban character when moving through the area from the east or west. It also creates a visual buffer for the residential areas to the north and south.

The precinct is mostly experienced from the motorist's perspective and is most frequently viewed from the road corridor and from adjoining roads such as Frederick, Miskin, and Dean Streets, Sylvan Road and to a lesser extent, Croydon Street. The approach from the Western Freeway is visible, though partially obscured by vegetation, from the Mt Coot-tha Lookout, Mt Coot-tha Botanic Gardens, Toowong Cemetery and parts of Anzac Park.

Pedestrian and cyclist experiences are also closely tied to road infrastructure, and are diminished by the width of and traffic along Milton and Mt Coot-tha Roads, which reduce pedestrian connectivity. A common theme to emerge from community consultations regarding Milton Road has been that there is a 'barrier effect' created by the road and the roundabout at Frederick Street, which is difficult for pedestrians and cyclists to cross. Accessibility is also hampered by steep terrain adjoining Frederick and Miskin Streets, although Anzac Park provides high amenity paths and spaces and relief from road infrastructure and traffic.

Designated cyclist networks within this area are interrupted by the roundabouts precinct, where cyclists are forced either to ride with the traffic, or detour around. A popular cyclist route to and from Mt Coot-tha is rendered extremely hazardous, because of the difficulty in gaining access to Mt Coot-tha Road. Under existing conditions, cyclists wanting to access Mt Coot-tha Road must either:

a) negotiate both roundabouts and the merge with traffic coming from the Frederick Street flyover off-ramp, or;

b) cross the Western Freeway from the bikeway on its southern side.

Goals and Objectives for Key Location 1

The following goals and objectives for the Study Corridor were identified for the purposes of addressing ToR requirements.

Goal:

Retain characteristics of the urban landscape that contribute to positive local image and the identity of Brisbane as a subtropical 'river' city.

Objectives:

- Retain the integrity of the gateway experience from the Western Freeway moving towards the Mt Coot-tha Road roundabout, including retention of roadside vegetation along the freeway and the edge of Anzac Park.
- Retain and enhance the character of residential precincts along Frederick Street, Miskin Street and Dean Street.

- Preserve the integrity of the Toowong Cemetery, including vegetation, monuments and more heavily vegetated edges along Mt Coot-tha Road and Frederick Street.
- Retain the character of Mt Coot-tha Road as an entrance to the Botanic Gardens and a popular tourist drive, particularly focusing on retention of roadside groups of *Eucalyptus microcorys* (Tallowwood) and complementary vegetation at the edge of Toowong Cemetery.
- Retain the integrity of vegetation at the Toowong Bus Depot on Milton Road as a buffer to the road for public transport users and a visual buffer to the bus workshop buildings.
- Minimise visual impacts of any proposed works near the Mt Coot-tha Road roundabout as viewed from Mt Coot-tha Lookout, Anzac Park, the Botanic Gardens and Toowong Cemetery, and as potentially viewed from Stuartholme and surrounding elevated residential areas.
- Minimise the visual impact of the vehicle flyover and ramp that connects Frederick Street with the entrance to the Western Freeway as viewed from all approaches to the Frederick Street roundabout and adjoining residential areas.

Goal:

Enhance the character and experience of circulation networks for all modes of movement (ie: for pedestrians, cyclists, motorists and public transport users).

Objectives:

- Improve circulation around the Toowong Park and Ride and Anzac Park, and provide safe connections for pedestrians and cyclists across Milton Road in the vicinity of the Frederick Street roundabout.
- Retain local on-road and off-road cyclist connections (including the Western Freeway pedestrian/cycle overpass, currently under construction) and extend through local streets and open space areas, particularly those connecting with, or with a potential to connect with local destinations such as schools, parks and shops.
- Improve vitality and safety for pedestrians and bus users, particularly at night, within and around the Toowong Park and Ride.
- Improve the safety and legibility for access to Mt Coot-tha Road for motorists and cyclists travelling west from Milton Road, particularly where Mt Coot-tha Road merges with traffic from the Frederick Street ramp.
- Design and develop treatments for local connections and new transport infrastructure that complement local character and enhance local image.

14.4.2 Key Location 2 – Kelvin Grove Road Precinct

Unlike the Toowong Roundabouts Precinct, the Kelvin Grove Road Precinct is visually and physically dominated by the massive scale of the infrastructure of Kelvin Grove Road, Musgrave Road, Hale Street and the Normanby five ways (**Figure 14-2**). Traffic volumes and road widths tend to limit pedestrian and cyclist movement through and around the precinct. Dedicated paths, bridges and a tunnel for pedestrians and cyclists provide safe connections, however legibility is low due to the convoluted nature of this system, which extends from Victoria Park Road to Musgrave Road.

Pedestrian amenity is generally low along the edges of major roadways. In Kelvin Grove Road, however, there are distinct areas where mature fig trees provide high levels of shade and visual amenity. Fig tree plantings are co-located with bus stops or interchanges at the Normanby Bus Station, McCaskie Park, Marshall Park and near the corner of Prospect Terrace. These prominent tree plantings act as local landmarks as the road approaches the

Normanby five ways, at which point their canopies tend to enclose the road and provide a distinct landscape character that acts as a gateway to the CBD and its immediate access routes. Other local landmarks include the Normanby Hotel and Saint Brigid's Church at Red Hill. The latter is of particular significance due to its place in Brisbane's history, its elevation and visual prominence, being visible from an extensive catchment.

Visual access to the precinct is mainly from within the road corridors and neighbouring properties, including elevated residential areas comprised of traditional housing to the west of Kelvin Grove Road.

Goals and Objectives for Key Location 2

The following goals and objectives for the Study Corridor were identified for the purposes of addressing ToR requirements:

Goal

Retain characteristics of the urban landscape that contribute to positive local image and the identity of Brisbane as a subtropical 'river' city.

Objectives:

- Retain the integrity of the gateway experience contributed to by mature fig trees in the road reserve in Kelvin Grove Road adjacent to the Normanby Hotel.
- Retain the strong landscape character and landscape amenity characterised by fig tree plantings at the Normanby five ways, Marshall Park, McCaskie Park, the corner of Prospect Terrace and Kelvin Grove Road, at the periphery of Brisbane Grammar School and along pathways adjacent to the ICB.
- Retain and enhance the character of residential precincts of Red Hill and Kelvin Grove between Musgrave Road and Kelvin Grove Road, and those located between the ICB and Kelvin Grove Urban Village (KGUV), including their built form, building scale and mature subtropical vegetation.
- Minimise visual impacts to the appreciation of views to St Brigid's church at Red Hill and promote the retention of its visual integrity and character.
- Contribute to the established urban design themes and character, which have been established at KGUV.

Goal:

Enhance the character and experience of circulation networks for pedestrians, cyclists, motorists and public transport users.

Objectives:

- Improve the legibility of off- and on-road circulation for pedestrians and cyclists between Musgrave Road, Victoria Park and KGUV and CBD.
- Improve connectivity and safety for cyclists travelling to and from KGUV and the south-west including connections to the Bicentenary Bikeway.
- Improve the amenity of the pedestrian environments along Kelvin Grove Road and Musgrave Road.
- Improve amenity and safety for pedestrians and bus users particularly at night, around the Normanby Hotel.
- Design and develop treatments for local connections and new transport infrastructure that complement local character and enhance local image.

SITE ANALYSIS
NORTHERN & KELVIN GROVE ROAD CONNECTION

LAND USE

- Multiple Unit Residential
- Residential
- Commercial/Retail
- Accommodation
- Office
- Health Care
- Sport and Recreation
- Park
- Education
- Community Facility
- Other/special use
- Car Park
- Retirement Village
- Child Care Centre

Land use information supplied by SKM

EXISTING FEATURES

- Drainage line
- Waterbody
- Shared pedestrian/cycle path
- Pedestrian path
- Shared pedestrian/cycle path behind ICB noise barrier
- Pedestrian/shared path with low visual & physical amenity
- Street tree plantings
- Brisbane Grammar's private pedestrian bridge across ICB
- Screening vegetation
- Locally significant vegetation
- Significant views

1. Pedestrian/cyclist movement around crossings at Kelvin Grove Road is characterised by poor legibility and low physical & visual amenity
2. Only a private cyclist/pedestrian connection across the ICB exists for the Brisbane Grammar Schools. The entrance to the crossing is characterised by poor legibility which may cause confusion for members of the public who attempt to use it.
3. The steep retaining wall alongside Kelvin Grove Road and the path's proximity to heavy traffic contribute to low physical & visual amenity for pedestrians & cyclists

14.4.3 Key Location 3 – Victoria Park Precinct

This precinct is quite unlike others studied as its urban structure is dominated by the extensive open space of Victoria Park, which is bisected by a transport corridor comprising the Inner City Bypass and rail infrastructure (see **Figure 14-2**). Immediate environs also include the Brisbane Grammar Schools on Gregory Terrace, and the Royal Brisbane Hospital complex at Herston.

Views to the target site are available from within the transport corridor and from elevated areas on either side, which include a small section of Victoria Park and Gregory Terrace at Spring Hill, some buildings and northern areas of the Brisbane Grammar School and Brisbane Girls Grammar School, and areas adjacent to the transport corridor at Kelvin Grove and Herston.

Strong pedestrian and cyclist connections exist to the north and south of the transport corridor, connecting Kelvin Grove Road with Bowen Bridge Road. However, connections across the corridor are limited. The land bridge towards the east and the narrow timber footbridge between Victoria Park and Brisbane Girls Grammar School provide the only public thoroughfares connecting northern and southern sections of Victoria Park.

Extensive open space and mature tree plantings contribute strongly to visual amenity on both sides of the transport corridor, as viewed from within the transport corridor and as experienced by a pedestrian or cyclist. To the north, the character is more natural as the landform is irregular in its undulations and the vegetation is predominantly eucalypt. To the south, Victoria Park slopes down to the transport corridor. Vegetation in this section of the park is comprised of fig trees, Hoop Pines and other subtropical trees, forming a strong vegetated buffer to Spring Hill and high amenity pathways and spaces within the park itself.

Pedestrian and cyclist amenity is variable to the north of the transport corridor. The path on this side is exposed to the ICB, with little shade for much of its length. York's Hollow provides some respite from both the road and the elements with extensive tree plantings, characterised by Melaleuca and Casuarina, and peaceful waterbodies which comprise part of a naturalised stormwater management system. This area visually buffers part of the ICB from neighbouring hospital buildings, provides potential local habitat for water fowl and contributes a strong sense of place.

Goals and Objectives for Key Location 3

The following goals and objectives for the Study Corridor were identified for the purposes of addressing ToR requirements:

Goal:

Retain characteristics of the urban landscape that contribute to positive local image and the identity of Brisbane as a subtropical 'river' city.

Objectives:

- Retain and enhance open space areas alongside the ICB/railway yard corridor to strengthen local urban landscape character.
- Retain and enhance vegetation within the urban landscape, including the existing diversity of vegetation communities, to build on the unique image of this inner city location.
- Promote the visual enhancement of prominent edges to public and private property to strengthen local landscape character and precinct identity.

Goal:

Enhance the character and experience of circulation networks for pedestrians, cyclists, motorists and public transport users.

Objectives:

- Improve the amenity of pedestrian/cyclist environments along the northern portion of the ICB/railway corridor.
- Establish another crossing over the corridor, particularly for pedestrians and local school users to access the western end of Victoria Park.
- Maintain formal connections to Gregory Terrace and improve accessibility for pedestrians and cyclists to the Centenary Pool at Spring Hill.
- Design and develop treatments for local connections and new transport infrastructure that complement local character and enhance local image.

14.5 Assessment of Impacts

14.5.1 Introduction

The EIS Reference Design is the blueprint for the assessment of the visual, urban design and landscape impacts and mitigation measures. The visual impact assessment has been carried out in accordance with the Principles, Goals and Objectives developed above, and landscape design guidelines. This section of the report provides a description of impacts of the proposed Northern Link infrastructure and the mitigation measures devised to minimise such impacts, followed by a visual assessment of the Project before, during and after the completion of construction.

14.5.2 The Study Corridor and Key Locations

Within the three 'key locations' identified above in Section 14.4, four specific locations have been identified that may be impacted by Northern Link, as illustrated in **Figure 14-3**. These include:

- the proposed Western Connection (Northern Link tunnel approaches from the Western Freeway adjacent to Mt Coot-tha Botanic Gardens);
- the proposed Toowong Connection (encompassing Frederick Street, Milton Road, Croydon Street and adjoining streets);
- the Northern Connection (Northern Link tunnel connections to the Inner City Bypass); and
- the Kelvin Grove Connection (Northern Link tunnel connections to Kelvin Grove Road).

14.5.3 The Terms of Reference for the Potential Impacts and Mitigation Measures

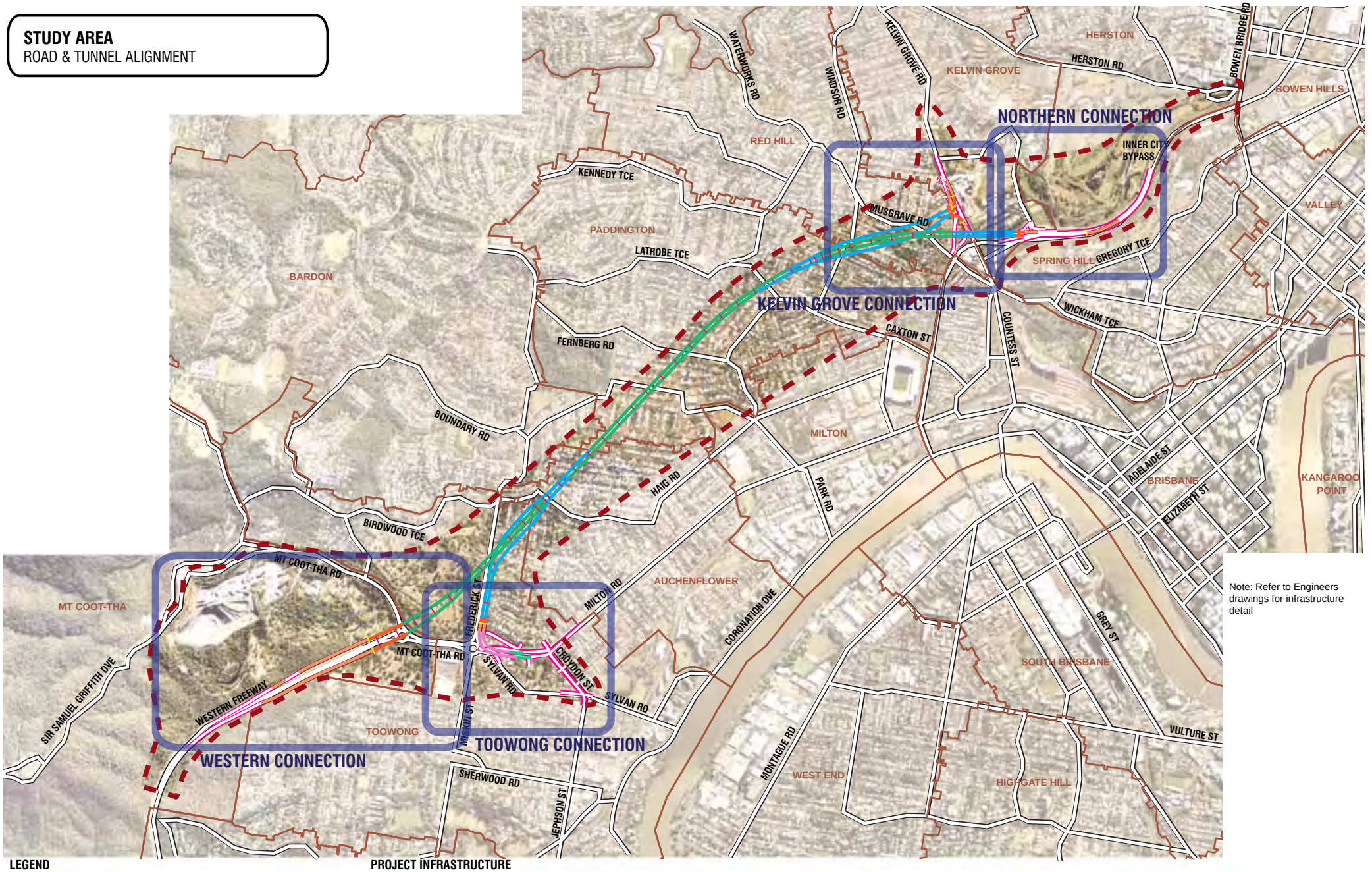
As highlighted at the beginning of this chapter, the Terms of Reference require that the EIS give due regard to the likely urban landscape and visual outcomes associated with the project, at the identified key locations. In response to the ToR, these matters are addressed below, including where appropriate, design enhancements and impact mitigation to improve the visual and landscape outcomes associated with the project.

14.5.4 Project Vision, Goals and Objectives for the EIS Reference Design

The following sections identify the potential negative impacts associated with the EIS reference design, and recommends appropriate mitigation through urban and landscape designs that are consistent with the visual character of each specific location. In order to achieve these improvements, an 'amenity framework' (vision, goals and objectives) for urban, landscape and visual elements has been developed to ensure the mitigation

measures are guided by appropriate principles with desired outcomes for each key location. Refer to Section 14.3 above for the complete set of project Vision, Goals and Objectives. Note that the three key locations identified in the existing environment section have been further divided into four key locations for the purposes of the impact assessment; the 'Toowong Roundabouts' precinct described in Section 14.3.1 is now considered as two separate 'key locations' for the Western Connection and the Toowong Connection, reflecting the different visual characteristics and potential impacts associated with each.

STUDY AREA
ROAD & TUNNEL ALIGNMENT



Note: Refer to Engineers drawings for infrastructure detail

LEGEND

- Study area outline
- Suburb Boundary
- Existing Road
- Key Locations

PROJECT INFRASTRUCTURE

- Portals
- Tunnel Roadheader
- Tunnel (TBM)
- Cut & Cover
- Tunnel Cross Passages
- Elevated Structure
- Reinforced Earth Structure
- Surface Works
- Transition Structure

SCALE 1:20 000 @ A3 1:10 000 @A1

0 200m 400m 600m 800m 1000m

14.5.5 Urban Design and Visual Guidelines

The ToR calls for urban, landscape and visual guidelines to be developed for the key locations within the project.

The guidelines also consider the project vision, goals and objectives relating to urban landscape values, character and connectivity. These common themes have been ordered into landscape and urban design elements so that they can be applied to a range of urban settings found in the study corridor. The guidelines have been used to provide urban and landscape design concepts and designs.

The following are the minimum guidelines to ensure urban and landscape designs are of the highest quality, longevity, sustainability and innovation in the provision of:

1) Environmental Revegetation / Waterway rehabilitation

- Protect existing significant vegetation
- Revegetate and enhance areas damaged during construction
- Where appropriate use species indigenous to each key location
- Improve the quality of run-off from roads and other hard surfaces before it reaches waterways or aquifers
- Size of procured plant stock should suit intended purpose, (ie: revegetation of bushland or waterways – tube stock to be used, for Street Trees – 100L stock to be used, for areas requiring impact of mature trees – Ex ground stock to be used).

2) Landscape Open Space Enhancement

- Urban Forest Treatment – Create well connected, sustainable and safe landscapes of diverse and high quality where the project creates open space or remnant space, incorporating existing parks and open space, where possible
- Create opportunities to enhance critical views and vistas including views to the CBD, Mt Coot-tha, local landmarks and other character elements or precincts
- Create water wise subtropical landscapes which are sustainable and provide shade and micro-climate benefits, where appropriate
- Size of procured plant stock should suit intended purpose, (ie: revegetation of bushland or waterways – tube stock, for Street Trees – 100L stock or greater, for areas requiring impact of significant trees – Ex ground stock 4m high or greater)
- Ensure that scenic amenity imparted by the city's characteristic terrain and vegetation is retained and enhanced
- Provide innovation in response to embankment planting
- Provide innovation in rain water harvesting for re-use
- Provide innovation in the use of permeable surfaces.

3) Recreational Opportunities

- Create well connected and safe community areas for active or passive recreation within discrete areas of open space
- For active areas consider BBQ's, shelters, drinking fountains, age appropriate play opportunities, park furniture and lighting.

4) Connectivity

- Provide safe, legible and comfortable connections to and from all areas affected by the project for pedestrians, cyclists and public transport users (eg: shade and CPTED principles)
- Make good and enhance all existing connections for pedestrian and cyclists
- Investigate other opportunities for improving alternative transport networks and user choice by providing safe pedestrian and cycle connections to local destinations and throughout the city
- Improve permeability for pedestrians and cyclists by establishing new connections that are able to safely penetrate or straddle 'barriers' in the built environment
- Provide transport networks of high environmental quality, including visual and physical amenity
- Provide lighting along connections and at decision points in accordance with CPTED principles
- Ensure pathway widths suit the degree and frequency of use, and are designed to accepted industry standards
- Provide surface treatments that enhance other connecting paths within the vicinity and street furniture that reinforces the local character of the area.

5) Neighbourhoods

- Retain and enhance characteristics of local neighbourhoods in close proximity to project works
- Provide sensitive urban regeneration solutions for areas adjoining neighbourhood precincts
- Provide vegetative screening to sound barriers and/or provide access to views and vistas of the surrounding area using transparent materials where possible
- Strengthen neighbourhood precincts through the implementation of well connected community park/s
- Retain and enhance the leafy character of Brisbane's suburbs, particularly those in the inner west by incorporating significant local indigenous or culturally-significant species into landscapes associated with existing and new development or infrastructure.

6) Boulevard Treatments

- Provide significant tree planting, street furniture, public art and accessible pathways to major roads
- Provide enhanced amenity to existing and proposed residential streets through the provision of street tree planting with under planting and footpaths.

7) Suburban Centre Improvement Schemes

- Urban Villages - Create well connected and safe new opportunities or strengthen the existing viability of destinations through urban design and landscape treatments.

8) Design Intervention and Integration with Engineering Proposals

  - Create high quality urban design and landscape treatments for the following infrastructure elements:
  - Retaining and transition structures (eg earth embankments, retaining walls, descending tunnel ramps)
  - Elevated structures (structures should be developed to integrate urban design with structural objectives, as opposed to add on embellishments)
  - Ventilation outlets, ventilation outlet stations,
  - Sub stations
  - Noise barriers

- Integrate the above with the existing environment of each key location
- Present urban regeneration options in appropriate locations.

9) Public Art

- Provide a Public Art Strategy with curatorial input and respond to all design elements within the project
- Provide opportunities for public art or character elements at key points within the transport network, such as entrances, public transport nodes, key destinations and places of cultural significance that respond to and enhance local image and the identity of the city, contributing to the legibility and user-friendliness of transport networks for people of all ages and levels of fitness.

10) Lighting

- Mitigate the potential for drivers to be distracted by the sun if possible
- Use lighting to assist legibility and choices about safe areas and routes
- Integrate sustainable lighting in the design integration with engineering proposals
- Ensure lighting during construction does not impact on any form of transport or residents
- Avoid inappropriate light pollution, shadowing or glare during construction and at operational stage.

11) Codes and Practices

- Include CPTED principles in all of the above mitigation measures refer 'Crime Prevention through Environmental Design Guidelines for Queensland Part A: Essential features for safer places. 2007'.
- Provide Australian best practice urban design and landscape standards, codes and practices to all urban and landscape designs.

14.5.6 Potential Impact Analysis

The likely impacts of the project in each key location are presented below in tables, accompanied by an illustrated spatial analysis. The tables list the individual built components of the Reference Design and discuss the resulting impact on the environment.

14.5.7 Mitigation Measures

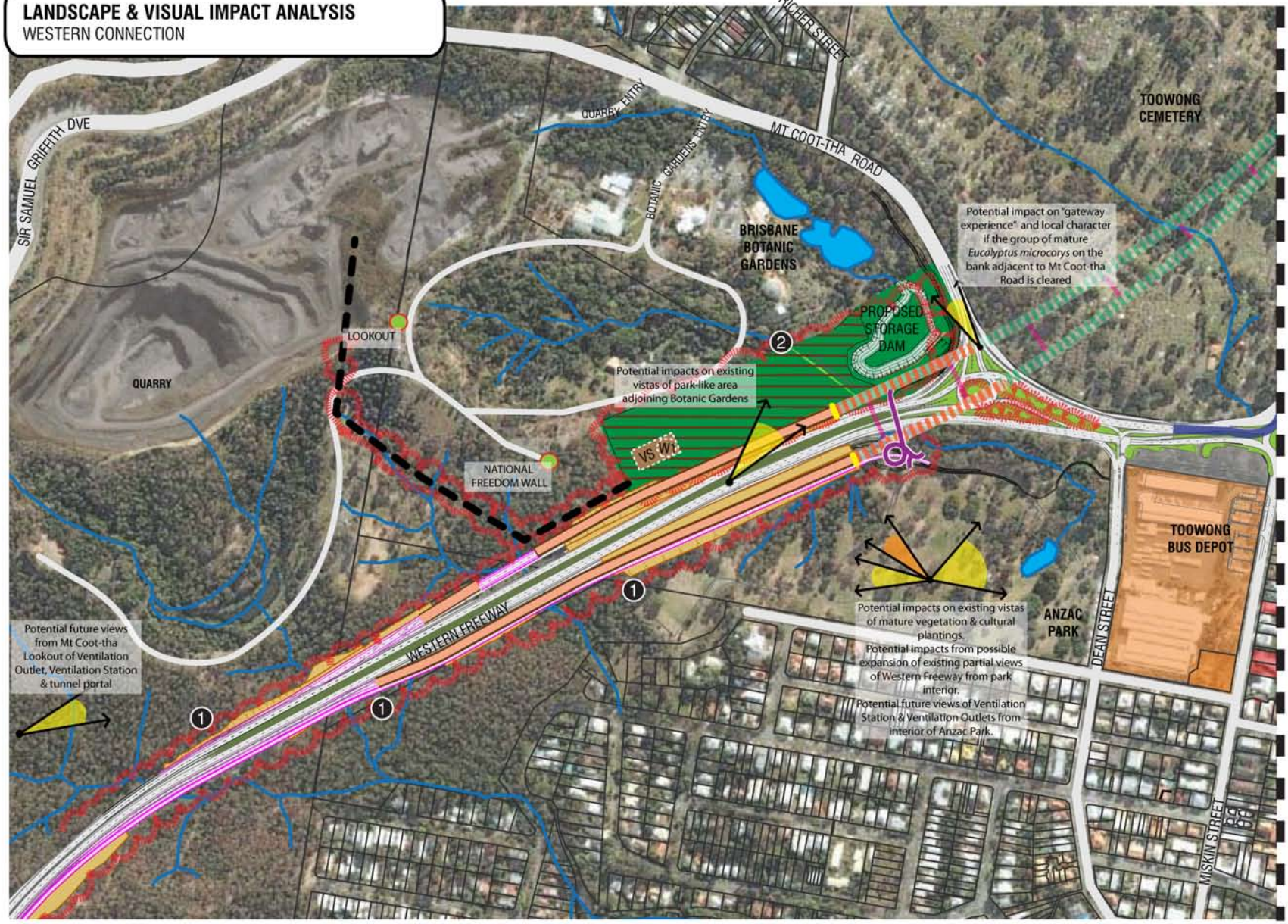
For each of the key locations, the assessment of impacts on the urban landscape and visual environment is accompanied by discussion of suggested mitigation measures to offset the potential negative impacts. The mitigations are guided by:

- the strategic framework for the City of Brisbane;
- the urban landscape and vision, goals and objectives; and
- the urban landscape and visual guidelines developed in response to both.

The mitigation measures deal with both the construction and operational phases of the project.

Below is a summary of the combined major impacts and mitigation measures of each key location.

LANDSCAPE & VISUAL IMPACT ANALYSIS
WESTERN CONNECTION



1. Potential impacts on existing vegetation from clearing & construction activities related to surface works, transition structures, ventilation structures and cut & cover works
2. Potential impacts on local drainage lines

N.B. LOCATION OF EXISTING FEATURES & PROPOSED PROJECT INFRASTRUCTURE IS INDICATIVE ONLY. REFER TO ENGINEERS DRAWINGS FOR INFRASTRUCTURE DETAIL

SCALE 0 100m 200m

LAND USE
- Multiple Unit Residential
- Residential
- Other/special use
- Education

EXISTING FEATURES
- Drainage line
- Waterbody
- Frederick Street Flyover
- Proposed pedestrian/ cycle overpass

PROJECT INFRASTRUCTURE
- Portals
- Tunnel Roadheader
- Tunnel (TBM)
- Cut & Cover
- Transition Structure
- Elevated Structure
- Reinforced Earth Structure
- Surface Works
- Cross Passages
- N4 Proposed Ventilation Outlet
- VS Proposed Ventilation Station
- Proposed Temporary Conveyor
- Earthwork embankments

POTENTIAL IMPACTS
- Remnant land
- Land remaining after construction
- Proposed Work Sites
- Potential impacts on existing vegetation
- Potential impacts on existing views

14.5.8 Western Connection – Summary

A detailed description of the potential impacts at the Western Connection during construction and operation is provided below in **Table 14-1**. The potential impacts are presented graphically in **Figure 14-4.**

The main impact at the Western Connection during operation would be the 800m long transition structures, which would extend along either side of the Western Freeway and require the construction of embankment cuttings approximately 20 m wide into the existing vegetated foothills of Brisbane Forest Park. This would be mitigated by planting appropriate species on the cuttings and medians to retain the integrity of this gateway experience. The existing pedestrian/cycle route along the southern edge of the Western Freeway would be re-aligned to the southern side of the southern transition structure, and connected to the new pedestrian/cycle bridge (currently under construction by Queensland Main Roads) across the Western Freeway to Mt Coot-tha.

The other key impact would be during construction, when a worksite is proposed to be established adjacent to the Botanic Gardens, on land at the corner of the Western Freeway and Mt Coot-tha Road. This land is owned by Brisbane City Council, and is not part of either the Botanic Gardens or Brisbane Forest Park. However, following construction it is possible that this land, when rehabilitated and revegetated, may be incorporated into the Mt Coot-tha Botanic Gardens.

The EIS Reference Design includes a proposed enclosed conveyor system to remove tunnel spoil from the Western Freeway construction site and deposit it in the Mt Coot-tha Quarry (see **Figures 14-4** and **4-20**). The conveyor would ideally follow the shortest, most direct route and the conveyor structure would be as low to the ground as possible. However, the shortest practicable route encroaches on the Mt Coot-tha Botanic Gardens and would therefore have an impact on visual amenity for the duration of construction. To minimise its visual impact during construction, the conveyor structure would be painted in dark or earth tones, to reduce its visual prominence within the Gardens setting. Surrounding vegetation would also act to shield the conveyor, particularly from more distant views.

On completion of the works, the conveyor would be removed and this corridor would be rehabilitated and revegetated with a species palette reflecting the biodiversity of this area of the Botanic Gardens. The worksite itself would be rehabilitated in consultation with the Botanic Gardens, so as to accommodate long-term plans for expansion of the Gardens at this location.

While the horizontal width and scale of the Western Freeway would increase, the low level nature of the constructed elements such as the transition structure and the portals means that there would be little increase in the vertical scale. The perceived width of project in this location would be mitigated by the planting of mature trees in the medians.

- **Table 14-1 Potential Impacts: Western Connection**

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
Portals	**Predominant Land Uses, Built Form and Variety** ▪ The portals are located approximately 200m south west of the Mt Coot-tha roundabout and encroach into the existing land uses of Anzac Park to the SE and the Botanic Gardens to the north-west. **Landscape Amenity and Open Space** ▪ The existing landscape amenity is low for pedestrians/cyclists but high for motorists. The portals would further decrease the landscape amenity and open space at the edges of Botanic Gardens and Anzac Park. ▪ Existing trees to the edges of the Botanic Gardens and Anzac park would be impacted by the portal footprint. ▪ Due to the portals low profile, the impacts on Landscape Character is negligible,

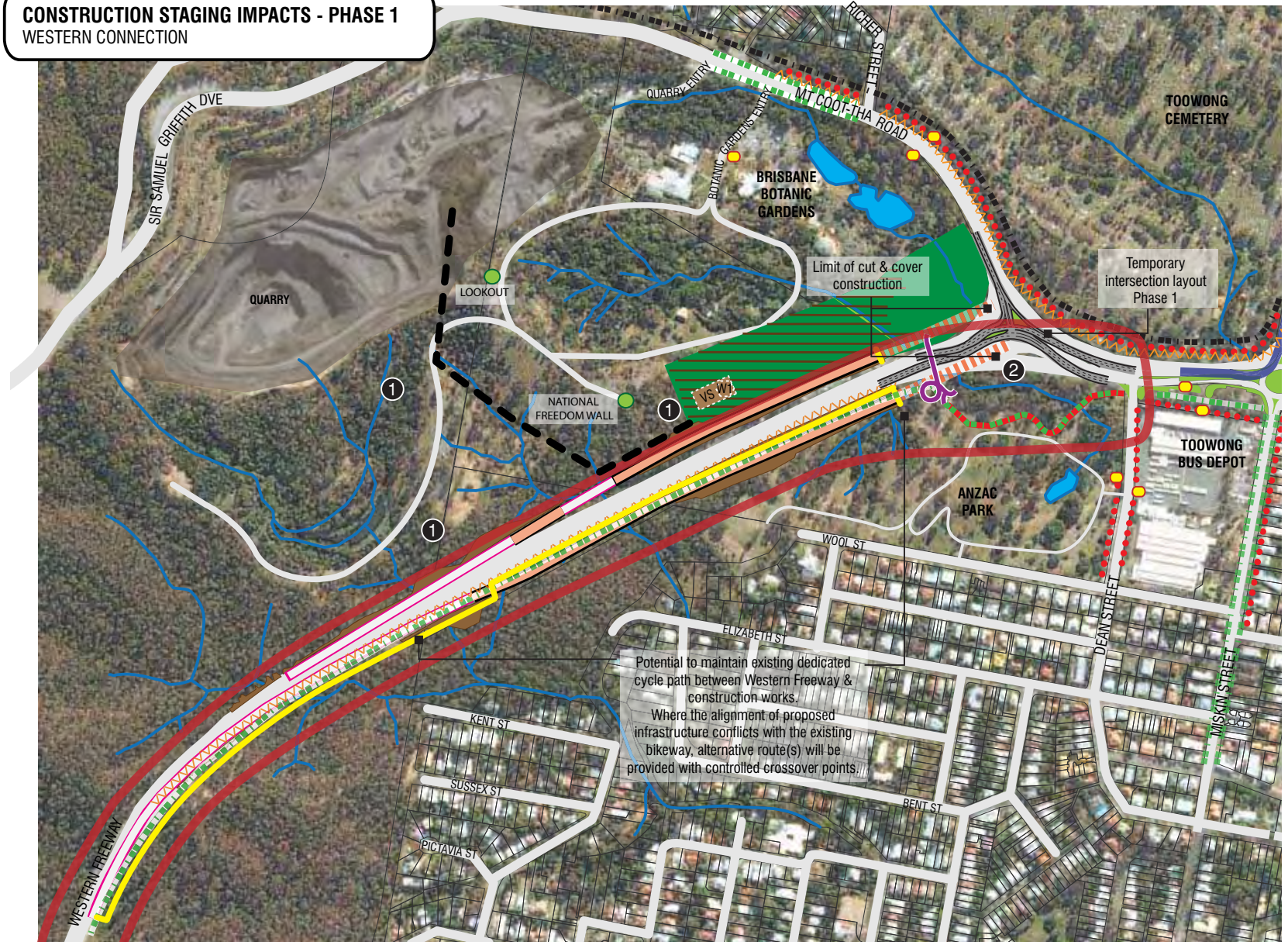
Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
	however the introduction of road infrastructure would change the perceived existing Landscape Character of open space, dense bush and vegetated hills. **Accessibility, Permeability and Connectivity** ■ The portals would impact on the existing pedestrian/cycle links along the Western Freeway. For road transport, the portals enhance permeability and connectivity. **Scale** ■ The portal roofs are level with the adjacent ground, and would have negligible impact on the vertical scale of this environment which is dominated by the Toowong Cemetery. **Landmarks, Legibility and Destinations** ■ The portal roofs are level with adjacent ground; therefore they are relatively low in profile and would have no impact on visual access to landmarks as viewed from approaches. They do not compromise legibility and promote access to destinations. The journey into the portals would obscure the views to the landmarks at the Toowong Cemetery.
Ventilation Outlet (VO)	**Predominant Land Uses and Variety** ■ The VO is located approximately 400 m south west of the Mt. Coot-tha roundabout, within BCC land adjacent to the Botanic Gardens. **Built Form, Typologies and Grain** ■ Not applicable at this connection. **Landscape Amenity** ■ The VO would impact on landscape amenity because it would be visible to motorists along the Western Freeway. The VO would be contrasted against the existing 'sylvan' nature of the dense bush and vegetated hills and would therefore have a high visual impact. ■ The VO would impact on landscape amenity because it would be visible to visitors to the Botanic Gardens, who may have intermittent or obstructed views to the VO depending on topography, open clearings and vegetation. ■ The VO is likely to impact on the existing landscape character of its immediate environment, including the surrounding residential areas which may have intermittent or obstructed views to the VO depending on topography, buildings and vegetation. ■ The type of aesthetic treatment of the VO would have an impact on the contribution to this immediate environment. ■ The VO includes a pipeline/ventilation duct from the tunnel to the VO; the trenching for the pipeline to the VO would run alongside the Western Freeway corridor and worksite, and would not affect existing vegetation. ■ The VO is likely to be visible from a wide catchment, but views would be limited and screened by topography, existing urban development and the extent of existing and future vegetation. **Open Space** ■ Because of the relatively small footprint of the VO's the impact on open space would be negligible. **Accessibility, Permeability and Connectivity** ■ The VSO would have no impact on Accessibility, Permeability and Connectivity **Scale** ■ The VSO would impact on the scale of the immediate surrounding land uses due to its size and elevation, but its scale would be mitigated by topography, existing urban development and the extent of existing and future vegetation. **Landmarks, Legibility and Destinations** ■ Depending on the design of the VSO it has the potential to be either a non-descript piece of infrastructure, camouflaged to blend into its environment or become an instantly recognised landmark which could be used to assist legibility (see Chapter 20).
Ventilation Stations (VS) The design of the VS	**Predominant Land Uses and Variety** ■ The VS would be located below the Ventilation Outlet approximately 400m south west of the Mt. Coot-tha roundabout, within BCC land adjacent to the Botanic

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
depends on the method of construction. It is proposed that the VS be partially buried.	Gardens. It would be partially buried. **Built Form, Typologies and Grain** ■ Not Applicable to this location **Landscape Amenity & Character** ■ The VS would be partially buried and situated between the Botanic Gardens and the Western Freeway therefore would have an impact on the landscape character of this area. **Open Space** ■ The ventilation station would be partially buried. There would be minor visual impact of this structure for motorists travelling along the Western Freeway **Accessibility, Permeability and Connectivity** ■ The VS would not impact on accessibility, permeability and connectivity. **Scale** ■ Because the VS would be partially buried its scale would be reduced and the building would have a negligible impact on the surrounding environment. It would not be visible from a wide catchment. **Landmarks, Legibility and Destinations** ■ Depending on the design of the VS it has the potential to be either a non-descript piece of infrastructure, camouflaged to blend into its environment, or to become an instantly recognised landmark which can be used to assist legibility. **Visual Environment** ■ The ventilation station would be partially buried and would have a medium visual impact for motorists travelling along the Western Freeway.
Surface Road Changes Surface road changes, for the purposes of this chapter, refers to the reinstatement of existing traffic conditions, pavements and line markings in either new or existing locations. It does not include proposed new ramps or transition structures.	**Predominant Land Uses and Variety** ■ Not Applicable at this connection. **Built Form, Typologies and Grain** ■ Not Applicable at this connection. **Landscape Amenity and Open Space** ■ There would be negligible impacts on Landscape Amenity and Open Space at this connection as there are no permanent surface road changes, due to proposed reinstatement of the existing round-about at Mt Coot-tha Road and the Western Freeway after the tunnel portal (cut and cover) works are complete (Refer Engineering Infrastructure (see below) for impacts due to transition structures along the Western Freeway). ■ Opportunity for positive impacts through provision of 'gateway' planting to the reinstated roundabout islands. **Accessibility, Permeability and Connectivity** ■ There would be negligible impacts on Accessibility, Permeability and Connectivity at this connection as there are no permanent surface road changes, due to the proposed reinstatement of the existing round-about at Mt Coot-tha Road and the Western Freeway (Refer Engineering Infrastructure (see below) for impacts due to transition structures along the Western Freeway). **Scale** ■ The removal of existing vegetation at the roundabout Mt Coot-tha Road and the Western Freeway would reduce the vertical scale of surrounding vegetation experienced in this location. Not withstanding the existing large scale of the Western Freeway, the surrounding vegetation provides a vertical frame to the freeway and imparts a more 'intimate' driving experience. **Landmarks, Legibility and Destinations** ■ Not Applicable at this connection.
Engineering Infrastructure	**Predominant Land Uses and Variety** ■ Not Applicable at this connection. **Built Form, Typologies and Grain** ■ Not applicable in this location.

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
	Landscape Amenity and Open Space ■ There would be perceived negative impact on existing landscape amenity for motorists at this connection due to 800m of transition structures through the Western Freeway cuttings. ■ Impacts would be perceived as widening of the freeway corridor and loss of bushland on the fringe of the Brisbane Forest Park. ■ The wide footprint would encroach on Botanic Gardens land on the north western side and Anzac Park on the South East side of the Western Freeway. **Accessibility, Permeability and Connectivity** ■ There would be impact on the existing pedestrian/cycle links on the south-eastern side of the Western Freeway. It is proposed this would be relocated to the outside of the new transition structure, for zero permanent impact, and be linked to the pedestrian/cycle bridge currently under construction. **Scale** ■ The scale of the transition structures and embankment cuttings would have an impact on existing motorist experience on both sides of the Western Freeway. **Landmarks, Legibility and Destinations** ■ Transition structures would be cut into the ground, therefore permanent impacts on surface conditions on the existing Western Freeway would be negligible, therefore visual access to landmarks of Toowong Cemetery and views to the CBD remain uninterrupted. ■ Legibility to and from destinations would remain as existing.
Construction Related Works **Worksites** Refer to **Figure 14-5**(a) and (b) for worksite locations. **Conveyors** **Changed surface conditions** The impact from these components of tunnel construction would be temporary.	**Predominant Land Uses and Variety** ■ The worksite would have a major impact on the Botanic Gardens on the north-western side of the Western Freeway. **Landscape Amenity, Character and Open Space** ■ The worksite footprint would have a major impact on the 'gateway experience' and local character provided by the existing *Eucalyptus microcorys* on the bank adjacent to Mt Coot-tha Road. (**Figure 14-5(a) and (b))** ■ Major impacts on existing vegetation from clearing and construction-related activities at the Botanic Gardens interface at this location. ■ Surface water impacts due to location of worksite downstream of existing Botanic Garden water bodies and natural drainage lines, which flow under the Western Freeway into Anzac Park. ■ The proposed water storage Dam for the Botanic Gardens would be delayed due to the worksite location. ■ The proposed conveyor to remove spoil from the tunnel to Mt Coot-tha Quarry would impact on the bushland surrounding the Botanic Gardens by removing existing vegetation. ■ The proposed conveyor would temporarily impact on the user experience of the Botanic Gardens, and would be visually incongruous with the Gardens setting. **Accessibility, Permeability and Connectivity** ■ Currently there is limited public access and connectivity to the area of land adjacent to the Botanic Gardens therefore there would be little or no impact on access and connectivity of the work site. ■ Site access for operations and workers would impact on the experience of connections to Mt Coot-tha Road, for residents and visitors to the Botanic Gardens and Mt Coot-tha Lookout. ■ There would be some interface impacts with the pedestrian/cycle bridge over the Western Freeway (currently under construction). This connection may be temporarily interrupted during construction of cut and cover portals near the roundabout. ■ Surface changes during the different phases of construction would temporarily impact on the existing pedestrian and cycle route to and from Mt Coot-tha. This route would remain open but in a changed traffic environment. **Scale** ■ The scale of the worksite would impact on the motorist experience along the

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
	Western Freeway, and potentially on residents with views to the site, and recreational users of the Gardens and Toowong cemetery. **Landmarks, Legibility and Destinations** ■ Legibility to the tourist destinations of Mt Coot-tha Lookout and the Botanic Gardens would be temporarily impacted due to the changed traffic environment.

CONSTRUCTION STAGING IMPACTS - PHASE 1
WESTERN CONNECTION



1. Temporary spoil conveyor through Brisbane Forest Park to quarry will impact on existing vegetation
2. Protect edge of Anzac Park during construction phase

N.B. LOCATION OF EXISTING FEATURES & PROPOSED PROJECT INFRASTRUCTURE IS INDICATIVE ONLY REFER TO ENGINEERS DRAWINGS FOR INFRASTRUCTURE DETAIL

SCALE
0 100m 200m

EXISTING FEATURES

- Drainage line
- Waterbody
- Bus stop
- Dedicated/on-road cycle path
- Shared pedestrian/cycle path
- Pedestrian path
- Pedestrian/cycle path with low visual & physical amenity
- Potential alternative route
- Future principle cycle route
- Frederick Street Flyover
- Proposed pedestrian/cycle overpass

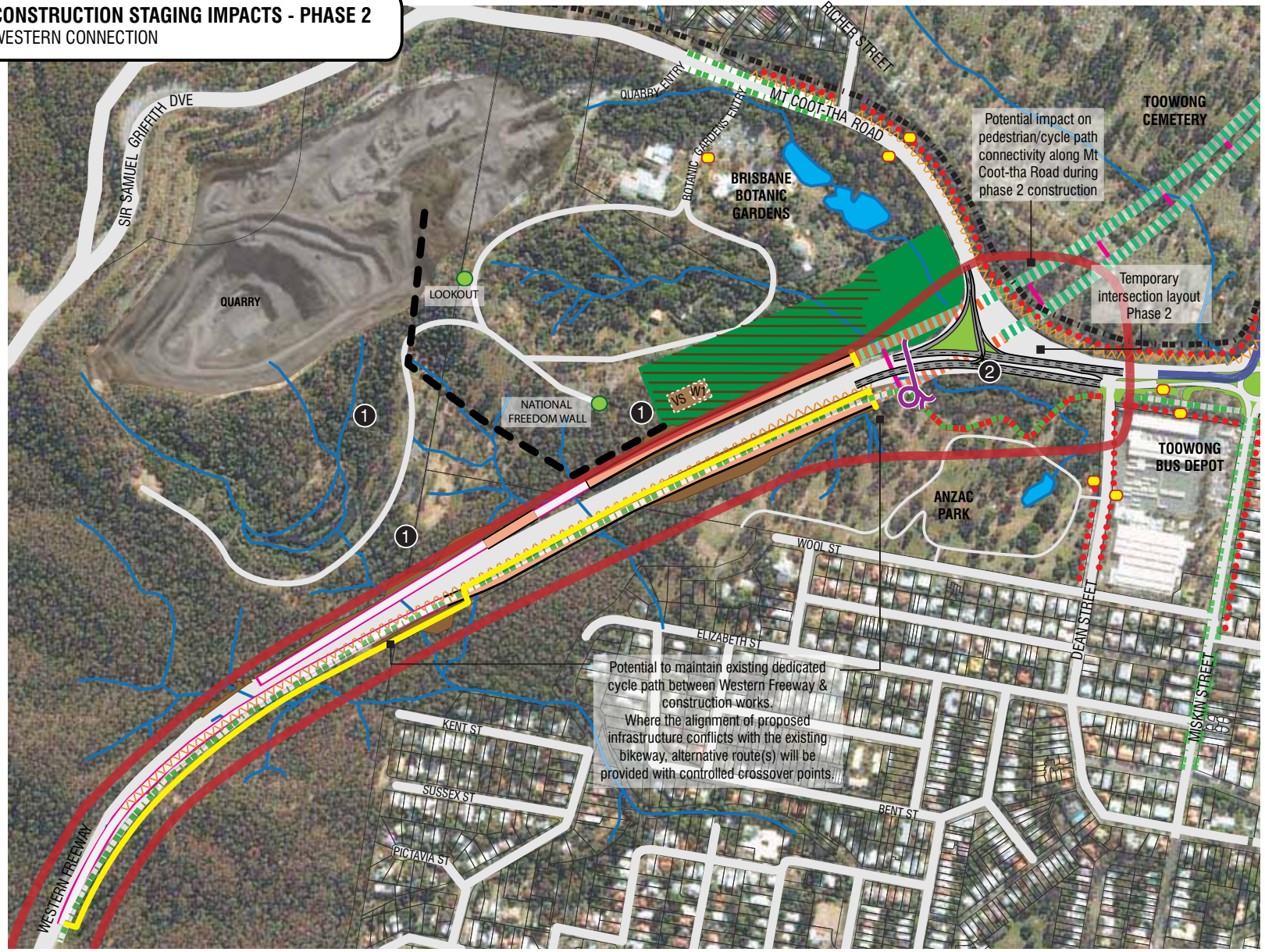
PROJECT INFRASTRUCTURE

- Portals
- Tunnel Roadheader
- Tunnel (TBM)
- Cut & Cover
- Transition Structure
- Elevated Structure
- Reinforced Earth Structure
- Surface Works
- Cross Passages
- N4 Proposed Ventilation Outlet
- VS Proposed Ventilation Station
- Earthwork embankments
- Temporary Conveyor

POTENTIAL IMPACTS

- Remnant land
- Land remaining after construction
- Proposed Work Sites
- Potential impacts on accessibility & connectivity of existing pedestrian/cycle paths during construction

CONSTRUCTION STAGING IMPACTS - PHASE 2
WESTERN CONNECTION



1. Temporary spoil conveyor through Brisbane Forest Park to quarry will impact on existing vegetation
2. Protect edge of Anzac Park during construction phase

N.B. LOCATION OF EXISTING FEATURES & PROPOSED PROJECT INFRASTRUCTURE IS INDICATIVE ONLY REFER TO ENGINEERS DRAWINGS FOR INFRASTRUCTURE DETAIL

SCALE
0 100m 200m

EXISTING FEATURES

- Drainage line
- Waterbody
- Bus stop
- Dedicated/on-road cycle path
- Shared pedestrian/cycle path
- Pedestrian path
- Pedestrian/cycle path with low visual & physical amenity
- Potential alternative route
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PROJECT INFRASTRUCTURE

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- Temporary Conveyor

POTENTIAL IMPACTS

- Remnant land
- Land remaining after construction
- Proposed Work Sites
- Potential impacts on accessibility & connectivity of existing pedestrian/cycle paths during construction

Northern Link - Environmental Impact Statement / Figure 14 - 5b

14.5.9 Toowong Connection – Summary

A detailed description of the potential impacts at the Toowong Connection during construction and operation is provided below in **Table 14-2**. The potential impacts are presented graphically in **Figure 14-5**.

The major potential impacts on the Toowong Connection would be the two proposed elevated structures over Milton Road adjoining the Frederick Street roundabout, which would require the resumption of properties below Valentine Street and on the southern side of Milton Road. The opportunity exists to treat the elevated structures with lighting effects and a strong planted edge, featuring the stately indigenous Hoop Pine to reinforce the curve of the flyovers. The space that would be created south of Valentine Street presents screening opportunities for the residents above.

The project would require the resumption of approximately half of Quinn Park, to accommodate the proposed widening of Milton Road. This would leave a flat open area which is currently used as a neighbourhood park. The opportunity exists to strengthen the existing design of the park in consultation with stakeholders. The park's interface with the project would be mitigated through the planting of suitable species on the southern side of the walled edge to the park. Pedestrian/cycle access would be encouraged through the middle of the park along an accessible pathway thereby improving surveillance.

Pedestrian/cycle movement on road through the area in general would remain difficult, with the north/south connections to and from the Brisbane River facing the barrier created by Milton Road and the Frederick Street intersection. At-grade crossing for pedestrians and cyclists is proposed at the Milton Road/Croydon Street intersection. An underpass would not have been acceptable, for reasons of safety and security, and would also have had limitations in respect of drainage. An overpass was not considered to be a feasible option, because of the height clearances required (above the vehicle ramp structures), and the subsequent length of the ramps that would be required on either side to achieve acceptable grades for pedestrians and cyclists using the overpass.

- **Table 14-2 Potential Impacts: Toowong Connection**

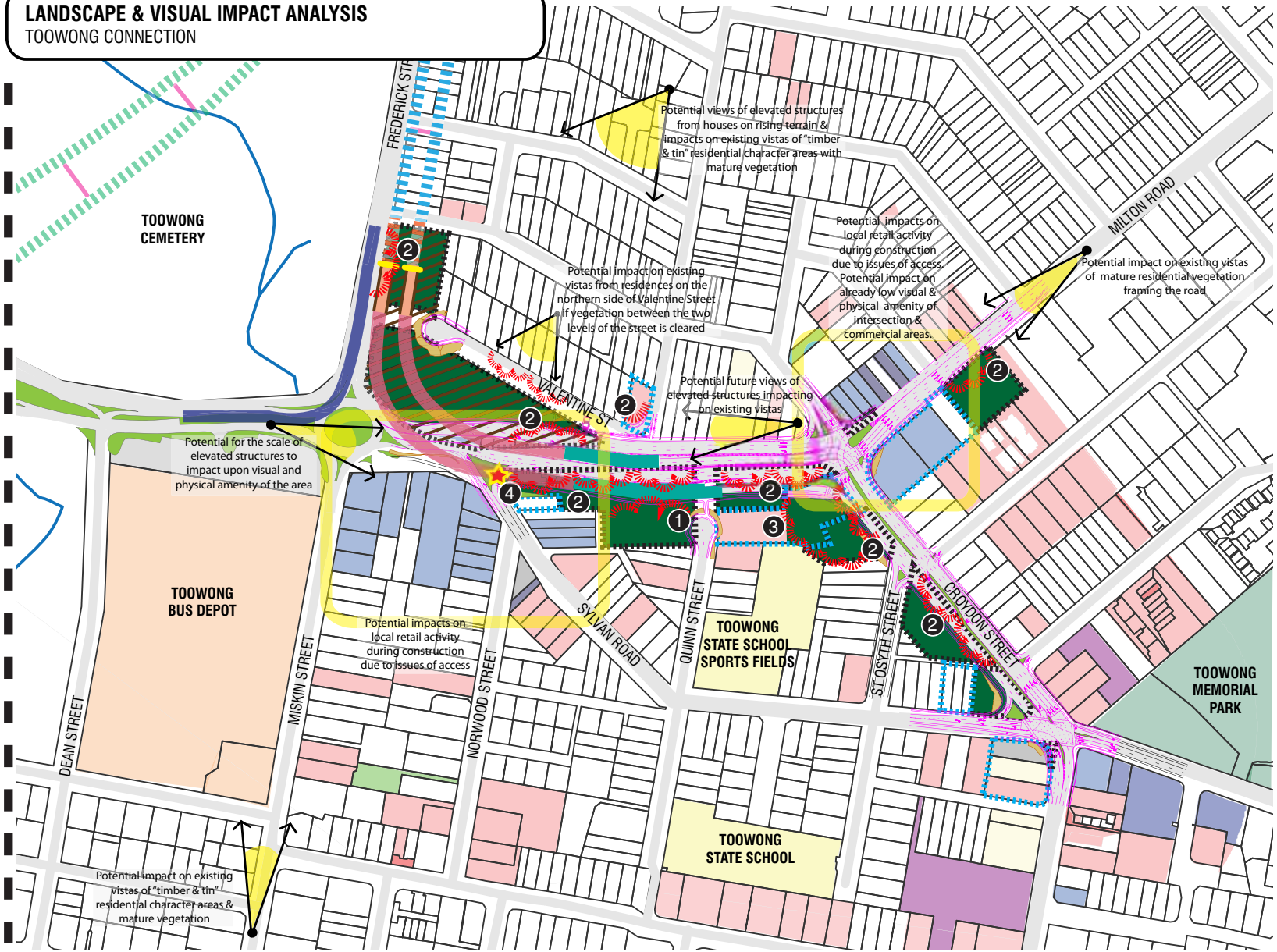
Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
Frederick Street Ramp Portals	**Predominant Land Uses, and Variety** ▪ The Frederick Street ramp portals would be sited south of Morley Street, and would impact on the existing residential character of Morley and Valentine Streets where they meet Frederick Street. **Built Form** ▪ Potential impacts from property resumptions and changed conditions for existing residents due to the proximity of the Frederick Street ramp portals. Refer to Engineering Infrastructure (see below) for impacts on commercial properties. **Landscape Amenity** ▪ Potential for impact on existing vegetation within existing private properties. **Open Space** ▪ The portals would not impact on existing open space **Accessibility, Permeability and Connectivity** ▪ The portals would not impact on existing low accessibility, permeability or connectivity. **Scale** ▪ The scale of the portals would be modest in the context of the adjoining ramp structures. By setting the portals into the hill next to Frederick Street, the portals achieve compatibility with the topography of the existing suburban neighbourhood **Landmarks, Legibility and Destinations** ▪ The portals would not obscure or impact on existing landmarks in the adjacent Toowong Cemetery

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
Ventilation Stations	▪ Not Applicable for Toowong Connection
Surface Road Changes Surface road changes, for the purposes of this chapter, refers to the reinstatement of existing traffic conditions, pavements and line markings in either new or existing locations. It does not include proposed new ramps or transition structures.	**Predominant Land Uses and Variety** ▪ Some properties along Milton Road and Croydon Street would be impacted by the EIS Reference Design through property resumptions, opening up the surrounding residential structure and creating a wider road corridor. **Built Form, Typologies and Grain** ▪ The commercial edge of the northern side of Milton Road and Frederick Street would be impacted through property resumptions. This would change the nature of the built form along this edge. **Landscape Amenity and Character** ▪ The existing mature vegetation along the northern edge of Quinn Park next to Milton Road would be cleared for surface works and ramp structures. ▪ The existing memorial on the corner of Sylvan Road and Milton Road would be compromised by the project works. This memorial also incorporates a protected (Vegetation Protection Order) tree (*Flindersia australis*) but the tree is in poor condition (see Chapter 12, Cultural Heritage for discussion of Cultural Heritage issues and impacts). ▪ Vegetation and street trees would be impacted along: i. Part of Croydon Street from Ventnor Street to Milton Road; ii. Part of Milton Road between Norwood Street and Eldridge Street; iii. The Southern side of Valentine Street; and, iv. Part of Sylvan Road from Croydon Street to St. Osyth Street. **Open Space** ▪ Quinn Park would be impacted by project surface works and also ramp structures. In addition to the encroachment into the park, the ramp structures would overshadow the park in the winter months, particularly in the morning and afternoon. Hence shade-tolerant species would be required for new planting and landscaping. **Accessibility, Permeability and Connectivity** ▪ Existing low Accessibility, Permeability and Connectivity would be impacted during construction and operation. ▪ The introduction of a cul-de-sac would impact on connectivity for motorists at Valentine Street, but not for pedestrians or cyclists. ▪ The regrading of Valentine Street would improve the amenity and accessibility of this street, but not for pedestrians or cyclists. ▪ The introduction of a cul-de-sac would impact on connectivity for motorists at Quinn Street, but not for pedestrians or cyclists. **Scale** ▪ The widths of Milton Road and Croydon Street (from Milton Road to Eldridge Street) would be doubled therefore increasing the scale of the road. **Landmarks, Legibility and Destinations** ▪ Not Applicable at this connection.
Engineering Infrastructure	**Predominant Land Uses and Variety** ▪ Land uses along the northern side of Milton Road (between Croydon and Frederick Street) would change from commercial uses to road infrastructure and residual land, which may have development potential subject to Council decisions post-construction. **Built Form, Typologies, and Grain** ▪ The removal of commercial properties south of Valentine Street would provide visual access to the 'Timber and Tin' built form character of the residential neighbourhood north of Milton Road. ▪ Residents and businesses on the southern side of Milton Road between Miskin St and Croydon St, would be impacted by the overshadowing of the elevated ramps and noise walls. Where possible the noise walls would be made transparent to mitigate micro climate issues. ▪ The 6m noise walls on the west side of Croydon Street would cause some overshadowing for residents along this north western edge. They would potentially

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
	block views and light if the noise walls are not transparent (see Chapter 9 for noise wall detail). **Landscape Amenity and Character** ■ The already poor landscape amenity would be further diminished by elevated structures and ramps. ■ The motorist's experience driving into and out of the tunnel would open up the 'Timber and Tin' landscape character of the residential neighbourhoods to the north and south. ■ The landscape character of the gateway experience to the Western Freeway (the Frederick Street roundabout) would become further 'cluttered' visually by the engineered infrastructure associated with the ramps, elevated structures, retaining walls and transition structures. ■ The landscape character experience inbound to the CBD at the Frederick Street roundabout would be impacted by the two elevated structures over Milton Road. ■ The landscape amenity for residents of Valentine Street and those overlooking the Frederick Street roundabout would be impacted by the EIS Reference Design due to the elevated structures and the ramps at Milton Road. ■ The landscape amenity of Quinn Park would be impacted due to the ramp and elevated structures which would run the length of its northern boundary. ■ A 6m Noise wall would impact on views to the south for residents of Valentine Street if panels are not transparent. ■ A 6m Noise wall on the west side of Croydon Street from Milton Road to Sylvan Road would impact on the residential character along this street (See Chapter 9 for noise wall details). ■ A 5 to 6m noise wall on the southern side of Milton Road from Croydon Street to Sylvan Road woul impact on the residential character along this side of the street (See Chapter 9 for noise wall details). **Open Space** ■ Half of Quinn Park would be impacted by surface works and ramp structures, along its edge to Milton Road. ■ There may be some open space created along Croydon Street between Milton Road and Sylvan Road, being the residual land from properties resumed for widening of Croydon Street. **Accessibility, Permeability and Connectivity** ■ The already low accessibility, permeability and connectivity would be further impacted by the EIS Reference Design in Milton Road between Frederick Street and Croydon Street. ■ Existing pedestrian/cycle connections would be improved with provision of an additional crossing of Milton Road at Gregory Street. **Scale** ■ The width of Milton Road and Croydon Street would be increased to accommodate traffic improvements therefore increasing the scale of the roads. ■ Elevated structures and ramps would impact on the vertical scale of the Milton Road environment especially at the roundabout at Frederick Street. **Landmarks, Legibility and Destinations** ■ Elevated structures and ramps would impact on the existing views to the Toowong Cemetery heritage gate at the Frederick Street roundabout.
Construction Related Works ■ **Worksites** Refer to **Figure 14-6** for worksite locations. ■ **Changed surface conditions** The impact from these components of tunnel construction would be temporary.	**Predominant Land Uses and Variety** ■ The work site at Milton Road / Frederick Street would introduce new temporary structures and would change the function of this parcel of land, from accommodating numerous commercial uses, to a single purpose work site with access onto the busy Milton Road. **Built Form, Typologies and Grain** ■ The work site at Milton Road / Frederick Street introduces new but temporary structures which would be highly visible along northern edge of Milton Road **Landscape Amenity and Character** ■ The already low landscape amenity along the northern edge of Milton Road would be further diminished by the work site at Milton Road / Frederick Street.

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
	Open Space ■ Not applicable. **Accessibility, Permeability and Connectivity** ■ The already poor accessibility, permeability and connectivity would be further impacted by the intrusion and phasing of construction works. **Landmarks, Legibility and Destinations** ■ Not Applicable

LANDSCAPE & VISUAL IMPACT ANALYSIS
TOOWONG CONNECTION



1. Potential impact on Quinn Park with loss of space & clearing of mature vegetation. Future impacts on park users include loss of visual amenity due to scale & proximity of overpass structures.
2. Potential impact on existing vistas from loss of mature residential vegetation, including cultural plantings such as Hoop Pines, that currently frame the road
3. Potential impact on built form as the back of existing residences becomes visible after resumed lots are cleared
4. Impact on VPO tree and memorial - refer to 14.7.2 for mitigation measures

N.B. LOCATION OF EXISTING FEATURES & PROPOSED PROJECT INFRASTRUCTURE IS INDICATIVE ONLY. REFER TO ENGINEERS DRAWINGS FOR INFRASTRUCTURE DETAIL

SCALE 0 100m 200m

LAND USE
- Multiple Unit Residential
- Commercial/Retail
- Accommodation
- Office
- Health Care
- Sport and Recreation
- Park
- Education
- Community Facility
- Other/special use
- Car Park

PROJECT INFRASTRUCTURE
- Portals
- Tunnel Roadheader
- Tunnel (TBM)
- Cut & Cover
- Transition Structure
- Elevated Structure
- Reinforced Earth Structure
- Surface Works
- Interface Earthworks

EXISTING FEATURES
- Drainage line
- Waterbody
- Frederick Street Flyover
- VPO tree (*Flindersia australis*) planted in 1924 on the corner of Milton & Sylvan Roads to commemorate the centenary of the landing of Lieutenant John Oxley

POTENTIAL IMPACTS
- Remnant land
- Land remaining after construction
- Proposed Work Sites
- Potential impacts on existing vegetation
- Potential impacts on existing views
- Potential partial lot resumption
- Potential full lot resumption

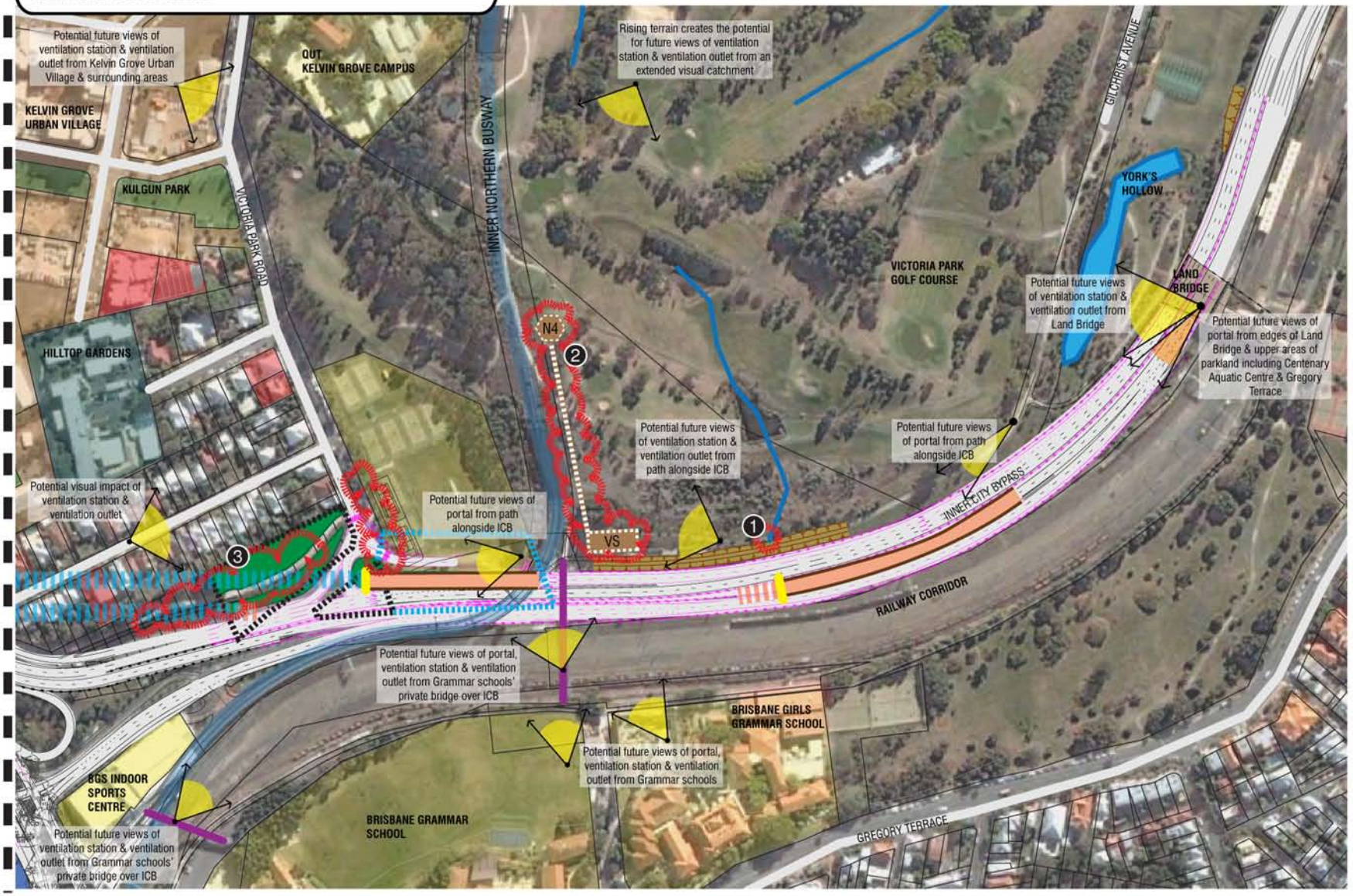
14.5.10 Northern Connection – Summary

A detailed description of the potential impacts at the Northern Connection during construction and operation is provided below in **Table 14-3**. The potential impacts are presented graphically in **Figure 14-7**.

The major impacts at the Northern Connection would be within the existing landscaped open space adjacent to the Inner City Bypass, between Victoria Park Road and Normanby Terrace, to accommodate the proposed eastbound tunnel portal. There would also be some reconfiguration required for the redesign of the Victoria Park Road – ICB intersection, which would impact on the existing access into the Brisbane Grammar playing field adjacent to Victoria Park Road. The impacts at the portal would be mitigated by extensive replanting of suitable species to provide landscape for both the residents of Normanby Terrace and the users of the Inner City Bypass. Access to the playing field would be maintained during construction, and would be reinstated after construction in a similar configuration to the existing.

Another key impact would be the widening of the Inner City Bypass to accommodate a (westbound) portal entrance to the tunnel. The widened roadway would cut into the open space on the northern edge of the Inner City Bypass. At present this edge contains a pedestrian/cycle pathway and a stormwater gully draining to York's Hollow further to the east, both of which would remain functional during operation. Overall, the mitigation opportunities at this connection centre around connecting pedestrians and cyclists into new and existing routes, and providing high amenity landscape planting to the edge of the Inner City Bypass.

LANDSCAPE & VISUAL IMPACT ANALYSIS
NORTHERN CONNECTION



1. Potential impact on the mature Fig Tree on the northern side of the path alongside the ICB by interface earthworks
2. Potential impacts on existing mature vegetation by construction of ventilation outlet & ventilation pipelines
3. Potential impacts on existing trees and medium to high amenity planting

N.B. LOCATION OF EXISTING FEATURES & PROPOSED PROJECT INFRASTRUCTURE IS INDICATIVE ONLY. REFER TO ENGINEERS DRAWINGS FOR INFRASTRUCTURE DETAIL

SCALE
0 200m 400m

LAND USE
- Multiple Unit Residential
- Residential
- Commercial/Retail
- Office
- Retirement village
- Other/special use
- Education
- Park

EXISTING FEATURES
- Drainage line
- Waterbody
- Brisbane Grammar's private pedestrian bridge across ICB

PROJECT INFRASTRUCTURE
- Portals
- Tunnel Roadheader
- Tunnel (TBM)
- Cut & Cover
- Transition Structure
- Elevated Structure
- Reinforced Earth Structure
- Surface Works
- Interface Earthworks
- N4 Proposed Ventilation Outlet
- Proposed Ventilation Pipeline
- VS Proposed Ventilation Station

POTENTIAL IMPACTS
- Remnant land
- Land remaining after construction
- Potential impacts on existing views
- Potential impacts on existing vegetation
- Potential partial lot resumption
- Potential full lot resumption

Table 14-3 Potential Impacts: Northern Connection

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
Portals	**Predominant Land Uses and Variety** ■ There would be little impact on existing land uses, resulting in little change to the variety of activities and opportunities currently existing in this area. ■ The strip of land running along the north of ICB would be encroached upon due to the portal in the middle of the ICB but function of this corridor would remain. **Built Form, Typologies and Grain** ■ Not applicable to this area **Landscape Amenity and Character** ■ The medium to high landscape amenity for motorists on the northern side of the ICB would be impacted by the location of the eastbound portal, at Ithaca Street. ■ Landscape amenity immediately to the west of the Brisbane Grammar School playing grounds would be impacted due to the removal of a defined landscape edge at Ithaca Street. This would be reinstated. ■ The westbound portal would be situated within the existing ICB corridor and would have little impact on existing landscape amenity. **Open Space** ■ The portal would have little impact on existing useable open space in the Ithaca Street location. **Accessibility, Permeability and Connectivity** ■ The relatively good pedestrian/cycle connectivity to the east and west of the ICB would be positively impacted but some re routing of existing paths would be needed. ■ Existing ICB barrier to Accessibility, Permeability and Connectivity in the north/south direction would remain for pedestrians/cycles. Distance to the land bridge is an obstacle, and Grammar School footbridge provides limited access on southern side. **Scale** ■ The eastbound portal would emerge adjacent to the bottom end of Victoria Park Road but the road surface at the portal would be considerably lower than the existing ICB road surface level. The portal would therefore be partially concealed from view and its scale would be consistent and compatible with the surrounding area and would have little impact. ■ The westbound portal would sit within the existing ICB corridor and would have a minor impact on the existing scale of the road. **Landmarks, Legibility and Destinations** ■ The portals would not interfere with any landmarks.
Ventilation Outlet (VO)	**Predominant Land Uses and Variety** ■ The VO would be located within Brisbane City Council owned Victoria Park Golf Course. (Refer **Figure 14-7** for location). The VO would have minimal impact on the existing use of the golf course, but does not change the variety of use or opportunities that already exist here. **Built Form, Typologies and Grain** ■ Not Applicable to this location **Landscape Amenity and Character** ■ The VO would have an impact on landscape amenity because it would be visible to motorists along the ICB especially those travelling west. The VO would be contrasted against the existing golf course environment and would therefore have a high visual impact. ■ The VO would have an impact on landscape amenity because it would be highly visible to users of the golf course who would have intermittent and unobstructed views to the VO depending user location, topography, open clearings and vegetation. ■ The VO is likely to impact on the existing landscape character of its immediate environment. The residents, students and workers located around the inner city ridges around Spring Hill, Kelvin Grove and the Royal Brisbane Hospital would have intermittent or unobstructed views to the VO depending obstructing topography, buildings and vegetation. ■ The type of aesthetic treatment of the VO would have an impact on the contribution

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
	to this immediate environment. ■ The VO would include a duct/pipeline from the tunnel to the VO; the pipeline would run parallel and offset from the existing Inner Northern Busway tunnel. There would be some impact on existing vegetation due to trenching for the pipeline from the Ventilation Station. **Open Space** ■ Because of the relatively small footprint of the VO the impact on open space would be negligible **Accessibility, Permeability and Connectivity** ■ The VO would have no impact on accessibility permeability or connectivity for golf course users. **Scale** ■ The VO would impact on the scale of the immediate surrounding land uses due to its size, material choice and elevation which would provide a contrast with the existing golf course surrounds. **Landmarks, Legibility and Destinations** ■ Depending on the design of the VO it has the potential to be either a non-descript piece of infrastructure, camouflaged to blend into its environment or to become an instantly recognised landmark which could be used to assist legibility (see Chapter 19).
Ventilation Stations (VS)	**Predominant Land Uses and Variety** ■ The VS would be located on the edge of the Victoria Park Golf Course between the ICB and the Inner Northern Busway tunnel (**Figure 14-7**), it would be partially buried into the existing landscaped bank. The VS would have a minor impact on the existing use of the golf course but would not change the variety of use or opportunities that already exist here. **Built Form, Typologies and Grain** ■ Not Applicable to this location. **Landscape Amenity & Character** ■ The VS would be partially buried into the existing bank between the ICB, the Golf Course and the Inner Northern Busway Tunnel, therefore it would have a medium to minor impact on the landscape character of this area. ■ Those land uses directly opposite the VS (Grammar Schools precinct) would notice a change in the landscape character of the existing vegetated bank. **Open Space** ■ The VS would be partially buried into the existing bank between the ICB, the Golf Course and the Inner Northern Busway Tunnel, and therefore would have a minor impact on the usable open space of this area. It would however encroach on existing open space. **Accessibility, Permeability and Connectivity** ■ The VS would not impact on the existing path and stairway between the ICB and the golf course. **Scale** ■ Because the VS would be partially buried into the existing bank between the ICB and the Golf Course the resulting scale of the building would have a negligible impact on the surrounding environment **Landmarks, Legibility and Destinations** ■ Not Applicable to this location **Visual Environment** ■ The ventilation station would be partially buried. The structure would have a minor visual impact for motorists travelling west along the ICB.
Surface Road Changes	**Predominant Land Uses and Variety** ■ There would be little impact on existing land uses and little change to the variety of activities and opportunities currently existing in this area. ■ The strip of land running along the north of ICB would be encroached upon due to the portal in the middle of the ICB but the function of this corridor would remain.

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
	Built Form, Typologies and Grain ▪ Not applicable to this area **Landscape Amenity and Character** ▪ The surface road changes would impact on the medium to high landscape amenity on the northern edge of the ICB due to necessary widening of the corridor to accommodate the westbound tunnel portal. **Open Space** ▪ The surface road changes would impact on the open space on the northern edge of the ICB from the embankment planting at Normanby Terrace to the land bridge **Accessibility, Permeability and Connectivity** ▪ Due to the widening of the ICB the existing pedestrian/cycle paths in the east/west direction would be moved slightly north. **Scale** ▪ Widening of the ICB would be necessary to accommodate the westbound tunnel portal, thereby increasing the scale of the roadway. **Landmarks, Legibility and Destinations** ▪ Not applicable
Engineering Infrastructure Below are the components of engineered infrastructure used to construct tunnels. The highlighted components below correspond to those used in this particular connection. ▪ **Transition Structures;** ▪ Elevated Structures; ▪ **Cut & Cover;** ▪ Reinforced Earth/Ramp Structures; ▪ **Noise walls.**	**Predominant Land Uses and Variety** ▪ The use of noise walls would have some minor impacts on the residents backing onto the ICB however this is the current situation. **Landscape Amenity and Character** ▪ The relatively short eastbound (portal) transition structure would not significantly alter the medium to high landscape amenity of this area. ▪ Noise walls along the edge of the ICB would impact on potential landscape amenity (see Chapter 9 for noise wall detail). **Open Space** ▪ The transition structures and cut and cover tunnel works would have little impact on existing useable open space at the Ithaca Street location. **Accessibility, Permeability and Connectivity** ▪ Existing ICB barrier to Accessibility, Permeability and Connectivity in the north/south direction would remain for pedestrians/cycles. Distance to the land bridge is an obstacle, and Grammar School footbridge provides limited access on southern side. **Scale** ▪ The length and depth of the (portal) transition structure in the centre of the ICB would change the horizontal scale in this location. ▪ The westbound transition structure in the centre of the ICB would require the widening of the ICB and would therefore increase its perceived width. **Landmarks, Legibility and Destinations** ▪ The transition structures would not interfere with any landmarks in the area.
Construction Related Works ▪ **Changed surface conditions** The impact from these components of tunnel construction would be temporary.	**Predominant Land Uses and Variety** ▪ Construction of the eastbound cut and cover portal and transition structure in existing open space west of Victoria Park Road would result in a temporary change of land use. **Built Form, Typologies and Grain** ▪ Not Applicable in this location **Landscape Amenity & Character** ▪ The medium to high landscape amenity along the northern edge of the ICB from Victoria Park Road to Kelvin Grove Road would be removed during construction to allow for construction of the eastbound cut and cover portal and transition structure.

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
	Open Space ■ The open space along the northern edge of the ICB from Victoria Park Road to Kelvin Grove Road would be impacted to allow for construction of the eastbound cut and cover portal and transition structure. **Accessibility, Permeability and Connectivity** ■ Accessibility, permeability and connectivity would be temporarily impacted by the phasing of construction works along the Northern edge of the ICB from Victoria Park Road to Kelvin Grove Road.

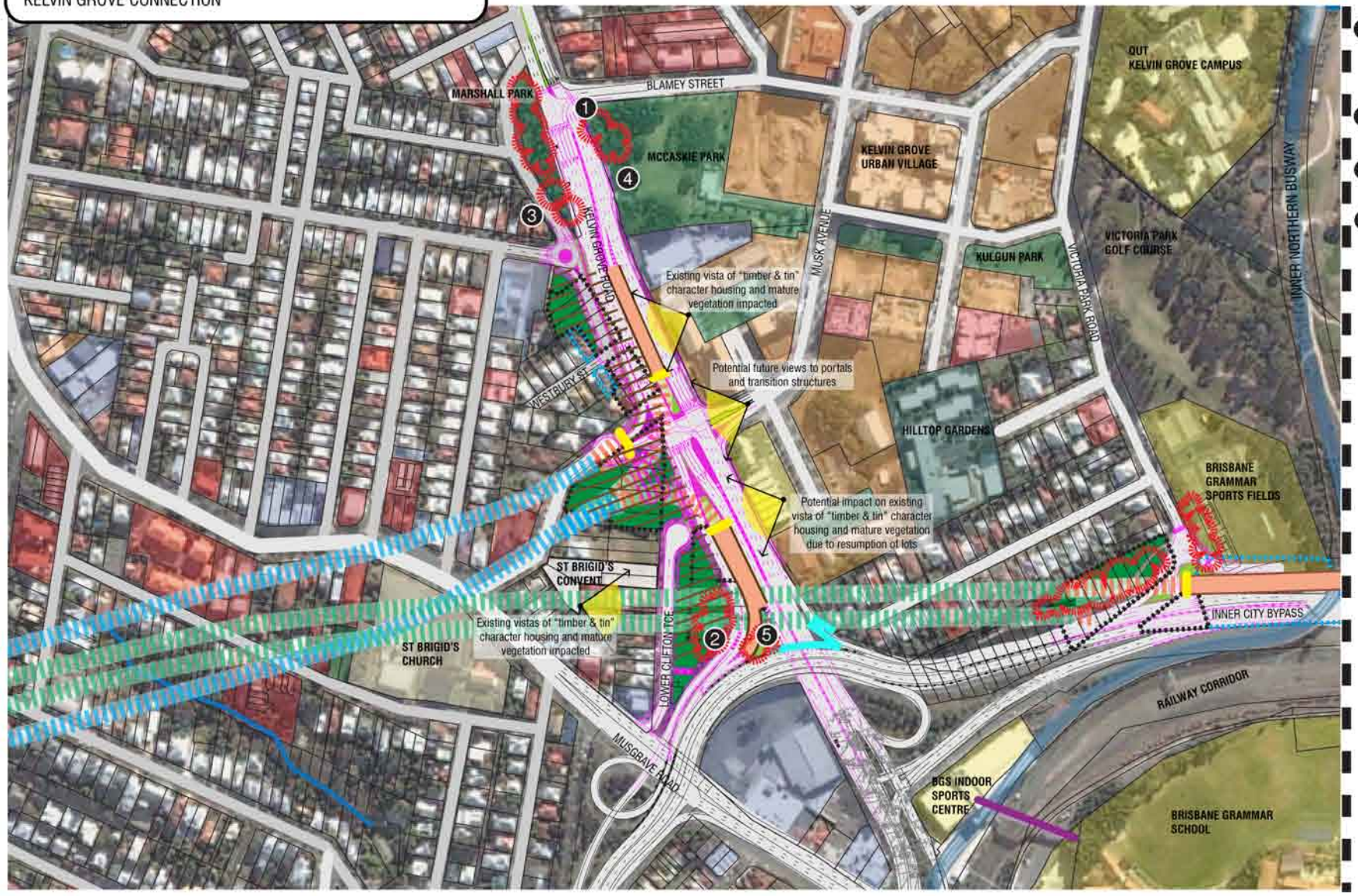
14.5.11 Kelvin Grove Connection – Summary

A detailed description of the potential impacts at the Kelvin Grove Connection during construction and operation is provided below in **Table 14-4**. The potential impacts are presented graphically in **Figure 14-8**.

The major impacts associated with the Kelvin Grove connection would be the widening of Kelvin Grove Road and the property resumptions on the western side of Kelvin Grove Road to accommodate the tunnel infrastructure. This would also impact on the ability to provide pedestrian and cycle connections safely along this edge. At the completion of the works, residual land from the construction worksites would be available for landscape or urban design treatments, presenting an opportunity to provide areas of high landscape amenity, for example by planting mature trees over the spaces created. The land below the wall at Lower Clifton Terrace would become a green edge to the busy Hale Street and Kelvin Grove Road. Further north along Kelvin Grove Road above and beside the proposed tunnel exit portal (opposite Musk Avenue), a new space would be created albeit with topographical challenges. This presents opportunities for local pedestrian/cycle connections, and also to create a dramatic and sculptural series of landscaped terraces on the western side of Kelvin Grove Road. The space above the portal exit would also provide a pedestrian link around the portal structure, along Kelvin Grove Road to Westbury Street, Victoria Street and Marshall Park.

Two tunnel portals (westbound entry from north and south) would be situated in Kelvin Grove Road, which would increase the scale of this road. Recommended mitigation measures would reduce the perceived width of the road infrastructure through appropriate landscaping and tree planting.

LANDSCAPE & VISUAL IMPACT ANALYSIS
KELVIN GROVE CONNECTION



1. Potential impacts on locally significant, mature roadside vegetation from construction works
2. Loss of mature vegetation that forms a significant green edge along the road with microclimate benefits for pedestrians & cyclists
3. Loss of 2 significant Heritage Listed Fig Trees in Marshall Park
4. Loss of 2 significant Fig Trees in McCaskie Park
5. Pedestrian Cycle connection from ICB to Lower Clifton Terrace re established

N.B. LOCATION OF EXISTING FEATURES & PROPOSED PROJECT INFRASTRUCTURE IS INDICATIVE ONLY. REFER TO ENGINEERS DRAWINGS FOR INFRASTRUCTURE DETAIL

LAND USE
- Multiple Unit Residential
- Residential
- Commercial/Retail
- Office
- Retirement village
- Other/special use
- Education
- Park

EXISTING FEATURES
- Drainage line
- Brisbane Grammar's private pedestrian bridge across ICB
- Existing Ped/cycle overpass at ICB over Kelvin Grove Road

PROJECT INFRASTRUCTURE
- Portals
- Tunnel Roadheader
- Tunnel (TBM)
- Cut & Cover
- Transition Structure
- Elevated Structure
- Reinforced Earth Structure
- Surface Works

POTENTIAL IMPACTS
- Remnant land
- Land remaining after construction
- Proposed Work Sites
- Impacts on existing vegetation
- Potential impacts on existing views
- Potential partial lot resumption
- Potential full lot resumption

Table 14-4 Potential Impacts: Kelvin Grove Connection

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
Portals There are three portals within this key location. 1. Northbound/city-bound portal opposite Musk Avenue; 2. Westbound portal from the city, within Kelvin Grove Road northbound carriageway adjacent Lower Clifton Terrace and: 3. Westbound portal within Kelvin Grove Road southbound carriageway adjacent to QUT, for traffic coming from the north.	**Predominant Land Uses and Variety** ■ The infrastructure would provide visual access to the 'Timber and Tin' hilly landscape character of the residential neighbourhood west of Kelvin Grove Road. The current residential land uses would be impacted by the portals opposite Musk Avenue, and as a result the residential nature of this edge would change. **Built Form, Typologies and Grain** ■ Due to the nature of the topography along the western edge of Kelvin Grove Road from the ICB overpass to Victoria Street, existing residential land uses would be impacted by the portals opposite Musk Avenue, and as a result the residential nature of this edge would change. **Landscape Amenity and Character** ■ In general the portals' physical locations would not interfere with the existing 'urban character' vegetation or the housing related 'transitional character' associated with housing on undulating terrain. **Open Space** ■ The portals themselves would not impact on existing open space. **Accessibility, Permeability and Connectivity** ■ The portals would result in the closure of existing vehicular connections to Kelvin Grove Road from Lower Clifton Terrace and Westbury Street. Lower Clifton Terrace would then be accessed from Musgrave Road only. Westbury Street would retain access to Kelvin Grove Road, but with an indirect local connection via Victoria Street. These changes would impact on accessibility, permeability and connectivity not only for these streets but in a north south direction along this portion of Kelvin Grove Road. ■ Accessibility in this area is already compromised by the topography, and the Project would not alter this characteristic of the locality. Access in and out of Westbury Street would be made safer by the proposed changes. **Scale** ■ The proposed portal locations currently lack human scale and the Kelvin Grove portals would do little to alleviate this condition. This is in part due to the topography of the location. ■ The eastbound portal opposite Musk Avenue would nestle into the hillside on the west side of Kelvin Grove Road and would change the character of this residential edge. **Landmarks, Legibility and Destinations** ■ The existing legibility of this area is heavily compromised by the complicated nature of the pedestrian network of bridges, ramps, underpasses and stairs. The portal structures would further compromise legibility at this location. ■ The QUT Creative Industries Precinct and the 'Artspace' billboard fronting the east side of Kelvin Grove Road would benefit from greater exposure, through their location directly facing the exit portal at Musk Avenue.
Surface Road Changes	**Predominant Land Uses and Variety** **Built Form, Typologies and Grain** ■ Due to the nature of the topography along the western edge of Kelvin Grove Road from the ICB overpass to Victoria Street, the current residential land uses would be impacted by the portals opposite Musk Avenue, and as a result the residential nature of this edge is likely to change. **Landscape Amenity** ■ The surface works would impact on the existing 'urban character' vegetation and the 'transitional character' associated with housing on undulating terrain, where Kelvin Grove Road is proposed to be widened to accommodate traffic changes. ■ The proposed widening of the Hale Street underpass (and establishment of a work site below Lower Clifton Terrace) would result in the loss of all existing trees within this triangular parcel of land. However, impacts would be temporary and new landscaping would be established on completion of construction.

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
	Open Space ▪ There would be minor encroachment on Marshall Park, on the western side of Kelvin Grove Road, due to the need for road widening between Blamey Street and Musk Avenue to accommodate proposed surface road changes. **Accessibility, Permeability and Connectivity** ▪ Proposed surface works required would add to existing accessibility difficulties associated with the hilly terrain in this location. In particular, connectivity along the western edge of Kelvin Grove Road would be impacted. **Scale** ▪ The widening of Kelvin Grove Road between the Normanby five ways and Blamey Street would increase the scale of the road infrastructure, further departing from the human scale in this area. **Landmarks, Legibility and Destinations** ▪ Surface road changes near Marshall / McCaskie Parks would necessitate the removal of two existing fig trees located at the southern end of Marshall Park.
Engineering Infrastructure Below are the components of engineered infrastructure used to construct tunnels. The highlighted components below correspond to those used in this particular connection. ▪ **Transition Structures;** ▪ Elevated Structures; ▪ **Cut & Cover;** ▪ Reinforced Earth/Ramp Structures; ▪ **Noise walls.**	**Predominant Land Uses and Variety** **Built Form, Typologies and Grain** ▪ Due to the nature of the topography along the western edge of Kelvin Grove Road from the ICB overpass to Victoria Street, existing residential land uses would be impacted by the portals opposite Musk Avenue, and as a result the residential nature of this edge is likely to change. ▪ The 5m noise walls on the western side of Kelvin Grove Road from Upper Clifton Terrace through to Victoria Street would impact through overshadowing for the residents along this western edge. There would be potential obstruction of views and natural light if the noise walls are not transparent. **Landscape Amenity** ▪ The transition structures and associated tunnel works would impact on the low landscape amenity along the western edge of Kelvin Grove Road, through property resumptions below Lower Clifton Terrace and the loss of vegetation associated with this. ▪ The 5m noise walls to the south of Lower Clifton Terrace would impact on the potential for landscape amenity in this area, unless they are transparent. (see Chapter 9 for noise wall details). ▪ The 2m noise walls to the eastern edge of Marshall Park would have a negative impact on the existing landscape amenity enjoyed by both motorists and park users (see Chapter 9 for noise wall details). **Open Space** ▪ The transition structures would result in the temporary loss (during construction) of the small triangular parcel of open space between Kelvin Grove Road, Lower Clifton Terrace and the Hale Street underpass. **Accessibility, Permeability and Connectivity** ▪ The transition structures along Kelvin Grove Road would create further barriers to connectivity between Kelvin Grove Urban Village and the residential areas on the west side of Kelvin Grove Road. ▪ The transition structures along Kelvin Grove Road near the Hale Street underpass and the ICB overpass would further alienate this area, in terms of accessibility, permeability and connectivity. ▪ In general the transition structures and associated tunnel works would impact on the north-south accessibility and connectivity along the western edge of Kelvin Grove Road. ▪ The 5m noise walls to the south of Lower Clifton Terrace would impact on the perceived safety of this area because of the lack of surveillance (see Chapter 9 for noise wall detail). **Scale** ▪ The transition structures would increase the scale of the road infrastructure, further departing from the human scale in this area. **Landmarks, Legibility and Destinations**

Tunnel Infrastructure	Impacts of EIS Reference Design on the visual and physical environment
	▪ The QUT Creative Industries Precinct and the 'Artspace' billboard fronting the east side of Kelvin Grove Road would benefit from greater exposure, through their location directly facing the exit portal at Musk Avenue.
Construction Related Works ▪ **Worksites** Refer to **Figure 14-8** for worksite locations. ▪ **Changed surface conditions** The impact from these components of tunnel construction would be temporary.	**Built Form, Typologies and Grain** ▪ The work sites would temporarily impact on the surrounding area by temporarily changing the built form through the provision of work sheds and offices. **Landscape Amenity** ▪ The worksites and changed road conditions would have a detrimental impact on the existing low landscape amenity environment along both sides of Kelvin Grove Road. **Open Space** ▪ Once construction is completed, residual land at the worksites may result in creation of new parcels of open space. **Accessibility, Permeability and Connectivity** ▪ Accessibility and Connectivity is likely to be highly constrained along the western side of Kelvin Grove Road during construction. **Landmarks, Legibility and Destinations** ▪ As referred to above, two fig trees at the southern end of Marshall Park would need to be removed to facilitate widening of Kelvin Grove Road.

14.6 Mitigation Measures – During Construction

Construction works would be temporary, but would impact on the existing environment in terms of clearing existing vegetation for worksites, some demolition of buildings and structures, and re-routing of some existing pedestrian/cycle connections. The following sections describe and illustrate the phasing of construction for each key location, and the measures proposed to ensure the management of urban landscape and visual issues during construction.

14.6.1 Western Connection

This connection would involve the establishment of a major worksite at the interface of Mt Coot-tha Botanic Gardens and the Western Freeway, immediately to the west of Mt Coot-tha Road (**Figure 14-5**). The worksite would require the removal of existing vegetation on this site, and long-term mitigation measures could only be implemented after completion of construction. Therefore, these measures are detailed below in **Section 14.7** (mitigation measures – operation).

This connection would also provide for a conveyor corridor for spoil removal, which would impact on existing vegetation within Brisbane Forest Park and the Botanic Gardens between the Western Freeway and Mt Coot-tha Quarry, where the tunnel spoil is proposed to be deposited (see Chapter 4). The conveyor structure would be incongruous with its Gardens setting, and therefore would have a significant temporary visual impact. A re-vegetation and rehabilitation plan would be put in place after the spoil conveyor is removed.

The other major impact on this area would be the temporary surface traffic diversions necessary to facilitate construction of the cut and cover tunnels and transition structures. The re-aligned surface works would also need to consider pedestrians and cyclists, at the roundabout to Mt Coot-tha Road, and the Western Freeway commuter/recreation route. (**Figure 14-5 (a)** and **Figure 14-5 (b)**). Mitigations would involve temporary reconfiguration or realignment of connections and pathways. Permanent (ie: operational) solutions are discussed in **Section 14.7** below.

The following are the minimum guidelines for mitigation of construction impacts at the Western Connection.

- A Visual Mitigation Plan during construction for the management of hoardings where appropriate.
- The spoil conveyor structure would be painted in dark or earth tones in order to reduce its visual prominence within its Botanic Gardens and parkland settings.
- A Vegetation Management Plan by a qualified arborist prior to construction, including bonding for significant tree protection during construction and for a period of two years after construction, including tree protection details.
- A Vegetation Management Plan by a qualified arborist for the conveyor route prior to final route selection.
- A Pedestrian and Cycle Plan designating how routes are to be managed where road realignment changes occur due to construction phasing.

The final mitigation measures for these sites would only be possible at the end of the construction, and this is discussed in **Section 14.7.1**.

14.6.2 Toowong Connection

The Toowong connection would require the establishment of a major worksite at the corner of Frederick Street, between Milton Road and Valentine Street. The worksite would require the removal of existing buildings and a re-grading of Valentine Street. Because this site is contained it would not directly interfere with existing pedestrian/cycle routes. However, where temporary road realignments or lane reconfigurations are required at different phases of construction, temporary re-routing of pedestrian/cycle movements would need to be managed.

The residents of Valentine Street would experience significant visual change to their surrounds during construction. The Toowong construction site would be enclosed by hoardings along all of its street frontages, and all existing trees and structures would be removed, creating a 'hard' edge to one side of this residential street. The construction site would be highly prominent visually for Valentine Street residents, for the duration of construction works at this location.

The construction site hoardings would provide mitigation of visual impacts in Valentine Street. See Chapters 8 and 9 for more information on the air quality and noise/vibration mitigations (respectively) in this area.

The following are the minimum guidelines for mitigation of construction impacts at the Toowong Connection:

- a Visual Mitigation Plan during construction for the management of hoardings where appropriate.
- a Vegetation Management Plan by a qualified arborist prior to construction, including bonding for significant tree protection during construction and for a period of two years after construction, including tree protection details.
- revegetation Plan for the lower half of Valentine Street, to provide a visual buffer for the residents of Valentine Street from the construction site to the south.
- a Pedestrian and Cycle Plan designating how routes are to be managed where road realignment changes occur due to construction phasing.

The final mitigation measures for these sites will only be possible at the end of the construction and this is dealt with in **Section 14.7.2**.

14.6.3 Northern Connection (ICB)

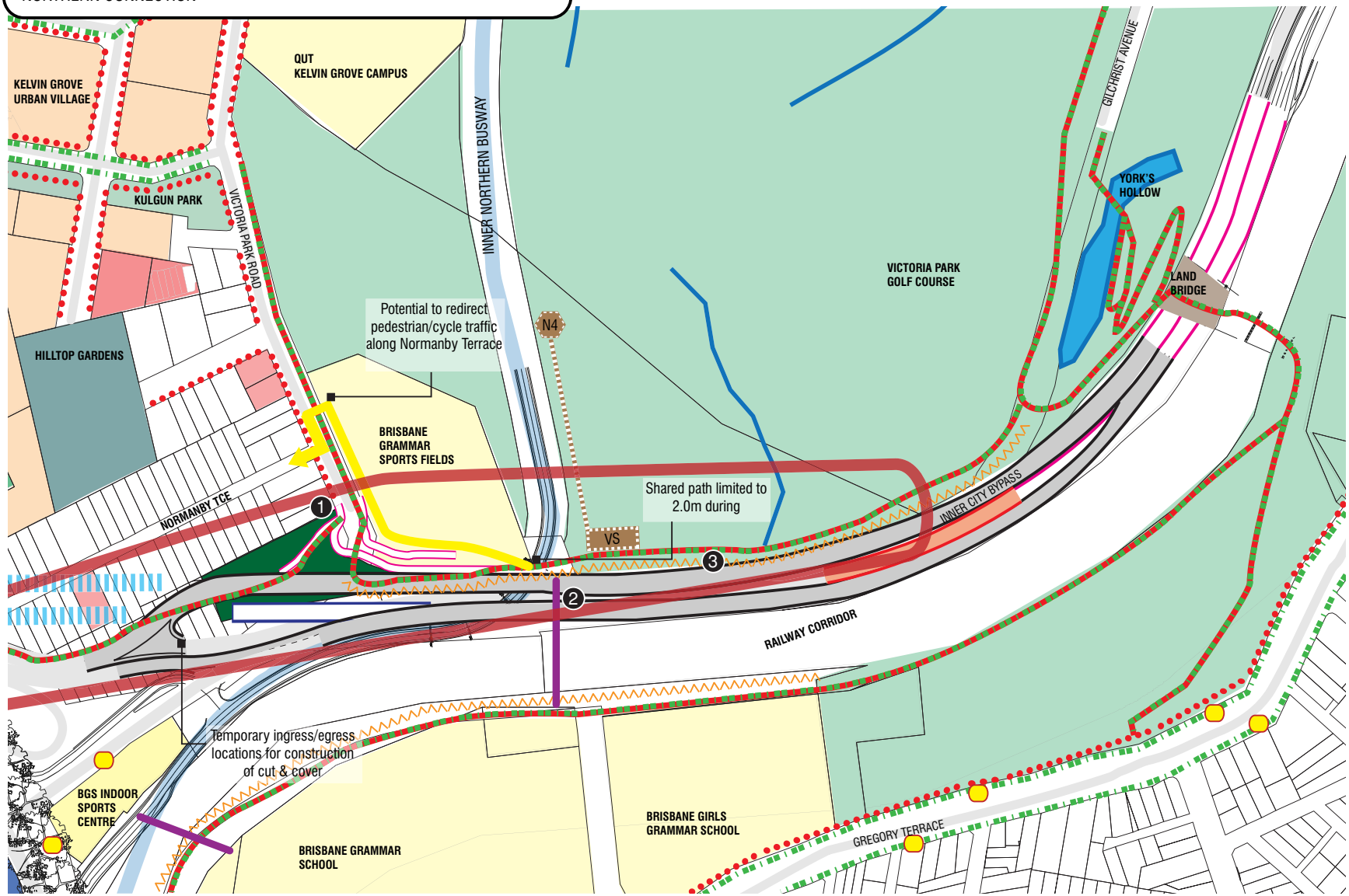
There would be no nominated work site at this connection. However, some temporary lane reconfigurations would be required on the ICB during construction phasing, leading to some re-routing of pedestrian and cycle movements, which would need to be managed (**Figure 14-9**). The residents of Normanby Terrace adjacent to the ICB would be impacted visually during construction and a combined hoarding / noise wall would provide some visual and acoustic mitigation. See Chapters 8 and 9 for more information on the air quality and noise/vibration mitigations (respectively) in this area.

The following are the minimum guidelines for mitigation of construction impacts at the Northern Connection.

- A Visual Mitigation Plan during construction for the management of hoardings where appropriate.
- A Vegetation Management Plan by a qualified arborist prior to construction, including bonding for significant tree protection during construction and for a period of two years after construction, including tree protection details.
- A Pedestrian and Cycle Plan to deal with the highly constrained existing pedestrian/cycle routes to be managed where road realignment changes occur due to construction phasing.

The final mitigation measures for these sites would only be possible at the end of the construction and this is dealt with in **Section 14.7.3**.

CONSTRUCTION STAGING IMPACTS
NORTHERN CONNECTION



1. Impacts on pedestrian/cyclist acces to and from Victoria Park Road to Kelvin Grove Road due to construction. Re-route through Normanby Terrace
2. Pedestrian/cyclist access to Grammar School's private bridge across the ICB potentially impacted during construction
3. Widening of ICB may potentially impact on existing low visual & physical amneity of pedestrian/cycle path

N.B. LOCATION OF EXISTING FEATURES & PROPOSED PROJECT INFRASTRUCTURE IS INDICATIVE ONLY REFER TO ENGINEERS DRAWINGS FOR INFRASTRUCTURE DETAIL

SCALE 0 50m 100m

LAND USE
- Multiple Unit Residential
- Commercial/Retail
- Office
- Retirement village
- Other/special use
- Education
- Park
- Residential

EXISTING FEATURES
- Drainage line
- Waterbody
- Bus stop
- Shared pedestrian/cycle path
- Pedestrian path
- Pedestrian/shared path with low visual & physical amenity
- On-road cycle lane
- Brisbane Grammar's private pedestrian bridge across ICB

PROJECT INFRASTRUCTURE
- Tunnel Roadheader
- Tunnel (TBM)
- Cut & Cover
- Transition Structure Preparation
- Concrete barrier/ structural walls
- Reinforced Earth Structure
- Surface Works
- Temporary Surface Works
- N4 Proposed Ventilation Outlet
- Proposed Ventilation Pipeline
- VS Proposed Ventilation Station

POTENTIAL IMPACTS
- Land remaining after construction
- Potential impacts on accessibility & connectivity of existing pedestrian/cycle paths during construction
- Potential alternative pedestrian/cycle route under investigation

14.6.4 Kelvin Grove Connection

A series of linear worksites would be established along the western side of Kelvin Grove Road, requiring some property resumptions and loss of associated vegetation. Urban design and landscape mitigations for these sites would only be possible on completion of construction, and this is discussed in Section 14.7. During construction, visual impacts would be addressed through the use of constructing hoardings and security fencing where appropriate.

The highly constrained existing pedestrian/cycle routes in this location would need to be managed during construction, to accommodate temporary road realignment changes resulting from construction phasing.

The following are the minimum guidelines for mitigation of construction impacts at the Kelvin Grove Connection:

- A Visual Mitigation Plan during construction for the management of hoardings where appropriate.
- A Vegetation Management Plan by a qualified arborist prior to construction, including a bond (calculated by BCC using a current and accepted tree valuation method) for significant tree protection (in particular the figs in Marshall and McCaskie Parks) during construction and for a period of two years after construction, include tree protection details. Removal of significant vegetation commits the contractor to mitigate against losses as determined by the client to the value of the bond.
- A Pedestrian and Cycle Plan to deal with the highly constrained existing pedestrian/cycle routes, to be managed where road realignment changes occur due to construction phasing.

The final mitigation measures for these sites would only be possible at the end of the construction and this is dealt with in **Section 14.7.4**.

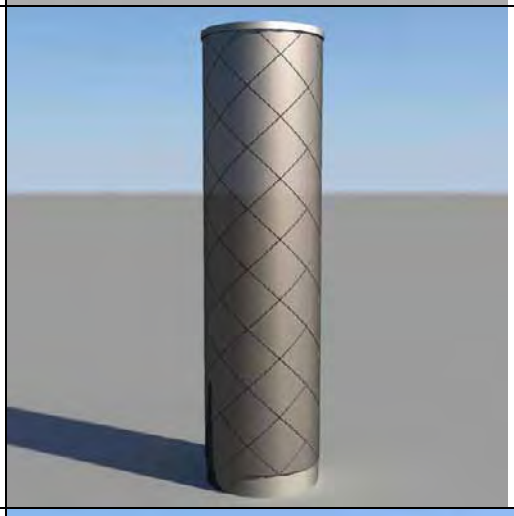
14.7 Mitigation Measures – Operation

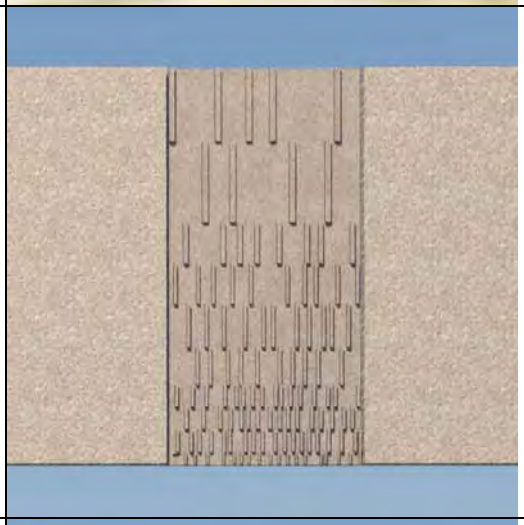
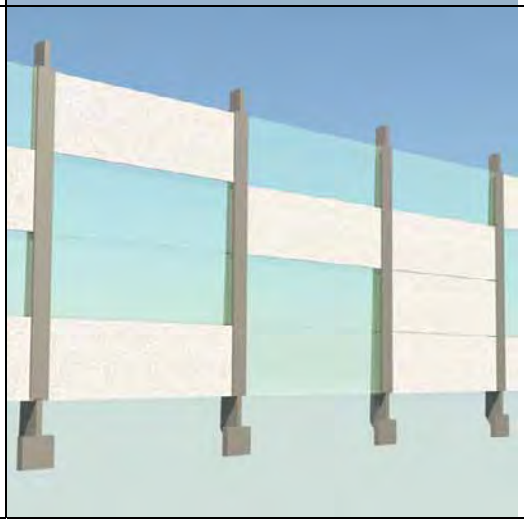
The proposed mitigation measures for Northern Link provide the means through which the existing environment could be enhanced by the integration of urban landscape design initiatives into the project's engineering works. This would ensure that urban and landscape design is incorporated into master planning designs, as well as the detailed technical design of the built elements of tunnel infrastructure.

This section provides discussion and examples of the types of built elements used for tunnel infrastructure, and the ways they could be integrated with urban and landscape design. It concludes with illustrated urban and landscape master plans designed to compliment the EIS Reference Design at the four key locations, and provides location specific guidelines for their successful integration.

Table 14-5 provides examples some of the ways the built elements of tunnel infrastructure could be designed without becoming mere embellishments. The inspiration for all of these examples has been drawn from the existing environment and abstracted into sculptural forms.

- **Table 14-5 Examples of urban design – infrastructure integration**

Tunnel Infrastructure	Urban Design integrated with Engineering Infrastructure
Portals	
Ventilation Station Outlets	
Transition Structures	

Tunnel Infrastructure	Urban Design integrated with Engineering Infrastructure
Elevated Structures	
Reinforced Earth Ramp Structures	
Noise Walls	

14.7.1 Mitigation Measures – Western Connection

The main impacts of the proposed Western Connection would be the transition structures extending from the cut-and-cover tunnel portals approximately 800 m along either side of the Western Freeway. The transition structures would require embankment cuttings into the existing vegetated hills of Brisbane Forest Park, and re-alignment of the pedestrian/cycle route along the southern edge of the Western Freeway. The other key impact would be the location of the worksite in between the Botanic Gardens and the Western Freeway, and the spoil conveyor corridor through the Botanic Gardens to the Mt Coot-tha Quarry. The Western Connection masterplan illustrates the mitigation measures to reduce these impacts and provides opportunities to enhance the surrounding environment as a result of the project works (**Figure 14-10**).

The following are the minimum guidelines tailored to the Western Connection to ensure urban and landscape designs of the highest quality, longevity, sustainability and innovation in the provision of:

1) **Environmental Revegetation/Waterway rehabilitation** (in addition to the objectives in **Section 14.4**)
   - Protect existing significant vegetation.
   - Revegetate, rehabilitate and enhance areas disturbed/damage during construction including:
     - Spoil conveyor corridor through Brisbane Forest Park and the Botanic Gardens,
     - Cuttings along either side of the Western Freeway,
     - Existing gateway to the Botanic Gardens and Mt Coot-tha Lookout,
     - New planting in the Botanic Gardens for worksite rehabilitation,
     - The waterway running through the Botanic Gardens and Anzac Park.

2) **Landscape Open Space Enhancement** (in addition to the overarching guidelines in Section 14.4)
   - Urban Forest Treatment – Create well connected, sustainable and safe landscapes using remnant space, incorporating existing parks and open space, where possible.
   - Provide opportunities to enhance the critical views and vistas.
   - Create sustainable subtropical landscapes which provide shade and micro-climate benefits, where appropriate.
   - Provide earth mounding, regrading and turfing of the worksite in accordance with proposed Botanic Gardens expansion plans.
   - Size of procured plant stock should suit intended purpose, i.e. revegetation of bushland or waterways – tube stock, for Street Trees – 100L stock or greater, for areas requiring impact of significant trees – Ex ground stock 4m high or greater;
   - Provide innovation in rainwater harvesting for re-use;
   - Provide innovation in the use of permeable surfaces.

3) **Recreational Opportunities** (in addition to the overarching guidelines in Section 14.4)
   - Create well connected and safe community areas for active or passive recreation within discrete areas of open space at Anzac Park.
   - In consultation with the Botanic Gardens develop a preferred option for the design and rehabilitation of the worksite, for its re-integration into the Botanic Gardens.

4) **Connectivity** (in addition to the overarching guidelines in Section 14.4)

- Provide safe, legible and comfortable connections within and between points around the western connection for pedestrians, cyclists and public transport users (eg: shade and CPTED principles).
- Enhance and make good all existing connections for pedestrian and cyclists, in particular the new pedestrian/cycle overpass over the western freeway.
- Provide and/or upgrade lighting along new or existing connections and at decision points in accordance with CPTED principles.
- Ensure new and/or reinstated pathway widths suit the degree and frequency of use, and are in accordance with the *Austroads Guide to Engineering Practice* (Part 14, Bicycles);
- Provide surface treatments that enhance other connecting paths within the vicinity and street furniture that reinforces the local character of the area.

5) **Boulevard Treatments** (in addition to the overarching guidelines in Section 14.4)

- Provide enhanced streetscape amenity through the provision of street tree planting with under planting and accessible footpaths to the following streets and roads affected by the project:
  - Mt Coot-tha Road from the Mt Coot-tha Road roundabout to the Quarry turn off,
  - Mt Coot-tha Road between Frederick St and the Mt Coot-tha roundabout.

6) Design Intervention and Integration with Engineering Proposals – (in addition to the overarching guidelines in Section 14.4)

- Create high quality urban design and landscape treatments for the following built elements of the tunnel infrastructure, integrated with the existing environment of the Western Connection:
  - Retaining and transition structures;
  - Portals;
  - Ventilation station and ventilation outlet (Section 14.5.8); and
  - Noise Walls.

7) **Public Art** (in addition to the overarching guidelines in Section 14.4)

- Provide a Public Art Strategy with curatorial input and respond to all design elements within the project.
- Provide opportunities for public art or character elements at key points within the transport network, at locations such as:
  - the Mt Coot-tha Road roundabout;
  - the Toowong Park and Ride;
  - Anzac Park; and
  - The Botanic Gardens interface with the Western Freeway.

8) **Lighting** (in addition to the overarching guidelines in Section 14.4)

It is not the purpose of this EIS to provide technical standards or requirements in regard to lighting. However, the following guidelines highlight issues that a qualified lighting designer would need to consider:

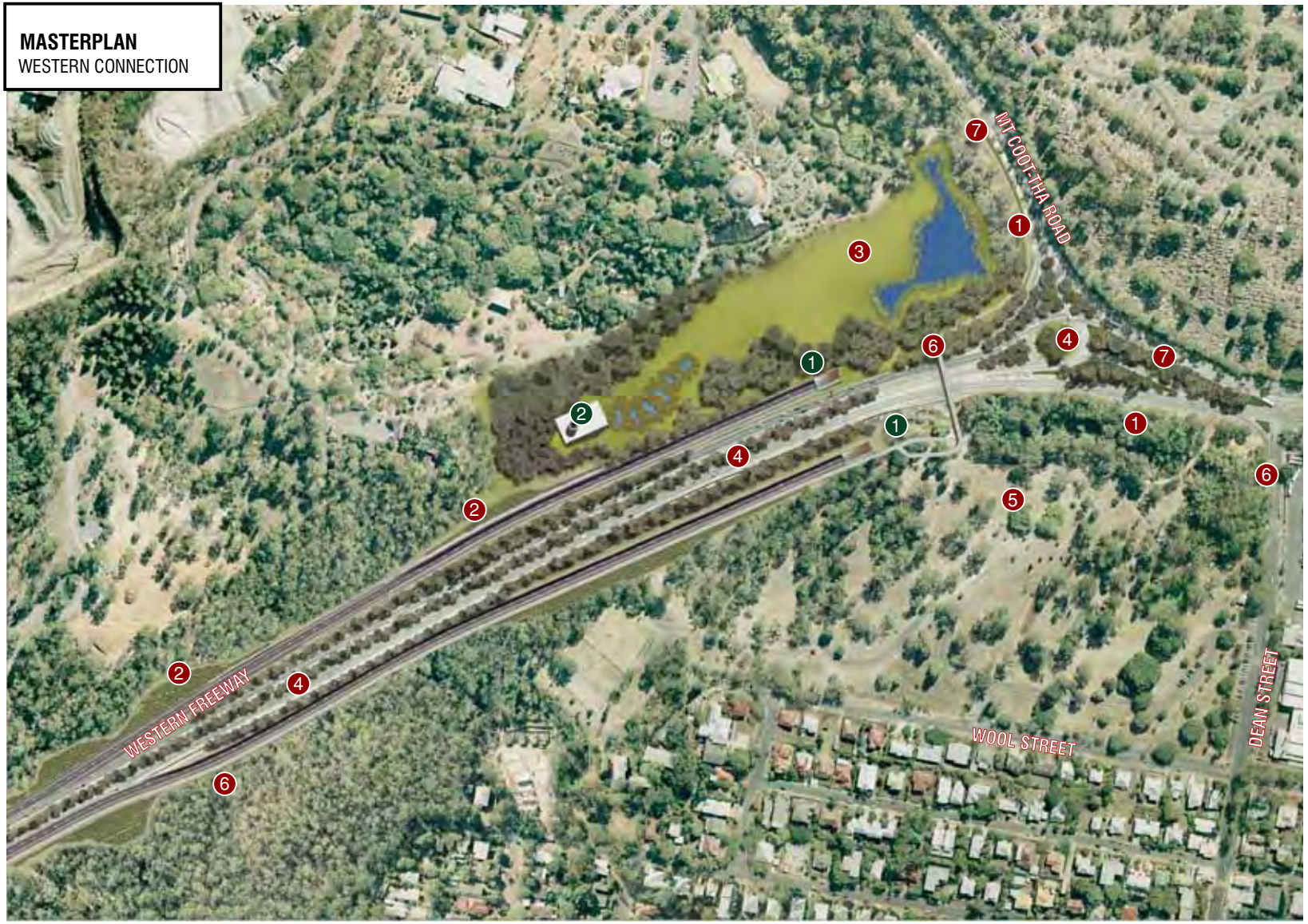
- Design to avoid solar reflection and glare, where possible.

- Use lighting to assist legibility and choices about safe areas and routes.
- Integrate sustainable lighting with engineering solutions.
- Ensure lighting during construction does not cause a danger to drivers or cyclists, or nuisance to local residents.
- Avoid inappropriate light spill, shadowing or glare during construction and at operational stage.

9) **Codes and Practices** (in addition to the overarching guidelines in Section 14.4)

- Include CPTED principles in all of the above mitigation measures, through reference to *Crime Prevention through Environmental Design Guidelines for Queensland Part A*: Essential features for safer places (2007).
- Provide and exceed Australian best practice urban design and landscape standards, safety and engineering standards, access and mobility standards and all relevant Australian Standards, codes and practices to urban and landscape designs.
- On and off road Cycleways and pathways in accordance with *Austroads Guide to Engineering Practice* (Part 14, Bicycles).

MASTERPLAN
WESTERN CONNECTION



MITIGATION MEASURES

Revegetation

1. Protect exisiting significant vegetation, in particular along Mt Coot-tha Road.
2. Revegetate, rehabilitate and enhance areas damaged during construction, in particular areas disturbed due to the spoil conveyor.
3. Provide the planting component in consultation with the Botanic Gardens to rehabilitate the worksite.

Landscape Open Space

4. Urban Forest Treatment - Provide significant tree plantings to medians with sight line considerations.

Recreational Opportunities

5. Provide opportunities for active and passive recreation within discrete areas of open space at Anzac Park.

   Develop a preferred expansion option in consultation with the Botanic Gardens.

Connectivity

6. Provide improved pedestrian/cycle connections to and from the western suburbs, the CBD, Mt Coot-tha, the Botanic Gardens, Toowong Park & Ride, Anzac Park, Toowong Cemetery & surrounding suburbs.

Boulevard Treatments

7. Provide enhanced streetscape amenity with under planting & accessible footpaths to Mt Coot-tha Road to the Quarry turn off, and between Frederick Street and the Mt Coot-tha turn off.

Public Art

Provide opportunities for public art and character elements within the transport network at locations such as the Toowong-Mt Coot-tha roundabout, the Toowong Park & Ride, Anzac Park and the Botanic Gardens interface with the Western Freeway.

1. Landscape treatments to assist in visual mitigation and integration of proposed infrastructure into surroundings.
2. Ventilation Outlet & Ventilation Outlet Station with a screening buffer of Indigenous plantings

   Note: Refer Engineers drawings for infrastructure detail.

Refer to Section 14.4 for comprehensive urban and landscape guidelines for the Western Connection

14.7.2 Mitigation Measures – Toowong Connection

The major impacts at the Toowong Connection would be associated with the portals adjacent to Frederick Street, the two elevated sections of road viaduct, and the reinforced earth structures over Milton Road approaching the Frederick Street roundabout. Construction of the Toowong connection would require the resumption of properties in Frederick, Morley and Valentine Streets, and on both sides of Milton Road. **Figure 14-11** illustrates the proposed landscape masterplan to reduce the impacts and enhance the surrounding environment after completion of the project works.

The following are the minimum guidelines to ensure urban and landscape designs of the highest quality, longevity, sustainability and innovation in the provision of:

1) **Environmental Revegetation/Waterway rehabilitation** (in addition to the overarching guidelines in Section 14.4)
   - Revegetate disturbed areas after construction, in particular Valentine Street, Morley Street, Quinn Street/Quinn Park, Croydon Street and Milton Road.
   - Provide significant tree plantings, where appropriate, to open space areas and medians created by the project. Avoid further overshadowing of Quinn Park and other spaces adjacent to ramp structures.
   - Size of procured plant stock should suit intended purpose (ie: for revegetation of bushland or waterways – tube stock to be used, for street trees – 100L stock to be used, for areas requiring impact of mature trees – Ex ground stock to be used).

2) **Landscape Open Space Enhancement** (in addition to the overarching guidelines in Section 14.4)
   - Urban parks – create well connected, sustainable and safe landscapes of high quality in remnant open space such as:
     - Between Valentine Street and Milton Road;
     - South of Morley Street; and
     - Quinn Park.
   - Create opportunities to enhance critical views and vistas including views to the CBD, Mt Coot-tha and Toowong Cemetery, and in particular soften the impact of the elevated structures over Milton Road and the Frederick Street flyover.
   - Provide opportunities for the appropriate setting and (re)location of park memorials and commemorative items impacted by the project, at Quinn Park and/or Anzac Park (including the plaque from the *flindersia Australis* memorial tree planting at the corner of Sylvan Road and Milton Road; see chapter 12).
   - Create water wise subtropical landscapes which are sustainable and provide shade and micro-climate benefits, where appropriate, in particular in the medians in Croydon Street and Milton Road to reduce the scale of these roads.
   - Size of procured plant stock should suit intended purpose (ie: for street trees – 100L stock or greater, for areas requiring mature trees – Ex ground stock 4m high or greater). New plantings adjacent to the elevated ramp structures, in Quinn Park and other locations along the southern side of Milton Road, would utilise shade-tolerant species. A key objective for landscape design in these locations would be to avoid the creation of further overshadowing, particularly in Quinn Park.

3) **Recreational Opportunities** (in addition to the overarching guidelines in Section 14.4)

- Provide a masterplan for the redevelopment of Quinn Park in consultation with stakeholders.
- Create well connected and safe community areas for active or passive recreation within Quinn Park.
- Enhance existing community facilities, park furniture, lighting and play ground equipment.

4) **Connectivity** (in addition to the overarching guidelines in Section 14.4)

- Provide safe, legible and comfortable connections to and from all areas affected by the project for pedestrians, cyclists and public transport users (eg: shade and CPTED principles) to and from:
  - the community north of Milton Road to the principle cycle route on Sylvan Road through to the Brisbane River and the CBD;
  - the southern side of Milton Road between Croydon Street and Frederick Street.
- Identify, make good and enhance all existing connections for pedestrian and cyclists, in particular the pedestrian/cycle path along Milton Road from Croydon Street to Miskin Street and the Toowong Park and Ride.
- Investigate other opportunities for improving alternative transport networks and user choice by providing safe pedestrian and cycle connections to and from:
  - Frederick Street and Sylvan Road;
  - Milton Road between Croydon Street, Miskin Street and the Toowong Park and Ride; and,
  - Milton Road as a possible future principle cycle route.
- Reduce the 'barrier' effect created for pedestrians/cyclists, in particular across Frederick Street into Toowong Cemetery, and across Milton Road between Frederick Street and Croydon Street.
- Provide new bus stops/bus shelters on Milton Road between Frederick Street and Croydon Street.
- Making transport networks more user-friendly by improving their legibility and ease of use by people of all ages and levels of fitness.

5) **Neighbourhoods** (in addition to the overarching guidelines in Section 14.4)

- Retain and enhance characteristics of local neighbourhoods in close proximity to project works in particular Valentine Street, Morley Street, Quinn Street, Croydon Street and Milton Road.
- Provide vegetative screening to sound barriers and/or provide access to views and vistas of the surrounding area using transparent materials;

6) **Boulevard Treatments** (in addition to the overarching guidelines in Section 14.4)

- Provide tree planting in the medians of Croydon Street and Milton Road to reduce the scale of these roads;
- Provide enhanced streetscape amenity through the provision of street tree planting and accessible footpaths in Sylvan Road, Valentine Street, Morley Street, Frederick Street and Quinn Street.

7) **Suburban Centre Improvement Schemes**

- Urban Villages - Strengthen the viability of the existing convenience precinct at the corner of Milton Road/Morley Street/Croydon Street, through urban design and landscape treatments.

8) **Design Intervention and Integration with Engineering Proposals** – Create high quality urban design and landscape treatments for the following infrastructure elements:

- Retaining and transition structures;
- Portals;
- Elevated structures (structures should be developed to integrate urban design with structural objectives, as opposed to add on embellishments);
- Noise walls; and
- Integrate the above with the existing environment of the Toowong Connection in a sustainable manner.

9) **Public Art**

- Provide opportunities for public art or character elements at key points around the Toowong Connection, such as:
  - Quinn Park; and
  - Remnant open space created by construction adjoining Croydon, Valentine, Frederick and Morley Streets.

10) **Lighting** (in addition to the overarching guidelines in Section 14.4)

It is not the purpose of this EIS to provide technical standards or requirements in regard to lighting. However, the following guidelines highlight issues that a qualified lighting designer would need to consider:

- Design to avoid solar reflection and glare, where possible.
- Use lighting to assist legibility and choices about safe areas and routes.
- Integrate sustainable lighting with engineering solutions.
- Ensure lighting during construction does not cause a danger to drivers or cyclists, or nuisance to local residents.
- Avoid inappropriate light spill, shadowing or glare during construction and at operational stage.

11) **Codes and Practices**

- Include CPTED principles in all of the above mitigation measures.
- Apply Australian best practice urban design and landscape standards, codes and practices to all urban and landscape designs.
- On and off road Cycleways and pathways in accordance with *Austroads Guide to Engineering Practice* – Part 14, Bicycles.

MITIGATION MEASURES

Revegetation
Replacement planting for the vegetation removed in Valentine Street, Morely Street, Quinn Street, Croydon Street and Milton Road.

Landscape Open Space

1. Urban Forest Treatment - Provide significant tree plantings to open space and medians.

Recreational Opportunities

2. Quinn Park - Provide opportunities for active and passive recreation. Enhance existing community park facilities and provide new facilities in consultation with stakeholders.

Relocate commemorative items to an appropriate setting within Quinn Park.

Relocate John Oxley memorial and Flindersia to appropriate setting eg Anzac Park.

Connectivity

3. Provide improved ped/cycle connections for recreational users along Milton Road to Toowong Park and Ride running through Quinn Park.

4. Link the community north of Milton Road to the principal cycle route at Sylvan Road.

5. Investigate new ped/cycle opportunities.

6. Relocate bus stops & provide new shelters

Boulevard Treatments

7. Provide significant tree planting, public art, street furniture and accessible pathways to Milton Road and Croydon Street.

8. Provide enhanced streetscape amenity to these Streets. Retain trees in centre of Valentine Street.

Suburban Centre Improvement Schemes

9. Strengthen the viability of the convenience precinct at the Milton Road intersection.

Integration with Engineering
Refer Appendix 8.1 for urban design treatment of built elements.

Public Art

1. Provide opportunities for public art and character elements.

2. Landscape treatments to assist in scale reduction and visual mitigation of impacts of infrastructure

Landscape treatments to assist in visual mitigation and integration of proposed infrastructure into surroundings.

Note: Refer Engineers drawings for Infrasturcture detail.

Refer to Section 4.2.2 for comprehensive urban and landscape guidelines for the Toowong Connection

14.7.3 Mitigation Measures – Northern Connection

The Northern Connection would have a relatively small footprint, and would be set in the context of the existing ICB road infrastructure. Therefore, the long term impacts would be confined largely to the existing ICB corridor, at the proposed tunnel portal locations. The major impacts would be associated with the widening of the ICB to accommodate the proposed westbound portal entrance to the tunnel, and the works adjacent to Normanby Terrace for construction of the eastbound exit portal.

Figure 14-12 illustrates the proposed landscape masterplan for the Northern Connection, to reduce the impacts and enhance the surrounding environment after completion of the project works.

The following are the minimum guidelines to ensure urban and landscape designs of the highest quality, longevity, sustainability and innovation in the provision of:

1) **Environmental Revegetation/Waterway rehabilitation** (in addition to the overarching guidelines in Section 14.4)
   - Rehabilitate waterways where appropriate, in particular the drainage channel flowing to Yorks Hollow beside the ICB.
   - Improve the quality of run-off from roads and other hard surfaces before it reaches waterways or aquifers, in particular the wetland at Yorks Hollow.

2) **Landscape Open Space Enhancement** (in addition to the overarching guidelines in Section 14.4)
   - Urban Forest Treatment – in particular at:
     - The open space created by the portals and cut and cover tunnels adjacent to the ICB;
     - The open space next to the Brisbane Grammar School playing fields, and between the ICB and Victoria Park Golf Course.

3) **Connectivity** (in addition to the overarching guidelines in Section 14.4)
   - Provide safe, legible and comfortable connections to and from all areas affected by the project for pedestrians, cyclists and public transport users (eg: shade and CPTED principles), in particular to and from:
     - Kelvin Grove Urban Village to the CBD;
     - The local connection from Victoria Park Road to the ICB pedestrian/cycle overpass (at Brisbane Grammar School);
     - The pathway along the ICB to Yorks Hollow and the land bridge.
   - Investigate other opportunities for providing safe pedestrian and cycle connections, in particular a green link between Kelvin Grove Urban Village over the ICB and Railway to Spring Hill and the CBD.
   - Improve permeability and visibility for pedestrians and cyclists by establishing new connections that are able to safely penetrate 'barriers' in the built environment.

4) **Neighbourhoods** (in addition to the overarching guidelines in Section 14.4)
   - Retain and enhance characteristics of local neighbourhoods in close proximity to project works, in particular Normanby Terrace and Victoria Park Road.

5) **Boulevard Treatments** (in addition to the overarching guidelines in Section 14.4)

- Provide enhanced amenity through street tree planting to the following streets:
  - Normanby Terrace;
  - The southern end of Victoria Park Road.

6) **Design Intervention and Integration with Engineering Proposals** (in addition to the overarching guidelines in Section 14.4)

- Create high quality urban design and landscape treatments for the following infrastructure elements:
  - Retaining and transition structures;
  - Ventilation outlets and fan stations
  - Sound barriers, and;
  - Integrate the above with the existing environment around the Northern Connection.

7) **Public Art** (in addition to the overarching guidelines in Section 14.4)

- Provide opportunities for public art or character elements at key points around the Northern Connection, such as within the open space corridor adjacent to the ICB.

8) **Lighting** (in addition to the overarching guidelines in Section 14.4)

It is not the purpose of this EIS to provide technical standards or requirements in regard to lighting. However, the following guidelines highlight issues that a qualified lighting designer would need to consider:

- Design to avoid solar reflection and glare, where possible.
- Use lighting to assist legibility and choices about safe areas and routes.
- Integrate sustainable lighting with engineering solutions.
- Ensure lighting during construction does not cause a danger to drivers or cyclists, or nuisance to local residents.
- Avoid inappropriate light spill, shadowing or glare during construction and at operational stage.

9) **Codes and Practices**

- Include CPTED principles in all of the above mitigation measures.
- Apply Australian best practice urban design and landscape standards, codes and practices to all urban and landscape designs.
- On and off road Cycleways and pathways in accordance with *Austroads Guide to Engineering Practice* – Part 14, Bicycles.

MITIGATION MEASURES

Revegetation
Protect exisiting significant vegetation.

1 Revegetate and enhance areas damaged during construction.

Landscape Open Space

2 Urban Forest Treatment - Provide significant tree plantings to open space and medians.

Connectivity

3 Provide safe, legible & comfortable ped/cycle connections, in particular to and from Kelvin Grove Urban Village to the CBD, between Victoria Park Road and the ICB ped/cycle overpass, and to and from York's Hollow and the Land Bridge.

Neighbourhoods

4 Retain and enhance characteristics of local neighbourhoods, in particular Normanby Terrace and Victoria Park Road.

Provide vegetative screening to sound barriers &/or provide access to views & vistas of the surrounding areas using transparent materials.

Boulevard Treatments

5 Provide significant tree planting to the rear of the portal of the west bound tunnel & ICB edge.

6 Provide enhanced streetscape amenity to Normanby Terrace and the southern part of Victoria Park Road.

Public Art
Provide opportunities for public art and character elements within the transport network at locations such as the new open space adjacent to the ICB.

1 Landscape treatments to assist in visual mitigation and integration of proposed infrastructure into surroundings.

2 Ventilation Outlet and Ventiation Outlet Station, provide indigenous plantings to base

Note: Refer to Egineers drawings for Infrasturcure detail.

Refer to Section 14.4 for comprehensive urban and landscape guidelines for the Northern Connection

14.7.4 Mitigation Measures – Kelvin Grove Connection

The major impacts at the Kelvin Grove connection would be associated with the proposed widening of Kelvin Grove Road, and property resumptions necessary on the western side of Kelvin Grove Road to accommodate the tunnel infrastructure. The two tunnel entry portals would be situated in Kelvin Grove Road, while the single exit portal would be located on the west side of Kelvin Grove Road opposite Musk Avenue. The key urban design challenges at this location are the pedestrian and cycle connections along the western side of Kelvin Grove Road.

Figure 14-3 illustrates the proposed landscape masterplan for the Kelvin Grove Connection, to reduce the impacts and enhance the surrounding environment after completion of the project works.

The following are the minimum guidelines to ensure urban and landscape designs of the highest quality, longevity, sustainability and innovation in the provision of:

1) **Environmental Revegetation / Waterway rehabilitation** (in addition to the overarching guidelines in Section 14.4)
   - Rehabilitate waterways below Lower Clifton Terrace where appropriate, and ensure that overland drainage flowpaths are not obstructed (see Chapter 7).

2) **Landscape Open Space Enhancement** (in addition to the overarching guidelines in Section 14.4)
   - Urban Forest Treatment – in particular at:
     - The land below Lower Clifton Terrace (however, do not encourage the use of this area as it has poor passive surveillance and is in a heavy traffic environment);
     - The land opposite Musk Avenue above the portals;
     - The land to the western side of Kelvin Grove Road, between Westbury Street and Victoria Street;
     - The medians above the portals and within Kelvin Grove Road.
   - Create opportunities to enhance critical views and vistas including views to the CBD, the Kelvin Grove Urban Village 'Artspace' billboard, St. Bridgid's church and (former) convent, and the space created opposite Musk Avenue above the portals.
   - Ensure that scenic amenity imparted by the city's characteristic terrain and vegetation is retained and enhanced, in particular the Figs at Marshall Park, McCaskie Park and the Normanby Fiveways.

3) **Recreational Opportunities** (in addition to the overarching guidelines in Section 14.4)
   - Create well connected and safe community areas for passive recreation within the following areas:
     - Marshall Park and McCaskie Park
     - The land to the western side of Kelvin Grove Road in between Westbury Street and Victoria Street.
   - Enhance existing community facilities, park furniture, lighting and play ground equipment.

4) **Connectivity** (in addition to the overarching guidelines in Section 14.4)
   - Improve amenity for pedestrians, cyclists and public transport users around the Kelvin Grove connection, with attention focused on existing and new connections as follows:
     - Along the western side of Kelvin Grove Road from the Normanby Fiveways to Victoria Street and Blamey Street;

- Across Kelvin Grove Road at Musk Avenue;
- The ICB pedestrian/cycle overpass to Lower Clifton Terrace;
- From Kelvin Grove Road to Lower Clifton Terrace;
- From Kelvin Grove Urban Village to Upper Clifton Terrace;
- From Lower Clifton Terrace to Upper Clifton Terrace.

- Improve permeability for pedestrians and cyclists by establishing new connections that are able to safely penetrate or straddle 'barriers' in the built environment.
- Provide lighting along connections and at decision points in accordance with CPTED principles.

5) **Neighbourhoods** (in addition to the overarching guidelines in Section 14.4)

- Retain and enhance characteristics of the local neighbourhood in and around Upper and Lower Clifton Terrace, Westbury Street, Victoria Street, in particular their character as narrow, low traffic, local streets with limited connectivity.
- Provide vegetative screening to sound barriers and/or provide access to views and vistas of the surrounding area using transparent materials.
- Provide access to views and vistas of the surrounding area from the elevated terrain around Upper Clifton Terrace, using transparent materials.

6) **Boulevard Treatments** (in addition to the overarching guidelines in Section 14.4)

- Provide significant tree planting and public art, in particular to the medians in the middle of Kelvin Grove and street furniture, and accessible pathways to major roads.
- Provide enhanced streetscape amenity through street tree planting to the following streets and roads affected by the project:
  - Lower Clifton Terrace;
  - Upper Clifton Terrace;
  - Victoria Street;
  - Westbury Street;
  - Repair any construction damage to Musk Avenue planting.

7) **Design Intervention and Integration with Engineering Proposals** – Create high quality urban design and landscape treatments for the following infrastructure elements:

- Retaining and transition structures.
- Portals.
- Noise barriers; it is recommended that noise walls be modified where possible to retain views, landscape values and loss of sunlight – through either relocation or through the use of transparent materials.
- Integrate the above with the existing environment of the Kelvin Grove connection.

8) **Public Art**

- Provide opportunities for public art or character elements at key points around the Kelvin Grove Connection, such as:

- Kelvin Grove Road from the Normanby Fiveways to Blamey Street,
- The new open space above the portal opposite Musk Avenue,
- The triangular shaped land between Hale Street and Kelvin Grove Road,
- The new open space between Westbury Street and Upper Clifton Terrace, and
- Marshall Park and McCaskie Park,

that responds to and enhances local image and the identity of the city.

9) **Lighting** (in addition to the overarching guidelines in Section 14.4)

These guidelines have been prepared to highlight issues that a qualified lighting designer would need to consider in their technical design:

- Design to avoid solar reflection and glare, where possible.
- Use lighting to assist legibility and choices about safe areas and routes.
- Integrate sustainable lighting with engineering solutions.
- Ensure lighting during construction does not cause a danger to drivers or cyclists, or nuisance to local residents.
- Avoid inappropriate light spill, shadowing or glare during construction and at operational stage.

10) **Codes and Practices**

- Include CPTED principles in all of the above mitigation measures refer '*Crime Prevention through Environmental Design Guidelines for Queensland Part A: Essential features for safer places*' (2007).
- On and off road Cycleways and pathways in accordance with *Austroads Guide to Engineering Practice* – Part 14, Bicycles.

MASTERPLAN
KELVIN GROVE CONNECTION

MITIGATION MEASURES

1 **Revegetation**
Protect exisiting significant vegetation, in particular the Fig Trees along Kelvin Grove Road.

2 Rehabilitate damage to waterways to area below Lower Clifton Terrace where appropriate.

3 **Landscape Open Space**
Urban Forest Treatment - Provide significant tree plantings to open space and medians.

4 Create opportunities to enhance critical views and vistas including views to the Kelvin Grove Urban Village "Artspace" billboard and new greenspaces.

5 **Recreational Opportunities**
Provide opportunities for active and passive recreation within Marshall Park and the land between Westbury Street and Victoria Street.

6 **Connectivity**
Provide safe, legible & comfortable ped/cycle connections, in particular to and from the ICB ped/cycle over/underpass to Lower Clifton Terrace, between Kelvin Grove Urban Village and Upper and Lower Clifton Terrace.

7 **Neighbourhoods**
Retain and enhance characteristics of local neighbourhoods and strengthen neighbourhood precincts through the implementation of well connected community park/s.

8 **Boulevard Treatments**
Provide significant tree planting in particular to the medians in the middle of Kelvin Grove Road.

9 Provide enhanced streetscape amenity to these streets.

Public Art
Provide opportunities for public art and character elements within the transport network and existing and new greenspace areas. Landscape treatments to assist in visual mitigation of impacts on built form from lot resumptions.

1 Landscape treatments to assist in visual mitigation and integration of proposed infrastructure into surroundings.

2 Note: Refer Engineers drawings for infrastructure detail.

Refer to Section 14.4 for comprehensive urban and landscape guidelines for the Kelvin Grove Connection

14.8 Visual Assessment

The EIS Terms of Reference require that an assessment be made of the 'likely visual impacts of the proposed works on the landscape and changes to the landscape.'

The method used to assess the visual impacts of the Northern Link project has been firstly to describe the composition of the existing landscape, which is the subject of the first part of this chapter. Secondly, the method has been to describe the sensitivity of the existing landscape, taking into consideration the topography, land use, built form, infrastructure and the natural environment (Section 14.2). Third, impacts and recommended mitigation strategies have been identified through generation of digital photomontage perspectives of the infrastructure, from a number of vantage points. With the aid of these visual tools, the assessment for each vantage point has been tabulated and summarised in a form that is consistent with the discussion of the key locations and the impact assessments in Sections 14.2 through 14.7 above.

14.8.1 Visual Sensitivity

The sensitivity of a landscape, or the scope to which it can absorb changes of the type proposed by the Northern Link project, is variable and depends on factors such as:

- existing land use
- pattern of the landscape
- scale of the landscape
- visual enclosure
- visual receptors
- scope for mitigation
- value of landscape

The visual assessment therefore considers how the landscape would take on and interact with the changes to the landscape character in terms of view sensitivity and the likely visual impacts discussed in Section 14.4. View sensitivity has been graded from high to low, as follows:

View sensitivity is ***high*** when viewed by residents from private dwellings. Viewers are familiar with and knowledgeable of the overlying character, and would immediately notice changes. Recurrent and static views are experienced in this viewing situation.

Landscapes of a ***significant*** sensitivity are generally viewed from open spaces and informal public/recreational facilities where view quality is important and changes would be judged critically. Views are observed at various low speeds of passage.

Sensitivity is ***moderate*** for landscapes viewed from public places and commercial, employment or educational facilities for example. The viewer is familiar with the landscape but its value is reduced as it is of a secondary nature, hence changes are generally not subject to close attention or scrutiny.

Views from surrounding road and rail infrastructure networks are of ***limited*** sensitivity. Views are transient owing to the high speed of passage. Therefore sensitivity is encountered through momentary glimpses, and changes in the landscape are largely inconsequential.

Low view sensitivity applies to travel routes and road corridors or recreation areas, not included above, where visual quality is of little concern to typical users. These may include non-recreational open space areas and some

watercourse environments. For the purposes of the assessment, view sensitivity is rated on a scale of one star (low sensitivity) to five stars (high sensitivity).

14.8.2 Visual Impact

The likely visual effect and its significance can then be gauged in order to help determine the appropriate mitigation measures. Visual effects are not always detrimental and may in fact be welcomed as beneficial, and may help to mitigate the negative impacts.

The following scale (and star rating) can be used to consider the mitigation approach:

Substantial Adverse (1 star):	Significant deterioration of view
Adverse (2 stars):	Noticeable deterioration of view
Neutral (3 stars):	No discernable deterioration or improvement of view
Beneficial (4 stars):	Noticeable improvement of view
Substantial Beneficial (5 stars):	Significant improvement of view

14.8.3 Mitigation Process

The perceived visual benefits and impacts are presented (below) through digitally generated perspectives. The mitigation measures relate to the urban design, landscape and visual goals, principles and objectives for the project. Consideration for a range of treatments in terms of visual elements and urban design opportunities is paramount. The treatments and measures are incorporated into surface landscaping, portal design, ramp design, and the siting and design of surface structures.

Mitigation efficiency is also rated on a scale of one to five stars, based on the quality and efficiency of the mitigation treatment, as follows:

1 star rating:	Basic level of mitigation treatment is required
2 star rating:	Acceptable level of mitigation treatment is required
3 star rating:	Good level of mitigation treatment is required
4 star rating:	High level of mitigation treatment is required
5 star rating:	Excellent level of mitigation treatment is required

14.8.4 Visual Assessment at Operational Phase

The illustrative photo-montage series evaluates the foreseeable visual effects of the project on the landscape, which is continually evolving, as experienced by the people who create and live within that landscape.

The visual assessment series is presented using key plans to locate the Vantage Points from which photos were taken; following these are the before and after images for each vantage point, accompanied by visual assessment tables.

Vantage Points: Western Connection

VANTAGE POINTS

1. Western Freeway driving inbound with Mount Coot-tha Gardens to the left.
2. Western Freeway looking outbound with ANZAC Park to the left.
3. Birdwood Terrace panoramic view over Toowong Cemetery.
4. Intersection of Birdwood Terrace and Richer Street.
5. Mount Coot-tha Lookout view across to Mount Coo-tha Botanic Gardens and Western Freeway.
6. Wool Street looking across Anzac Park and the Dog Off Leash Area.

PHOTOGRAPHIC VANTAGE POINT

VIEW (LINE OF SIGHT)

LOCATION OF PORTALS

W1 POSSIBLE VENTILATION LOCATIONS

Vantage Point: WC1

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
WC1	0 - 50m	Limited	★★★☆☆	★★☆☆☆	★★★☆☆
Western Freeway heading inbound in north-easterly direction. Transition section with portals.	Immediate surrounding bushland of Mt. Coot-tha Botanic Gardens to the left and scattered trees and grass in Anzac Park to the right.	Vehicles in motion, with heavy regular commuter and transport traffic. Visible signage.	Due to changed views on approach to Mt. Coot-tha junction with noticeable impact in immediate and middle distance for the length of the proposed infrastructure.	Noticeable deterioration of view by driver due to embankments and transition zone to portal	Landscape enhancements and stabilisation of eastern and western embankments to improve visibility along Western Freeway. Reinstatement of existing vegetation.

Vantage Point: WC2

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

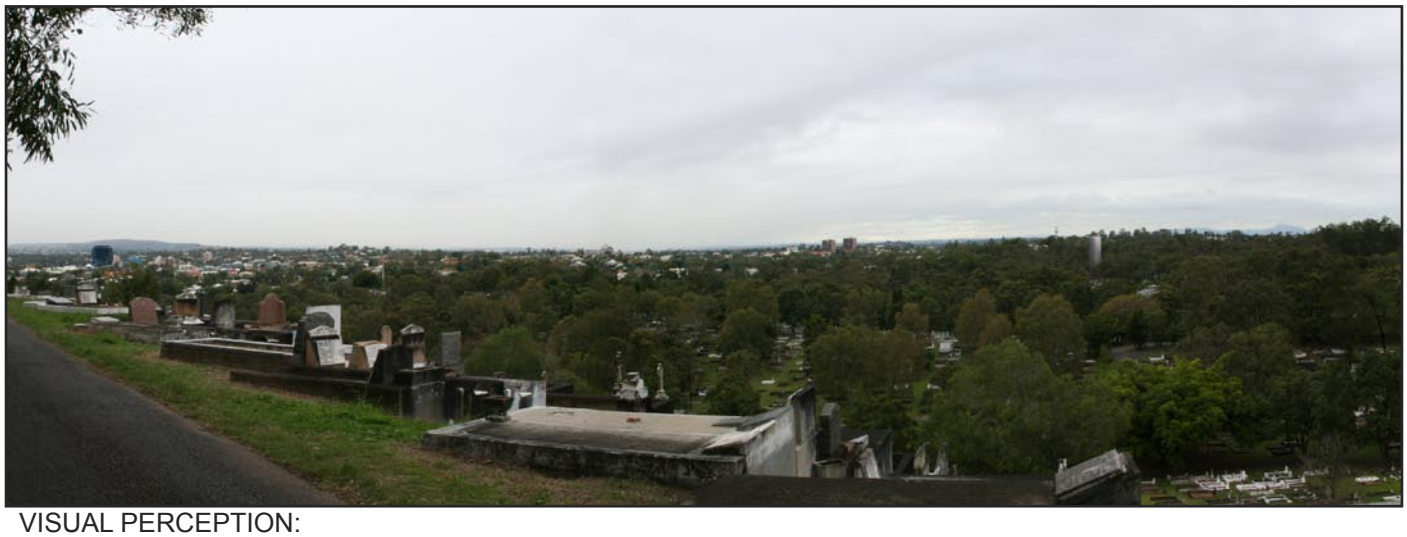
VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
WC2	100 - 200m	Moderate	★★★☆☆	★★☆☆☆	★★★☆☆
Western Freeway heading outbound in a westerly direction with the tunnel portals in view.	Middle-ground focus on the Western freeway with the interface of Portals and signage.	Vehicles in motion, pedestrians, cyclists, heavy regular commuter and transport traffic.	Due to transient views of new western embankment in the middle-ground.	Noticeable deterioration of view due to embankments, transition zone and portals.	Landscape enhancements and stabilisation of western embankment to improve visibility along Western Freeway.

Vantage Point: WC3

IMAGE VIEW:

INTEGRATED VIEW:



VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
WC3	10 - 1000m	Moderate	★★★★☆	★★☆☆☆	★★★☆☆
Birdwood Terrace panoramic view over Toowong Cemetery	Middle-ground focus on the Cemetery and beyond in the direction of the Western Freeway.	Pedestrians, cyclists, and residential aspects.	Due to transient views across the Cemetery and the downward sloping embankments.	Noticeable deterioration of view due to the high vantage point showing the location of Ventilation complex.	Some landscape enhancements required to add to effect of dense existing vegetation canopies.

Vantage Point: WC4

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

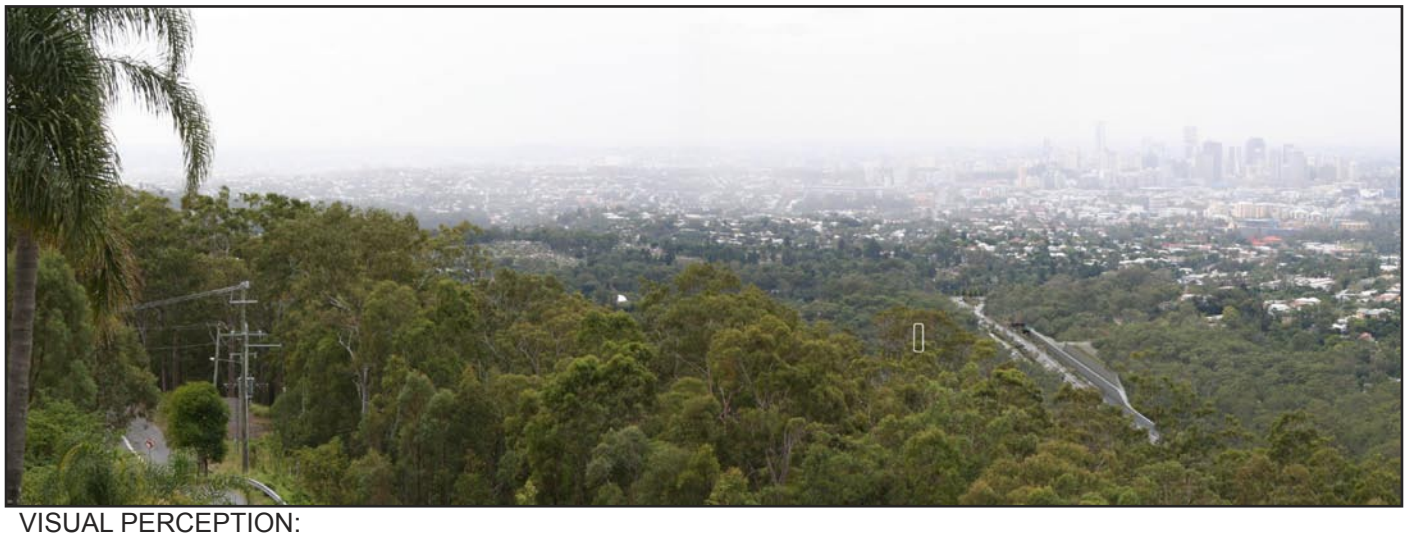
VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
WC4	10 - 600m	Significant	★★★★☆	★★☆☆☆	★★★☆☆
Intersection of Birdwood Terrace & Richer Street looking across towards Mount Coot-tha Gardens and the Western Freeway	Middle-ground focus on the white Planetarium dome in the Mount Coot-tha gardens area.	Pedestrians, vehicles, cyclists, and static residential aspects.	Due to transient views across the residential streets and dwellings on the downward sloping embankments.	Noticeable deterioration of view due to the high vantage point showing the location of Ventilation complex.	Landscape enhancements and reinstatements required to add to existing effect of dense vegetation canopies.

Vantage Point: WC5

IMAGE VIEW:

INTEGRATED VIEW:



VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
WC5	100- 10,000m	Significant	★★★★☆	★★☆☆☆	★★★☆☆
Mount Coot-tha Lookout looking towards the Western Freeway road alignment with the CBD on horizon.	Middle-ground focus on the Western Freeway and the white Planetarium dome in the Mount Coot-tha Botanic Gardens.	Pedestrians, cyclists, and static lookout aspects. (some enhanced telescopic views are possible from lookout)	Due to transient views across Mount Coot-tha Gardens and dense vegetation on downward sloping embankments.	Noticeable deterioration of view due to the high vantage point showing the location of portals and Ventilation complex.	Landscape enhancements and reinstatements required to add to soften impact of major infrastructure presence.

Vantage Point: WC6

IMAGE VIEW:

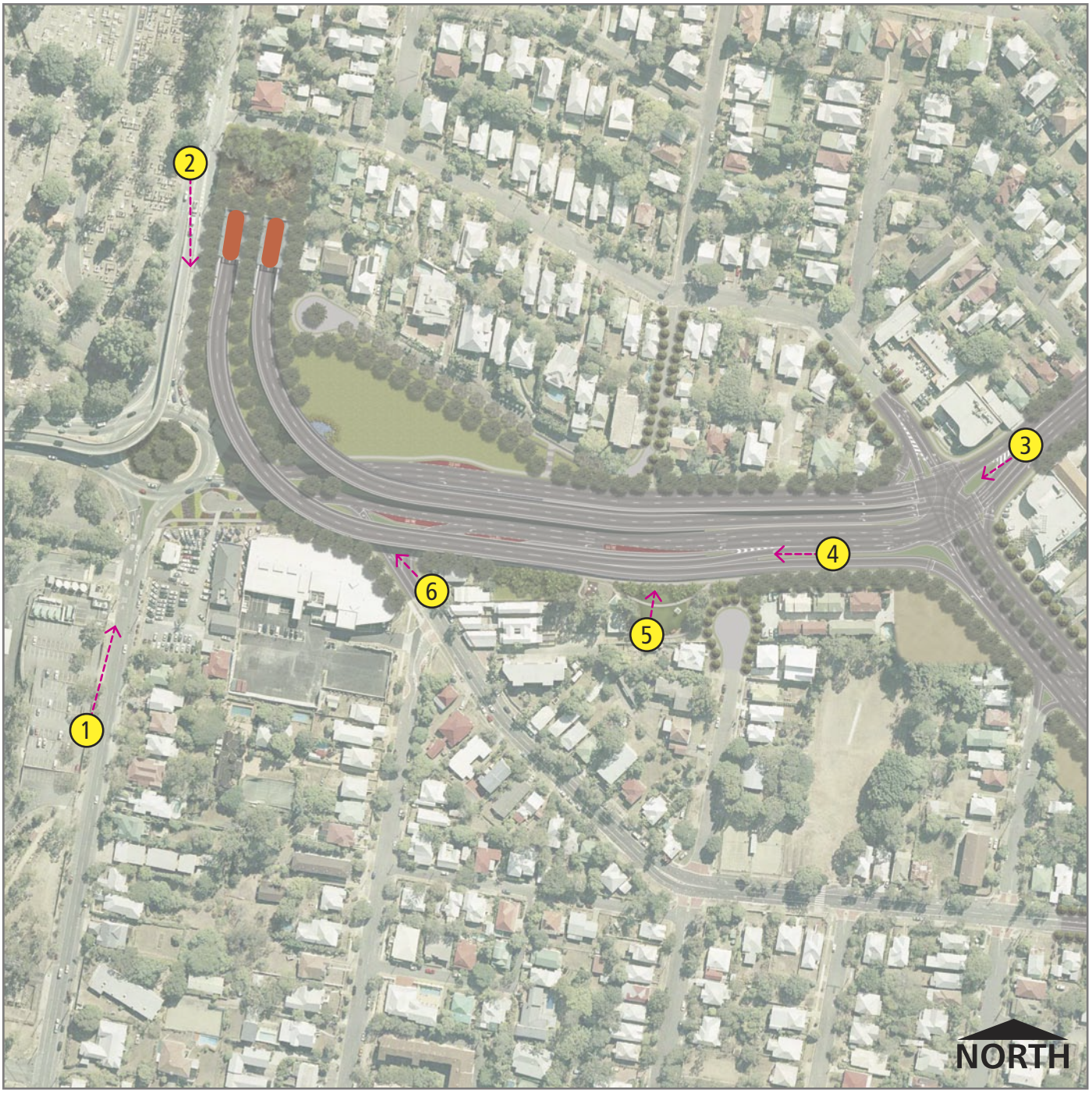
INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
WC6	10 - 1000m	Moderate	★★★★☆	★★★☆☆	★★★☆☆
Wool Street looking across Anzac Park and the Dog Off Leash Area.	Middle-ground focus on the vegetation layers in the direction of the Western Freeway.	Pedestrians, cyclists, and residential dwelling aspects.	Due to potential residential views from Wool Street and through Anzac Park.	Nodiscernable change of view due to the dense vegetation screening the location of Ventilation complex.	Some landscape enhancements and reinstatement at the Ventilation complex site required to add to effect of dense existing vegetation canopies.

Vantage Points: Toowong Connection



PHOTOGRAPHIC VANTAGE POINTS

1. Miskin Street looking towards the roundabout interchange.
2. Frederick Street looking into the WF flyover with Toowong Cemetery on right.
3. Milton Road looking towards the roundabout interchange.
4. Croydon Street intersection on Milton Road.
5. Quinn Park looking directly at the embankment of Milton Road.
6. Norwood Street road connection to the major intersection entering Milton Road.

PHOTOGRAPHIC VANTAGE POINT

VIEW (LINE OF SIGHT)

LOCATION OF PORTALS

Vantage Point: TC1

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
TC1	100 - 400m	Significant	★★★★☆	★★☆☆☆	★★★★★
Miskin Street approach to the roundabout and Toowong flyover. Duplication of eastern flyover will be visible.	Immediate surrounds of street trees and houses and existing road infrastructure. Toowong flyover partially screened by existing vegetation in the near distance.	Vehicles in motion or parked along Miskin Street. Pedestrian access along footpath.	Due to changed views from Miskin Street with proposed eastern flyover.	Noticeable deterioration of view due to a partly obstructed view along Miskin Street towards flyovers.	Streetscape enhancement including tree planting in roundabout and required screening of portal areas and elevated structures.

Vantage Point: TC2

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
TC2	0 - 100m	Significant	★★★★☆	★★☆☆☆	★★★★☆
Western side of Frederick Street approaching proposed eastern flyover with Toowong Cemetery.	Immediate surrounds of houses and footpaths with fringing vegetation along Toowong Cemetery.	Vehicles in motion or parked along Frederick Street, Pedestrian access along footpaths.	Due to changed views from Frederick Street proposed eastern flyover and portals.	Substantial deterioration of view due to the loss of residential interface and planting.	Streetscape enhancement including planting and screening of portals and flyover.

Vantage Point: TC3

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

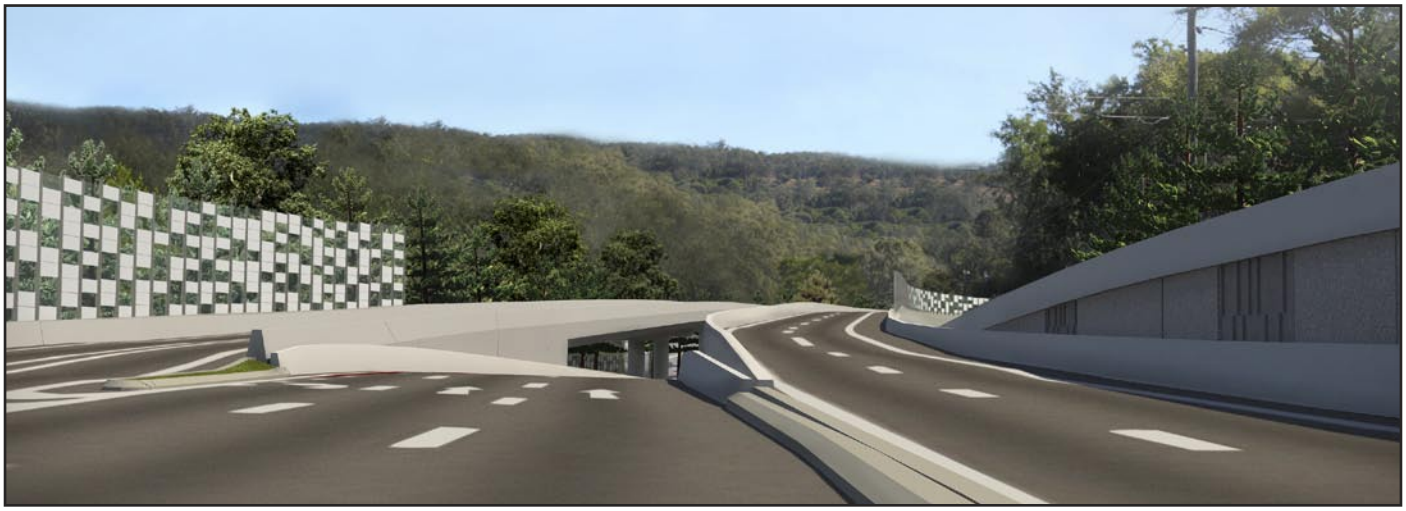
VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
TC3	100 - 200m	Moderate	★★★★☆	★☆☆☆☆	★★★★★
Croydon Street intersection with Milton Road on western approach to Toowong flyovers.	Immediate surrounds of Croydon Street and Milton Road - houses, businesses, street trees and existing road infrastructure leading to Toowong flyovers.	Vehicles in motion or parked along Sylvan and Milton Roads. Pedestrian access along footpaths.	Due to distance, topography and existing houses and infrastructure. Change due to proposed eastern flyover and extensive surface works.	Adverse change of view due to loss of residential interface and extensive surface works and elevated structures.	Formal vertical planting to create screening along linear edges of the road surfaces.

Vantage Point: TC4

IMAGE VIEW:

INTEGRATED VIEW:



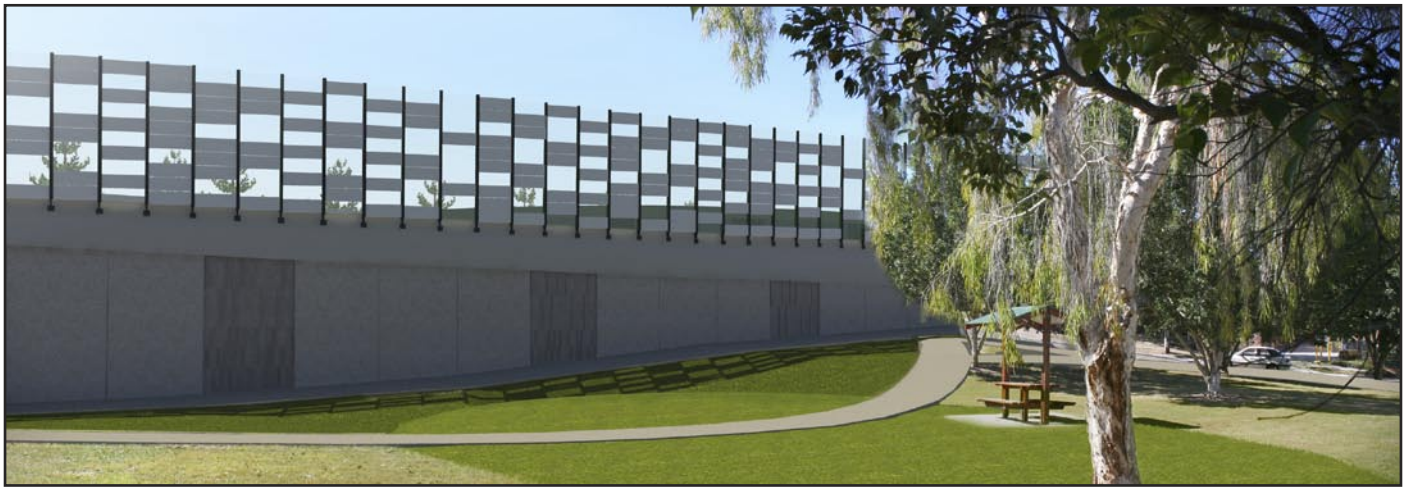
VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
TC4	0 - 100m	Significant	★★★★☆	★☆☆☆☆	★★★★☆
Milton Road and Quinn Street intersection. Approach to Toowong roundabout and flyover with Toowong Cemetery to the right.	Near and middle distance surrounds of existing roads, houses, footpaths with fringing vegetation.	Vehicles in motion along Milton Road. Pedestrian access along footpaths. Access to residential streets.	Due to significant view changes on Milton Road with the addition of elevated road structures and extensive surface works.	Substantial deterioration of view due to obstructed views along Milton Road towards Toowong flyover and proposed eastern flyover.	Streetscape enhancements along Milton Road and reinforced structures. Screening to soften the vertical extent of retaining structures.

Vantage Point: TC5

IMAGE VIEW:



INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
TC5	100m	Significant	★★★★★	★☆☆☆☆	★★★★★
Quinn Park looking north towards Milton Road and Quinn Road to the east.	Surrounds of existing parkland backing onto Residential rows with fringing trees.	Pedestrian access along footpaths to open space parkland and informal recreational facilities.	Due to changed views from Milton Road of proposed eastern flyover.	Substantial Adverse deterioration of view due to loss of open space amenity.	Comprehensive visual screening of proposed infrastructure with extensive planting and streetscape treatments.

Vantage Point: TC6

IMAGE VIEW:

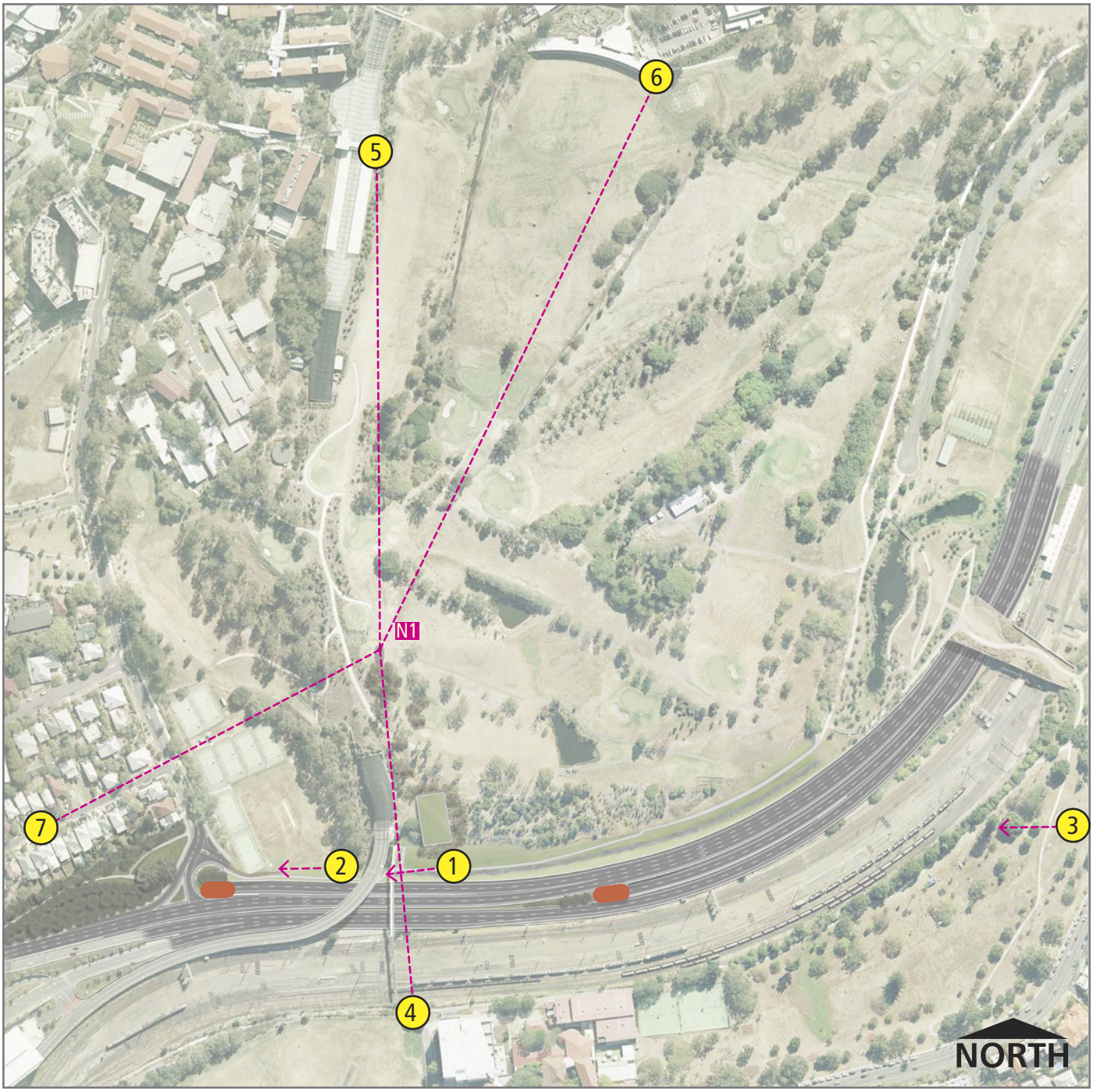
INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
TC6	100m	Significant	★★★★★	★☆☆☆☆	★★★★★
Norwood Street road connection to the major intersection entering Milton Road.	Surrounds of existing parkland backing onto Residential rows with fringing trees.	Pedestrian access along footpaths of road connection and medium to heavy commuter traffic.	Due to changed views from Milton Road of proposed elevated flyover structures.	Substantial Adverse deterioration of view due to loss of pedestrian and spatial amenity .	Comprehensive visual screening of proposed infrastructure with extensive planting and streetscape treatments.

Vantage Points: Northern Connection



VANTAGE POINTS

1. Inner City Bypass pedestrian path heading inbound approaching ICB pedestrian bridge.
2. Inner City Bypass pedestrian path heading inbound adjacent to BGS playing fields.
3. Gregory Terrace and Gregory Grove through Victoria Park and ICB.
4. Pedestrian ICB overpass at BGS end across to QUT Kelvin Grove campus and INB canopy.
5. QUT Kelvin Grove campus busway station.
6. Victoria Park Driving Range.
7. Normanby Terrace looking across Victoria Park Road and BGS Tennis Courts.

PHOTOGRAPHIC VANTAGE POINT

VIEW (LINE OF SIGHT)

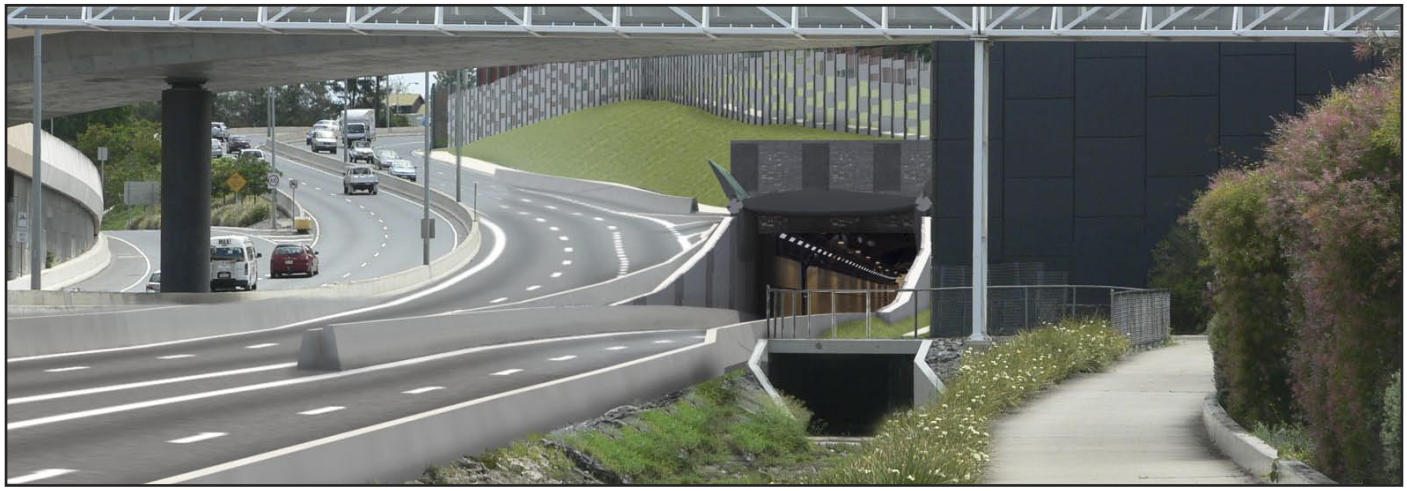
LOCATION OF PORTALS

N1

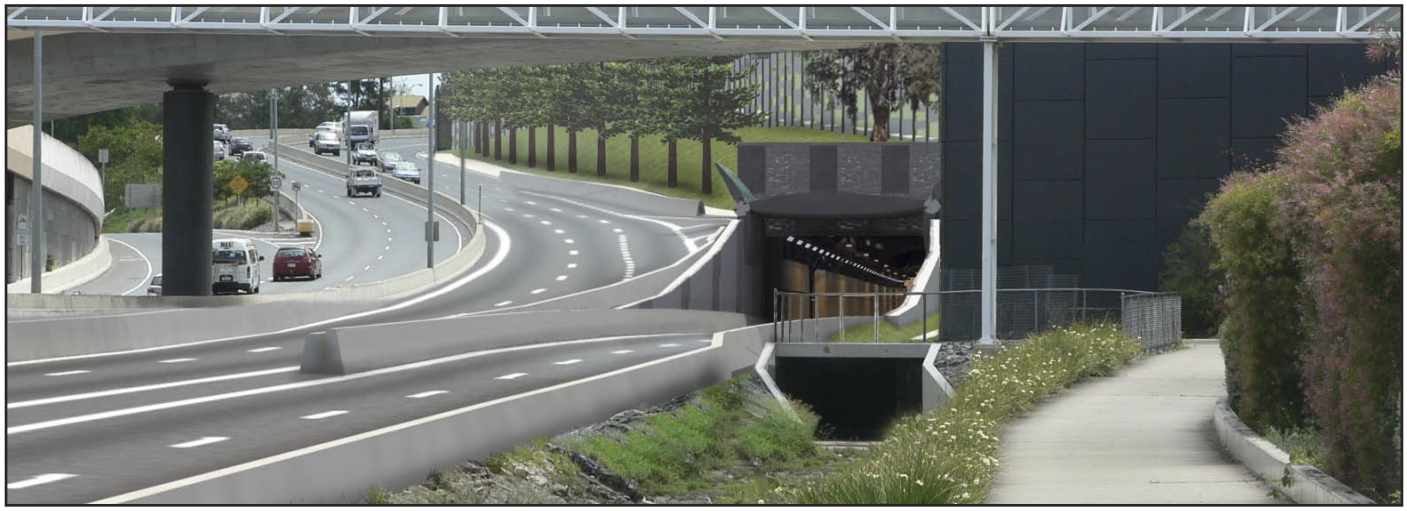
POSSIBLE VENTILATION LOCATIONS

Vantage Point: NC1

IMAGE VIEW:



INTEGRATED VIEW:



VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
NC1	200m	Moderate	★★★☆☆	★★☆☆☆	★★★☆☆
Inner City Bypass near Inner Northern Busway bridge passing Victoria Park.	Beside the ICB surface road towards the portal from Kelvin Grove Road in middle distance.	Vehicles in motion, heavy regular commuter and transport traffic with pedestrians and cyclists using other adjacent accessways.	Due to presence of portal within existing infrastructure elements.	Noticeable deterioration due to portal presence. Changes to existing landscape on northern side embankments	Landscape enhancements, stabilisation of embankments to improve visual amenity along ICB.

Vantage Point: NC2

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

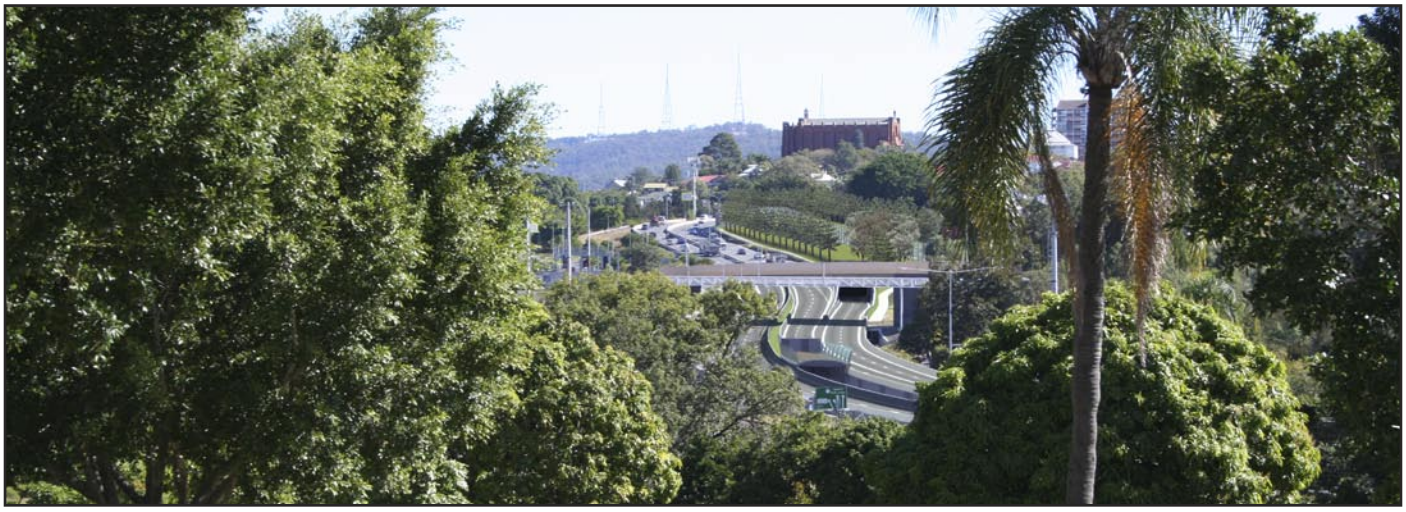
VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
NC2	100m	Moderate	★★★☆☆	★★☆☆☆	★★★☆☆
Inner City Bypass passing Victoria Park Road. Looking in a westerly direction.	Immediate streetscape with portal presence outbound from Kelvin Grove Road.	Vehicles in motion, heavy regular commuter and transport traffic with pedestrians and cyclists using other adjacent accessways.	Due to presence of portal within this major infrastructure and institutional precinct.	Noticable change of view due to proposed portal and constructed embankments.	Landscape enhancements and screening to embankments on nothern side along ICB.

Vantage Point: NC3

IMAGE VIEW:

INTEGRATED VIEW:



VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
NC3	500 - 1500m	Low	★★★☆☆	★★☆☆☆	★★★☆☆
Victoria Park, from Gregory Terrace level, overlooking the Inner City Bypass.	Looking through Victoria Park towards ICB area across to St. Brigid's Church and Mt. Coot-tha on the horizon.	Distant glimpse by pedestrians, cyclists and park users.	Due to proposed Portal area noticeable in the middle distance as part of the existing ICB.	Noticeable change in view due to works associated with the portal area.	Landscape enhancements to embankments north of the ICB.

Vantage Point: NC4

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
NC4	200m	Moderate	★★★☆☆	★★☆☆☆	★★★☆☆
Pedestrian ICB overpass at BGS end across to QUT Kelvin Grove campus and INB canopy.	Middle-ground views of transport infrastructure modes and elevated pedestrain bridging towards the embankments of Victoria Park	Glimpses on various levels by pedestrians, vehicle drivers, cyclists and park users.	Due to current presence of extensive structural features into the landscape terrain.	Noticeable change of view due to the location of the proposed ventialation complex.	Landscape enhancements to areas north of the ICB beyond the Victoria Park embankments seen.

Vantage Point: NC5

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
NC5	200m	Moderate	★★★☆☆	★★★☆☆	★★★☆☆
QUT Kelvin Grove campus busway station view from within the overpass enclosure.	Middle-ground views of transport infrastructure and surrounding Victoria Park Golf Course and Driving Range.	Glimpses on various levels by pedestrians, public transport patrons and cyclists.	Due to current presence of extensive structural features into the landscape terrain.	Noticeable change of view due to the location of the proposed ventialation complex.	Landscape reinstatement and enhancements required to soften the presence of the Ventilation structures.

Vantage Point: NC6

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
NC6	200m	Moderate	★★★☆☆	★★★☆☆	★★★☆☆
Victoria Park Golf Course Driving Range from the edge of the carpark and platform embankment.	Middle-ground views of Driving Range and surrounding Victoria Park grounds.	Glimpses on various levels by pedestrians, private vehicles and Golf Course patrons.	Due to existing Driving Range configuration and surrounding landscape terrain.	No discernable change of view due to the location of the proposed ventialation complex.	Landscape reinstatement and enhancements required at the Ventilation structure site.

Vantage Point: NC7

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
NC7	200m	High	★★★★★	★☆☆☆☆	★★★★★
Normanby Terrace looking across Victoria Park Avenue and the BGS Tennis Courts.	Middle-ground views of Victoria Park embankments and existing vegetation.	Glimpses on various levels a residential precinct by pedestrians, cyclists, private vehicles and residents.	Due to existing Residential aspect and views across surrounding landscape terrain.	Significant deterioration of view due to the location of the proposed ventialation complex.	Landscape reinstatement and enhancements required at the Ventilation structure site.

Vantage Points: Kelvin Grove Connection

VANTAGE POINTS

① Musk Avenue intersection, Kelvin Grove Urban Village gateway.
② Musk Avenue intersection view from 'The Hub' podium, Kelvin Grove Urban Village.
③ Normanby Terrace pedestrian overpass looking over Kelvin Grove Road.
④ Lower Clifford Terrace looking into KGUV intersection the QUT 'The Hub' building.

PHOTOGRAPHIC VANTAGE POINT

VIEW (LINE OF SIGHT)

LOCATION OF PORTALS

Vantage Point: KG1

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
KG1	50 - 100m	Moderate	★★★☆☆	★★☆☆☆	★★★★☆
Musk Avenue intersection with Kelvin Grove Road looking south-west.	Immediate streetscape view towards portal area.	Vehicles in motion, pedestrians, cyclists, heavy regular commuter and transport traffic.	Due to changed views with proposed portal area.	Adverse deterioration of view due to works associated with the portal and embankments.	Streetscape enhancements with screening and planting along the western side of Kelvin Grove Road.

Vantage Point: KG2

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
KG2	50 - 100m	Significant	★★★★☆	★☆☆☆☆	★★★★☆
Musk Avenue intersection with Kelvin Grove Road, in a southerly direction.	Immediate streetscape with portal presence outbound from Kelvin Grove Road.	Vehicles in motion, pedestrians, cyclists, heavy regular commuter and transport traffic.	Due to changed elevated views with proposed portal area and associated infrastructure works.	Substantial deterioration of view due to proposed portal areas and loss of residences with associated embankments.	Streetscape enhancements to screen and soften proposed portal areas along western side of Kelvin Grove Road.

Vantage Point: KG3

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
KG3	200 - 400m	Significant	★★★★½	★★★☆☆	★★★★½
Kelvin Grove Road heading outbound from the City and looking in a northerly direction.	Immediate streetscape with portal presence outbound from Kelvin Grove Road.	Vehicles in motion, pedestrians, cyclists, heavy regular commuter and transport traffic.	Due to changed elevated views with proposed portal area and associated infrastructure works.	Noticable deterioration of view due to works associated with portal areas, transition areas and associated embankments.	Streetscape enhancements to screen and soften proposed portal areas along western side of Kelvin Grove Road.

Vantage Point: KG4

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
KG4	0 - 50m	Moderate	★★★☆☆	★★☆☆☆	★★★★☆
Musk Avenue intersections with Kelvin Grove Road, and Lower Cliffton Terrace heading outbound from the City in a northerly direction.	Immediate streetscape and topography upon transition zone and portal areas.	Vehicles in motion, pedestrians, cyclists, heavy regular commuter and transport traffic	Due to changed elevated views with proposed portal area and associated infrastructure works.	Noticeable deterioration of view due to transition zone and tunnel portals.	Streetscape enhancements to screen and soften proposed portal areas along western side of Kelvin Grove Road.