M2 Upgrade

VOLUME 2 – PART 2
ENVIRONMENTAL ASSESSMENT – TECHNICAL PAPERS

MAY 2010

RTA/Pub. 10.136
ISBN 978-1-921766-10-7

M2 Upgrade Environmental Assessment

Volume 2 – Part 2: Technical Papers

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M2 UPGRADE - URBAN DESIGN + VISUAL ASSESSMENT REPORT

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April 2010

Issue/Revision	Date	Revision Description	By	Chk	App
A	27.03.2009	Visual Assessment Report - Draft	M.Walker	M.Walker	M.McGirr
B	3.12.2009	Urban and Landscape Design Visual Assessment Report - Preliminary Draft for information only	M.McGirr/M. Easton	None	None
C	8.12.2009	Urban and Landscape Design Visual Assessment Report - Draft for Approval	M.McGirr/M. Easton	M.McGirr/M. Easton	M.McGirr
D	14.12.2009	Urban and Landscape Design Visual Assessment Report - Final for Approval	M.McGirr/M. Easton	M.McGirr/M. Easton/AECOM	M.McGirr
E	18.12.2009	Urban and Landscape Design Visual Assessment Report Final - Issue to RTA	M.McGirr/M. Easton	M.McGirr/M. Easton/AECOM Leightons Transurban	M.McGirr
F	28.01.10	Urban and Landscape Design Visual Assessment Report Final - Issue to RTA	M.McGirr/ M.Easton	M.McGirr/M. Easton	M.McGirr
G	17.02.10	Urban and Landscape Design Visual Assessment Report Final - Issue to RTA	M.McGirr/ M.Easton	M.McGirr/M. Easton	M.McGirr
H	24.02.10	Urban and Landscape Design Visual Assessment Report Final - Issue to RTA	M.McGirr/ M.Easton	M.McGirr/M. Easton	M.McGirr
I	03.03.10	Urban and Landscape Design Visual Assessment Report Final - Issue to RTA	M.McGirr/ M.Easton	M.McGirr/M. Easton	M.McGirr
J	15.03.10	Urban and Landscape Design Visual Assessment Report Final - Issue to RTA	M.McGirr/ M.Easton	M.McGirr/M. Easton	M.McGirr
K	23.04.10	Urban and Landscape Design Visual Assessment Report Final - Issue to RTA	M.McGirr/ M.Easton	M.McGirr/M. Easton	M.McGirr

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EXECUTIVE SUMMARY

Hills Motorway are proposing to upgrade the capacity of the M2 Motorway. Urban and Landscape Design consultants HBO+EMTB and Tract Consultants have prepared an Urban Design and Visual Assessment Report, as a Technical Paper for the Environmental Assessment project approval process. The Report has been prepared as part of a collaborative design process with Hills Motorway, Leighton Contractors and AECOM.

The M2 Motorway is an important part of the Sydney Orbital Network connecting Sydney's north-west to the lower north shore and Sydney's CBD. Increased traffic volume on the motorway has resulted in the need to increase capacity and improve the level of service for users. The proposed M2 Upgrade project would include the following components:

- Widening and/or provision of a third lane along sections of the eastbound and westbound carriageways between Windsor Road and Lane Cove Road.
- Provision of new on/off ramps at Windsor Road and Herring Road.
- Widening and provision of a third lane in the Norfolk Road tunnel.
- A continuous shoulder which provides an emergency and cyclist lane.
- Upgrades to the Motorway's Operational Management and Control Systems.

A.1 Existing environment

An analysis of the physical context of the motorway was documented to assist in understanding the environment surrounding the motorway and the existing conditions of the natural and urban setting. This analysis took the form of field surveys and a desktop study and was used to establish the key attributes of the motorway which in turn determine the urban and landscape character precincts and specific site constraints and opportunities. These were used to generate objectives and principles which form the urban and landscape design framework for the upgrade works.

Both the Westlink M7 and the Lane Cove Tunnel, recent high quality additions to the Sydney Orbital Network, contrast strongly with the older M2 existing character which has a lower quality of urban and landscape design reflected not only in the appearance of the bridges, noise walls and retaining walls, but also in the vehicular travel experience due to the uneven road surface.

Existing M2 Motorway Character

The M2 Motorway passes through Hills Shire, Hornsby and Ryde Local Government Areas (LGAs) and is in close proximity to Blacktown and Parramatta LGAs. The M2 Motorway passes through the urban development of the north-western suburbs of Sydney and the expanding commercial area around Macquarie Shopping Centre, Macquarie University and Macquarie Business Park. The existing land uses along the edges of the Motorway corridor characterise the visual qualities of the corridor and its landscape setting.

Connectivity with existing public transport networks are key functional attributes of the corridor. The Northern Rail Line crosses the motorway east of the Beecroft Road Interchange. The Chatswood to Epping rail line, recently opened, carries additional passengers to and from Macquarie University, Macquarie Park and North Ryde.

The topography of the site varies as the road traverses both ridges and valleys as the route heads east towards the centre of Sydney. The current road alignment is generally not responsive to the landform through which it passes, slicing through the landscape, with cuttings, tunnels, high embankments, retaining walls and bridges used to achieve the road design requirements. This to some extent removes the road user from the contextual experience. Despite this there are a number of key topographical characteristics which remain evident and inform the user of their journeys progress.

The vegetation of the M2 Motorway corridor is a mix of re-vegetation works, undertaken as part of the original development, stands of remnant vegetation and weeds. The natural vegetation of the region is preserved in National Park or Reserves along with isolated remnant stands within the urban fabric of the adjoining residential areas.

The Motorway travels through a highly populated area of metropolitan Sydney with Motorway built elements, such as noisewalls, dominating most of the corridor. Along many lengths of the motorway the views are confined to the road corridor, opening up only occasionally. In most cases, the motorist is unaware of the residential housing outside the road corridor as noise walls interrupt the flow of the landscape and restrict views from the motorway. The noise walls, despite efforts to camouflage the structures by painting them green, are visually dominant along much of the route.

The six major intersections create decision points for the motorists. These intersections are defined by large bridge infrastructure overpasses crossing the motorway, with on and off-ramps and increased directional signage and road furniture, such as street lighting. The man-made built structures dominate, with large cuttings and/or retaining walls visually limiting the motorway views.

Towards Pennant Hills Road, the Motorway alignment descends into the low lying landform of the creek valley. Pennant Hills Road intersection is a strong, hard-edged built form. The motorway burrows beneath the wide bridge resulting in high vertical retaining walls. The walls are not well designed and finishes consist of shotcrete with exposed rock bolts. Planting on top of the bridge structure softens and greens the wide expanse of asphalt.

The overbridge structures along the Motorway are generally poorly resolved with the overall structural form and pier/headstock detailing creating a solid and overly bulky visual impression. At Beecroft Road intersection, visual complexity is created with the additional crossing of the Northern Rail Line, the overpass structure for buses and a series of messy, complicated noise walls and cuttings.

Large sandstone cuttings run parallel to the Motorway, where the road is lower than the surrounding topography. The natural sandstone is attractive and warmly coloured enriching the visual travel experience. The cuttings also create a hard edge contributing to restricting the motorist views of the Motorway. In multiple locations the cuttings have been stabilised with shotcrete creating a dull, colourless vertical or near-vertical wall. Often vegetation is visible at the top of the cuttings, softening the overall effect.

The distribution and frequency of key visual qualities, built elements and vegetation along the corridor define the different character experiences. When combined with the adjoining land uses these form distinct precincts with specific visual qualities. The following five precincts have been identified through the contextual analysis:

- Precinct 1: Old Windsor Road to Windsor Road Interchange – Cumberland Plain
- Precinct 2: Windsor Road to Pennant Hills Road – Bushland Interface
- Precinct 3: Pennant Hills Road to Beecroft Road / Devlins Creek – Suburban Forest Interface
- Precinct 4: Beecroft Road /Devlins Creek to Terrys Creek – Suburban Bushland Interface
- Precinct 5: Crimea Road to Delhi Road – Urban Bushland Interface

A.2 Impact assessment

Visual Assessment

The undertaking of the visual assessment and landscape and urban design concept involved an iterative process in which preliminary information was provided to highlight key issues and constraints and potential ways of handling critical issues which were then integrated into the engineering design. This process enables the basic aims of designing to reduce the impact of the built roadway to be adopted in the development of the design proposal thereby minimizing the potential visual impact.

Key considerations in terms of design for mitigation are to visually screen the built form entirely where possible and otherwise to whatever extent practicable; to reduce the apparent scale of the motorways structures, especially its noise barriers; to add landscape elements where possible to assist the process of reducing noise impact and to obscure or reduce views to the traffic stream. As the motorway already exists, its impact in a visual sense, beyond its immediate neighbours, is limited. That is its visual impacts are primarily to the immediate neighbours of the motorway where the scale of change is most significant, due to the facility being an upgrade rather than new infrastructure element.

The context in which the road sits is one which has been associated with natural communities, be that the Lane Cove National Park, Devlins Creek Valley or the Darling Mills Creek Valley. The suburban development adjacent to the corridor is also an environment in which trees are dominant (be they natural/indigenous or exotic). The upgrade nature of this project means that to some extent the ability to substantially influence the degree of change is minimal as the general alignment is a given, the primary impacts are already experienced, and the extents to which modifications can occur are limited.

Visual impacts are assessed in terms of both the road viewer – the corridors neighbours and the road user - those travelling along the road. The road viewer has been the primary consideration in terms of the assessment due to the permanent nature of the impacts experienced by this viewer. Visual impacts experienced as a result of the proposal are associated with the following areas:

- construction and/or realignment of noise walls, resulting in potential increases in scale, visual bulk of the structures when viewed from both within and outside the corridor;
- changes to cutting profiles and their treatment;
- changes to bridges involving the widening of existing structures and the support structures needed to facilitate this;
- widening of pavement extents increase the expanse of road pavement, visible primarily from with in the corridor by the road user;
- construction of retaining walls to fill embankments - minimizing vegetation loss but introducing a built element; and
- Loss of vegetation cover, potentially revealing more of the road and its structures to the adjoining residences which have become accustom to the vegetative buffer.

In addition to these direct impacts there are short term indirect impacts caused by the need for construction compounds both within and or adjoining the road corridor. Site compounds include the construction of temporary site sheds and amenities, provision of lay down areas for storage of structures such as bridge girders, culverts etc; car parking etc.

Visual impacts associated with such facilities include:

- clearing of lands of existing screening vegetation; and
- Construction of temporary structures with potential to overlook or be overlooked by adjacent properties.

The report covers a review of the key changes and there impacts. Space is a critical element both in terms of impacts and proposals but also in terms of the potential for mitigation. Some impacts will be unavoidable and the only means of addressing these changes will be through the architectural design of this element so that its detailing is simple and refined and the material qualities of texture, colour, and so on address the critical concerns of the adjacent use.

A number of areas are identified as having potential for significant visual change, these include:

- At the Windsor Road Interchange, the addition of on and off ramps to the west will mean higher visual impacts due to the increased height of noise and retaining walls and loss of screen planting. Mitigation measures will include design treatment of noise and retaining walls with texture and colour to reduce bulk and scale, and screen planting of properties.
- The historic villa at 266 Windsor Road will lose several metres from its frontage. Property adjustment works will be required to both address the loss of curtilage and to provide a buffer between house and road. Key to this will be the establishment of screen planting to the front and the retention in some form of the side drive and turn-a- round.
- At Woodvale Road, North Epping, the new road alignment will require noise walls to be relocated closer to properties (existing is 10 metres, proposed is 3 metres). Mitigation measures will include noise wall architectural design and screen planting.
- The proposed removal of the bus bridge, east of Beecroft Road, reflects the changes in the public transport system over the last decade and the implementation of better bus priority connections within the M2 corridor as a result of this proposal. The removal of the bridge will provide an enhanced visual outcome with the loss of part of the visual clutter created within this zone by a range of elevated structures.

A.3 Mitigation measures

The current M2 Motorway design does not take full advantage of its distinctive contextual setting. There is an opportunity through the functional upgrade of the motorway to capitalise on the bushland setting, through which the route passes, to improve the visual experience and provide a consistent and recognisable identity. Design solutions address the character of the existing Motorway built elements and provide solutions which compliment and improve the visual outcome of the Motorway built form.

In responding to the visual impacts, mitigation measures have been directed towards achieving an integrated and well considered design solution. To do this a desired future character (Vision) for the M2 Motorway Upgrade has been proposed:

The M2 Motorway upgrade should reflect the corridor's role as an important north-west route linking Ryde and Blacktown, and the M7. Its design should be simple, well considered, elegant, refined, robust, reflect the natural and cultural qualities of the region through which it passes and establish a clear and recognisable identity for the motorway.

This desired character (vision) will be applied to all future developments of the motorway and implemented gradually. This limited upgrade provides the opportunity to commence the process of improving the presentation of the Motorway but it is not within the scope of this project to improve the whole of the Motorway. It is envisaged that as the road is developed and maintained, as part of the concession period, this design vision and its objectives and principles will be progressively implemented.

A.4 Urban Design

The urban design concept for the alignment is one which builds on the existing natural assets of the alignment. In particular it strengthens the connection with the natural environment through the exposure of sandstone cuttings and strengthening of the vegetated back drop of the alignment. Built elements are handled with care so that details are simple and subtle.

The following elements have been identified as key in enhancing the current road corridor character and providing a new higher quality character and identity for the M2 Motorway.

A.4.1 Noise Walls

The existing noise walls lack consistency in colour, alignment and height. The same Hebel panel wall design with four metre post spacings is used for the entire length of the M2 Motorway showing no consideration of the adjacent context - the walls used in the bushland precincts are the same as those used in the more urban precinct. The green colour seems to have been chosen in an attempt to camouflage the walls against the natural bush setting however the reality is that the walls actually contrast with the bushland.

The new walls will be the most visible and continuous built form elements on the motorway and provide one of the few opportunities to create a recognizable identity for the M2 Motorway. The urban design noise wall strategy has assumed that apart from the existing walls that will remain unchanged in both form and colour, all other situations will result in the construction of new noise walls.

The noise wall strategy therefore has an emphasis on both sensitivity towards integrating with the existing noise walls and also a strong focus on high quality urban design for the new noise walls. All the new walls will be constructed using light-weight aerated concrete panels (Hebel, or similar). The design features four different noise wall designs (Type B, Type L, Type H, and Type U).

Each of the identified character precincts has a predominant panel pattern that is carefully designed to reflect and be sympathetic to the surrounding environment. With form and alignment playing a major role, a secondary layer of information in the form of patterning and colour on the new noise walls will reveal the changing environment for the motorway user. A better colour palette will complement the existing green walls, reference the surrounding bushland context and visually recede into the context.

A.4.2 Bridges

Between Windsor Road and Delhi Road there are a total of 21 existing bridges and one tunnel. In order to accommodate the additional traffic lanes, the project includes the widening of 8 of the bridges plus the lengthening of 2 of the vehicular overbridges, 1 pedestrian overbridge and 1 pedestrian underpass. Bridge widening requires adjustment to the edges of some bridges. This will require modifications to throw screens, and a general expansion of the footprint. From the motorway the changes are most evident in the structures associated with the bridge including, abutment walls, bridge girders and parapets. To minimise the impact of these elements they shall be designed to present a slim consistent profile that relates to the existing structure.

Most overbridges on the current M2 Motorway are Super-T girder structures. The strategy for the bridge design, where widening or lengthening of the bridge occurs, is to match existing construction methods as closely as possible and to match the existing detailing of parapets, piers, girder type and bridge furniture. Although, the project is unable to change the appearance of such bridges, it is intended that where the existing bridge has been poorly designed some consideration will be given to improving the appearance of the bridge. New bridges will be designed to improve upon the appearance of the existing bridges.

A.4.3 Retaining Walls

Retaining walls are proposed in locations where the motorway is on fill. The proposed use of retaining walls minimises the extent of disturbance to existing vegetation cover and consequently on views from adjacent properties. The design of new retaining walls should consider the use of colour and texture to minimise their impact. Reinstatement of the vegetation cover to the disturbed footprint will assist in mitigating against the impact of the walls.

The existing retaining walls lack a consistent appearance along the length of the existing M2 Motorway. In many locations where ground stabilisation was required, rock anchors and shotcrete were used. A mix of cast in-situ concrete walls and shotcrete surfaces face the motorway, while walls facing away from the corridor range from patterned precast concrete panels to stacked sandstone boulders with no real distinction made between bushland and urban areas. The end result is one in which the walls, particularly those facing the motorway, are unattractive and visually dominating.

As part of the upgrade works, the widening of the corridor results in further cuttings, new or extended walls facing the motorway and new or extended walls facing outside the corridor, towards the bushland or residential neighbourhoods. The urban design retaining wall strategy has assumed that apart from the existing walls that will remain unchanged in both form and colour, all other situations will result in the construction of new retaining walls. The strategy therefore has an emphasis on both sensitivity towards the existing retaining walls, and also a strong focus on high quality urban design for the new walls. Because of the variable topography of the motorway alignment, there are a significant number of retaining walls in this project. The longest wall stretches for approximately 455 metres and some are over 10 metres high. With the intention of minimizing their perceived impacts, the proposed design seeks not to treat them all the same, but to differentiate them on the basis of their location, orientation, role and consistency with existing M2 Motorway walls. With form and alignment playing a major role, a secondary layer of information in the form of patterning and finish on the new retaining walls will create some linear identity for the motorway. Planting will be located in front of retaining walls wherever possible to soften their appearance and create a greener road corridor.

A.4.4 Temporary Structures

Site compounds, while temporary structures still have the potential to have significant impacts on the visual character of the corridor in the short term. The location of these elements therefore needs to consider the existing vegetated address and seek to limit the scale of visual change. Planting to the perimeter of the proposed site should be preserved, where possible, to maintain a level of screening from the adjoining land uses. Where this is not possible the re-establishment of vegetation cover should be prioritised.

A.4.5 Landscape

The landscape response is an integral element of the mitigation strategy. Landscape areas have focused on achieving vegetated buffers between motorway structures and over looking residential properties in order to enhance both visual screening and the sense of a bushland corridor. In terms of the road user landscape has been used only in front of walls where a substantial space is available to achieve long lasting, minimal maintenance landscape outcomes. Visual quality for the road user is enhanced by improved design quality of structures and enhanced back drop rather than attempts to soften the road appearance between carriageway and structure.

The key elements of the landscape design comprise:

- Use of a landscape palette which is responsive to the differing vegetation communities through which the corridor passes;
- Strengthening of the bushland character to reinforce the perception of the Motorway being in a bushland corridor and to provide a sense of separation from adjacent properties;
- Screening of noise and retaining walls where practicable, particularly where residences are in close proximity;
- Use of landscape only in zones where it can be established, maintained and make a meaningful contribution to the visual presentation of the corridor.
- Use of vegetation to enhance environmental outcomes of the project.

The above considered approach to the design of the new urban and landscape elements for the M2 Motorway Upgrade will result in a presentation that is consistent with the existing character and through the integration of new higher standard design elements will provide a new desired character and identity for the M2 Motorway. In doing so the visual impacts of the proposed upgrade are reduced.

Executve Summary

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1.0 INTRODUCTION

1.1 Purpose of the document

Hills Motorway are proposing to upgrade the capacity of the M2 Motorway. Urban and Landscape Design consultants HBO+EMTB and Tract Consultants, have prepared an Urban Design and Visual Assessment Report, as a Technical Paper for the Environmental Assessment project approval process. The Report has been prepared as part of a collaborative design process with Hills Motorway, Leighton Contractors and AECOM.

The preparation of this report has been through a series of design iterations and consultations to ensure that all parties are aware of the visual/urban design issues associated with the proposal and have actively sought to minimise the impacts. The initial phase of this report was the formulation of the Framework Report the purpose of which was to determine a consistent urban design approach for the upgrade of the M2 Motorway. This set agreed objectives and principles and has guided the designers during the development of the design for the upgrade and related corridor improvements.

This document takes the Urban Design Framework document and builds upon its findings, expanding on the definition of the context, adding a visual assessment of the proposal, and providing an indication as to the treatments and measures that should be adopted to ensure that the impacts of the proposal are reduced and the visual character of the Motorway improved.

1.2 Director General Requirements

Urban Design has been assessed as being a key issue by the Director General for the Environmental Assessment process and requires the following:

"Urban Design and Landscape Issues - the Environmental Assessment must include consideration of the Urban design and landscape implications of the project, including identification of urban and landscape design objectives to enhance the current road corridor and to demonstrate how the proposed urban design elements of the project would be consistent with the existing (and desired) character of the area."

The Director General Requirements have been addressed in this Report as follows:

- Urban and landscape design objectives are identified in Section 4.0.
- The Visual Assessment documents the impact of the proposal on the existing context and potential mitigation which in turn informed the urban design concept.
- Existing and desired urban character is discussed in Section 2.0, 3.0 and 4.0 and demonstrated in Section 6.0.

1.3 The Proposal

The M2 Motorway is an important part of the Sydney Orbital Network connecting Sydney's north-west to the lower north shore and Sydney's CBD (Refer to Figure 3). Increased traffic volume on the motorway has resulted in the need to increase capacity and improve the level of service for users. The proposed M2 Upgrade project would include the following components:

- Widening and/or provision of a third lane along sections of the eastbound and westbound carriageways between Windsor Road and Lane Cove Road.
- Provision of new on/off ramps at Windsor Road and Herring Road.
- Widening and provision of a third lane in the Norfolk Road tunnel.
- A continuous shoulder which provides an emergency and cyclist lane.
- Upgrades to the Motorway's Operational Management and Control Systems.

1.4 Study Methodology

The undertaking of the visual assessment and urban design concept involved an iterative process in which preliminary information was provided to highlight key issues and constraints and potential ways of handling critical issues which were integrated into the engineering design. This ensured that a consistent character and identity was created for the Motorway. The findings of this preliminary analysis formed the Framework Report. The Framework documented the regional and local planning context through which the M2 Motorway passes.

An analysis of the physical context of the motorway was documented to assist in understanding the environment surrounding the motorway and the existing conditions of the natural and urban setting. This analysis took the form of field surveys and a desk-top study and was used to establish the key attributes of the motorway which in turn determine the urban character precincts and specific site constraints and opportunities. These were used to generate objectives and principles which form the urban design framework for the upgrade works. At that stage, information regarding the location and nature/extent of the works was not fully defined and so the report focus was to provide an overview of the typical issues and constraints which would be assessed in greater detail as the design evolved.

From this preliminary Framework Report, an Urban Design Visual and Assessment Report has been prepared. This document is a Technical Paper which supports the Environmental Assessment Report and has been compiled to meet the requirements of the Director General as part of the Part 3a Environmental Assessment Process.

1.5 Report Structure

The structure of the assessment follows that of the Framework Report but extends and expands on the information presented. Like the Framework Report it uses both desk top and field survey to define the context of the road in terms of physical characteristics. The initial assessment is reviewed and expanded with detail gathered to address the specific issues of the concept design. Information gathered from site comprised a review of all public areas, including streets, parks and so on to assess likely view points and impacts. Private properties were not accessed, although an assessment of proximity to the Motorway and likely impacts of the proposal have been made. From this recommendations of the treatments and strategies for implementation are described.

The structure of the report is as follows:

Section 1: Introduction

Section 2: Contextual Analysis: a comprehensive analysis, depicted through maps, photos and text, of the regional and local context, natural setting and urban setting adjoining the corridor. Character precincts and key attributes are identified which influence the design response.

Section 3: Visual Impact Assessment: describes the likely visual impacts of the project through a review of key vantage points and public spaces adjoining the corridor.

Section 4: Objectives and Principles: outlines urban and landscape design objectives and principles for the project.

Section 5: Opportunities and Constraints: an identification of key opportunities and constraints for the built and landscape elements of the M2 Motorway corridor, depicted through photos, text and sections.

Section 6: The Urban Design Concept: provides a description of the urban and landscape design proposal, including text, plans, sections, photomontages.

Section 7: Implementation Strategy.

Section 8: References.

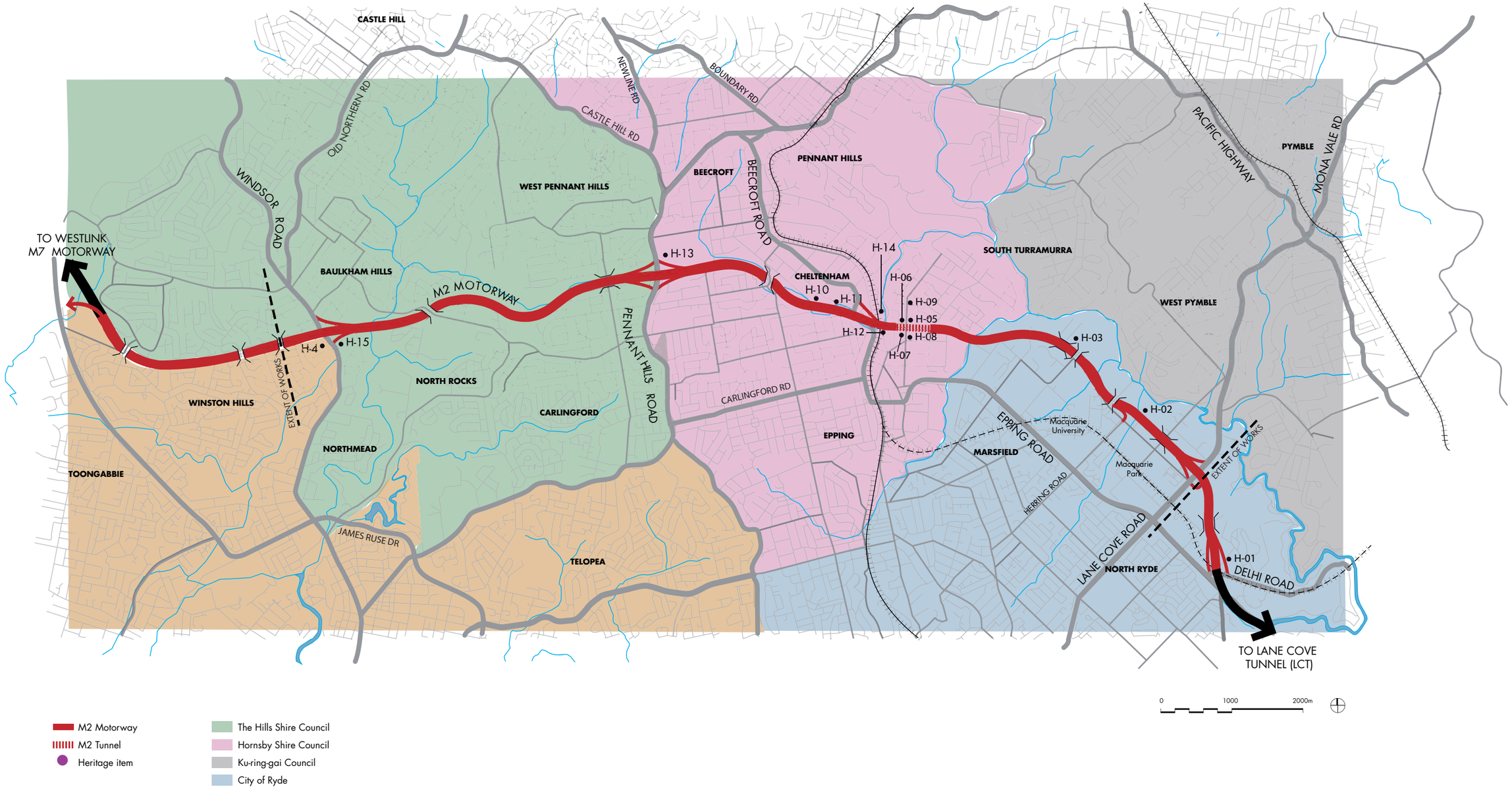


Figure 2.1 Local Council Areas

2.0 CONTEXTUAL ANALYSIS

2.1 Regional Context

Refer to Figures 2.1 and 2.2.

The M2 Motorway is a four lane dual carriageway which extends 21 kilometres from the intersection of Abbott Road, Baulkham Hills in the north-west, to Lane Cove Tunnel on the Lower North Shore. The shoulder, which provides an emergency and cyclist lane, also forms part of the Motorway. The M2 was opened to traffic on 26 May 1997 and forms an essential link in the Sydney Orbital motorway system.

Both the Westlink M7 and the Lane Cove Tunnel, recent high quality additions to the Sydney Orbital Network, contrast strongly with the older M2 which has a much lower quality of urban and landscape design. The quality of design is not only reflected in the appearance of the bridges, noise walls and retaining walls, but also in the vehicular travel experience due to the uneven road surface.

The current M2 Motorway does not take full advantage of its distinctive contextual setting. There is an opportunity through the functional upgrade of the motorway to capitalise on the bushland setting, through which the route passes, to improve the visual experience and provide a consistent and recognisable identity.

Photo 2.1 Aerial view of the M2 Motorway in its regional setting

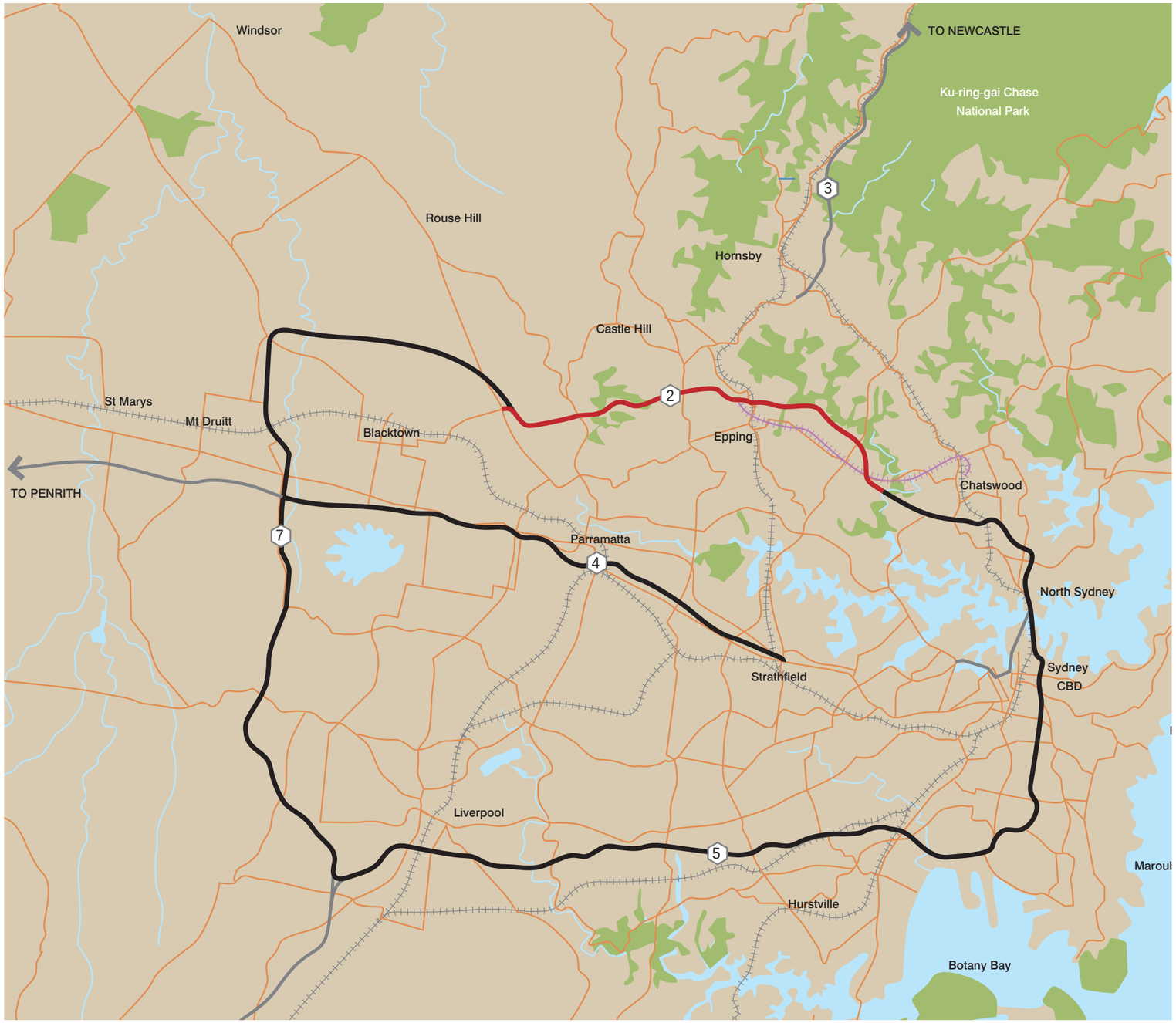


Figure 2.2 Regional Location

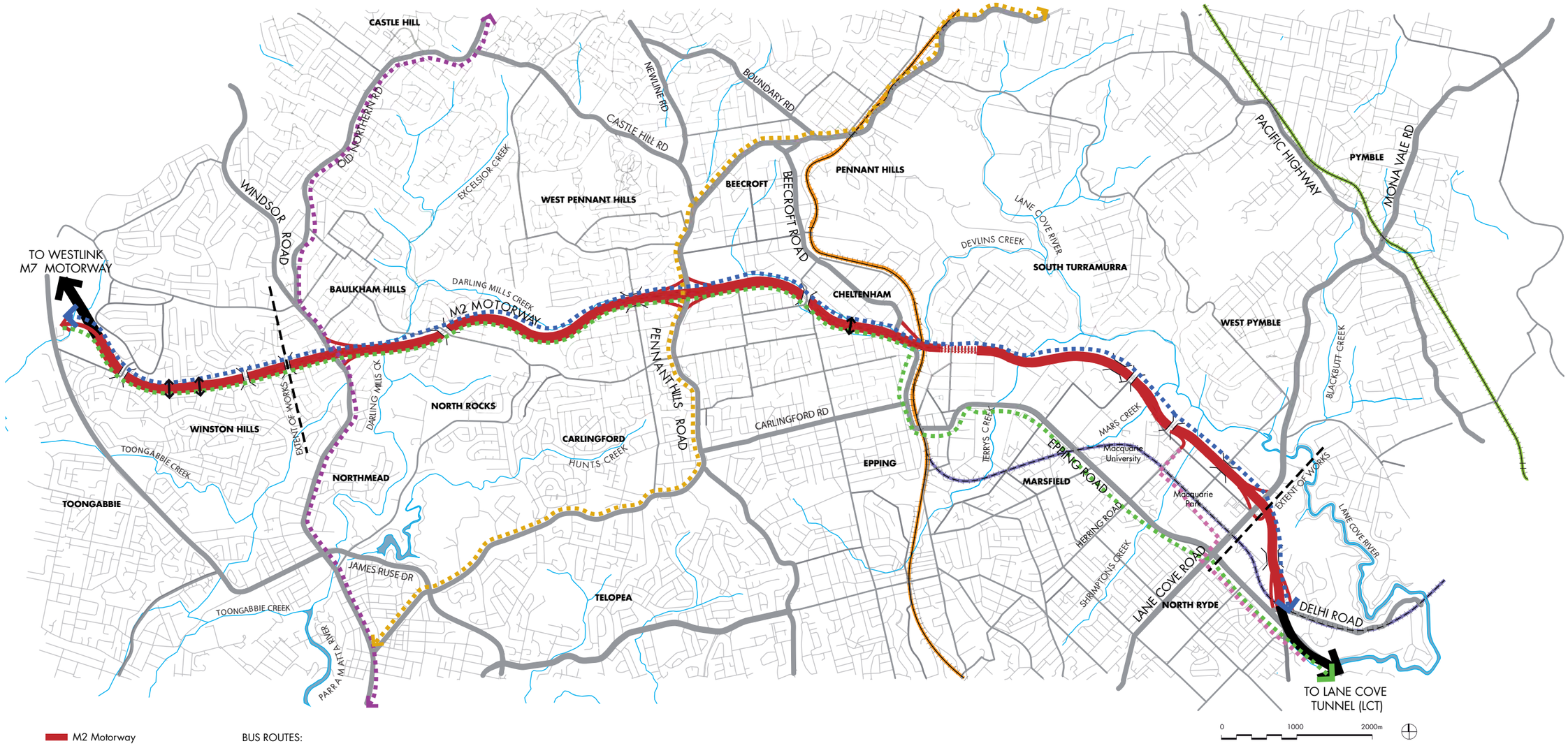


Figure 2.3 Public Transport Network

2.2 Local Context

Refer to Figure 2.3.

The M2 Motorway passes through Baulkham Hills, Hornsby and Ryde Local Government Areas (LGAs) and is in close proximity to Blacktown and Parramatta LGAs. The M2 Motorway passes predominantly through the urban development of the north-western suburbs of Sydney and the expanding commercial area around Macquarie Shopping Centre, Macquarie University and Macquarie Business Park. It was opened in 1997 to accommodate the transport needs of the growing population in these areas.

The north-western and central sections of the motorway are dominated by hilly land form and a residential built form character, resulting in a low scale suburban environment which is therefore not always evident to the travelling motorist. In the eastern section of the motorway, the topography flattens and the area close to Macquarie Shopping Centre, Macquarie University and Macquarie Business Park consists of large scale commercial and educational buildings which are visible along the edges of the corridor, as illustrated in Photo 2.2.

Connectivity with existing public transport networks are key functional attributes of the corridor. The Northern Rail Line crosses the motorway east of the Beecroft Road Interchange. The Chatswood to Epping rail line, recently opened, carries additional passengers to and from Macquarie University, Macquarie Park and North Ryde. It is estimated that this new rail line will increase the passenger movement and capacity requirements on the bus network which uses the M2 Motorway. Currently a two-lane eight kilometre busway (between the eastbound and westbound carriageways) operates along the M2 from Windsor Road to Beecroft Road and utilises bus stops in the median of the motorway, as illustrated in Photo 2.3.

Photo 2.2 Macquarie Business Park and Lane Cove National Park

Photo 2.3 Public bus stop in the median of the motorway at Carlingford

Figure 2.4 Topography

2.3 Topography

Refer to Figure 2.4.

The topography of the site varies as the road traverses both ridges and valleys as the route heads east towards the centre of Sydney.

The current road alignment is generally not responsive to the landform through which it passes, slicing through the landscape, with cuttings, tunnels, high embankments, retaining walls and bridges used to achieve the road design requirements. This to some extent removes the road user from the contextual experience. Despite this there are a number of key topographical characteristics which remain evident and inform the user of their journey progress.

From Abbott Road heading east, the motorway traverses the Cumberland Plain, characterised by flat terrain and few creek lines. Just west of the Windsor Road intersection, the plain is terminated by a valley, Northmead Gully. The creek in the gully flows to the south-east through an adjoining reserve. The road here is located on reinforced earth walls and the road user is unaware of the topography through which they are passing. East of this valley, you move onto the Hornsby Plateau.

Windsor Road straddles the main ridge line of the Hornsby Plateau and is marked by a distinct change in topography as the Motorway heads east. The Motorway crosses the deeply incised Darling Mills Creek as it drains to the south and the Parramatta River system. North of this crossing Darling Mills Creek and the Stevensons Creek system converge. At this point Darling Mills Creek runs east where it joins the Blue Gum Creek system which has its source near Pennant Hills Road. This drainage corridor runs parallel to the M2 corridor, the character of which is defined by the remnant vegetation cover of the Bidjigal Reserve. The Pennant Hills Road Interchange marks the highest point along the corridor, defines the two key drainage catchments of the Parramatta and Lane Cove River systems, and is the edge between two character precincts.

Travelling east, the motorway traverses the Devlins Creek Valley running parallel to the creek line until its approach to Beecroft Road (refer Photos 2.5 and 2.6). The motorway descends from 100 metres at Burns Road, Beecroft, to a low of 60 metres at Beecroft Road. The corridor here is lined both by public open space/reserves and housing.

From Beecroft Road, the motorway cuts deeply into the topography at the edge of the Hornsby Plateau. The motorway alignment avoids traversing this steeper landform by tunnelling beneath Norfolk Road, as illustrated in Photo 2.7. East of Norfolk Tunnel the landform descends towards Terrys Creek.

Between Terrys Creek and Delhi Road the motorway crosses five creek lines including Shrimptons Creek near Alma Road (refer to Photo 2.8), Mars Creek between Culloden Road and Christie Road and three unnamed creeks. The valley of Terrys Creek marks the edge of this first precinct with its incised channel some 30 metres below the adjoining ridge.

In the eastern half of the corridor the motorway is generally located at the edge of a broad flat ridge, as depicted at the toll plaza in Photo 2.9, with an elevation of approximately 50 metres. This ridge line is cut by the natural cross drainage which typically flows to the northeast before entering the adjacent Lane Cove River. The Lane Cove River, runs parallel to the motorway and flows to the south east.

Photo 2.4 The ridgeline prior to Darling Mills Creek valley

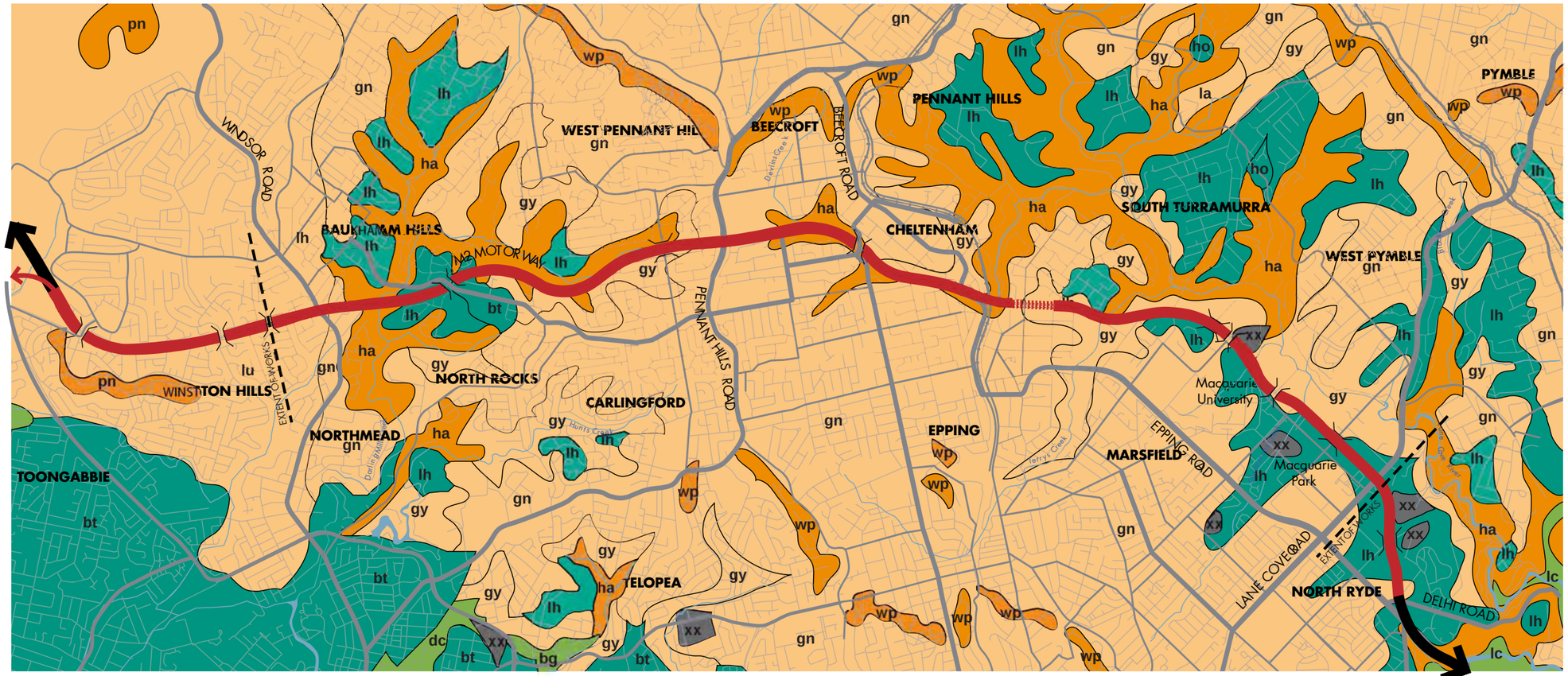
Photo 2.5 Devlins Creek runs parallel to the M2 which is constructed on a retaining wall

Photo 2.6 View west over Devlins Creek valley

Photo 2.7 Eastern portal of Norfolk Road Tunnel

Photo 2.8 Bridge over Shrimptons Creek

Photo 2.9 Toll plaza located on the broad flat ridge



Source: Soil Landscapes of the Sydney 1:100,000 Sheet, Soil Conservation Service of NSW, Chapman, G.A and Murphy, C.L. (1989) and Soil Landscape of the Penrith 1:100,000 Sheet, Soil Conservation Service of NSW, Bannerman, S.M and Hazelton, P.A (1989).

LEGEND (Soil Landscape Groupings)

	Residual		Colluvial		Fluvial		Erosional		
lh	Lucas Heights	ha	Hawkesbury	dc	Deep Creek	gy	Gymea	lu	Luddenham
bt	Blacktown	pn	Picton	bg	Birrong	gn	Glenorie		**Disturbed**
ho	Hornsby	wp	West Pennant Hills	lc	Lane Cove	la	Lambert	xx	Disturbed Terrain

Figure 2.5 Geology

2.4 Geology

Refer to Figure 2.5.

The geology of the area is typical of Sydney and is dominated by sandstone. In assessing the geology of the area five soil units have been identified in accordance with Soil Landscapes of Sydney (Chapman and Murphy, 1989). These are Luddenham, Hawkesbury, Glenorie, Gymea and the Lucas Heights soil landscapes. These landscapes have distinct landforms and soil characteristics which may influence the landscape design response for the motorway.

Luddenham

The Luddenham Soil Landscape characterises the corridor west of Windsor Road. This landscape is underlain by the Wianamatta Shale Group and is composed of Ashfield and Bringelly shale formations, between which Minchinbury sandstone is interlaid.

This soil is of low to moderate fertility and is highly erodible.

Glenorie

Glenorie Soil Landscape occurs as minor incursions at the western end of the corridor and on the Hornsby Plateau. Soil is underlain by the Wianamatta Group composed of the Ashfield shale and Bringelly shale formations. Ashfield shales are characterised by laminates of dark grey shale and Bringelly shale consisting of a shale calcerous claystone and lithic quartz sandstone.

Soils are of low to moderate fertility, with high available water capacity, and are acidic. The soils are of moderate erodibility.

Hawkesbury

Hawkesbury Soil Landscape is located between Windsor Road and Pennant Hills Road where it occurs in association with Blue Gum and Darling Mills Creeks, as depicted in Photo 2.11. The unit is characterised by steep rugged sandstone slopes and ridges of Hawkesbury sandstone which is a medium to coarse grained quartz sandstone with minor shale laminate lenses. A second area adjoins the Gymea landscape where the motorway follows the Devlins Creek Valley.

Fertility of soils in this landscape is very low, strongly to extremely acidic, with low to very low nutrient availability. These soils are typically shallow and stony.

Gymea

The Gymea Soil Landscape occurs in steeper terrain west of Terrys Creek and is evident by increased valleys. The steeper terrain is highlighted by the Norfolk Road Tunnel as depicted in Photo 2.12 and reveals the character of this rock. It marks the edge of the Hornsby Plateau. The geology is Hawkesbury sandstone which is a medium to coarse grained quartz sandstone with minor shale laminate lenses. The geology is similar to the Lambert and Hawkesbury Soil Landscapes.

Soils within this area are shallow stony, moderately acidic and highly permeable, with very low nutrient levels. The soil is subject to high erosion risk when exposed.

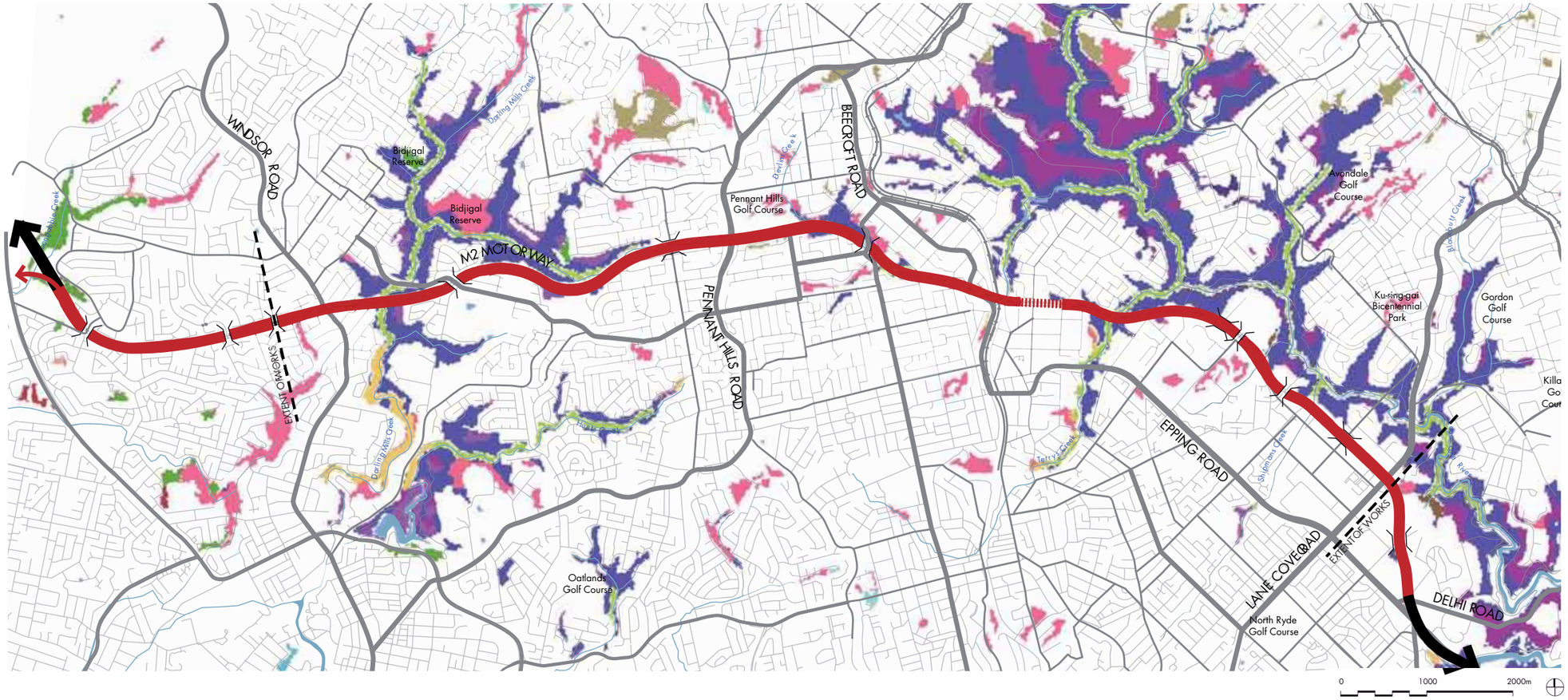
Lucas Heights

The Lucas Heights landscape is typified by the Mittagong formation which is characterised by interbedded shale, laminate and fine to medium grain quartz sandstone. A small incursion occurs towards the western end at Barclay Road. Soils here are generally of low fertility and nutrient availability, hard setting and stony. The subsoils are occasionally sodic and impermeable. When exposed they are of moderate erodibility. This landscape is located predominantly at the eastern end of the corridor, between Terrys Creek and Delhi Road where the motorway runs along a relatively flat ridge.

Photo 2.10 Shale seam in sandstone dominated geology

Photo 2.11 Sandstone is exposed in the motorway cuttings

Photo 2.12 Tunnel portal area reveals the local geology



Legend

- Blue Gum High Forest
- Coastal Sandstone Gully Forest
- Coastal Sandstone Ridgetop Woodland
- Coastal Warm Temperate Rainforest
- Cumberland River Flat Forest
- Cumberland Shale Hills Woodland
- Cumberland Shale Plains Woodland
- Cumberland Shale Sandstone Transition Forest
- Hinterland Sandstone Gully Forest
- Lower Blue Mountains Wet Forest
- Sandstone Riparian Scrub
- Sydney Hinterland Transition Woodland
- Sydney Swamp Forest
- Sydney Turpentine Ironbark Forest

Source: DECC, 2009; MapData Sciences; Tozar et.al (2006) Native vegetation of southeast NSW

Figure 2.6 Vegetation

2.5 Vegetation

Refer to Figure 2.6.

The vegetation of the M2 Motorway corridor is a mix of revegetation works, undertaken as part of the original development, stands of remnant vegetation and weeds.

The natural vegetation of the region is preserved in National Park or Reserves along with isolated remnant stands within the urban fabric of the adjoining residential areas. These provide the basis for determining the likely communities to be used in revegetation works associated with the upgrade.

Tozer et al 2006, has mapped the communities adjoining the corridor as part of a study on Native Vegetation of Southeast NSW which identifies a number of key communities along the route. These communities are limited in that they are predominantly associated with the valleys where vegetation has been preserved. Despite this they appear to provide a good indication of likely communities and associations which would have once occurred along the alignment.

1. Hinterland Sandstone Gully Forest is a tall open forest in which *Eucalyptus pilularis* (Blackbutt), *Angophora costata* (Smooth barked apple) and in some locations *Syncarpia gummifera* (Turpentine) are dominant. Refer Photos 2.13 to 2.15. Under the canopy a moderately dense sub canopy of *Allocasuarina littoralis, A. torulosa, Banksia serrata, Ceratapetalum gummiferum*, and *Elaeocarpus reticulatus* occurs. The understorey is sparse to moderately dense with *Acacia linifolia, Dondonea triquetra, Grevillea linearifolia, Leptospermum trinervium* and *Pultanea flexilis*. The ground layer includes *Dianella caerulea, Entolasia stricta, Lomandra longifolia, Microlaena stipodes*, and *Pratia purpurascens*.

   This community occurs within gullies on Hawkesbury Sandstone with enriched soils as a result of the influence of the Wiannamatta group of shales within the sandstone bedrock. It is the dominant community within the corridor and adjacent to it.

2. Sandstone Riparian Scrub is found in narrow bands along creeklines within sandstone gullies. Dominant canopy species include *Ceratapetulum apetalum, Tristania laurina*, and *Callicoma serrata*. The understorey is composed largely of ferns including *Adiantum aethiopicum, Blechnum ambiguum*, and *Sticherus flabellatus*. *Lomandra longifolia* is also a common element of the understorey.

   This community occurs along all creeks within the corridor with the most intact occurrences at Darling Mills Creek and Terrys Creek.

3. Sydney Turpentine Ironbark Forest is a listed community under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. It is an open-forest of mixed and varying canopy species composition, in which *Syncarpia glomulifera* (Turpentine) and *Eucalyptus crebra* and/or *E. fibrosa* (ironbarks) are dominant. Other tree species include *Corymbia gummifera, E. saligna , E. punctata , E. cypellocarpa*, and *E. deanei*. Low tree and shrub species include *Acacia parramattensis, Breynia oblongifolia, Dodonaea triquetra, Leucopogon juniperinus, Notelaea longifolia, Ozothamnus diosmifolius, Pittosporum revolutum, P. undulatum, Polyscias sambucifolia* and *Maytenus silvestris*. Ground layer species include *Adiantum aethiopicum, Austrostipa pubescens, Dianella caerulea, Dichondra repens, Entolasia stricta, Lomandra longifolia, Poa affinis, Pseuderanthemum variable* and *Themeda australis*. Climbers include *Eustrephus latifolius, Glycine clandestina* and *Pandorea pandorana* (DEWHA 2009). Its distribution within the corridor has been questioned with similarities drawn between it and the Hinterland Gully Forest, however, it is considered it would have been the dominant community west of Windsor Road where a transition to shale derived soils becomes stronger.

4. Blue Gum High Forest is listed community under the Threatened Species Conservation Act, 1995; and Environmental Protection and Biodiversity Conservation Act, 1999. It is a moist tall open forest community which would have once occurred along sections of the corridor. Today it is limited to a narrow band between the M2 and Pennant Hills Golf Course. Dominant species include *Eucalyptus pilularis, E. saligna, E. paniculata, Angophora costata*, and *Syncarpia glomulifera*. It will not be impacted as part of the works.

5. Coastal Sandstone Ridgetop Woodland is an open dry sclerophyll community which occurs on the shallow sandy soils of the ridge tops and exposed slopes. This community is interpreted as likely to have occurred east of Terrys Creek. Dominant canopy species include *Angophora bakeri, A. costata, Corymbia gummifera, Eucalyptus haemastoma* and *E. piperita*. The understorey frequently includes *Banksia spinulosa, Isopogon anemonifolius, Leptospermum trinervuium, Dillwynia retorta, Eriostemon australis*. Some of the likely shrub species are illustrated in Photo 2.16 to 2.19.

   The existing revegetation works have had mixed success. While canopy trees are beginning to emerge above the noise walls, the understorey is heavily infested with weeds.

The landscapes success has been limited by a number of factors:

1) Topsoil depths - this has been an issue particularly in cuttings where exposed rock and subgrades are left exposed with no provision for achieving a vegetative cover.
2) Space - the narrow corridor has meant that landscape spaces have been limited to narrow strips which have poor microclimate due to reflected heat from tarmac and adjoining walls and soil preparation has been limited by access.
3) Weed infestation – due to adjoining suburban influences and the disturbance created by the initial construction works and the linear nature of the corridor, the area has suffered significant weed infestations.

Weed species including small leaf privet, lantana and cestrum to name just a few. All are listed on the noxious weed register and require control activities to be implemented. In addition to these weeds, numerous woody weeds are also evident. Control of weed species will be an important consideration in undertaking the new works as the level of infestation present could rapidly affect any new works adjacent.

In moving forward, the upgrade works need to consider the viability of the landscape works within confined zones, the ability to access and maintain the landscape and the role the landscape can play in both improving the character of the corridor by unifying its appearance and relating it back to its natural context.

Photo 2.13 Hinterland Sandstone Gully Forest adjoining Kirkham Street

Photo 2.14 Angophora costata and Syncarpia glomulifera

Photo 2.15 Eucalyptus pilularis and Syncarpia glomulifera

Photo 2.16 Sandstone ridgetop woodland

Photo 2.17 Leptospermum laevigatum

Photo 2.18 Banksia spinulosa

Photo 2.19 Grevillea speciosa

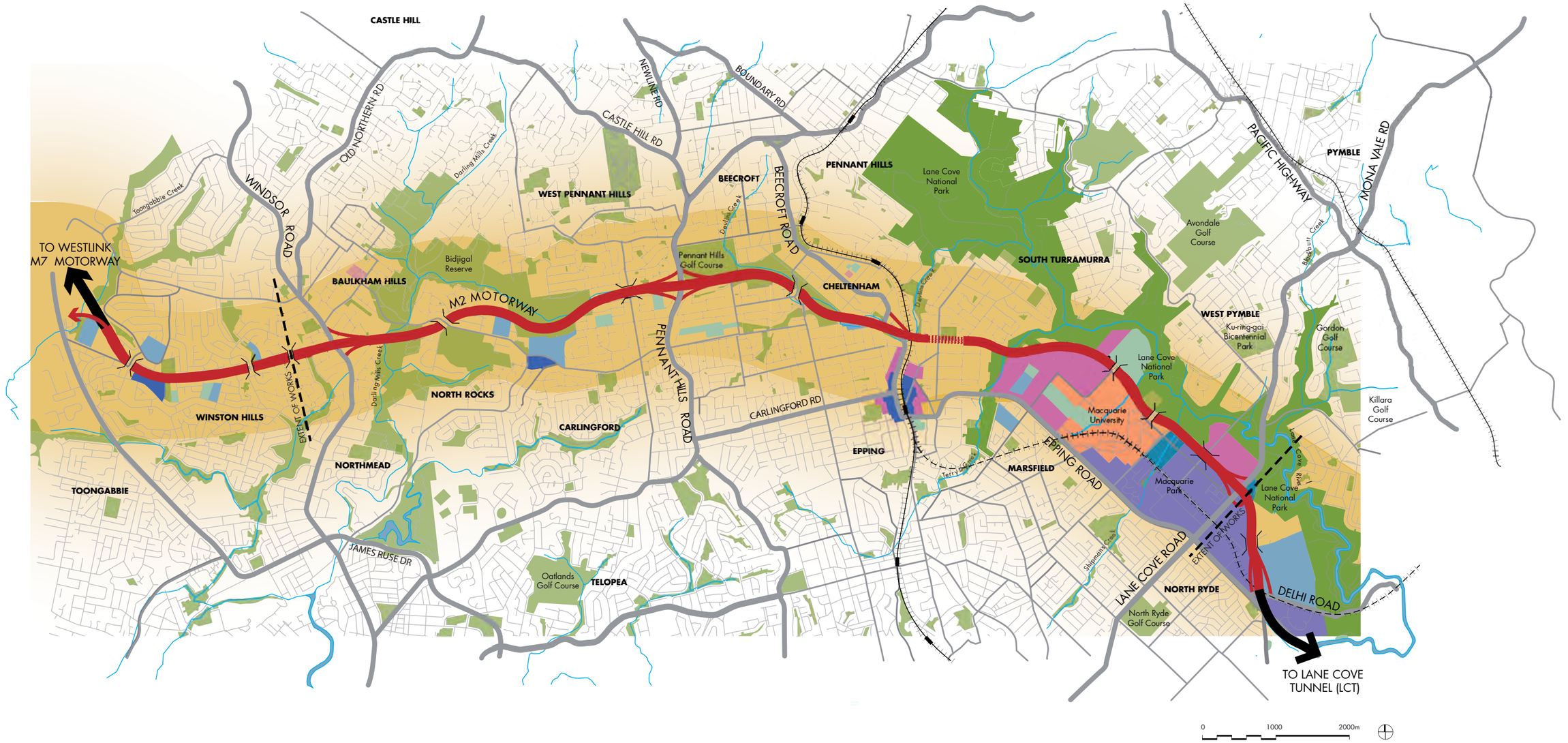


Figure 2.7 Land Use Character

2.6 Land Use Character

Refer to Figure 2.7.

The existing land uses along the edges of the Motorway corridor characterise the visual qualities of the corridor and its landscape setting. The land use character and zonings comprise generally low and medium density residential housing, commercial such as Business Parks, National Parks and Reserves and special uses such as schools and universities.

West of Windsor Road comprises a large industrial area and residential belt which is set into the vegetation and geology of the sparse, flat, Cumberland Plain surroundings. As you travel east, the Plains are replaced by an undulating forest reserve.

The north-western and central sections of the study area are predominantly zoned residential, resulting in a low scale suburban environment with a bushland feel. The numerous street tree plantings along local roads and the hilly topography associated with Bidjigal Reserve and the bushland in Baulkham Hills creates a pleasant leafy suburban environment, as illustrated in Photo 2.20. Heading east towards Pennant Hills Road, the undulating hilly bushland of Bidjigal Reserve and residential Baulkham Hills transition to the low-lying landform of the creek valley.

A small retail and commercial activity node is concentrated around Epping Train Station and a traditional suburban neighbourhood radiates out from that centre. East of Beecroft Road, Lane Cove National Park along with various recreational parks, reserves and vegetated corridors visually dominate the northern edge of the motorway resulting in a leafy suburban character. There is a distinct shift in character after the Terrys Creek Valley from a low scale residential and creek valley character to a larger scale commercial urban form.

The eastern end of the study area includes Macquarie Business Park, Macquarie University and Macquarie Shopping Centre. With the recently completed Epping to Chatswood train line this area has experienced a surge in medium-density residential and large-scale commercial development (as illustrated in Photo 2.21). As a result, the area is now densely populated, and is visually dominated by new multi-storey commercial office built form. On the northern side of the M2 Motorway, the natural vegetation of the Lane Cove National Park and the grassed sports grounds of the University visually contrast with the built up urban areas to the south.

Photo 2.20 Terrys Creek Bridge and low scale residential housing at North Epping

Photo 2.21 Medium density residential housing adjacent to the M2 Motorway at Marsfield

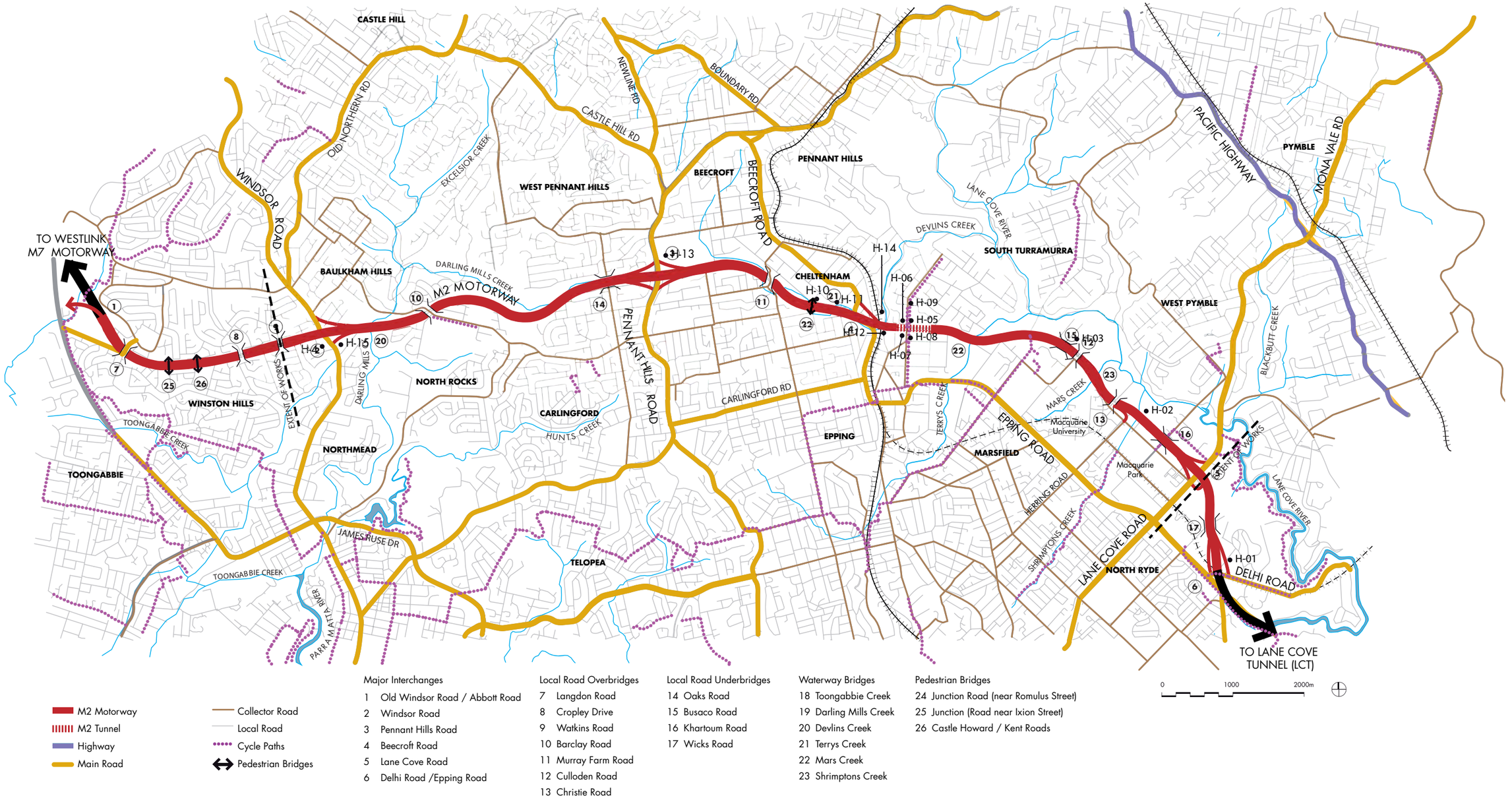


Figure 2.8 Vehicular, Pedestrian and Cyclist Network

2.7 Local Access

2.7.1 Vehicular Networks and Major Road Infrastructure Elements

Refer to Figure 2.8.

The M2 intersects with several arterial roads resulting in the six (6) major roads interchanges on the M2 Motorway:

- Old Windsor Road/Abbott Road
- Windsor Road
- Pennant Hills Road
- Beecroft Road
- Lane Cove Road
- Delhi Road
- Epping Road.

Whilst the regional road network was not affected by the construction of the M2 Motorway in 1997, the network of local roads were impacted. A series of north-south lateral connections in the form of overbridges, pedestrian bridges and pedestrian underpasses was constructed to provide safe access and good connectivity for the communities living adjacent to the motorway. There are seven (7) locations where local roads cross the M2 on overbridges:

- Langdon Drive
- Cropley Drive
- Watkins Road
- Barclay Road
- Kirkham Street
- Culloden Road
- Christie Road.

There is one tunnel where the motorway cuts through a major hill at Epping allowing local roads, Norfolk Road and Constance Close, to retain access along the original topography.

There are three (3) locations where the motorway crosses over the local roads on underbridges:

- Oaks Road
- Busaco Road (Refer Photo 2.22)
- Khartoum Road
- Wicks Road.

Within the study area, the motorway crosses seven (7) creeks/waterways along the route. The underbridges and viaducts upon which the motorway traverses the creeks create additional connections for the communities living adjacent to the corridor. They are often located within bush reserves or parks and effectively extend the open space network from north to south. The creeks crossed by the motorway include:

- Shipmans Creek
- Toongabbie Creek
- Darling Mills Creek
- Devlins Creek (in multiple locations)
- Terrys Creek
- Mars Creek
- Shrimptons Creek.

2.7.2 Pedestrian and Cyclist Networks

Refer to Figure 2.8.

There are three (3) locations where pedestrian bridges cross the motorway:

- Junction Road (near Romulus Street), Baulkham Hills
- Junction Road (near Ixion Street), Baulkham Hills
- Castle Howard and Kent Roads, Epping (Refer Photo 2.23

There are no shared path facilities provided along the M2 Motorway, creating a missing link in the shared path network which extends from the Westlink M7 to Old Windsor Road to the west and from the Gore Hill Freeway to Epping Road to the east. Until 2007, commuter cyclists utilised both east-bound and west-bound shoulders. Temporary road widening utilised the shoulder area heading west bound, forcing cyclists to detour through local streets in North Ryde/ Macquarie Park, Marsfield and Epping.

The community is at present generally not well linked to the corridor. Pedestrian, cyclist and public transport links to the North West Transitway, Beecroft Road, Windsor Road, Pennant Hills Road, Macquarie Business Park and the Macquarie University precinct are connections that could potentially be improved.

Existing path networks below the M2 Motorway alignment occur at places such as at Devlins Creek and Terrys Creek.

Photo 2.22 "Bebo" arch bridge over Busaco Road

Photo 2.23 Pedestrian bridge near Epping Heights Primary School

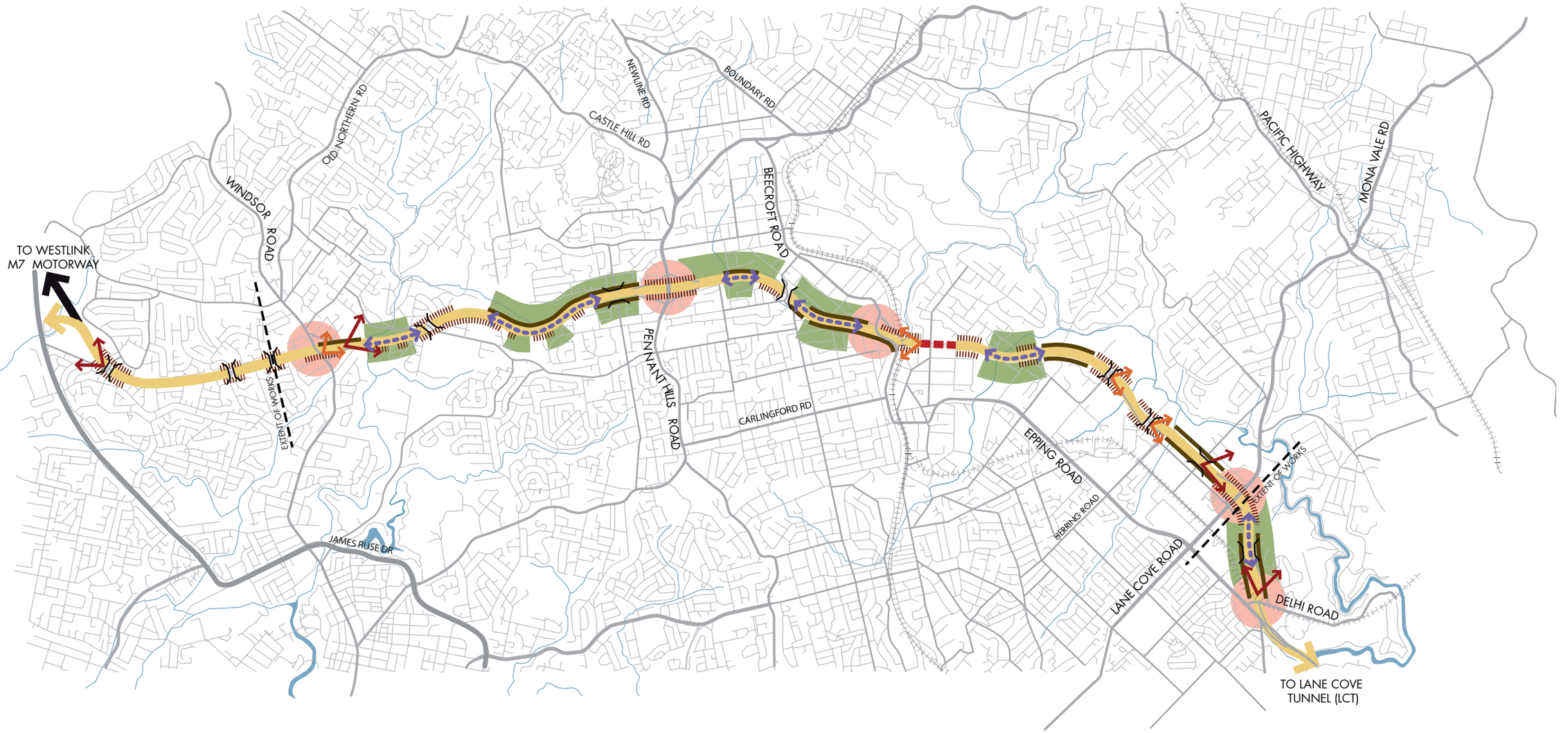


Figure 2.9 Motorway Elements and Views

2.8 Motorway Elements and Views

Refer to Figure 2.9.

The Motorway travels through a highly populated area of metropolitan Sydney with Motorway built elements, such as noisewalls, dominating most of the corridor. Along many lengths of the motorway the views are confined to the road corridor, opening up only occasionally. Figure 2.9: Motorway Elements and Views, illustrates the Motorway elements, views and vegetated edges of the corridor. It is these elements which determine the character of the Motorway and which reflect the topography, geology and vegetation through which the Motorway passes.

The six major intersections create decision points for the motorists. These intersections are defined by large bridge infrastructure overpasses crossing the motorway, with on and off-ramps and increased directional signage and road furniture, such as street lighting. The man-made built structures dominate, with large cuttings and/or retaining walls visually limiting the motorway views.

East of Windsor Road is the undulating hilly bushland of residential Baulkham Hills and Bidjigal Reserve. The typography creates a dynamic and unique backdrop with views both north and south into the forest of Bidjigal Reserve. In most cases, the motorist is unaware of the residential housing outside the road corridor as noise walls interrupt the flow of the landscape and restrict views from the motorway.

The noise walls, despite efforts to camouflage the structures by painting them green, are visually dominant along much of the route. The stepped top edge profile and variable distance from the road edge creates a jagged and inconsistent visual line in direct contrast to the smooth flowing alignment of the motorway, the rolling hills of the area and the visual 'softness' of the vegetation.

Towards Pennant Hills Road, the Motorway alignment descends into the low-lying landform of the creek valley. Pennant Hills Road intersection is a strong, hard-edged built form, as illustrated in Photo 2.24. The motorway burrows beneath the wide bridge resulting in high vertical retaining walls. The walls are not well designed and finishes consist of shotcrete with exposed rock bolts. Planting on top of the bridge structure softens and greens the wide expanse of asphalt.

The overbridge structures along the Motorway are generally poorly resolved with the overall structural form and pier/headstock detailing creating a solid and overly bulky visual impression. At Beecroft Road intersection, visual complexity is created with the additional crossing of the Northern Rail Line, the overpass structure for buses and a series of messy, complicated noise walls and cuttings.

The Norfolk Road Tunnel is a major built form landmark and memorable experience on the Motorway journey. However, the height of the portal cuttings, the darkness and narrowness of the tunnel itself can be visually overbearing and contribute to driver anxiety. The exposed sandstone around the portal entry is attractive and creates character. (Refer to Photo 2.25)

The built form context outside the corridor, heading towards the commercial hub of Ryde, is low-scale residential housing. The residential housing is not visible from the Motorway due to large areas of vegetation, topographic changes and noise wall structures. The motorist's vision is often limited to views within the corridor framed by noise walls or rock cuttings creating a strongly defined built edge.

Large sandstone cuttings run parallel to the Motorway, where the road is lower than the surrounding topography. The natural sandstone is attractive and warmly coloured enriching the visual travel experience. The cuttings also create a hard edge contributing to restricting the motorist views of the Motorway. In multiple locations the cuttings have been stabilised with shotcrete creating a dull, colourless vertical or near-vertical wall. Often vegetation is visible at the top of the cuttings, softening the overall effect.

The urban development of Macquarie Shopping Centre, Macquarie University and Macquarie Business Park provides a strong indication of the land use and built character at the eastern end of the motorway. Larger scale commercial buildings are visible along the edges of the corridor and large expanses of sky are visible as the size and scale of the vegetation increases.

In the eastern section of the motorway, the topography is relatively flat and has a soft vegetated edge as it passes parts of Lane Cove National Park and Macquarie Park Cemetery. A slightly elevated regional view of the tree canopy is available when heading west, providing an indication of the natural environment and well-vegetated road corridor through which the motorist is passing. There are no visible noise walls in this section of the motorway and the visually dominant built items are the expanse of asphalt and the steel W-beam and concrete Type-F traffic safety barriers.

Photo 2.24 The strong built form structures at the intersection of the M2 Motorway with Pennant Hills Road

Photo 2.25 Sandstone cuttings and noise walls at the western Norfolk Road Tunnel portal

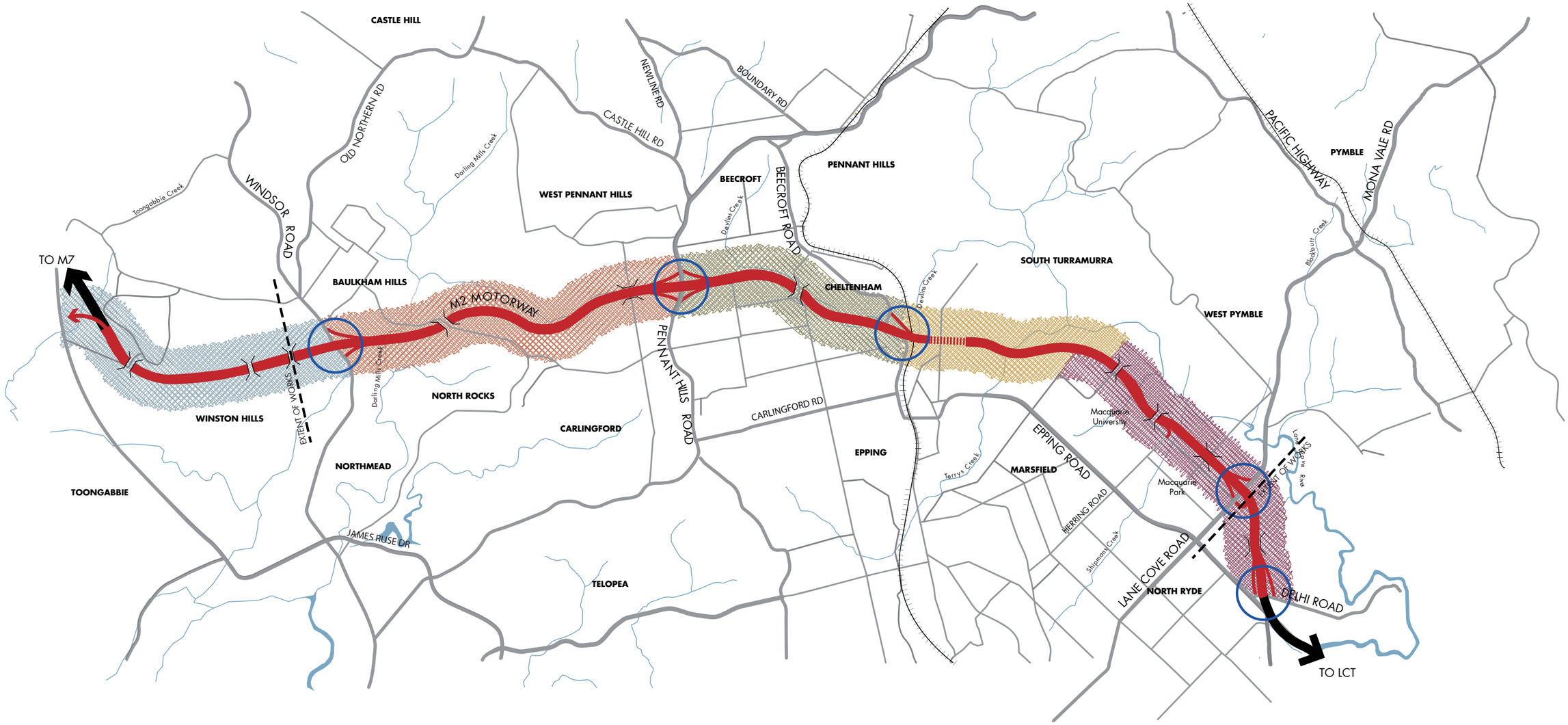


Figure 2.10 Character Precincts

2.9 Character Precincts

Refer to Figure 2.10.

The distribution and frequency of key visual qualities, built elements and vegetation along the corridor define the different character experiences. When combined with the adjoining land uses these form distinct precincts with specific visual qualities. The following four precincts have been identified through the contextual analysis:

Precinct 1 Old Windsor Road to Windsor Road Interchange – Cumberland Plain

Located at the western end of the upgrade, this section is typified by a change in vegetation and geology as it travels onto the flatter topography of the Cumberland Plain to the west.

Here the motorway vertical alignment adopts a flatter less undulating profile and becomes more open in character, despite the presence of noise walls. This in part relates to the wide grassed median which appears for the first time along the route. The flatter topography of the Cumberland Plain starts to become evident to the west as you look towards Abbott Road. (Refer to Photo 2.26)

Precinct 2 Windsor Road to Pennant Hills Road – Bushland Interface

Located in the western half of the central section, this area is characterised by the Motorway alignment curving over and around the hilly terrain associated with the Bidjigal Reserve and the bushland in Baulkham Hills. The dramatic topography provides a diverse travelling experience with some views of the surrounding bushland.

This section contrasts with the preceding precinct in that its character is more closely associated with the natural attributes of the adjacent context with less of a suburban feel. The hilly sandstone terrain adjacent to the Bidjigal Reserve creates a strong bushland edge to the corridor. (Refer to Photo 2.27)

Precinct 3 Pennant Hills Road to Beecroft Road / Devlins Creek – Suburban Forest Interface

Located in the central section of the corridor this area is characterised by the natural vegetation of a series of nature reserves, which connect along the Devlins Creek Valley and the traditional suburban development with leafy gardens associated with the suburbs of Carlingford, Cheltenham, and Epping.

Passing through the valley of Devlins Creek the Motorway moves higher up the plateau into strongly undulating terrain which rises either side of the road corridor. While heavily treed a stronger mix of exotic and native canopies is more evident than the adjoining precincts. Exotic trees are evident from their bright green foliage in summer. Beyond the noise walls the traditional suburban development with leafy gardens can be viewed outside the road corridor. (Refer to Photo 2.28)

Precinct 4 Beecroft Road /Devlins Creek to Terrys Creek – Suburban Bushland Interface

Norfolk Road Tunnel marks the western edge of this Precinct as it cuts through the ridge defining the edges of Terrys Creek and Devlins Creek catchments. East of the ridge line the road crosses the Terrys Creek valley dominated by the natural forest landscape typical of the area. (Refer to Photo 2.29)

Precinct 5 Crimea Road to Delhi Road – Urban Bushland Interface

Located at the eastern end of the corridor this area is characterised by the urban environment associated with North Ryde and Macquarie Park. Located to the south of the corridor, these corridor edges are dominated by large scale multi-storey commercial office buildings.

North of the corridor a softer edge is visible with the landscape flowing into the Lane Cove National Park. From within the corridor the strength of this edge is weakened by the presence of sports ovals and disturbed landscapes impacted by weeds and exotic plantings.

The southern edges of the corridor are dominated by large scale commercial buildings with low bushland along the northern edge. (Refer to Photo 2.30)

Photo 2.26 Precinct 1 - Western view from Windsor Road

Photo 2.27 Precinct 2 - Eastern view from Barclay Road

Photo 2.28 Precinct 3 - Western view from the top of Norfolk Road tunnel portal

Photo 2.29 Precinct 4 - Forest near Terrys Creek

Photo 2.30 Precinct 5 - Eastern view from Christie Road

2.10 Key Visual Attributes

The M2 Motorway corridor was subjected to a critical visual analysis and this section provides a description of the key visual highway elements and landscape treatments within the corridor which will influence and provide a guide for the M2 Motorway Upgrade design response. There are three key visual attributes to the existing corridor:

1. Built Form

Built infrastructure elements presently dominate the corridor. Noise walls and bridge structures are generally poorly resolved and not integrated with their surrounds. The present built fabric is considered by the RTA as an example of "what not to do". Small simple interventions and careful integration of any new structures, as part of the M2 Upgrade Works, could provide the opportunity to improve the M2 Motorway urban design reputation. (Refer to Photo 2.31)

2. National Parks, Forests and Reserves

The National Park, Forests and Reserves form one of the distinctive edge characteristics along the length of the corridor. The scale of this borrowed vegetation has the potential to redefine the corridor if strengthened by strategic urban and landscape design interventions as part of the M2 Upgrade Works. (Refer to Photo 2.32)

3. Sandstone

The underlying sandstone geology of the route defines the character of the road corridor where it is exposed in cuttings. (Refer to Photo 2.33)

Photo 2.31 Bridge abutment at Beecroft Road Interchange

Photo 2.32 Forest adjacent to motorway

Photo 2.33 Sandstone cutting

3.0 VISUAL ASSESSMENT

3.1 Introduction

The visual assessment has been undertaken to inform the concept development process for the project in order to assist in the avoidance and mitigation requirements of potential impacts up front. The outcomes of this are reflected in the Urban Design Concept in Chapter 6.

The visual assessment of the corridor considers the impacts of both permanent and temporary works as part of the assessment process. The inclusion of temporary works is considered an important issue as they have the potential to have long term impacts beyond the period of construction, as well as to have impacts on areas beyond the immediate impacts of the works.

In assessing the visual impacts of the proposed upgrade two key viewer groups need to be considered, these are:

The Motorway Viewer - those looking into or over the motorway corridor (i.e. its neighbours). The impact on views will vary according to distance from and nature (scale, colour, texture, form) of the change proposed. The way in which the impact is considered will vary according to land use or the sensitivity of the viewer.

The Motorway User - those people travelling the motorway. The motorway user will be aware of the immediate environs and experience of the space as a cumulative sequence of views, rather than focusing on specific elements. Visual properties experienced by the motorway user are defined by the built structures of the motorway itself and the landscape beyond the corridor.

Key amongst these attributes are:

- The visual impact of poorly integrated and detailed noise walls. This element plays a significant role in defining the character of the motorway. At present opportunities to limit the impact of the noise walls are lost as a result of: poor and inconsistent colour selection; and poor detailing that emphasises the scale of the walls;
- The character of bridge structures over the motorway; and
- The vegetation of the adjoining National Park and reserves.

The responses and needs of these two groups differ due to the static nature of one of the viewers - the adjacent residents and the transitory nature of the other – the motorway user.

In assessing the impacts of the proposal both groups need to be considered and a clear methodology for the assessment defined. This chapter:

- defines the Visual Assessment Methodology,
- provides a general context of the project, and
- provides a detailed assessment of each precinct based on the visual assessment methodology.

The final recommendations of this process are then reflected in the Urban Design Concept covered in Chapter 6.

3.2 Visual Assessment Methodology

The visual assessment methodology is responsive to the overall road planning and design process. The methodology is comprised of three distinct parts:

1. Understanding of context, setting, and key view fields;
2. Assessment of the proposed concept ; and
3. Recommendations of opportunities/treatments to address impacts.

3.2.1 Understanding of Context, Setting and Key View fields

Understanding the make up of the area through which the proposal passes and what characterises it, are essential to defining critical visual issues and providing an opportunity to address these. The key physical attributes (topography, geology, vegetation, land use character, local access, and existing motorway character) have already been defined in Chapter 2. From this base information an assessment of the spatial characteristics of the corridor has been made. This has identified the relationship of properties to the corridor and the degree of visual screening that presently exists, refer Figure 3.1. This is then broken down in to more detail on a precinct basis in which key view points are defined and issues assessed.

3.2.2 Assessment of the proposed concept

With the knowledge gained by assessing the corridor and its visual attributes it is possible to assess areas where impacts are likely to occur and if they are likely to have a positive or negative effect. This involves both the identification of a viewer, and a review of the proposal for changes which will influence the viewer. Having done this if a change is proposed, which will influence the view, issues can be identified which need to be assessed ie what the change is and likely consequences arising from that change.

Having established a view point and issue this is then assessed in terms of the following attributes:

The visual sensitivity - a judgement of the ability of an environment to accept change of a particular scale and type without unacceptable adverse effects on its character. The visual sensitivity of a site reflects the nature of the present outlook but also the values of the land use viewing the site. The way an outlook is perceived and valued has been quantified and is reflected in figure 3.2.

The visual magnitude of the proposal - the scale of the change that is to occur. Magnitude is a product of the nature of the proposal and its proximity to the viewer. Changes can have both a positive or negative impact. In assessing magnitude it is important to differentiate what the nature of the impact is, be it adverse or beneficial. An adverse impact for example would be the increase in scale and height of a retaining wall in close proximity to an adjacent property. A beneficial impact for example would be the realignment of a major road away from a residential property.

The overall rating of visual impact – a combined rating of sensitivity and magnitude.

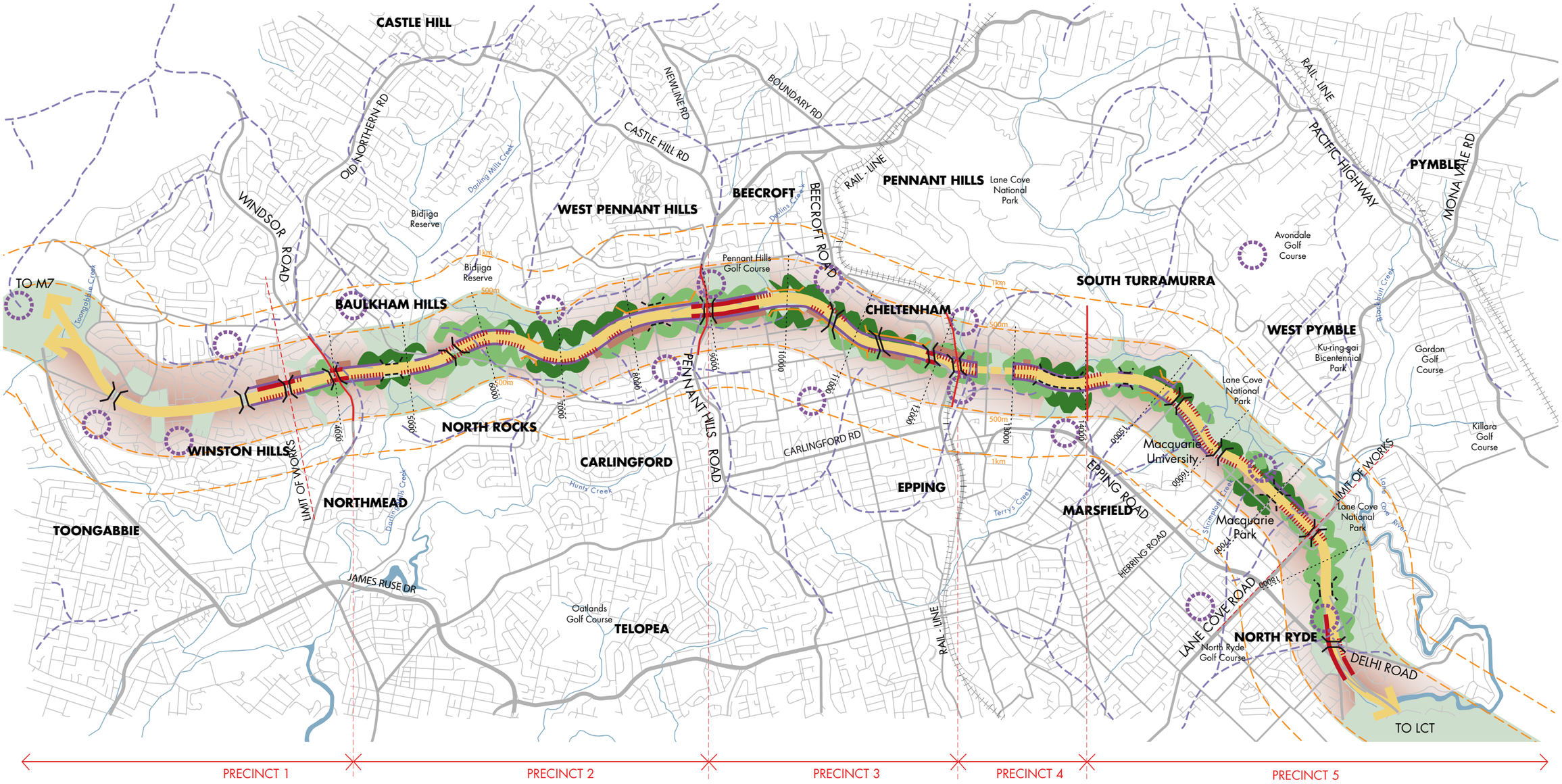


Figure 3.1 Spatial Sequence - M2 Corridor

In determining both visual sensitivity and magnitude a rating system has been adopted to provide a consistent measure of assessment from Negligible to High. These have been combined into a matrix to establish the overall rating of visual impact. This can be summarised in the accompanying Table 3.2.2 (Source: Environmental Impact Assessment - Guidance Note – Guidelines for landscape character and visual assessment. 24/3/2009)

SENSITIVITY \ MAGNITUDE	High	High to Moderate	Moderate	Moderate to low	Low	Negligible
High	High Impact	High Impact	Moderate - High	Moderate - High	Moderate	Negligible
High to Moderate	High Impact	Moderate - High	Moderate - High	Moderate	Moderate	Negligible
Moderate	Moderate - High	Moderate - High	Moderate	Moderate	Moderate - Low	Negligible
Moderate to low	Moderate - High	Moderate	Moderate	Moderate - Low	Moderate - Low	Negligible
Low	Moderate	Moderate	Moderate - Low	Moderate - Low	Low impact	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

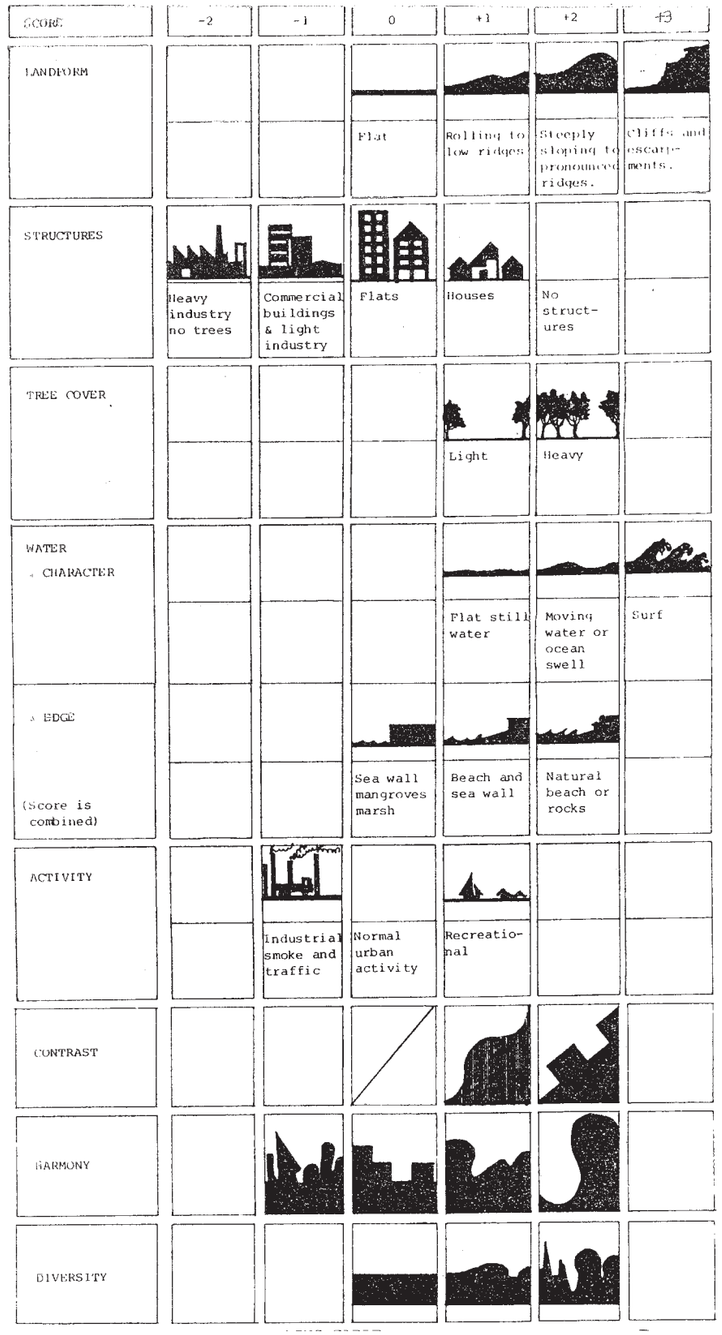
Table 3.2.2 Visual Sensitivity and Magnitude Matrix

3.2.3 Recommendations of Opportunities/Treatments to Address Impacts

Having identified the issue and the level of visual impact, it is then possible to assess the context of the impact and make recommendations as to how these may be addressed. This process is the identification of potential mitigation measures.

Mitigation – The purpose of mitigation is to avoid, reduce, and where possible remedy or offset, any significant negative or adverse effects on the landscape arising from the proposed development. It involves the identification of measures or strategies by which the design can be addressed to limit against any significant visual impacts.

The identification of opportunities to mitigate by various methods does not indicate a commitment to them. A number of factors influence the final design outcome which may limit the potential to adopt a mitigation method or its suitability. The final outcomes of the design process are described in Chapter 6.0.



Visual Preference Scoring
Source: Visual Survey Methodology : Review Supplement - Jackson Teece Chesterman Willis, BBS 12A, ISBN 0-7240-4155-9, 1979 SPCC

Figure 3.2 Visual Preference Scoring

Visual Assessment

Photo 3.1 Precinct 1 - View from Windsor Road Overbridge reveals a corridor contained between noise walls.

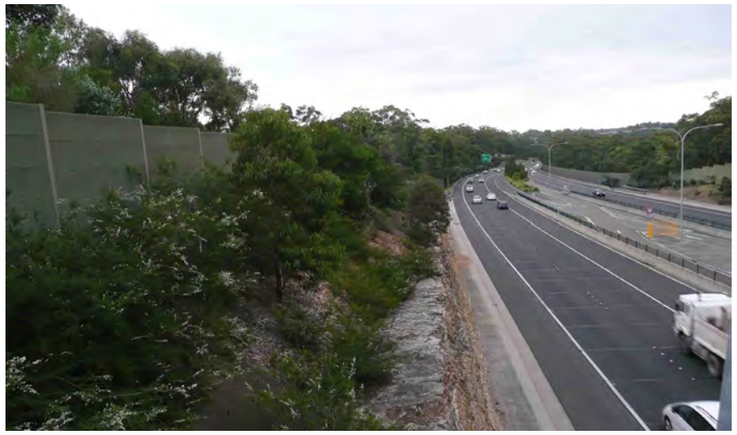


Photo 3.2 Precinct 2- View from Barclay Road looking west as motorway passes through bushland corridor.

Photo 3.3 Precinct 3 - View from Kirkham Road bridge showing bushland setting adjoining motorway.

Photo 3.4 Precinct 3 - View looking east from Kent Street bridge showing walled corridor.

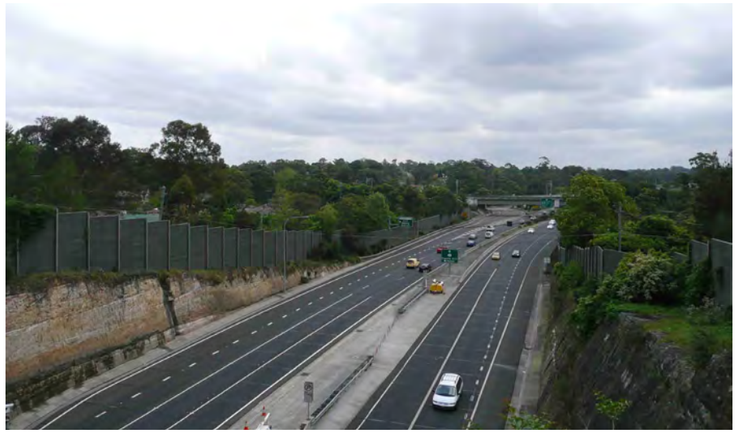


Photo 3.5 Precinct 3 - View from Western Tunnel Portal to Beecroft Road.

Photo 3.6 Precinct 4 - Eastern Tunnel Portal with sandstone geology exposed .

Photo 3.7 Precinct 5 - View from Christie Street bridge looking west.

Photo 3.8 Precinct 5 - View from Herring Road towards Macquarie Park commercial.

Photo 3.9 Precinct 5 - View from Lane Cove Road looking west revealing shale cutting and the office development beyond.

3.3 Definition of View Points and Catchments

The upgrade nature of this project means that to some extent the ability to substantially influence the degree of change is minimal as the general alignment is a given. This does not mean that the activities of avoidance and minimisation are inappropriate but rather that the extents to which modifications can occur are limited. Minimisation is therefore a product of the careful handling of the elements which contribute to the motorway formation and structures.

The Motorway Viewer

While the motorway already exists its impact in a visual sense beyond its immediate neighbours is limited. The context in which the motorway sits is one which has been associated with natural communities, be that the Lane Cove National Park, Devlins Creek Valley or the Darling Mills Creek Valley. The suburban development adjacent to the corridor is also an environment in which trees are dominant (be they natural/indigenous or exotic).

The limited visibility of the motorway from the public domain reflects both the heavily treed nature of the adjoining suburbs and parkland but also the topography of the terrain through which the motorway passes and the way it has been constructed. Of the elements visible it is predominantly the noise wall and cuttings/retaining walls that are easily discerned from beyond the corridor. Limited opportunities to view either road pavement or traffic exist with the exception of views from bridges which cross the alignment.

As part of the original assessment process the following objective was proposed in terms of mitigation strategy and means of addressing the impacts of the current M2 motorway.

"The basic aims of designing to reduce the impact of the built roadway are to visually screen it entirely where possible and otherwise to whatever extent practicable; to reduce the apparent scale of its structures, especially its noise barriers; to add landscape elements where possible such as earth mound profiling to assist the process of reducing noise impact and to obscure or reduce views to the traffic stream"[1]

This strategy has been largely effective, in upgrading the motorway this intent should be carried forward. Space however will be the critical limitation. Where activities occur on boundaries the only means of addressing the impact is the handling of the design of this element so that its detailing is simple and refined and the material qualities texture, colour, etc. address the critical concerns of the adjacent use.

The Motorway User

The spatial experience of the motorway user and the general attributes of the corridor are illustrated in Photos 3.1 to 3.9. This series of photos captures the character of the motorway within the corridor revealing key elements: close coupled retaining walls, rock cuttings and a strong vegetated back drop to the corridor created by the adjoining bushland forest and leafy suburbs.

Photo 3.10 View looking east to Windsor Road Bridge and Interchange.

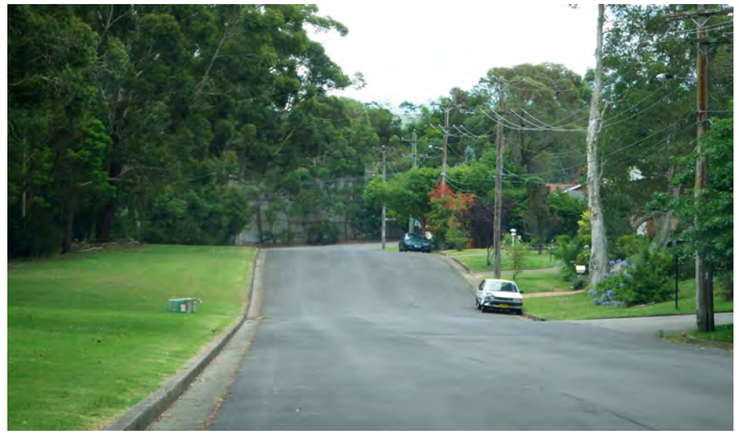


Photo 3.11 View from Godin Street to retaining walls of M2 Motorway.

Photo 3.12 View looking west along Junction Road

Photo 3.13 Existing noise wall and screen planting on Junction Road.

1 North West Transport Links East: Environmental Impact Statement Working Paper - Landscape and Visual Assessment, Bruce Mackenzie and Associates, 1992

Visual Assessment

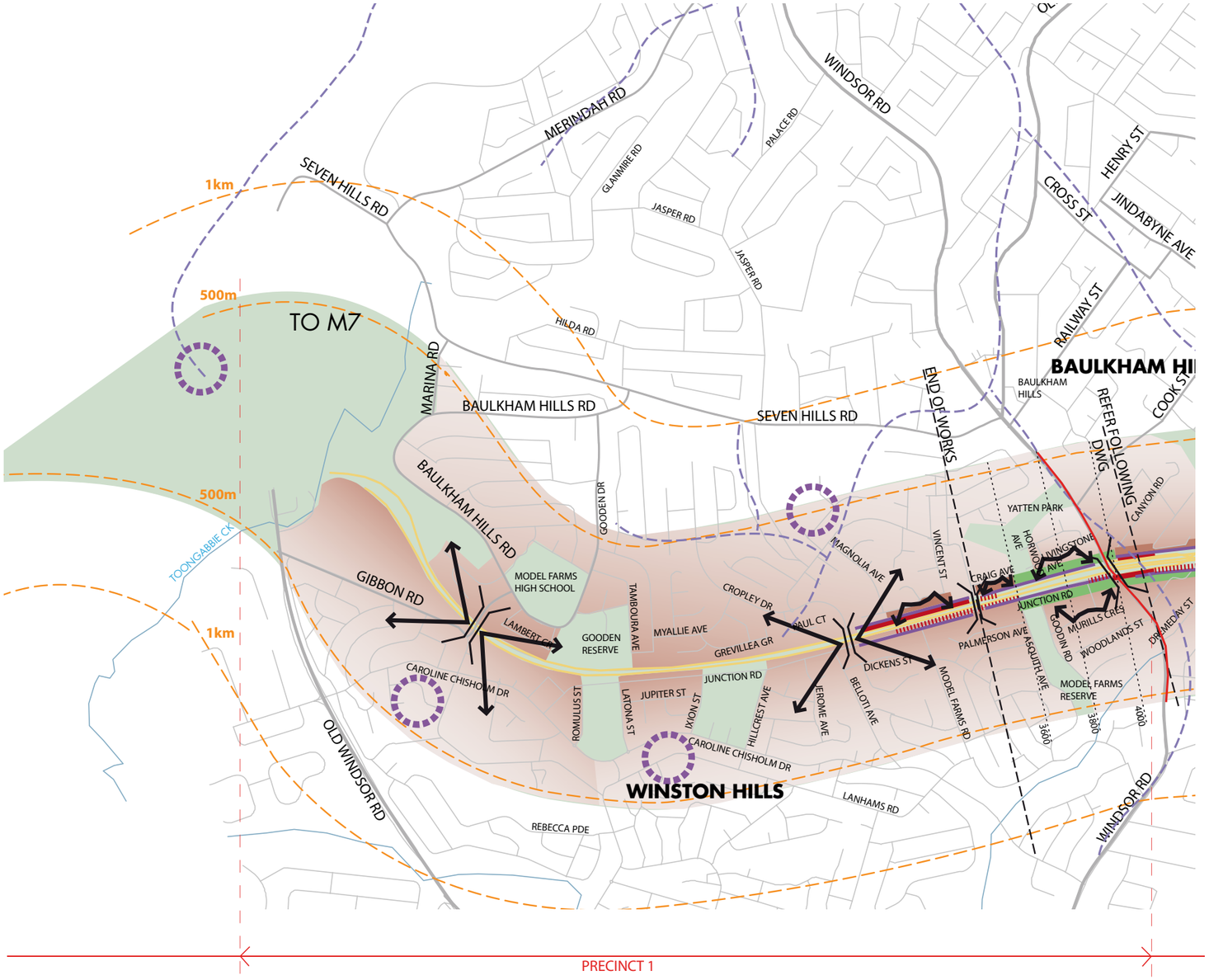


Figure 3.3 Spatial and Visual Analysis - Precinct 1

3.4 Precinct 1: Old Windsor Road to Windsor Road - Windsor Road Interchange

Precinct 1, depicted in Figure 3.3., is proposed to have the construction of on and off ramps to the western side of the Windsor Road interchange. The present configuration of this is depicted in photo 3.10. The proposed design for Precinct 1 is detailed in Chapter 6.

Impacts on Motorway User

Within the corridor, the main changes to the view of the motorway user are the expansion of road pavement and structures associated with the Windsor Road Bridge works. These works include construction to the western side of the bridge of: west bound on and east bound off ramps and associated retaining walls to support these; widening of the bridge structure to facilitate the new movements; and modifications to parapets and throw screens.

Modifications to the bridge structure should seek to minimise the impact of the additional structural element by designing them as an integrated part of the existing composition which seeks to achieve a consistent uncluttered profile.

Within the M2 corridor the expansion of the motorway pavement and introduction of new retaining walls to either side of the carriageway to support the new on/off ramps will create a moderate impact. The impact of these new walls and pavement, from within the motorway corridor, can be moderated by planting located behind barriers in front of walls and appropriate detailing.

Within the Windsor Road corridor the increase in pavement area can be minimised by the introduction of planting associated with turning islands. These islands would assist in defining travel paths and reduces the visual expanse of pavement.

Impacts on Motorway Viewers

The corridor is constrained, with much of the corridor on retaining walls and/or lined by noise walls. Consequently the alignment through this section is located above the adjacent residences. Presently the walls range in height from 2 to 4 metres on the northern side of the corridor and 3 to 9 metres on the south. Vegetation has been used effectively to minimise the impacts of these walls, as illustrated in photo 3.11.

The proposed changes have the potential to impact the landscape screening that exists and will increase the scale of the structures required. Properties which potentially may be impacted are located in: Junction Road and its environs (depicted in Photo 3.12); Craig Avenue (East) and Livingstone Avenue.

In Junction Road, the proposal sees the construction of a new retaining wall, above the existing wall (depicted in Photo 3.13). The total height of the resultant wall will be up to 11 metres tall. On top of this a new noise wall is to be constructed. Existing vegetation on top of the retaining wall will be lost and construction access could see the loss of vegetation below the wall reducing level to which this element is screened from adjacent properties.

The view, (Photo 3.14), from Murrills Crescent, will see a significant change in the short term, with the loss of all screen planting and the construction of a retaining wall. These impacts in part could be reduced by the retention of existing vegetation cover, where possible, and in the longer term by the re-establishment of planting to the front of the walls.

Craig Avenue properties vary in offset and impact (refer to Photo 3.15). Presently properties at the western end of Craig Avenue, closer to Watkins Road, back onto the noise wall, this condition will not change. East of this, the M2 corridor widens and the motorway moves onto embankment or retaining wall. Where on retaining wall, the existing retaining wall is to be retained and a new wall constructed above the existing and closer to the M2 alignment. The introduction of these retaining walls will see the noise wall located along the top of the retaining wall increasing the visual bulk and removing much of the screen planting which reduced the current alignments impact. Some mitigation of this is possible through reinstatement of a reduced vegetated buffer.

Livingstone Avenue, like Craig Avenue, is impacted by the proposal moving the motorway closer to property boundaries and an increase in scale of the built structures proposed. Offsets from adjacent property boundaries vary - some properties have large backyards with trees that screen the corridor, others have minimal backyard space. The impact on these properties varies according to the available yard space. Similarly the offset of the proposed structure varies from minimal offset from the boundary which has limited potential for screening to up to 5 metres which should enable some screening to limit the impact.

The proposal's interface with Windsor Road also sees changes to the configuration of Windsor Road and its neighbours. Changes to Windsor Road include the addition of turning lanes to facilitate turning movements associated with the new on and off ramps. As part of this widening process, the resumption of land from properties on the western side of the corridor is required. In particular the historic villa at 266 Windsor Road (Refer to Photo 3.16.) which loses several metres from its frontage. Property adjustment works will be required to both address the loss of curtilage and to provide a buffer between house and road. The treatment to this property is to be resolved subject to heritage assessment and property negotiations. Key to this will be the establishment of screen planting to the front and the retention in some form of the side drive and turn-a- round.

Photo 3.14 Murrills Cresent looking to embankment and noise wall of M2 Motorway.

Photo 3.16 View of Heritage Homestead 266 Windsor Road

Photo 3.15 View from Craig Avenue to M2 Motorway retaining wall and noise walls.

Table 3.4 Precinct 1: Visual Assessment Summary

PRECINCT 1 – Old Windsor Road to Windsor Road – Windsor Road Interchange

Station	Location	Nature of impact			Visual sensitivity	Scale or magnitude of visual affect	Overall rating of visual impact	Issues	Opportunities/Potential Treatments
		A	N	B					
3550–3640 (EB)	Windsor Road EB Off–Ramp (No. 14–22 Craig Avenue to 22 Livingstone Avenue)	■			HM	H	H	– An existing 4–7m high wall will increase to 7–11m high + 4m noise wall along property boundaries. – Loss of existing embankment and screen planting above retaining wall.	– Design treatment of noise walls and retaining walls may consider use of texture, materials and colour to reduce mass of new walls. – Offset from boundary to be maximised to allow revegetation/ screen planting to occur.
3600 EB/ WB	Entry/exit to off ramps (Motorway viewer)	■			M	M	M	– Construction of Toll gantry may result in light spill beyond the corridor.	– Design gantry and associated lighting so that gantry is simple, clean structure and lighting is focused and is of a cut off type that minimises light spill.
	(Motorway user)	■			M	L	ML	– Structure could be visually obtrusive within the corridor	– Design gantry so that a simple, clean light profile is achieved.
3640–3770 (EB)	Windsor Road EB Off–Ramp (No. 12–20 Livingstone Avenue to 3 Horwood Avenue)	■			H	HM	H	– Between stations 3640–3770 the existing walls range between 0–7m high and will increase to 8.5–11m high + 4m noise wall, leaving a 3.5–4m green corridor behind noise wall. – Loss of existing embankment and screen planting behind noise wall.	– Design treatment of noise walls and retaining walls may consider use of texture, materials and colour to reduce mass of new walls. – Offset from boundary to be maximised to allow revegetation/ screen planting.
3700 (WB)	Windsor Road WB On–Ramp (Junction Road and Goodin Road)	■			HM	H	H	– An existing 6m high wall will increase to 10m high + 4m noise wall. – Loss of existing embankment and screen planting behind noise wall but potential to retain verge planting. – There is no opportunity for additional screen planting to top of wall in current proposal.	– Acrylic noise walls may be considered where solar access is reduced to adjacent properties (subject to other project priorities). – Potential to widen the verge, on the north side of Junction Road to allow the establishment of screen planting at the base of the retaining wall to be reviewed with agencies.
3730 (WB)	Windsor Road WB On–Ramp (Junction Road)	■			H	H	H	– A new 3.5m high wall + 4m noise wall will move closer to adjacent properties. – Loss of existing embankment planting behind noise wall.	– Provide additional vegetation behind noise wall for screening. – Potential to widen verge, on north side of Junction Road to allow the establishment of screen planting at the base of the retaining wall to be reviewed with agencies.
3770–3820 (EB)	Windsor Road EB Off–Ramp – 3 Horwood Ave to 8 Livingstone Ave Baulkham Hills	■			H	H	H	– A new 6–7m high wall + 4m noise wall will be introduced, leaving a 0 –3.5m wide green corridor behind wall. – Loss of existing embankment planting behind noise wall.	– Design treatment of noise walls and retaining walls may consider use of texture, materials and colour to reduce mass of new walls. – Provide additional vegetation behind noise wall for screening.
3700– 4000 EB/WB	Adjacent on/off ramps (Motorway user)			■	M	M	M	– Construction of new retaining walls adjacent the main alignment both east and west bound. – Expansion of Motorway footprint.	– New alignment will see revisions to the existing shotcrete abutment which should improve the visual appearance of the abutment integrating it with the bridge. – Landscape can be incorporated adjacent walls to create a distinct interchange character.
3820–3880 (EB)	Windsor Road EB Off–Ramp – No. 2 to 8 Livingstone Avenue Baulkham Hills Model Farms	■			H	H	H	– A new 7–7.5m high wall + 4m noise wall will be introduced along property boundary. – Loss of green buffer zone between motorway.	– Design treatment of noise walls and retaining walls may consider use of texture, materials and colour to reduce mass of new walls. – Potential to provide screen planting as part of property adjustments to mitigate against impacts.
3550-4000 (EB & WB)	Verge of Motorway Corridor (Motorway user)			■	ML	M	M	– Construction of new noise wall and removal of patchy landscape	– Enhance noise wall treatment and simplification of landscape and barrier treatments will improve visual appearance.

Table 3.4 (continued)

Station	Location	Nature of impact			Visual sensitivity	Scale or magnitude of visual affect	Overall rating of visual impact	Issues	Opportunities/Potential Treatments
		A	N	B					
3900 (WB)	Windsor Road WB On–Ramp – Junction Road (Murrills Crescent) Model Farms	■			H	H	H	– Existing embankment and screen planting will have to be removed. – A new 3.5m high wall + 4m high noise wall will have significant visual impact along Junction Road.	– Acrylic noise walls may be considered where solar access is reduced to adjacent properties (subject to other project priorities). – Potential to widen verge, on north side of Junction Road to allow the establishment of screen planting at the base of the retaining wall to be reviewed with agencies.
3900 (EB)	Windsor Road EB Off–Ramp	■			HM	H	H	– A new 3.5m high wall + 4m noise wall will have significant visual impact to properties on Livingstone Avenue. – Existing corridor for screen planting visible from adjacent open space will be lost. – Large level difference between off–ramp and adjacent land.	– Review grading to minimise scale of wall and provide usable space on adjoining land.
4000 (WB)	Windsor Road On–Ramp/ Vacant Land Model Farms	■			H	H	H	– Road alignment of on–ramp will be closer to adjacent properties. – A new 2m high wall (approx.) + 4 m noise wall will have significant impact to adjacent property.	– Provide additional planting for screening at base of new wall. – Opportunity for surplus land to be used for noise wall housing or similar as a show case for housing adjoining arterial roads.
4000 (EB)	Windsor Road Bridge widening	■			L	L	L	– Increase in scale, width of the existing bridge.	– Provide a structure that is consistent with the proportions of the existing structure and its elements. – Provides a smooth clean transition between the old and new structures.

Site compounds – potential location of temporary construction activities

4000 (WB)	Windsor Road (north)		■		M	M	M	– Site compound to be established for duration of works, including: team office and lay down area.	– Siting of buildings to consider impact of overlooking of adjacent properties. – Siting of noise generating activities(lay down area) to be sited as far from adjoining residences as possible. – Temporary screening to minimise dust and noise impacts.

Visual Sensitivity

Ne = Negligible; VL = Very Low; L = Low; ML = Medium Low; M = Medium; MH = Medium High; H = High; VH = Very High

Nature of Impact

A = Adverse; N = Neutral; B = Beneficial

Station

EB – East Bound – Works widened beyond east bound carriageway.

WB – West Bound – Works widened beyond east bound carriageway.

3.5 Precinct 2: Windsor Road to Pennant Hills Road – Bushland Interface

Refer to Figure 3.4.

Precinct 2 spatial and visual context of the motorway are illustrated in Figure 3.4 and the Proposed design in Chapter 6.

Works in Precinct 2 relate to the widening of the motorway carriageway between Windsor Road and Pennant Hills Road. Works include bridge widening at Darling Mills Creek, and Barclay Road; relocation of noise walls; widening of road formation including cuttings and fill embankment extents.

For significant lengths of this section the corridor is lined by parklands - either Nature Reserve or recreational areas - with remnant vegetation adjacent the edge of the corridor. This vegetation cover provides the ability to absorb some of the visual impacts associated with the proposal.

Impacts within this section relate to both sides of the corridor, as the widening alternates from side to side to fit within the corridor, to maintain geometric standards for motorways and to minimise the impacts on adjoining properties.

Impacts on Motorway Viewers

The widening of Darling Mills Creek Bridge will require the construction of new piers and deck to the northern side of the bridge. The bridge presently is a substantial yet slim structure, (refer photos 3.18 and 3.19). The new works need to consider the present bridge design and not detract from it. The access to the valley floor for construction is limited and any clearing associated with this should seek to limit removal of mature trees and keep earthworks to a minimum.

Between Windsor Road and just north of Barclay Road, Stn 4000 to 5700, widening is to the northern side of the corridor adjoining the eastbound carriageway. Properties affected by this are in Barclay Road and Mill Drive, which back onto the corridor. The properties in Mill Drive currently overlook a noise wall, which varies in distance from the boundary but generally has sufficient offset from the boundary for some screening. As a result of the works the noise wall will move closer to properties reducing the potential for this to be screened by planting. The design needs to consider the visual scale and bulk of the wall where screening is not possible.

Photo 3.17 View of noise wall at rear of property in Dremeday Street, where no change is experienced

Photo 3.18 View of eastern abutment to Darling Mills Bridge.

Photo 3.19 Yale Close -View of bridge from rear property boundary.

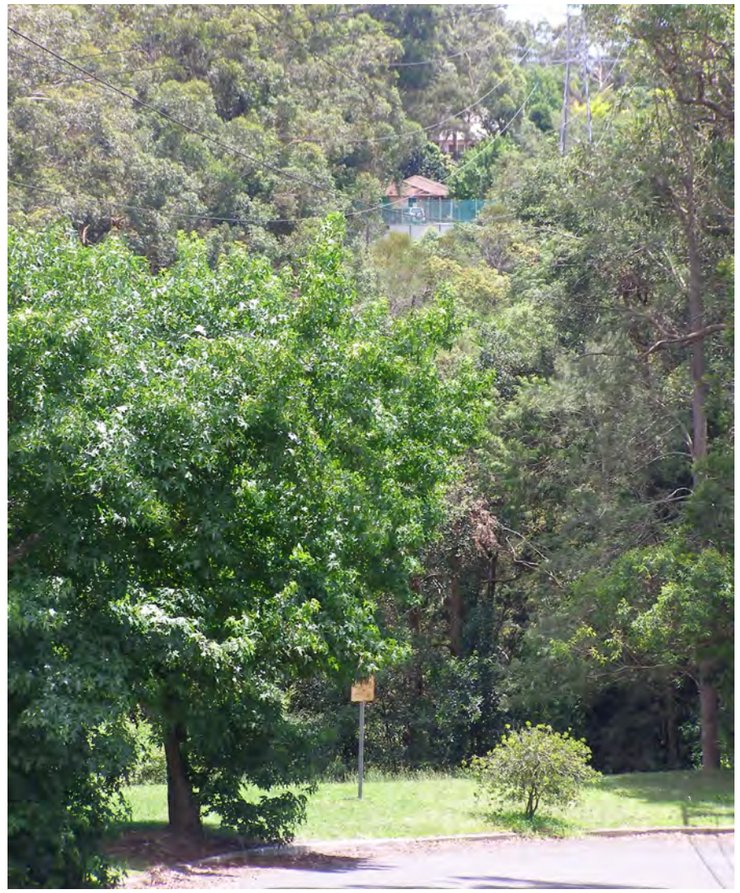


Photo 3.20 View from Morton Avenue overlooking the Motorway.

A site compound has been identified at the intersection of Barclay and Perry Roads. The treatment of this needs to consider the present vegetated address that this site presents and seek to limit the scale of visual change. This may be achieved by the retention of vegetation along the Perry Street frontage. Where this is not possible the re-establishment of vegetation cover should be prioritised.

East of Dale Place, Stn 6100, the widening moves to adjacent the west bound lane. Widening is typically 3.5 metres in width, resulting in a steepening of the existing cut and minor adjustment to the noise wall location. A wide landscape verge behind the wall means any change to the motorway viewer is easily managed.

At Yale Close (Photo 3.20) the bridge is widened to the west, moving both bridge and noise wall closer to properties. Presently vegetation in this zone is of a relatively poor density and could be improved to mitigate the impacts of the proposed widening.

Widening continues along this western edge of the corridor until Oakes Road. Widening works will result in impacts to cuttings and noise walls along this edge of the corridor. Generally cuttings within the corridor have been steepened enabling noise walls to be retained rather than moving noise walls closer to properties. This minimises impacts to the adjoining community through maintaining both the existing offset but also the vegetation cover. Morton Avenue is an example of such a situation photo 3.20. Presently views overlooking the motorways alignment consist of obscured glimpses of passing traffic. This situation is likely to remain unchanged with the existing noise wall retained in place.

Carmen Drive on the other hand is presently impacted by noise walls which occur at the edge of the verge (refer to Photo 3.21); and walls which occur just to the rear of properties as is depicted in Photos 3.22 and 3.23. There will be no change in this outlook with the existing walls retained.

Impact on Motorway Viewers

Widening from Darling Mills Creek to Barclay Road has minimal visual impact on the road user. From the existing motorway, (photo 3.24), the main change will be evident in an increase in paved area, as the existing bushland backdrop will be retained.

At Barclay Road, Photos 3.25 and 2.26, the bridge is to be lengthened requiring changes to cuttings, abutments to the northern edge of the alignment and the bridge structure itself. The treatment to the cuttings should avoid the use of shotcrete particularly in proximity of the bridge itself. Lengthening of the bridge should adopt a profile which is simple, clean and integrated with the existing structural profile.

Photo 3.21 View of existing noise wall adjacent Carmen Drive.

Photo 3.22 View of existing noise wall to the rear of property in Carmen Drive.

Photo 3.23 View of noise wall adjacent to east bound off ramp from Westmore Drive. No additional impacts to occur at this location.

Photo 3.24 View of existing motorway environs crossing Darling Mills Creek.

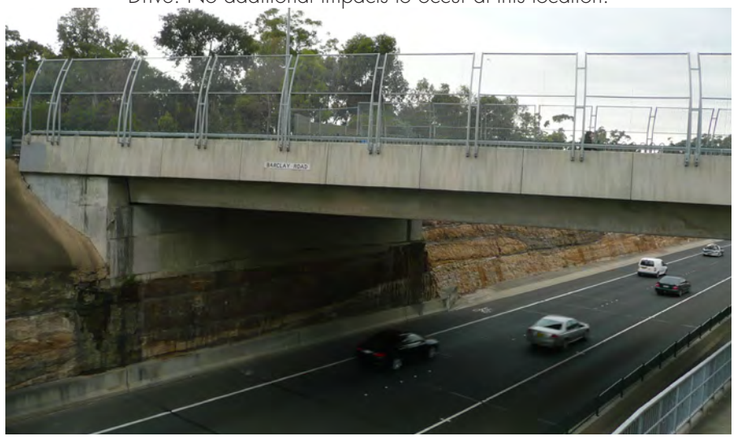


Photo 3.25 View from Barclay Road looking west.

Photo 3.26 View from Barclay Road Bridge and abutment.

Visual Assessment

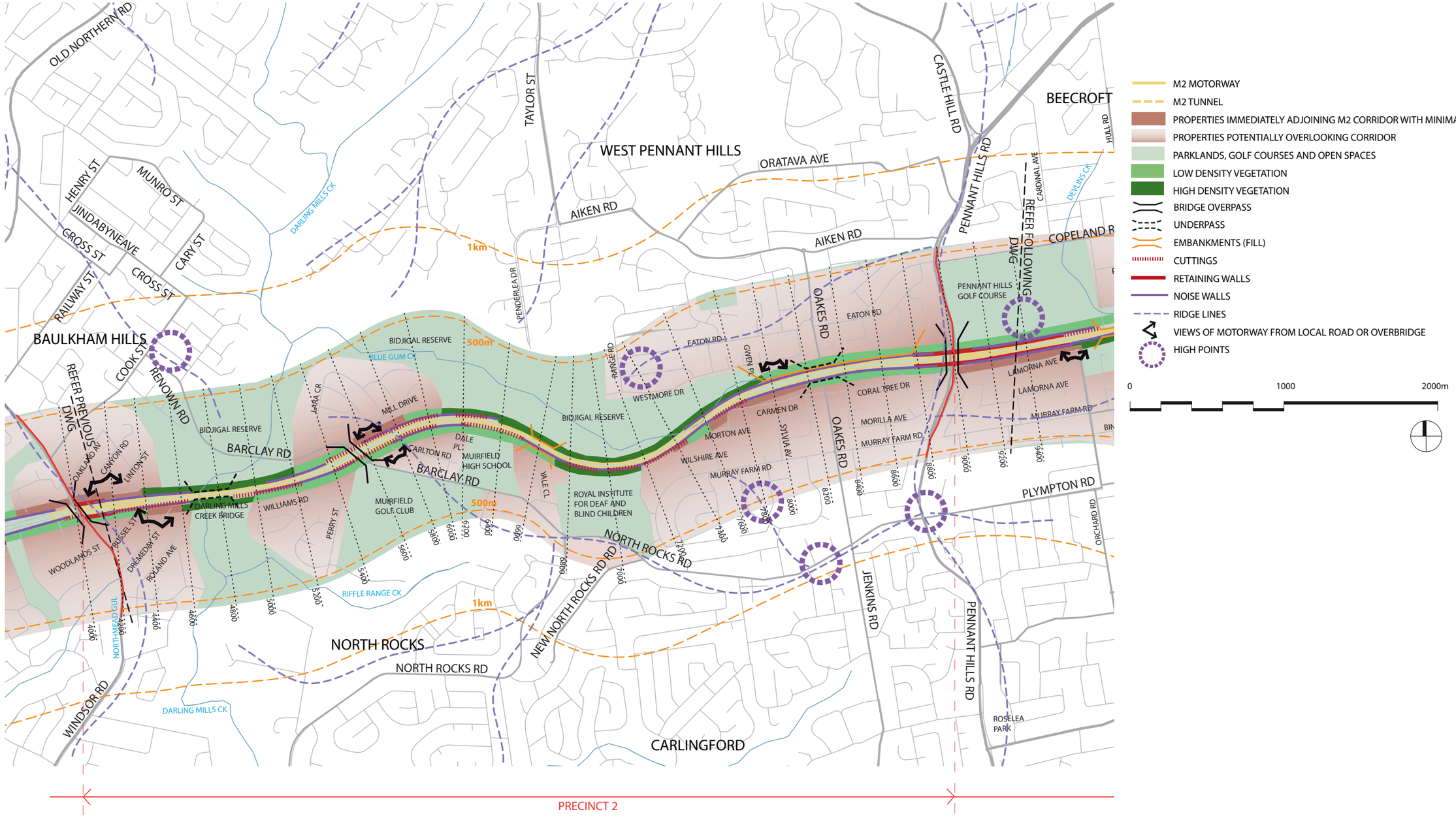


Figure 3.4 Spatial and Visual Analysis - Precinct 2

Table 3.5 Precinct 2: Visual Assessment Summary

PRECINCT 2 Windsor Road to Pennant Hills Road – Bushland Interface

Station	Location	Nature of impact			Visual sensitivity	Scale or magnitude of visual affect	Overall rating of visual impact	Issues	Opportunities/Potential Treatments
		A	N	B					
4550 – 4750 (EB)	Darling Mills Creek Bridge (Motorway Viewer)		■		M	L	ML	– Construction of bridge widening will conflict with existing vegetation under bridge. – The EB widening, poses a low visual impact due to sufficient screening provided by the surrounding bushland from adjoining residences. – Visual amenity under bridge should consider existing walking tracks.	– Care needs to be taken with the design of the bridge structure so that it does not detract from the natural environment and is consistent in character with the existing. – Clearing for construction access should be limited and mature trees retained where practical
	(Motorway User)		■		M	L	ML	– Pavement area increased	– Detailing of existing bridge parapets retained to maintain visual character of existing structure.
4850–4950 (EB)	Retaining wall		■		L	L	L	– Construction of retaining walls in relatively steep and inaccessible terrain may result in loss of vegetation cover beyond work footprint.	– Design of retaining wall may consider use of texture and materials to reduce the scale of retaining wall. – Vegetation to be reinstated where damaged by works.
5100–5400 (EB)	Darling Mills Forest/ Renown Road Baulkham Hills	■			L	L	L	– Existing retaining and noise walls are to be relocated nom. 3.5m closer to residential properties.	– Improve design treatment of noise walls – Reinstate cleared vegetation behind noise wall to provide screening from residences.
5400–5700 (EB)	Renown Road/ Mill Drive Baulkham Hills	■			L (others) HM (Property No. 27–31)	L (others) HM (Property No. 27–31)	L (others) HM (Property No. 27–31)	– Existing noise walls are at least 15m away from adjacent properties. The noise walls are being relocated closer to adjoining properties. No.27–31 Mill Drive are most impacted. – Loss of buffer vegetation along embankment.	– Alignment and supports to be considered in relation to adjoining residences. A simple, smooth, even alignment should be adopted and the impacts of the supports minimised. – Provide vegetation behind noise wall to provide screening to adjacent residences where space permits.
5500	Barclay Road Bridge (Motorway User)		■		M	L	ML	– Bridge is to be lengthened, requiring removal of existing abutment, and alteration to spans resulting in uneven spans.	– Structural detailing to consider the form of the leading edge of the new structure so that a consistent edge line is created. – Bridge design is to integrate with that of the existing structures including, rails, throw screens parapets etc.
5700–5950 (EB)	Mill Drive Baulkham Hills		■		L	L	L	– Existing noise walls are being relocated up to 4m closer to adjacent property.	– Alignment and supports to be considered in relation to adjoining residences. A simple, smooth, even alignment should be adopted and the impacts of the supports minimised.
5900–6230 (WB)	Dale Place/ Muirfield High School North Rocks		■		L	L	L	– Existing noise wall is being relocated up to 3m closer to adjacent property.	– Reinstate cleared vegetation behind noise wall to provide screening to adjacent residences.
6220–6560 (WB)	Muirfield High School North Rocks (Motorway viewer)		■		L	NE	L	– New embankment is being proposed up to 5m closer to adjacent property.	– Provide additional vegetation along top of embankment.
	(Motorway user)			■	M	ML	ML	– Additional carriageway and widening of cutting	– Potential to steepen lower half of cut and flatten top to enhance revegetation and screening of walls

Table 3.5 (continued)

Station	Location	Nature of impact			Visual sensitivity	Scale or magnitude of visual affect	Overall rating of visual impact	Issues	Opportunities/Potential Treatments
		A	N	B					
6480–6740 (WB)	Yale Close Bridge		■		M	ML	M	– Retaining and noise walls, and bridge are being relocated up to 4m closer to adjacent properties in Yale Place.	– Reinstate cleared vegetation to provide additional screening of bridge from adjoining residences. – Noise and retaining walls may be designed using either colour, materials or texture consistent with the existing bridge and which minimise impacts on adjacent residences
6700–7270 (WB)	Bidjigal Reserve/ Royal Institute for Deaf and Blind Children, North Rocks		■		L	L	L	– Existing noise wall is being relocated along top of new embankment. – 6850 – 6920 retaining wall is being constructed with noise wall attached.	– Reinstate cleared vegetation to provide additional screening of bridge from adjoining residences. – Retaining wall /noise wall may consider use of colour, texture or materials to reduce visual bulk.
7370–7640 (WB)	Wilshire Avenue/ Morton Avenue/ Carmen Drive Carlingford		■		L	VL	L	– 3.5m lane widening with new embankment. – Existing noise wall is being relocated up to 3.5m closer to adjacent property.	– Provide additional vegetation behind noise wall for screening.
7600–7950 (EB)	Bushland		■		L	NE	L	– Existing noise wall is being relocated into bushland.	– Reinstate cleared vegetation behind noise wall for screening.
7630 (WB)	Morton Avenue Carlingford		■		L	NE	L	– The widening of the EB lane will have some impact to views on Morton Avenue. There are currently filtered views of the M2 traffic through existing vegetation.	– Provide additional vegetation behind noise wall for screening.
Site compounds – potential location of temporary construction activities									
4550	Darling Mills eastern end of Windsor Road Slip Lane	■			ML	M	M	– Site compound to be established for: site sheds and lay down area. – Impact on existing vegetation cover for construction access.	– Limit footprint to a minimum maintaining as much canopy vegetation as possible. – Minimise earthworks to retain natural topographical features.
5500	Barclay Road / Perry Street	■			M	M	M	– Site compound to be established for: stockpile and handling area. – Removal of existing mound and vegetation to Perry Street frontage.	– Potential to retain vegetation on periphery of site. – Once complete area to be revegetated enhancing landscape character of area.
6840	Yale Close Bridge Compound (Duncan Place)	■			H	M	MH	– Site Compound to be established for: stockpile and handling area. – Access track along boundary. – Potential loss of Existing vegetation cover between Property and Motorway.	– Potential to retain vegetation on periphery of site. – Once complete area to be revegetated enhancing landscape character of area.

Visual Sensitivity

Ne = Negligible; VL = Very Low; L = Low; ML = Medium Low; M = Medium; MH = Medium High; H = High; VH = Very High

Nature of Impact

A = Adverse; N = Neutral; B = Beneficial

Station

EB – East Bound – Works widened beyond east bound carriageway.

WB – West Bound – Works widened beyond east bound carriageway.

3.6 Precinct 3: Pennant Hills Road to Beecroft Road/ Devlins Creek - Suburban Forest

Precinct 3 spatial and visual context of the motorway are illustrated in Figure 3.5.

Works in Precinct 3 relate to the widening of the motorway carriageway between Pennant Hills Road and just east of Beecroft Road at Devlins Creek. Works include bridge widening over Devlins Creek, lengthening of Kirkham Street Bridge, relocation of noise walls; widening of the motorway formation including cuttings and fill embankment extents. The details of this proposal are depicted in Chapter 6.

This section of the motorway corridor is the most developed with residential properties backing onto the corridor for a substantial length of it. Despite the level of development, the area when viewed from the motorway is still dominated by a canopy of trees, which line the streets and backyards of the surrounding suburbs.

Just east of Pennant Hills Road off/on ramps, the motorway is widened to the south. The realignment of noise walls to properties fronting Lamorna Avenue has the potential to have a significant impact on these properties due to the scale and close proximity of the existing structure, refer Photo 3.27.

As you progress east the impact is reduced as landscape is established in front of the walls, photo 3.28. East of Orchard Road the corridor follows the valley of Devlins Creek and is constrained by its presence. The Devlins Creek Bridge adjoining Chilworth Recreational Reserve is widened both internally (into the median) and to the south (adjacent the westbound lanes). This widening will see the loss of vegetation both for the permanent structure but also for access. Care should be taken to maximise the retention of significant trees and minimise the extent of disturbance to a minimum.

The design of the new bridge structures, in order to reduce the visual impact, should reflect the design of the existing bridge and its component parts and should not detract from the reserve. The infilling of the median between the two bridges will result in a reduction in light under the new structure and loss of any vegetation which presently exists under the bridge. This will impact the feel of the zone under the bridge. In designing the modifications to the bridge it will be important to retain a sense of openness to either side of the bridge so that a sense of safety for those using the access path is maintained (refer to Photo 3.29).

As part of the construction process new noise walls are to be constructed both on the bridge and leading on and off it. In developing the design of the new walls, the use of acrylic noise wall panels may be considered (subject to other project priorities). This would assist in reducing the scale and mass of the bridge as well as improving light distribution and connections between the road and its environment.

Just east of here the road enters a significant existing cut. The proposal sees this cut steepened with the intent to maintain the existing noise wall insitu. The existing cut has been treated with shotcrete which is coloured to minimise its visual impact. Despite this the treatment is still evident due to its uniform colouring and texture. The new works will require replacement of this treatment. In applying new treatments care needs to be taken to better integrate the new works and any shotcrete. This may involve integrating visually with the rock face through use of colouring and

Photo 3.27 View off Lamorna Avenue - Note: Visual impact reduced by vines and hedge on the surface of the wall.

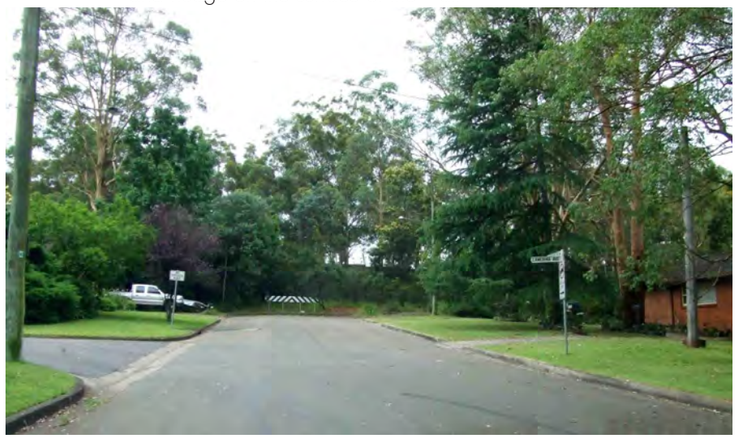


Photo 3.28 View of noise wall at the end of Orchard Road.

Photo 3.29 View of space under existing westbound bridge over Devlins Creek.

Photo 3.30 View of Kirkham Street.

Photo 3.31 View of drainage line under Kirkham Road Bridge.

Photo 3.32 View from Meadow Close off Devlin Crescent, Channel Wall and M2 noise wall.

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texture. The use of shotcrete should be consistent with the RTA design guidelines for the use of shotcrete.

From here the widening continues to the southern (west bound) side of the alignment, where it is required to straddle Devlins Creek (Photo 3.31and 3.32). This widening impacts the Kirkham Street Bridge with the need for relocation of a pier and the northern abutment but also sees the alignment cantilevered off the existing retaining wall bring it and the noise wall closer to properties. Visually it is not possible to enhance the screening of the structure from adjacent properties within the corridor due to the creek channel occupying much of the space within the corridor. The use of a cantilevered structure however provides a neat uncluttered appearance which will not change substantially the existing outlook. Care needs to be taken so that the noise wall is neatly integrated and coloured to minimise impacts

Permanent construction works, within this section terminate at the Kent Street Overbridge, depicted in Photo 3.33. However, to facilitate these works the need for a site compound could see the use of a parcel of motorway land which fronts Barombah Road (Photo 3.34). This parcel of land is presently vegetated and it will be important to seek to maintain this appearance in order to minimise impacts.

Photo 3.33 View of Kent Street pedestrian bridge and noise wall.

Photo 3.34 View from corner of Baromba road and Cunmore Road to site compound and M2.

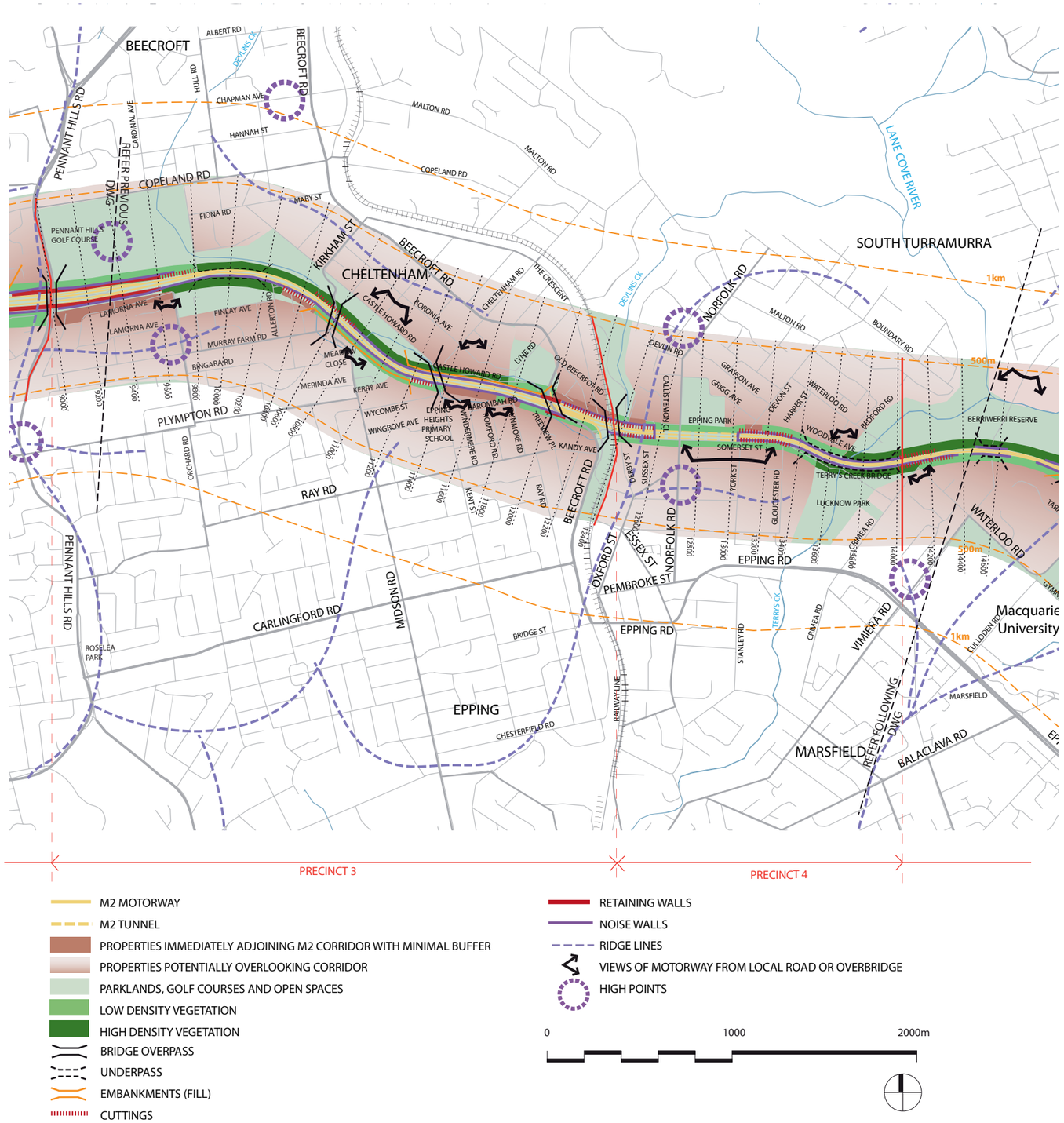


Figure 3.5 Spatial and Visual Analysis - Precincts 3 and 4

Table 3.6 Precinct 3: Visual Assessment Summary

PRECINCT 3 Pennant Hills Road to Beecroft Road/ Devlins Creek – Suburban Forest

Station	Location	Nature of impact			Visual sensitivity	Scale or magnitude of visual affect	Overall rating of visual impact	Issues	Opportunities/Potential Treatments
		A	N	B					
9650 – 9850 (WB)	Lamorna Avenue/ Orchard Road Beecroft	■			H	M	MH	– Existing noise wall backs onto houses with mimimal offset from house wall. – Noise wall may be relocated onto boundary potentially impacting existing screening.	– Improve treatment of noise walls and provide additional screen planting behind noise wall. This may be undertaken as a property adjustments.
9670–10260 (WB)	Recreation Reserve Beecroft/ Bridge		■		M	M	M	– Existing noise wall is being relocated up to 3m into bushland.	– Re–vegetate in response to disturbance to natural bushland.
9850–10350 (EB)	Chilworth Recreation Reserve Beecroft	■			L	ML	ML	– Existing noise walls are to be replaced and increased in height.	– Acrylic noise walls may be considered to allow solar access and to improve connection with adjoining environment (subject to other project priorities).
9900–10100 (EB & WB)	Devlin Creek Bridge	■			M	M	M	– Devlins Creek Bridge widening to western side including construction of new piers, girders, deck and noise wall. – Widened in centre lane removing light well.	– Consider design of bridge to be consistent with existing. – Potential to improve linkages with natural environment with noise wall through use of acrylic panels where noise walls are replaced on bridge (subject to other project priorities). – Maintain access under new bridge structure.
10260–10550 (WB)	Allerton Road to Kirkham Street Bridge Beecroft (Motorway user)			■	ML	M	M	– Existing noise wall is retained and cutting steepened. Cutting has a significant area if shotcrete which would need to be addressed in the new cutting.	– Provide additional vegetation behind noise wall for screening. – Where structural support needs to be provided to cut face this should be undertaken in accordance with RTA Shotcrete Guidelines. Extent of shotcrete is to be minimised and integrated with cut face.
10550–10800	Kirkham Street Bridge Beecroft to Meadow Close Roselea	■			M	L	ML	– Existing noise wall is being relocated up to 2.5m closer to adjacent properties. – Lane widening over open canal and embankment. – Kirkham Street Bridge is to be lengthened, including removal and replacement of southern pier.	– Design of new structure over drainage canal to be carefully considered to reduce apparent scale of structure and maintain drainage capacity. – Bridge structure to be integrated with existing through use of common parapet and girder profile to leading edge.
10800 (WB)	7 Meadow Close Roselea			■	HM	L	M	– Proposed widening will move 4m high noise wall closer to residential properties. – Existing noise wall and concrete drainage canal are presently visually dominant as they run past residential properties.	– Noise wall and retaining walls may consider the use of materials, colour and/or texture to minimise scale of walls. – Potential for improved screen planting.
10800–11150 (WB)	Meadow Close to Kerry Avenue bushland Roselea		■		L	L	L	– New noise wall and retaining walls are being relocated up to 2.5m closer to adjacent properties and bushland.	– Noise wall and retaining walls to consider the use of colour and/or texture to minimise scale of walls.
11150–11300 (WB)	Wycombe Street Epping		■		L	NE	L	– Lane widening occurs within existing footprint, no change in noise wall location required.	– Potential to improve vegetation cover and remove weeds.
11300–11350 (WB)	Wycombe Street to Kent Street Bridge Epping	■			ML	ML	ML	– Existing noise wall is being relocated up to 2m closer to adjacent property. – Existing basin cleared and improvements made.	– Provide screen planting along property boundary to screen noise walls.

Table 3.6 (continued)

Site Compounds – potential location of temporary construction activities

Station	Location	Nature of impact			Visual sensitivity	Scale or magnitude of visual affect	Overall rating of visual impact	Issues	Opportunities/Potential Treatments
		A	N	B					
9850–10200	Devlins Ck Bridge	■			ML	M	M	– Site compound to be established for: Site shed and lay down area. – Loss of existing vegetation. – Impacts on local pedestrian access.	– Maximise retention of mature canopy trees. – Strip and stockpile site soil to retain soil seed bank. – Reinstate pedestrian access improving accessibility where possible.
11700–11800	Barombah Road	■			HM	ML	M	– Site compound to be established for: Site shed and lay down area. – Loss of existing vegetation.	– Maximise retention of existing vegetation along street frontage. – Reinstate and improve vegetation cover post construction

Visual Sensitivity

Ne = Negligible; VL = Very Low; L = Low; ML = Medium Low; M = Medium; MH = Medium High; H = High; VH = Very High

Nature of Impact

A = Adverse; N = Neutral; B = Beneficial

Station

EB – East Bound – Works widened beyond east bound carriageway.

WB – West Bound – Works widened beyond east bound carriageway.

3.7 Precinct 4: Beecroft Road /Devlins Creek to Terrys Creek - Suburban Bushland Interface

Precinct 4 spatial and visual context of the motorway are illustrated in Figure 3.6.

Works in Precinct 4 relate to the widening of the road corridor between Beecroft Road at Devlins Creek and just east of Terrys Creek. Works include widening of Norfolk Road Tunnel; bridge widening over Terrys Creek; relocation of noise walls; widening of the road formation including cuttings and fill embankment extents. The details of this proposal are depicted in Chapter 6.

Impacts on Motorway Users

As part of the widening works, through this section of road, the removal of the Beecroft Rd Bus Bridge is proposed. This reflects the changes in the public transport system over the last decade and the implementation of better bus priority connections within the M2 corridor as a result of this proposal. The removal of the bridge will provide an enhanced visual outcome with the loss of part of the visual clutter created within this zone by a range of elevated structures. This is depicted in Chapter 6.

West and east of the Norfolk Road Tunnel the approach cuttings to either side of the corridor, (depicted Photo 3.35) are to be widened to facilitate the construction of additional lanes in both directions and the incorporation of a breakdown/cyclist lane. This will have the effect of broadening the cut but will not affect the height. The treatment of cuttings should ensure the strong character of the existing sandstone walls are retained and minimise the use of shotcrete which may otherwise detract from the walls.

The construction of the additional carriageway width has the potential to upset the symmetry of either of the tunnel portals. In the design development of the tunnel portals a treatment is to be developed that creates a consistent profile for the tunnel entrance.

Impacts on Motorway Viewer

Like Precinct 3 this section of the corridor adjoins a predominantly residential area being bordered by Somerset Street and Woodvale Avenue to the south and north respectively.

The widening of the cuttings at the western and eastern approaches to the tunnel has the potential to impact the noise walls which run on the southern sides adjacent to Somerset Street, depicted in Photo 3.36 and 3.37. In the proposal the alignment of the walls is generally to be retained with a small section east of Station 13250 to be moved closer to properties. Works should the limit impact to adjoining vegetation cover and if damaged reinstate.

Stn 13500 northern side of the corridor, adjoining Woodvale Avenue, has a number of properties which back onto the corridor, depicted in Photo 3.38. Presently these overlook the corridor and its noise walls. The proposal sees both the noise wall and a retaining wall moved closer to properties. This has the potential to increase the impact on the adjoining properties due to a reduction in space within the boundary for screening and a greater sense of enclosure. Care will need to be taken to improve the outlook of the noise wall and maximise potential for screen planting.

The construction of a widened bridge over Terrys Creek requires the construction of new piers, girders and abutment. The design of this needs to be simple and refined so as to minimise impact on native vegetation and limit visual impacts when viewed from walking track or adjacent properties and to relate to the existing structure (Photo 3.39). The construction of a temporary site compound to support these activities is also required. The construction of this should seek to retain as much of the existing canopy as possible to facilitate screening of works.

Photo 3.35 View of eastern tunnel approach.

Photo 3.36 View looking west along eastern half of Somerset Street.

Photo 3.37 View from Woodvale Avenue showing proximity of houses and existing screening.

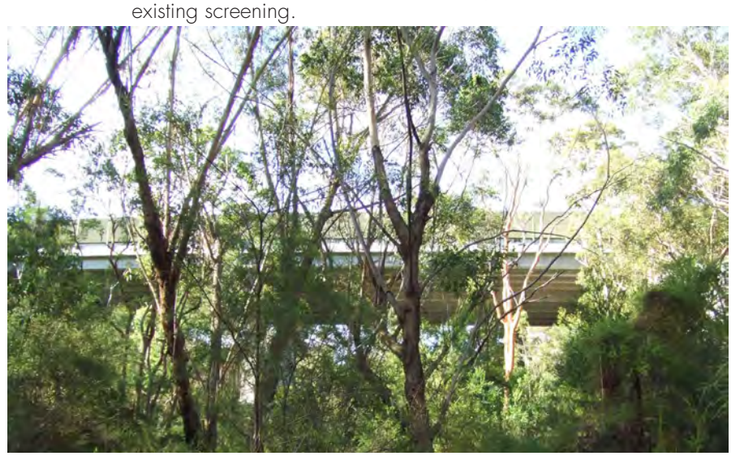
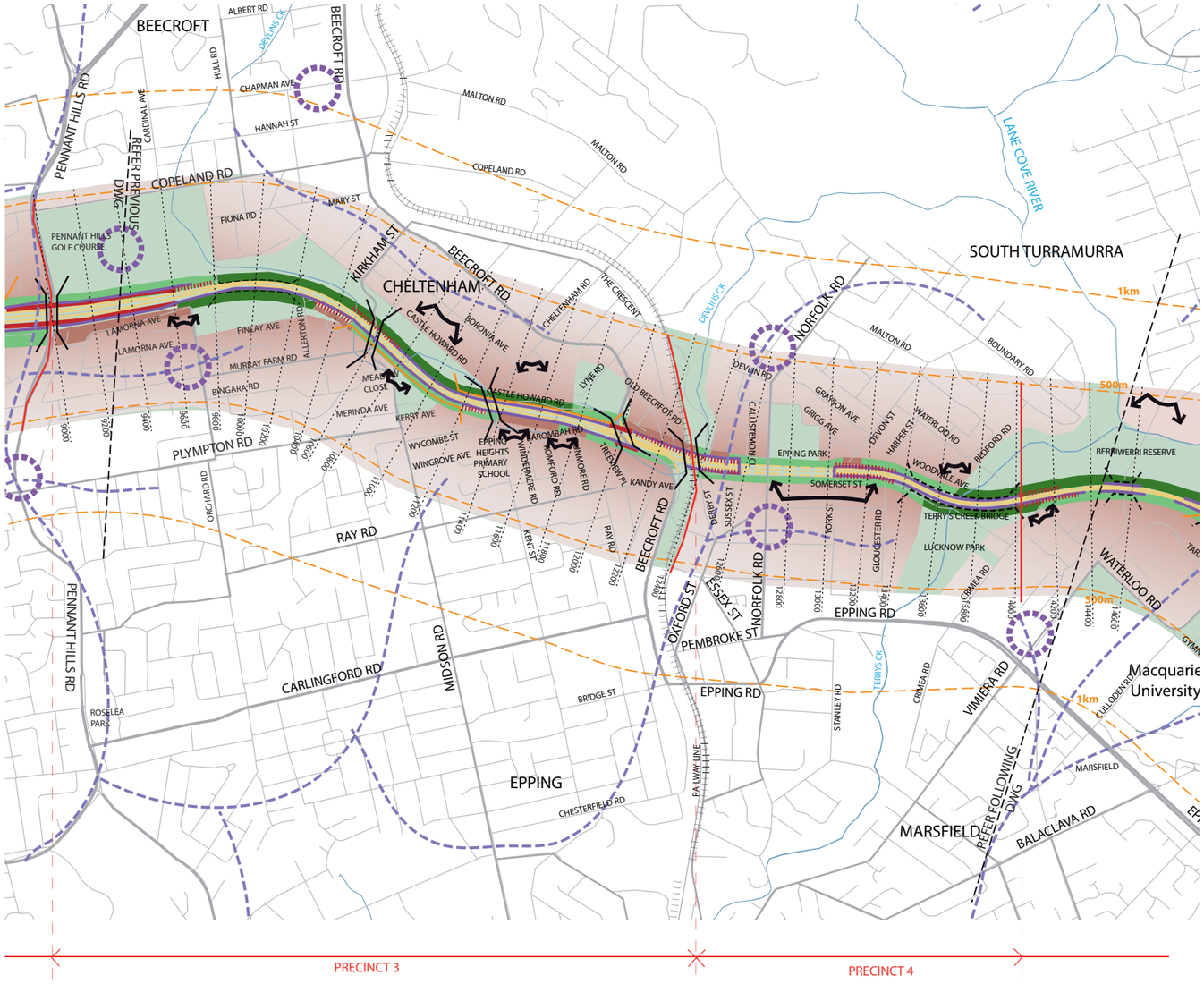


Photo 3.38 View of Terrys Creek Bridge from the walking track located on the valley floor, illustrating the level of screening offered by existing vegetation.

Visual Assessment



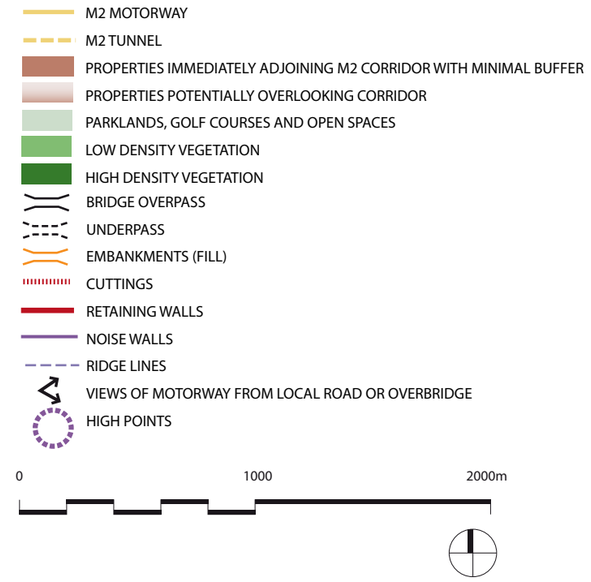


Figure 3.6 Spatial and Visual Analysis - Precinct 4

Table 3.7 Precinct 4: Visual Assessment Summary

PRECINCT 4 – Beecroft Road /Devlins Creek to Terrys Creek – Suburban Bushland Interface

Station	Location	Nature of impact			Visual sensitivity	Scale or magnitude of visual affect	Overall rating of visual impact	Issues	Opportunities/Potential Treatments
		A	N	B					
12000 to 12300	Beecroft Road Interchange (Motorway User)		■		ML	MH	M	– Removal of existing busway bridge. – Expansion of detention basin in central island.	– Potential for enhanced landscape treatments. – Removal of bridge enhances the skyline at this point by reducing visual clutter.
12440–12600 (WB)	Somerset Street Epping (Motorway Viewer)		■		M	NE	NE	– Existing noise walls remain unchanged along Somerset Street.	– Maintain existing vegetation cover in front of Noise wall
	(Motroway User)			■	ML	M	M	– Rock cutting below wall is steepened.	– Stabilisation treatments to be minimised. If shotcrete is to be used treatment should be in accordance with RTA design guidelines and part of an integrated treatment to the tunnel portal.
12620–13080	Norfolk Tunnel North Epping (Motorway User)		■		L	L	L	– Additional lane and cycle lane in Norfolk Tunnel requiring widening of tunnel including portals.	– Rework of tunnel lining and ventilation. – Consider potential to create and strengthen character of tunnel portals. Portals to integrate any requirements for rock fall etc with the revised structure.
13080–13250 (EB)	Devon Street Epping (Motorway viewer)		■		HM	NE	NE	– Existing noise walls are being retained unchanged along Devon Street. .	– Enhance screening of existing wall
	(Motorway User)		■		M	M	M	– Rock cutting below wall is steepened	– Stabilisation treatments to be minimised. If shotcrete is to be used treatment should be in accordance with RTA design guidelines and part of an integrated treatment to the tunnel portal.
13080–13250 (WB)	Somerset Street Epping (Motorway viewer)		■		HM	NE	NE	– Existing noise walls are being retained unchanged along Somerset Street.	– Enhance screening of existing wall
	(Motorway User)		■		M	M	M	– Rock cutting below wall is steepened.	– Stabilisation treatments to be minimised. If shotcrete is to be used treatment should be in accordance with RTA design guidelines and part of an integrated treatment to the tunnel portal.
13250–13460 (WB)	Somerset Street Epping	■			HM	M	MH	– Existing noise walls are being relocated closer to properties between 62 –76 Somerset Street. – This potentially could impact existing road carriageway width and result in the loss of street trees and screen planting within the adjacent verge.	– Improve treatment of noise walls and provide additional screen planting behind noise wall. – Potential to widen verge and reduce carriageway width to improve screening of noise wall.
13460–13680 (WB) 13460 – 13540 (EB)	Terrys Creek Bridge approach	■			M	M	M	– New bridge alignment will see both retaining and noise walls realigned with impacts on bushland on both side of bridge approach, due to a widened footprint.	– Revegetate bushland adjacent to bridge approaches, strengthening screen planting to reduce impact. – Retaining walls may consider colour and/or texture to reduce mass of structure.
13540–13680 (EB)	Woodvale Avenue North Epping	■			H	HM	H	– New road alignment will require noise walls to be relocated closer to adjacent properties. Existing noise walls will move from approx. 10m way to 3m from property boundaries. – Loss in buffer planting.	– Improve treatment of noise walls and provide additional screen planting behind noise wall.

Table 3.7 (continued)

Station	Location	Nature of impact			Visual sensitivity	Scale or magnitude of visual affect	Overall rating of visual impact	Issues	Opportunities/Potential Treatments
		A	N	B					
13680–13850	Terry's Creek Bridge	■			ML	L	ML	– Residential properties on both sides of bridge have filtered views of bridge and are almost at level with the bridge. – Widening the bridge on the northern side will bring the bridge marginally closer to residential properties. – Visual amenity under bridge should consider existing walking tracks and aim to minimise disturbance of bushland vegetation.	– Acrylic noise walls may be considered where noise walls are adjusted on bridge to reduce visual impact of solid noise walls and improve road user experience (subject to other design considerations). – Care needs to be taken with the design of the bridge structure so that it does not detract from the natural environment and is consistent in character with the existing.
13920–14250 (EB)	Bushland (Motorway User)			■	L	L	L	– Road widening will create a new small embankment along edge of bushland.	– Revegetate embankment providing potential for weed removal and landscape improvement.

Site Compounds – potential location of temporary construction activities

Station	Location	Nature of impact			Visual sensitivity	Scale or magnitude of visual affect	Overall rating of visual impact	Issues	Opportunities/Potential Treatments
		A	N	B					
12200–12300	Area below old bus ramp parallel to Beecroft Road			■	L	L	L	– Site compound to be established for: Site shed and lay down area. – Loss of existing vegetation. – Cannot be used until demolition is complete affecting staging.	– Potential to enhance landscape character and vegetation cover as a result of removal of Bus over bridge.
12400–12500 (EB)	Adjoining Sutherland Road – former compound site			■	L	L	L	– Site compound to be established for: Site shed and lay down area. – Residential properties 30m plus from compound	– Potential to enhance landscape character and vegetation cover. Present area is derelict with heavy cover of grass and weeds. Could be integrated with adjoining remnant of vegetation.
13300 – 13500(WB)	Somerset Road (Terrys Creek Approach)			■	M	L	ML	– Site compound to be established for: Site shed and lay down area. – Drainage channel which runs through site.	– Potential to enhance visual screening of motorway noise walls and improve connection with remnant bushland.
13750–14050 (WB)	Terrys Creek			■	M	M	M	– Site compound to be established for: Site shed and lay down area. – Overlooked by apartment blocks. – Utilises former access track.	– Potential to enhance visual screening of motorway noise walls and improve connection with remnant bushland.

Visual Sensitivity

Ne = Negligible; VL = Very Low; L = Low; ML = Medium Low; M = Medium; MH = Medium High; H = High; VH = Very High

Nature of Impact

A = Adverse; N = Neutral; B = Beneficial

Station

EB – East Bound – Works widened beyond east bound carriageway.

WB – West Bound – Works widened beyond east bound carriageway.

3.8 Precinct 5 - Crimea Road to Delhi Road – Urban Bushland Interface

Precinct 4 spatial and visual context of the motorway are illustrated in Figure 3.6

Works in Precinct 5 relate to the widening of the road corridor between Crimea Road and Lane Cove Road. Works include bridge and pavement widening over Busaco Road and Khartoum Road, relocation of noise walls; widening of road formation including cuttings and fill embankment extents. The details of this proposal are depicted in Chapter 6.

The character of Precinct 5 is predominantly defined by commercial addresses on the southern side of the corridor and natural woodland or parkland to the north of the corridor. West of Culloden Street is predominantly residential. A small pocket of residential development is also located north of the road between Khartoum Road and Lane Cove Road.

Impacts on the Motorway Viewer

The road is predominantly in cutting and lined by noise walls with landscape screening throughout this section limiting the visual impact of the proposed widening from the public domain. Key areas where the changes will be visible are:

- where motorway bridges cross the alignment; or
- where local roads cross the alignment; or
- from high rise or multi-storey offices/residential.

Unlike other sections of the corridor in this section the motorway can be glimpsed from sites almost a kilometre from the alignment due to a combination of topography and vegetation cover. These locations include Wallalong Crescent, Photo 3.40, and Koombalah Avenue, Photo 3.41, from which the motorway traffic can just been discerned through the canopy.

Retaining walls

Retaining walls have been used in locations where the motorway is on fill. Locations include: a bushland interface at stations 14200 to 14550, 14800 to 15050 which also includes Busaco Bridge (Photo 3.42); and a commercial interface 16950 to 17150. The use of retaining walls minimises the extent of disturbance to existing vegetation cover and consequently on views from adjacent properties. The design of retaining walls should consider the use of different materials and texture to minimise its impact. Reinstatement of the vegetation cover to the disturbed footprint will assist in mitigating against the impact of the walls.

Photo 3.39 View from Intersection of Koombalah/ Ashburton Avenue.

Photo 3.40 View from Wallalong Crescent.

Photo 3.41 View of Busaco Road headwall, illustrating sandstone headwall, to be replaced by vertical headwall and noise wall on top.

Photo 3.42 View from Herring Road overlooking motorway. Vegetation in foreground will be lost as a result of bridge works.

Photo 3.43 View of Talavera Road looking east twoards Herring Road.

Photo 3.44 View from Lane Cove Road of office/commercial buildings overlooking the motorway.

Photo 3.45 View of Christie Road Bridge and abutments.

Photo 3.46 View of cutting opposite Vimiera Road transmission tower looking east.

Photo 3.47 View from Northern Suburbs Cemetery looking west. Office towers are located on the southern side of the motorway.

Noise Walls

Realignment and replacement of noise walls along Talavera Road has the potential to increase the visual impact of the proposal. The impact of this is most prominent at Stations 15700 to 15900 where offset from Talavera Road is tightest. The impacts of this can be mitigated through the use of appropriate noise wall design and the reinforcement of screen planting along this edge.

Talavera Road

Modifications to Talavera Road are proposed to facilitate improved access to and from the Motorway. These works will see the widening of Talavera Road, (Photo 43) from three lanes and a bike lane to four lanes and a turning lane. This will see the loss of a portion of the verge on the northern side of the street corridor. Visually much of the streets character is created within the private domain of the adjoining properties and this will not change. In addition to modifications to Talavera Road an off ramp is to be provided at Herring Road (Photo 44), doubling the width of Herring Road at the intersection of Talavera Road. This area is presently utilised for stockpiling of materials etc. The visual address will be improved as part of these works.

Impacts on the Motorway User

Impacts on Motorway users relate to changes in bridge configuration, widening of pavement and realignment and replacement of noise walls.

Bridges

Culloden Road and Christie Road are both overbridges which need changes to abutment and cuttings to facilitate the increased in travel lanes. In the case of Christie Road, (Photo 3.45), the lengthening and widening of Christie Road Bridge will alter the visual character increasing its scale. The bridge design should consider the character of the existing bridge in its design, improving existing details so that a simple elegant bridge profile is achieved. The design should integrate all elements of the bridge including: pier and headstock, parapets, drainage and throw screens and barriers.

Khartoum and Busaco Roads have local road underpasses which are widened to facilitate the addition carriageway requirements. The changes here will be evident in the widened pavement and realignment and replacement noise walls.

Cuttings

Cuttings are to be impacted in a number of locations where they are cut back for bridges or to facilitate the introduction of additional lanes without the need to relocate noise walls if possible. This includes Stations 15200 to 15400 (east bound), 15700 to 16100 (west bound) and 17200 to 17300 (west bound, Photo 46). All are existing cuttings. The character of the existing sandstone cuttings, depicted in Photo 3.47, is to be retained, with cuttings kept vertical where rock strength permits. This minimises the impacts beyond the corridor as noise walls are retained and consequently views remain unchanged.

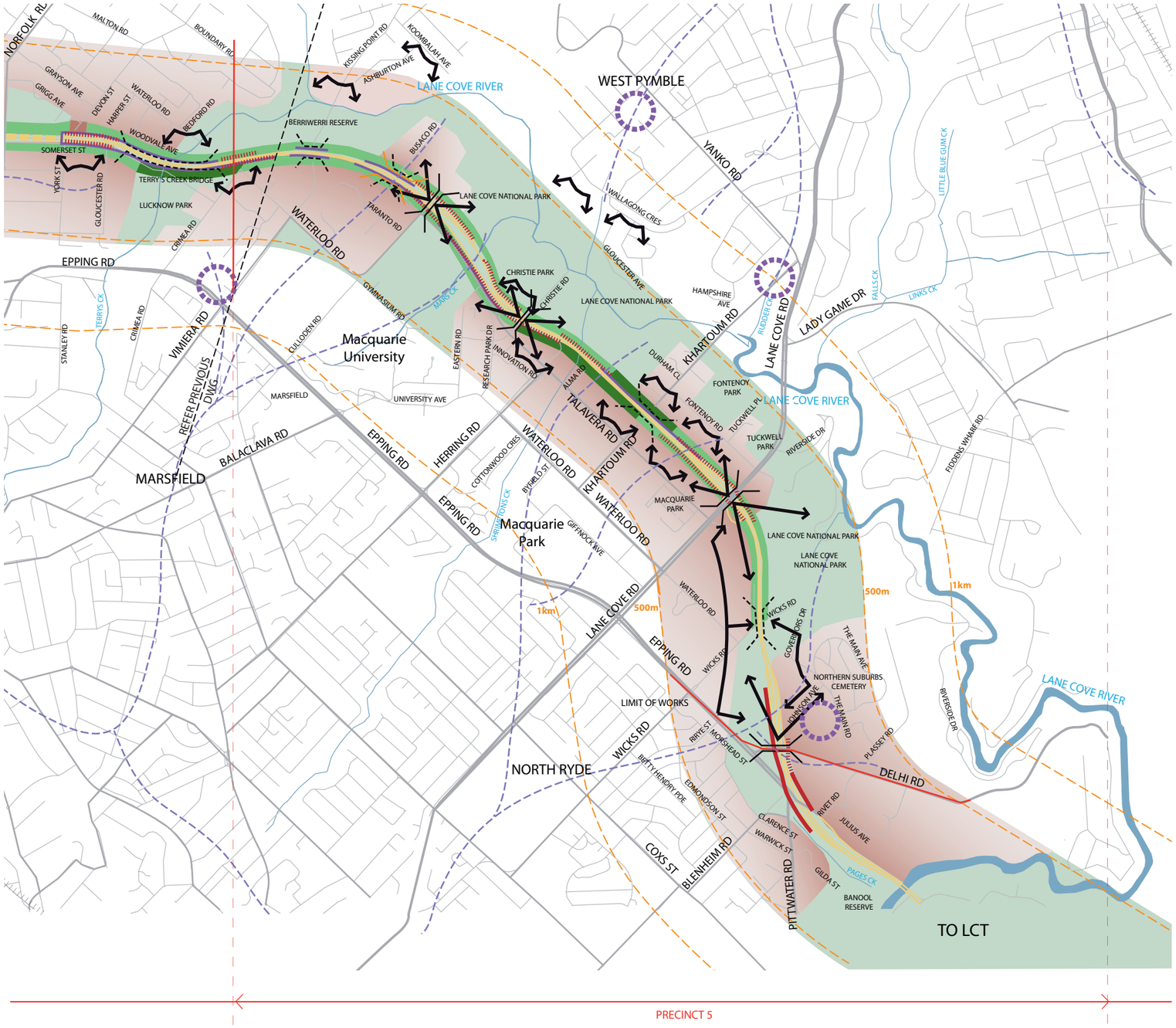
Care, however, needs to be taken in the steepening of slopes to minimise the use of shotcrete. Treatments similar to those of an existing cutting within the M2 Corridor illustrated in Photo 3.48 are unacceptable. Should it become evident that significant areas of shotcrete are required then appropriate treatments would need to be considered to ensure an acceptable finish.

Landscape should be used to assist in the integration of this element and to minimise change on adjacent properties. Screen planting should be used along the southern edge of the corridor. The landscape treatment should assist in the creation of an identity for the road and interchanges in general, to enhance legibility of the motorway.

Site Compounds

A number of site compounds are proposed within this precinct, reflecting the movement from a residential dominant landuse to commercial and industrial landuses which are more compatible with the works proposed. In principle potential sites have identified areas which are already utilised for similar activities such as the TIDC compound used for the Chatswood to Epping rail line; and Wicks Road sites associated with the waste transfer site and Northern Suburbs Cemetery Photo 3.49. In addition to these a number of sites within the corridor have been identified including the Toll Plaza site and Macquarie Park site which both occur within the corridor and have limited impact on the adjoining properties.

Three potential site have been identified which adjoin residential precincts and as a result are considered to have a greater impact. These include Vimiera Road, Busaco Road and Christie Road. The scale of works associated with these compounds is limited to stockpiling of materials either won from site or materials required for construction of the road such as bridge girders. All sites have been disturbed in the past and have a range of vegetation cover including grassed areas, weed infestations and some canopy trees. Existing vegetation cover should be preserved to at least the perimeter of the site, where possible to maintain a level of screening from the adjoining land uses.



- M2 MOTORWAY
- M2 TUNNEL
- PROPERTIES IMMEDIATELY ADJOINING M2 CORRIDOR WITH MINIMAL BUFFER
- PROPERTIES POTENTIALLY OVERLOOKING CORRIDOR
- PARKLANDS, GOLF COURSES AND OPEN SPACES
- LOW DENSITY VEGETATION
- HIGH DENSITY VEGETATION
- BRIDGE OVERPASS
- UNDERPASS
- EMBANKMENTS (FILL)
- CUTTINGS
- RETAINING WALLS
- NOISE WALLS
- RIDGE LINES
- VIEWS OF MOTORWAY FROM LOCAL ROAD OR OVERBRIDGE
- HIGH POINTS

0 1000 2000m

Figure 3.7 Spatial and Visual Analysis - Precinct 5

Table 3.8 Precinct 5: Visual Assessment Summary

PRECINCT 5 – Crimea Road to Delhi Road – Urban Bushland Interface

Station	Location	Nature of impact			Visual sensitivity	Scale or magnitude of visual affect	Overall rating of visual impact	Issues	Opportunities/Potential Treatments
		A	N	B					
14090 (WB)	Crimea Road and Waterloo Road Marsfield		■		L	NE	NE	– There are existing distant views to the Norfolk Road tunnel from the corner of Crimea Road and Waterloo Road. Expansion of the road pavement and changes to tunnel portal will be visible. – No change in noise wall height or location is to occur here.	– Handling of tunnel portal needs to be considered.
14200–14550 (EB)	Vimiera Road		■		ML	L	L	– Retaining wall to be constructed to top of existing fill embankment, adjacent to widened East bound lanes, minimising footprint of works.	– Retaining wall may consider use of materials and/or texture to minimise mass and scale of structure. – Re–vegetation of area cleared for construction will assist in mitigating impacts, screening structure from view.
14260 - 14400	Vimiera Road	■			M	M	M	– Construction of new section of noisewall 3m high at top of existing embankment over looked by residential apartments	– Potential to improve vegetation cover to embankment minimising visibility of wall
14260 - 14400	Vimiera Road (Motorway user)	■			M	M	MH	– Construction of close coupled noisewall reducing visual connection with context	– Potential to achieve a consistent maintenance edge treatment – Potential to provide colour and texture in wall to reduce mass and provide interest
14550–14850 (EB)	Bushland			■	L	L	L	– Road widening will create a small to large embankment. – Ensure embankment is no steeper than 1 in 2 slope to allow planting.	– Revegetate embankment.
14850–15050 (EB)	Busaco Road Marsfield		■		M	L	ML	– Existing road and noise wall is being relocated closer to adjacent property. – Road to be supported by retaining wall due to steep topography and to minimise extent of impact.	– Retaining and noise walls may consider use of materials, colour and/or texture to minimise mass and scale of structure. Walls should be integrated with the existing bridge structure. – Provide additional screen planting behind noise wall.
15200–15280 (EB)	Culloden Road Bridge (Motorway User)		■		L	L	L	– Existing spill through bridge abutment to be stood vertical to widen opening under bridge	– Exposed shotcrete should be concealed by the use of cladding. Cladding is to be designed to present a smooth even abutment profile that ties in with the adjoining embankment.
15260–15400 (WB)	Talavera Road Macquarie Park (Motorway user and viewer)		■		L	L	L	– Existing noise wall is being relocated closer to Talavera Road, requiring removal of some vegetation cover. – Cutting is to be steepened, potentially increasing visual presence and need for shotcrete type treatments.	– Avoid the use of shotcrete on cutting where unavoidable use is to be in accordance with RTA design guidelines. – Provide additional screen planting to front and behind noise wall to minimise impacts of wall from within and outside of the corridor.
15500–15700	Main toll plaza, Talavera Road Macquarie Park (Motorway user)		■		L	L	L	– Existing toll awning and booths to be substantially removed with new tolling gantries to be installed. – Lanes through toll plaza to be rationalised to enhance user legibility.	– Tolling gantry should be a simple, functional slimline structure with lighting placement considered as part of the overall design. – Lighting to be cut off type lighting to minimise light spill.
15700–16070 (WB)	Talavera Road Macquarie Park	■			M	MH	MH	– Existing noise wall is being relocated closer to Talavera Road. – Large cutting for lane widening. – Loss in street planting and buffer vegetation along Talavera Road.	– Provide additional screen planting behind noise wall to maintain streetscape character. – Avoid the use of shotcrete on cutting where unavoidable use is to be in accordance with RTA design guidelines.

Table 3.8 (continued)

Station	Location	Nature of impact			Visual sensitivity	Scale or magnitude of visual affect	Overall rating of visual impact	Issues	Opportunities/Potential Treatments
		A	N	B					
16070–16170 (EB)	Christie Road Bridge	■			L	M	ML	– Existing spill through bridge abutment to be stood vertical. – Bridge is to be widened and lengthened.	– Exposed shotcrete is to be concealed by the use of cladding. Cladding is to be designed to present a smooth even abutment profile that ties in with the adjoining embankment.
16820–17100(EB)	Khartoum Road Macquarie Park (EB)	■			ML	M	M	– Existing noise wall is being relocated closer to adjacent properties.	– Improve treatment of noise walls and provide additional screen planting behind noise wall.
16900–17140 (EB)	Khartoum Road Bridge (EB)			■	L	L	L	– Bridge is to be widened including reconstruction of abutments perpendicular to Khartoum Road.	– Bridge design is to present a simple, clean profile similar to existing which incorporates noise walls to parapet in an integrated fashion.
17240–17650 (EB)	Fontenoy Road Macquarie Park	■			ML	L	ML	– New noise wall is being relocated closer to adjacent properties.	– Additional screen planting to be undertaken behind noise wall to reinstate vegetation lost as part of construction works and to minimise impact.
17200– 17300 (WB)	West bound on ramp from Lane Cove Road			■	M	L	ML	– Existing shale cutting, overlooked by residential tower, to be steepened potentially requiring stabilisation treatments.	– Treatment of embankment to be provided which is consistent with urban design strategy and minimises shotcrete. If shotcrete and bolting is required appropriate treatments need to be considered.
17600 (EB)	EB Off–Ramp to Lane Cove Road Macquarie Park		■		ML	ML	ML	– New noise wall to be constructed	– Provide screen planting along open corridor.

Site compounds – potential location of temporary construction activities

14400– 14600 (WB))	Vimiera Road		■		ML	L	ML	– Site compound to be established for: Stockpile and lay down area. – Overlooked by a number of apartment blocks. – Divided by access associated with Vimiera Pedestrian Underpass.	– Potential to retain vegetation located on boundaries adjoining residences.
15000 (WB)	Busaco Road		■		M	M	M	– Site compound to be established for: Stockpile and lay down area – Parkland adjoins Creekline with some large trees.	– Potential to address privet infestation of creekline and improve usability of parkland.
15400–15800 (EB)	Toll Plaza		■		L	L	L	– Site compound to be established for: Stockpile and lay down area.	– Treatment of hoardings to consider site lines for safety and may address the character of the interchange.
15900–16100 (WB)	Christie Road		■		M	M	M	– Site compound to be established in informal carpark for: Stockpile and lay down area. – some existing vegetation cover to be removed.	– Potential to maintain vegetation on perimeter of site to limit impact on street address.
16500–16900 (EB)	Macquarie Park		■		L	L	L	– Site compound to be established for: Stockpile and lay down area. – Adjoins national park and is overlooked by some residences.	– Opportunities to screen and improve revegetation on previous compound area which is becoming weed infested.
18200–18400 (EB)	Wicks Road		■		L	L	L	– Site compound to be established for: Stockpile; lay down area; and overflow car park.	– Existing waste transfer handling site, potential to revegetate depending on owner end use.
18400–18700 (EB)	Wicks Road Cemetery		■		HM	M	MH	– Site compound to be established for: Stockpile, batchplant; and lay down area.	– Part of cemetery land would need to screen and control activities adjoining cemetery to avoid negative impacts. – Batchplant would need to be sited closer to Wicks Road.
18700–18900 (WB)	TIDC compound		■		L	L	L	– Primary Site Compound including: Main office; Canteen; Laboratory, Traffic management stores, and Main Car park.	– Existing Chatswood to Epping Rail compound provides the perfect opportunity to continue this use with no significant change in impact.

Visual Sensitivity

Ne = Negligible; VL = Very Low; L = Low; ML = Medium Low; M = Medium; MH = Medium High; H = High; VH = Very High

Nature of Impact

A = Adverse; N = Neutral; B = Beneficial

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4.0 OBJECTIVES AND PRINCIPLES

4.1 Vision

The vision for the M2 Motorway is that the vegetated landscape and the uniqueness of the topography in this part of Sydney should inspire the design of the future upgrade and development of the motorway. In keeping with the original design, a key objective would be that the:

"…. landscape design would include the desire to preserve existing visual linkages or establish new linkages across the expressway."[1]

The Vision is therefore that:

The M2 Motorway upgrade should reflect the corridor's role as an important north-west route linking Ryde, Blacktown and the M7. Its design should be simple, well considered, elegant, refined, robust, reflect the natural and cultural qualities of the region through which it passes and establish a clear and recognisable identity for the motorway.

This vision can be applied to all future developments of the motorway and implemented gradually. The limited upgrade provides the opportunity to commence the process of improving the presentation of the Motorway but it is not within the scope of this upgrade to improve the whole of the Motorway. Only areas that are to be impacted by the upgrade are to be addressed as part of this process.

It is envisaged that as the road is developed and maintained, as part of the concession period, this design vision and its objectives and principles will be progressively implemented by Hills Motorway.

4.2 Design Objectives and Principles

The key urban design objectives for the upgrade of the M2 Motorway will be considered throughout all phases of the project, will inform all design decisions and will be used to evaluate the success of design proposals.

Objective 1

Upgrade works are to improve the visual appearance and character of the road corridor and create a recognisable identity for the M2 Motorway.

Principles

- Motorway elements are to enhance the visual quality of the corridor.
- Motorway elements are to be constructed of appropriate materials that are contextually responsive.
- Motorway elements are to provide/establish a consistent and identifiable architectural language.
- Provide a consistent set of built elements along the length of the corridor to strengthen the identity of the road.
- Conserve, enhance and interpret any historically significant items along the corridor.

Objective 2

Motorway elements are to complement the surrounding setting.

Principles

- The use of colour and form needs to relate to the landscape setting.
- Motorway elements should capture/complement the strength of the sandstone geology of the ridge lines.
- Motorway elements are to make a positive and appropriate contribution to the defined character and essential qualities of the motorway corridor.

Objective 3

Maintain a safe and accessible corridor.

Principles

- The new works should maintain a safe and accessible corridor which reinforces safe driver behaviour and provides a pleasant and interesting travel experience.
- Hard and soft landscape should be used to emphasise road geometry, yet retain views for driver safety.

Objective 4

Improve connectivity

Principle

- Maintain, improve and strengthen the connectivity of the community across the Motorway corridor, linking footpaths, cycleways, public transport, recreation areas and major precincts.

Objective 5

Revegetation strategies need to relate to scale, composition and colour of the adjacent built form.

Principles

- Landscape plantings need to be simple, bold, robust, long-lasting, accessible and manageable.
- Any new landscape or built works need to balance capital cost against long-term maintenance.
- Implement a management strategy for the long term control of weeds within the corridor.

Objective 6

Protect and enhance the natural systems and ecology of the corridor.

Principles

- Natural vegetation communities should be enhanced.
- Weed infestations should be managed and controlled.
- The drainage design needs to respond to the landscape context and not just be another hard engineering element. Soft engineering solutions can provide a drainage system which is both attractive and robust providing improved sustainability and flood control.
- The existing landscape character is to be strengthened so that a continuous and prominent backdrop of landscape is created and maintained.

Objective 7

Maintenance of hard and soft landscape elements must be accessible and maintainable with minimal resources.

Principles

- Achieve a simple and unified design which minimises maintenance and associated long term costs.
- Development of access tracks in areas associated with construction disturbances should be adopted.
- Built elements should be designed to have minimal maintenance.
- The utilisation of maintenance tracks for drainage can be an integral element of the overall landscape maintenance.

1 North West Transport Links East: Environmental Impact Statement Working Paper - Landscape and Visual Assessment, Bruce Mackenzie and Associates, 1992

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5.0 OPPORTUNITIES AND CONSTRAINTS

As an existing road corridor, within a developed suburban setting, there are a number of constraints which will influence the final design outcome. These constraints also provide opportunities to improve the character and identity of the road corridor within the context of the upgrade works.

Key Site Constraints include:

- Property boundaries with immediately adjacent noise walls which restrict road widening;
- Extent of space available for landscaping and screening of noise walls and retaining walls;
- Scope of project constrained to upgraded areas only;
- Devlins Creek which runs across and immediately parallel to the motorway;
- Topography in proximity to Norfolk Road Tunnel; and
- Heritage homestead curtilage on Windsor Road.

Constraints also exist in terms of the existing fabric of the road.

The upgrade works are constrained in scope to only those required to implement the upgrade. The urban design challenge is therefore to address the way the current fabric is changed where upgraded and how this relates to the existing structures. Whilst the existing built form is an unsuccessful urban design outcome which fails to meet current RTA standards, it is important that the relationship between the old and new is considered in the design process and not exacerbated by the new works. Design solutions therefore need to address the character of the existing Motorway built elements and provide solutions which compliment and improve the visual outcome of the Motorway built form.

Opportunities exist to improve:

- pedestrian, cyclist and vehicular connections across the Motorway corridor;
- open space networks;
- the travel experience along the motorway;
- the appearance of cuttings stabilised with shotcrete;
- the appearance of bridge and noise wall structures;
- the landscape design of the Motorway to respond the differing contexts;
- maintenance access;
- weed levels through the adoption of appropriate plant densities and treatments; and
- visual amenity through increased vegetation coverage in front of noise walls and on embankments.

The upgrade of the Motorway and the expansion of the existing carriageways brings with it the opportunity of addressing some of the shortcomings or failings of the present urban design. In addressing these issues the objective would be to unify the corridor and improve the appearance of the road thereby creating a stronger identity to the corridor. Elements where improved urban design outcomes can be implemented include:

- Noise walls (Refer to Section 5.1)
- Cuttings (Refer to Section 5.2)
- Bridges (Refer to Section 5.3)
- Retaining walls (Refer to Section 5.4)

5.1 Noise Walls

An opportunity exists to significantly improve the urban design of the existing noise walls along M2 Motorway corridor. The following design issues related to the different noise wall types are discussed:

- Location of the walls in relation to the Motorway and topography;
- Material selection - type, colour, texture;
- Use of planting to respond to context and create an improved visual outcome;
- Architectural detailing.

5.1.1 Noise Wall Location in Relation to the Road

Noise walls should either provide a sufficient setback for landscape screening or be a defined hard urban edge, closely coupled to the road.

Close Coupled Noise Wall

The close coupled noise wall can create a clean hard edge to the road that can reduce maintenance if detailed correctly (refer to Figure 5.1 and Photo 5.1). If a gap is left it may be affected by weed growth and become a collection point for debris.

In designing a close coupled noise wall the support structure, panel fixing and colour need to be carefully considered.

Noise Wall Relationship to Cutting and/or Retaining Walls

The alignment of noise walls on road cuttings can accentuate the verticality of the cutting.

Refer to Photo 5.2.

The scale of the wall may be reduced by providing additional revegetation in front of walls and/or increasing the setback of noise walls from the motorway.

Care needs to be taken so that the built element relates to and complements the character of the natural geology or the underlying retaining wall panel design.

Alignment of Noise Walls

Walls must use a consistent methodology to define their relationship to the road. Consideration of the noise wall alignment in plan and elevation is critical in achieving an integrated outcome, particularly in relation to retaining walls.

Refer to Photo 5.3.

Irregular and random setbacks can provide a profile which is distracting and provides poor visual amenity.

The profile of the walls should be as streamlined as possible. Random stepping to accommodate a slope should be avoided.

Refer to Photo 5.4.

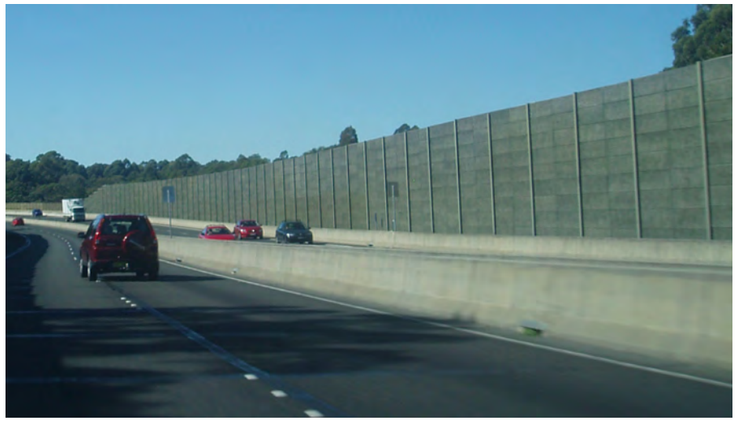

Photo 5.1 Noise wall directly adjacent to concrete traffic barrier.

Photo 5.2 Sandstone cutting with shotcrete top edge and noisewall.

Photo 5.3 Noisewall on top of shotcrete wall at Pennant Hills Road Interchange.

Photo 5.4 Noisewalls with irregular stepping and offset from the road edge.

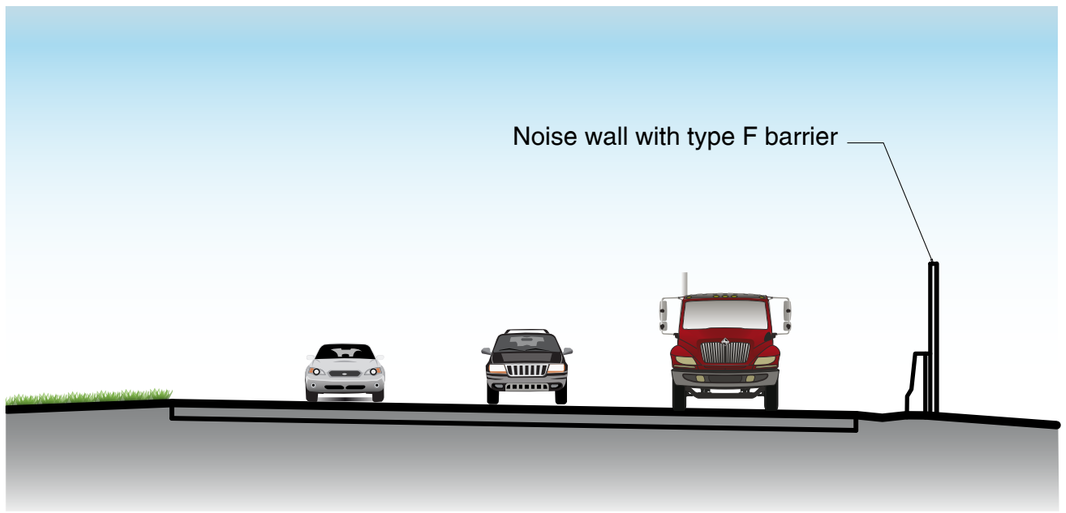

Figure 5.1 Close Coupled Noise Wall.

5.1.2 Noise Wall Materials Selection

Noise wall materials should be designed as part of a coordinated palette of materials, colours and textures. The profile of the walls should be as streamlined as possible. The following palette of noise wall materials should be considered.

Precast Concrete Panels

Precast concrete is useful and cost efficient when creating long lengths of repetitive panels. The material is strong, durable, versatile and a high quality finish can be achieved. Panel lengths can be determined to maximised post spacings and to suit the desired proportions and length of the individual wall. The detailing is important and looks attractive when the steel support structure is concealed. Contextually appropriate patterns can be applied to add interest and establish linear identity. (Refer to Photo 5.5)

Hebel Lightweight Concrete Panels

Hebel lightweight concrete panels are currently used for all walls on the M2 Motorway. This cost effective material is useful for matching with existing walls that require additional length or height. Care should be taken to achieve clean lines and a controlled top edge to the wall alignment. (Refer to Photo 5.6)

Transparent Panels

Best practice urban design utilises transparent panels to allow views of the surrounding context, specifically at bridge crossings. This provides the motorist with a visually pleasing journey experience and landmarks for orientation and way-finding. The panels can be acrylic or glass however, consideration must be given to the risk of vandalism. It is noted that other project priorities may also effect the choice of transparent versus solid panels. (Refer to Photo 5.8)

Absorptive Panels

Absorptive panels are used where higher acoustic performance is required. Absorptive surfaces have been applied at several locations along the Motorway and may be required to integrate into existing absorptive walls. Even when painted the same colour as typical walls, their visual appearance can differ markedly due to their rough texture and over time tend to collect more grime. (Refer to Photo 5.9)

Colour

As previously mentioned, the noise walls, despite efforts to camouflage the structures by painting them green, are a visually dominant element. There is an opportunity to provide a better colour palette which complements the existing green walls, references the surrounding bushland context and visually recedes into the context. Photos 5.7 and 5.10 illustrate the existing colour scheme versus use of a more blue/grey colour. Adopting a better grafitti managment policy, such as painting the whole panel rather than patching, may also improve the appearance.

Photo 5.5 Patterned precast concrete panels on the Pacific Highway.

Photo 5.6 Hebel wall with clean lines and top edge.

Photo 5.7 Existing colour scheme palette.

Photo 5.8 Transparent panels on a Pacific Highway bridge.

Photo 5.9 Absorptive panels adjacent to smooth panels.

Photo 5.10 Proposed blue/grey alternative colour palette.

5.1.3 Use of Planting in Front of Noise Walls

Landscape planting can be used to improve amenity and create landscape character. Where a wider space exists, the insertion of landscape in front of the wall can provide a heightened user experience along the corridor and better visual connection to the adjoining context. The following describes the different type of setbacks.

Wide Setback

This is where the setback behind a barrier is greater than 3 metres and can accommodate trees, shrubs or ground covers. The provision of a wide setback can dramatically improve the visual amenity in front of noise walls. The scale of the revegetation relates well with the built form as shown in Figure 5.2. Wide areas of planting provide amenity and soften the road corridor (refer to Photo 5.9), however, consideration needs to be given to additional maintenance requirements and their associated costs.

Narrow Setback

When the setback behind a barrier is greater than 1.5 metres and less than 3 metres it can accommodate shrubs and ground covers only. The use of ground covers only to the base of the noise wall can provide separation between the road pavement and the noise wall strengthening the architectural qualities of the noise wall.

The design of the traffic barrier needs to be considered in the adoption of the minimum setback. The present road alignment predominantly uses W-beam barrier or Type F barrier. These barrier types will be continued. When using a Type F barrier in association with planting consideration to filling behind the barrier is recommended.

Refer to Figures 5.3 and 5.4.

Where a minimal setback is adopted, planting needs to consider the environmental constraints (physical and micro-climatic). When the setback is too narrow, the success of the planting can be sporadic (refer to Photo 5.10). Three areas influence the success of this zone:

1) Ground preparation is critical for the plants establishment and long term survival.
2) Plant selection needs to be cognisant of the environmental constraints to achieve a successful and robust outcome.
3) Maintenance – landscape is a "living finish" and so will need some level of maintenance input.

When deciding on a treatment it should be remembered that sometimes having planting can be a worse response than to not have planting, due to the haphazard appearance of the planting and the difficulty of maintenance. In such instances it may be better to consider the whole of life cost and adopt a close coupled noise wall and barrier approach with no planting that relies on a well detailed wall for a more consistent and durable outcome.

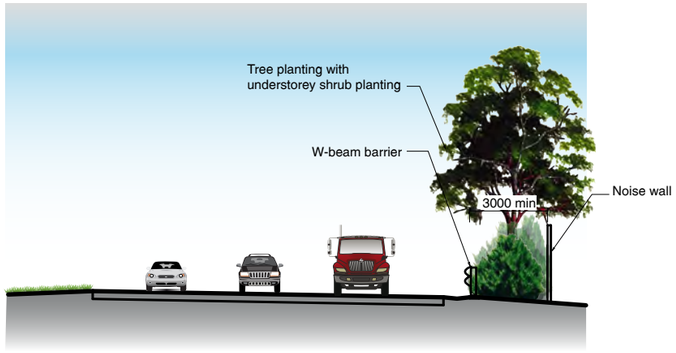

Figure 5.2 Planting - wide setback (greater than 3m width)

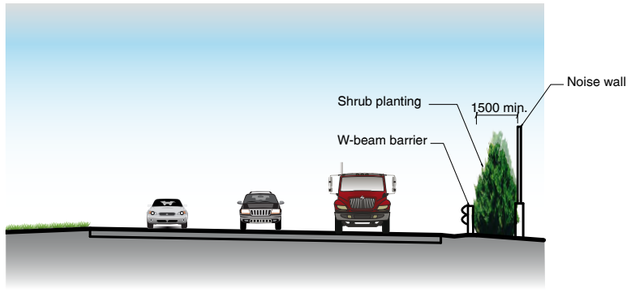

Figure 5.3 Minimal setback with W-Beam barrier (1.5m to 3m width)

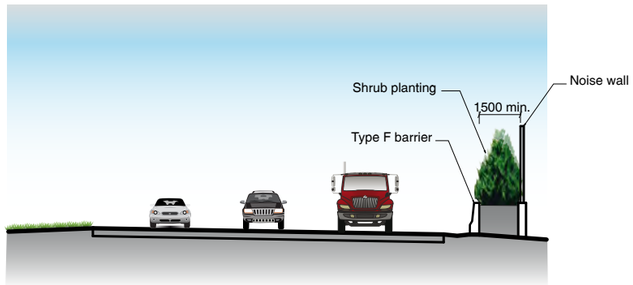

Figure 5.4 Minimal setback with Type F barrier (1.5m to 3m width)

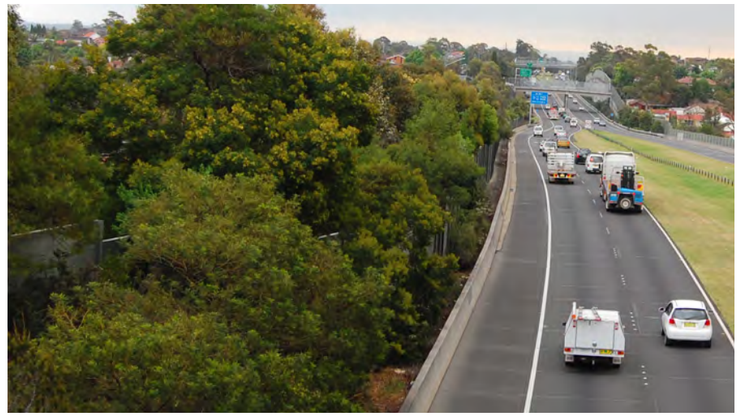

Photo 5.9 Noisewall concealed in wide setback with shrub plantings.

Photo 5.10 Poor and irregular planting between traffic barrier and noise wall.

5.1.4 Architectural Detailing of Noise Walls

The architectural detailing of the noise walls must be considered not only for acoustic performance but also for visual. Details to consider include:

Post Position

Structural noise wall posts concealed from the motorway side create a cleaner line, although care with the off-road side wall appearance must be taken. Photo 5.11 illustrates poor landscaping screening treatment of an off roadside noise wall.

Posts, particularly if visible, should be spaced regularly and any stepping to accommodate slopes should maintain the regular spacing (refer to Photo 5.12). Post spacing should also consider the desired visual proportions of the noise wall. For example, the existing noise walls on the motorway are at spacings of 4 metres and when the walls increase in height, they appear visually taller than the actual height.

Joints and Junctions

The joints and junctions should be fully sealed with no gaps, as this affects the acoustic performance of the noise wall. Joints can be expressed or concealed depending on the directional emphasis of the design and panel sizes should be consistent. The stepped joints between panels on the existing Motorway walls create a horizontal emphasis which can be distracting when the panels step up a slope or the joints are misaligned.

Terminations

The end of each noise wall must be designed to 'fade out' into the landscape or terminate with a design feature. Walls which interact or merge with other structures, such as bridges or retaining walls, must have an integrated design intent. Most existing noise walls on the Motorway simply terminate with no consideration given to the aesthetic appearance of the end panels. (Refer to Photo 5.13)

Bolt Connections

Bolted connections should be designed to fit with the style or theme of the noise wall and appear simple and robust. Connections are to be as simple in appearance as possible, vandal proof, durable and not left up to the contractor to solve on site. Photo 5.14 shows the current poor resolution of this detail on the motorway.

Photo 5.11 Noise wall posts viewed from the off-road side.

Photo 5.12 Tree trunks echo the regular panel joint spacings.

Photo 5.13 Poor noise wall termination viewed from the local road.

Photo 5.14 Noise wall post connection to a bridge parapet.

5.2 Cuttings

An opportunity exists to significantly improve the urban design of the existing cuttings along M2 Motorway corridor. The following design issues related to the different cutting profiles are discussed:

- Profile
- Stabilisation - use of rock bolts, architectural shotcrete or cladding
- Revegetation.

Sandstone cuttings are a strong and repetitive element within the current M2 corridor. These cuttings have a positive visual impact on the M2 Motorway however retention in their natural state is dictated by their structural strength.

5.2.1 Cutting Profile

The current M2 has adopted a benched profile for a number of cuttings.

The benching relates to the transition between the strong and weak sandstone, with the weaker stone laid back at 1 in 2 slope or flatter and the higher strength rock set near vertical (refer to Figures 5.5 and 5.6). This strategy has enabled vegetation to establish along the top of the embankment. This is a successful approach that should be carried forward into the design of the upgrade works.

Near vertical cuttings have also been used without benching (refer to Photo 5.15). Where vertical cuttings occur in association with built elements such as noise walls, care needs to be taken to ensure an integrated interface between the two elements.

Where a weaker seam occurs within the near vertical cut profiles shotcrete has been used to stabilise the face of the wall. In such instances a flatter slope would have been more successful outcome as illustrated in Photo 5.16.

Where weaker rock has been exposed cuttings have been generally laid back at 1in 2 or flatter. For weak rock embankments, revegetation is most successful on slopes flatter than 1in 3. Slopes steeper than 1:2 are not able to be effectively revegetated in the short term. Over time vegetation may establish in the weaker plans of such rock as can be seen in photo 5.15, this process is slow and uneven and best left to nature.

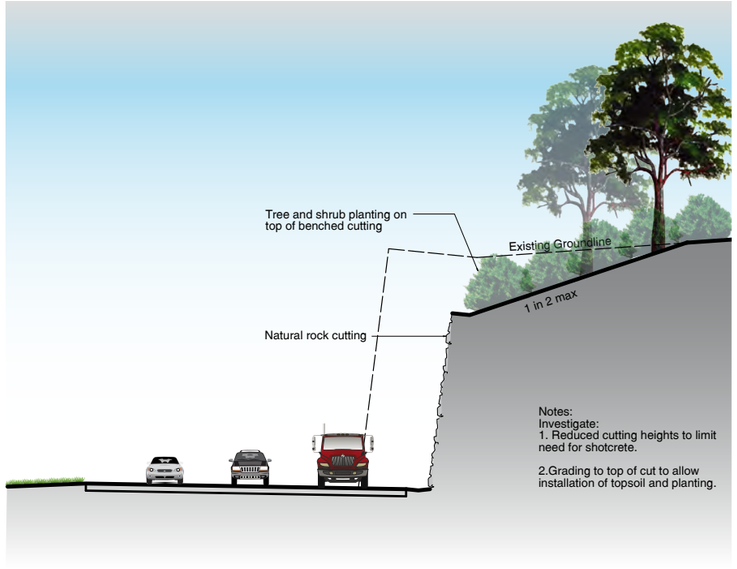

Figure 5.5 Cut slope – Option to reduce scale of vertical cut and avoid use of shotcrete.

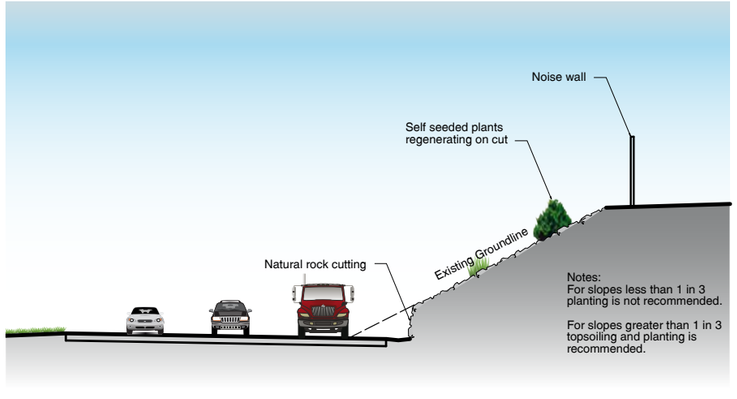

Figure 5.6 Cut slope - Option to minimise change in slope profile by standing vertical.

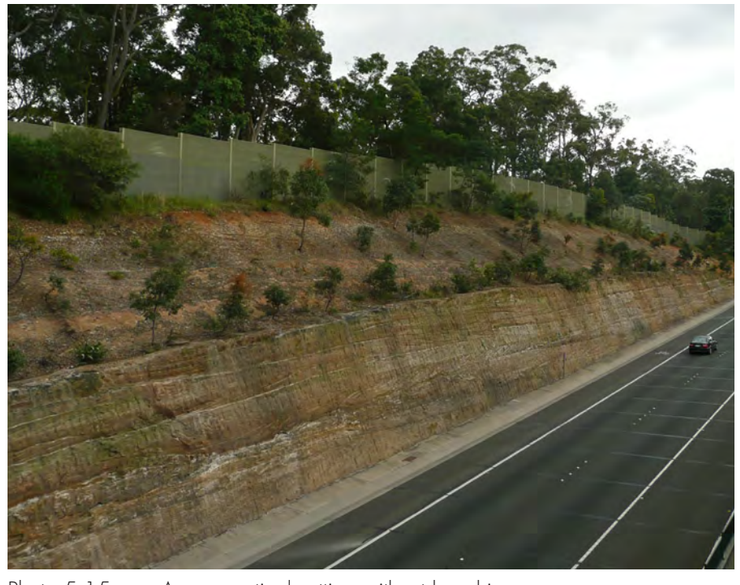

Photo 5.15 A near vertical cutting without benching.

Photo 5.16 Shotcrete stabilisation applied to a near vertical cutting.

5.2.2 Cutting Stabilisation

The use of rock bolts with shotcrete on the cutting face creates a visually unappealing finish along the corridor (refer to Photo 5.17). Where large expanses of shotcrete have been applied, an improvement in the wall could be provided by either treatment of the shotcrete, the application of concrete cladding panels or a redesign of the wall treatment to improve its visual amenity such as texture, colour or patterning subject to other project priorities.

Problems experienced with the use of shotcrete are:

- Large uniform textures which do not relate to the geology or context;
- Colours need to reflect the material to which they are being applied; and
- Extent needs to be focused and overspray avoided.

The use of shotcrete on the top edges of sandstone cuttings is not always a successful solution. An enhancement of the visual character of the cutting may be more effectively achieved by using:

- Stone pitching;
- Creating a benched profile with reduced upper slope, that is 1 in 4 slope enabling revegetation; or
- Shotcrete to achieve a texture, colour and patterning that reflects that of the underlying stone.

5.2.3 Revegetation on Cuttings

Revegetation on road cuttings creates an improvement to the visual amenity of the road corridor. The benching also allows a higher success rate of reseeding of native species and a safer environment for maintenance. (Refer to Photos 5.18 and 5.19)

The design of cuttings should consider the potential to apply top soil to flatter slopes for revegetation, softening the impacts of cuts and providing better integration with the adjacent landscape.

Photo 5.17 External rock bolts beneath shotcrete stabilisation.

Photo 5.18 Revegetation of a cutting conceals the noise wall.

Photo 5.19 Shotcrete stabilisation and vegetation on top of a cutting.

5.3 Bridges

An opportunity exists to significantly improve the urban design of the existing bridges along the M2 Motorway corridor. The following design issues related to the bridges are discussed:

- Structural form
- Pier, headstock and parapet design
- Bridge furniture.

5.3.1 Structural Bridge Form

The choice of bridge structure is fundamental to the aesthetic outcome of the Motorway. The complexity of the structure should be minimised to create a simple and elegant bridge. Form, proportion, symmetry, and detailing are all important factors.

The structural from of a new bridge should reflect the context within which it is located and the nature and type of load that is being carried. The superstructure must be well proportioned and simple in its design. It is generally accepted that a bridge with a slender girder depth is more elegant. Symmetry in a bridge structure assists in creating an harmonious whole.

Most overbridges on the current M2 Motorway are Super-T girder structures as shown in Photos 5.20 and 5.25. Any bridge expansions required in the motorway upgrade works should be a straightforward repetition of the existing bridge structure. Any new works should attempt to enhance the appearance of the bridge and integrate cleanly with the existing form.

5.3.2 Pier, Headstock and Parapet Design on Bridges

The piers and headstocks should be integrated with the bridge. Headstocks are more successful if they are integrated with the pier design and their ends not exposed past the edge of the bridge structure (refer to Photos 5.22 and 5.23). This allows the superstructure to dominate the appearance of the bridge.

Piers should be evenly spaced along the length of the bridge. On road bridges, the piers should be located to facilitate clear spans for the passing of traffic beneath. Piers can be tapered, elliptical, round or rectangular and the shape is selected to reflect the natural transfer of loads to the ground.

The outer face of the parapet is often the most dominant feature when the bridge is viewed from below. The parapet should be as slender as possible and appear as a continuous element. The thinner this leading edge, the more elegant the bridge. (Refer to Photo 5.24)

The parapet should be a single clean plane and be angled to control staining from rain water runoff. Transparency through the parapet, utilising single or double rail steel barriers maintains a slender edge profile and allows views for the motorist.

The bridge extension works of the M2 upgrade will match new piers, headstocks and parapets to the existing bridge language on the road.

Photo 5.20 Lane Cove Road double span overbridge.

Photo 5.21 "Bebo" arch bridge over Busaco Road.

Photo 5.22 Bridge at Beecroft Road with exposed piers and headstocks.

Photo 5.23 Piers and headstocks beneath Christie Road overbridge.

Photo 5.24 Noisewall adds extra depth to the structure over Khartoum Road.

Photo 5.25 Single span Super-T girder bridge over Wicks Road.

Photo 5.26 Pedestrian bridge over the M2 Motorway.

Photo 5.27 Double motorway bridge over bushland and Devlins Creek.

5.3.3 Bridge Furniture

Noise barriers on bridges increase the visual depth of the structure and transparent acrylic panels may be considered to offset this effect (subject to other project priorities). The bolted post connections must be set out evenly across the bridge parapet as shown on Photo 5.28.

The safety screen should be an integral part of the bridge design. The detailing of safety screens on bridges should be simple, safe, robust and complementary to the surrounding setting (refer to Photo 5.30). Screens that curve or splay outwards provide a less enclosed experience on top of the bridge. The handrails and throw screens on bridges should be integrated as one element to simplify the design.

Steel traffic barriers, handrails and cyclist rails should be integrated with each other, as shown in Photo 5.30 and extend to the very ends of the bridge parapet to create a clean, elongated visual line. The elements should be simple in their design yet meet all the safety requirements without becoming oversized.

Drainage pipes should be concealed between girders or behind precast concrete parapet extensions. The pipes should not be exposed (see Photo 5.31).

Bridge furniture on any new or expanded bridges, as part of the M2 Motorway upgrade, will endeavour to integrate with the existing style of bridge furniture, maintain the existing character and improve the appearance of the bridges.

Photo 5.28 Solid noisewalls fixed to the bridge parapets at Khartoum Road.

Photo 5.29 Simple, well defined safety screens on Christie Road overbridge.

Photo 5.30 Well integrated handrails on the pedestrian bridge at Kent Road.

Photo 5.31 Exposed drainage pipes on Watkins Road overbridge.

5.4 Retaining Walls

An opportunity exists to significantly improve the urban design of the existing retaining walls along M2 Motorway corridor. The following design issues related to the different retaining wall types are discussed:

- Location and profile in relation to other structures;
- Materials selection - type, colour, texture;
- Use of planting - screening, contextual response and identity.

5.4.1 Location and Profile

Retaining walls should be well integrated with the structures they are supporting and be designed to enhance the character of a precinct. Ideally, retaining walls should be setback from the edge of the road to provide space for planting. Where this is not possible the wall should be designed as a feature, possibly with a pattern or colour to match the setting.

Walls facing motorways and major local roads may be more urban in their style whereas walls around reserves, creeks and parklands should use natural materials and be as recessive as possible.

The top edges of retaining walls should be designed to create a smooth, flowing line, despite local deviations in the adjacent topography.

Retaining walls which are integrated with bridge abutments should have clean, lines and not distract from the clarity of the bridge structure.

5.4.2 Material Selection

Retaining walls can be built out of many materials creating a variety of appearances ranging from very urban to more rural in character. Existing retaining wall types comprise:

- Precast concrete panels - with relief patterns to create visual interest (refer to Photo 5.32).
- In-situ concrete walls, where a high quality of finish is not required (refer to Photo 5.33 and 5.34).
- Gabion baskets - colour and type of stone should match the local types (refer to Photo 5.35).

Shotcrete should be minimised in highly visible locations (as far as practicable). (Refer to Photo 5.36 and 5.37)

Photo 5.32 Precast concrete panel wall bridge abutment at Khartoum Road.

Photo 5.33 In-situ concrete walls along Devlins Creek at Kirkham Street.

Photo 5.34 Precast concrete walls at Beecroft Road bus ramps.

Photo 5.35 Low gabion basket walls near Khartoum Road bridge.

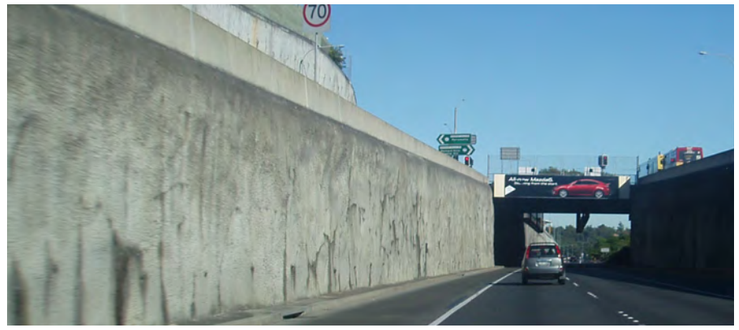

Photo 5.36 Shotcrete retaining wall at Pennant Hills Road Interchange.

Photo 5.37 Shotcreted abutment cutting at Watkins Road overbridge.

5.4.4 Use of Planting with Retaining Walls

Planting can be used to screen, break up or provide a setting for a retaining wall.

Planting strategies include:

- the use of trailing plants to spill over the retaining wall;
- climbing plants to cover the face of the retaining wall;
- garden beds to the front of walls to assist in reducing the scale (refer to Photo 5.38);
- where a gabion or crib lock wall is used, planting could be integrated into the wall structure creating a living wall (refer to Photo 5.39).

New retaining walls or those which require alterations as part of the M2 Motorway upgrade will be designed to be in keeping with the identified existing character precincts and to improve the overall appearance of the motorway.

Photo 5.38 Planting in front of the existing precast concrete walls along Junction Road.

Photo 5.39 Stacked sandstone boulders retain earth at Busaco Road bridge.

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6.0 URBAN DESIGN CONCEPT

The overall urban design concept is described in Section 6.1, followed by further detail of the built elements in the design (bridges, retaining walls and noise walls) in section 6.2.

6.1 The Alignment and its Precincts

The urban design concept for the alignment is one which builds on the existing natural assets of the alignment. In particular it strengthens the connection with the natural environment through the exposure of sandstone cuttings and strengthening of the vegetated back drop of the alignment. Built elements are handled with care so that details are simple and subtle.

The design has been broken into five precincts each with its own distinctive character (refer to Figure 2.10). They are:

Precinct 1 - Old Windsor Road – Windsor Road Interchange: Cumberland Plain

Precinct 2 - Windsor Road – Pennant Hills Road: Bushland Interface

Precinct 3 - Pennant Hills Road – Beecroft Road: Suburban Forest Interface

Precinct 4 - Beecroft Road /Devlins Creek – Terrys Creek /Crimea Road: Suburban Bushland Interface

Precinct 5 - Terrys Creek /Crimea Road – Delhi Road: Urban Bushland Interface

Precinct 1 Old Windsor Road – Windsor Road Interchange: Cumberland Plain

Refer to Figures 6.1.1 to 6.1.10

The works here are associated with the establishment of an on/off ramp connection to Windsor Road. The landscape response has sought to moderate the impacts of the proposed works, including the increased height of retaining walls and /or movement of noise walls closer to properties. The focus from outside the corridor is on providing a landscape buffer which filters views from the adjoining properties to the road alignment, where space permits. Particular focus is on the retention of the landscape character along Junction Road through the augmentation of existing plantings and the undertaking of new works to replace vegetation lost as a result of the construction process. Refer figures 6.3 and 6.4.

For the road user, care has been taken to ensure that the existing experience is enhanced through appropriate detailing of hard elements such as noise walls and retaining walls and the use of landscape where it can make a meaningful contribution to the setting. The constrained nature of the corridor has generally seen the use of the close coupled noise wall with no landscape. While reliant on good detailing this provides a strong design element which is both easy to maintain and clearly defines the road edge.

Between the on / off ramps, and the main alignment space exists in front of the retaining walls. This space is sufficiently wide, i.e. > 2 metres, and therefore facilitates the planting of shrubs and ground covers as illustrated in Figures 6.5, 6.6, 6.7 and 6.8. This provides both the opportunity to visually soften the corridor and provides a base for the new retaining walls.

The intersection of Windsor Road and the off ramps termination is marked by a garden bed. These provide an address to the adjoining arterial road network. The landscape treatment also links with that provided at Pennant Hills Road providing a common entry theme to the motorway corridor.

Figure 6.1.1 Alignment Plan 1

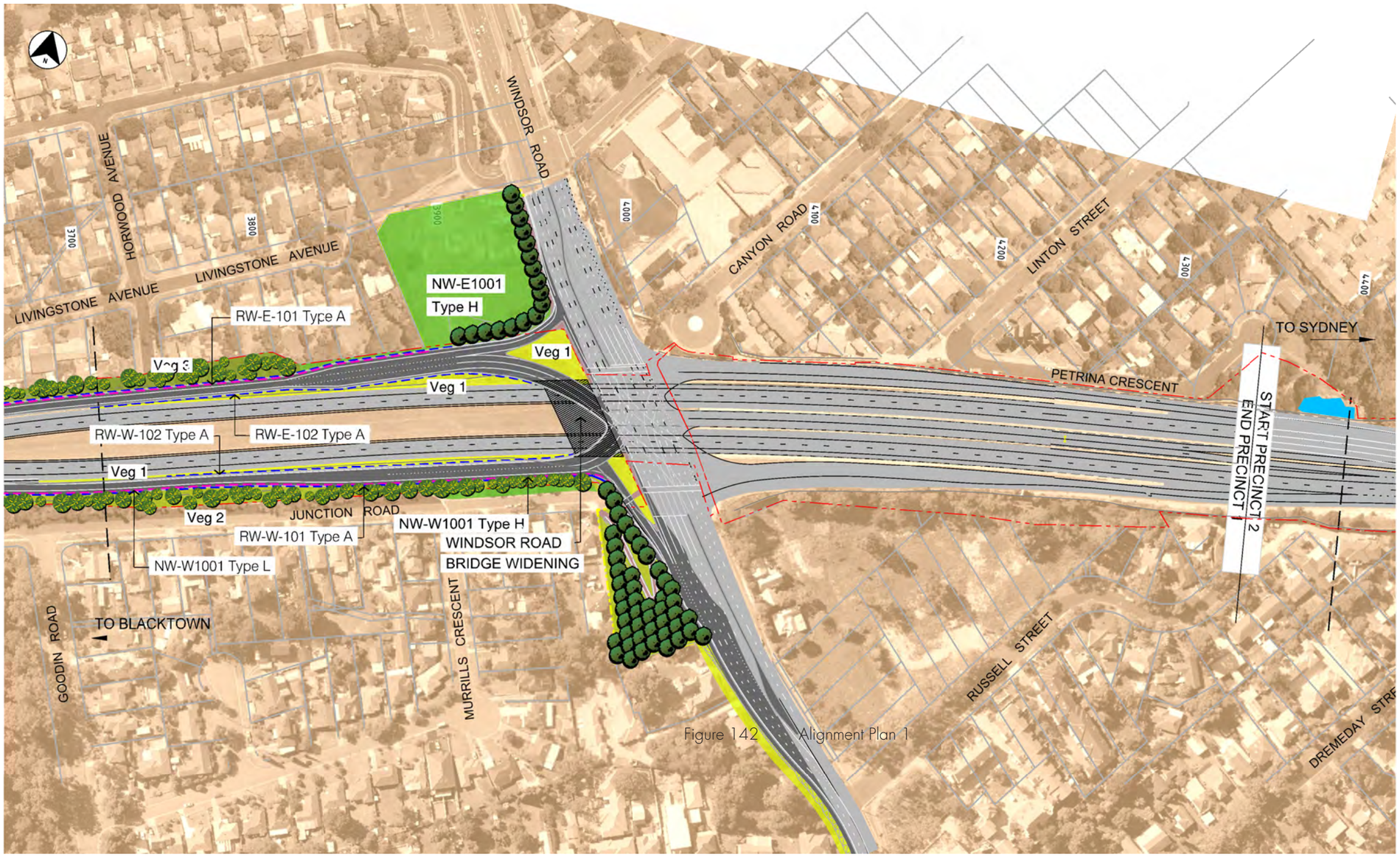


Figure 142 Alignment Plan 1

GENERAL

- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT

- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES

- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT

- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES

- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.2 Alignment Plan 2

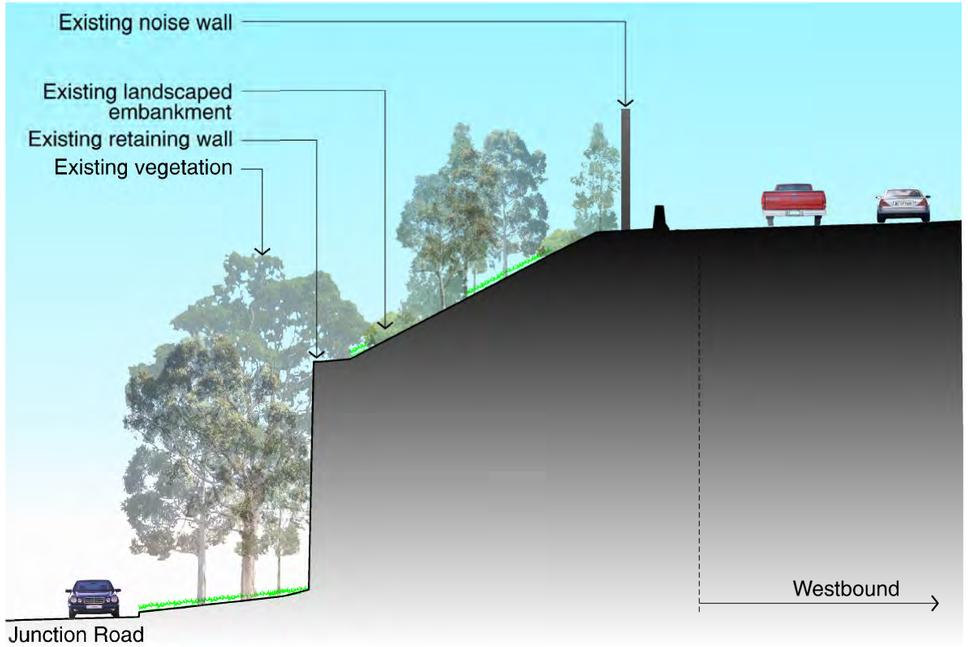


Figure 6.1.3 Stn 3700 Windsor Road on ramp (westbound) - Existing

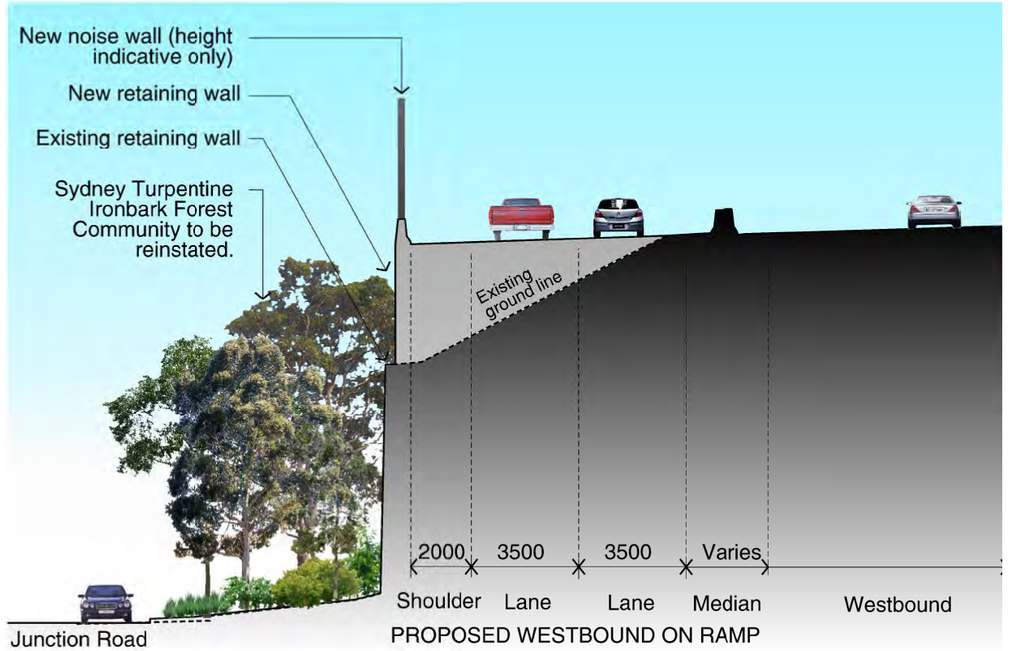


Figure 6.1.5 Stn 3700 Windsor Road on ramp (westbound) - Proposed

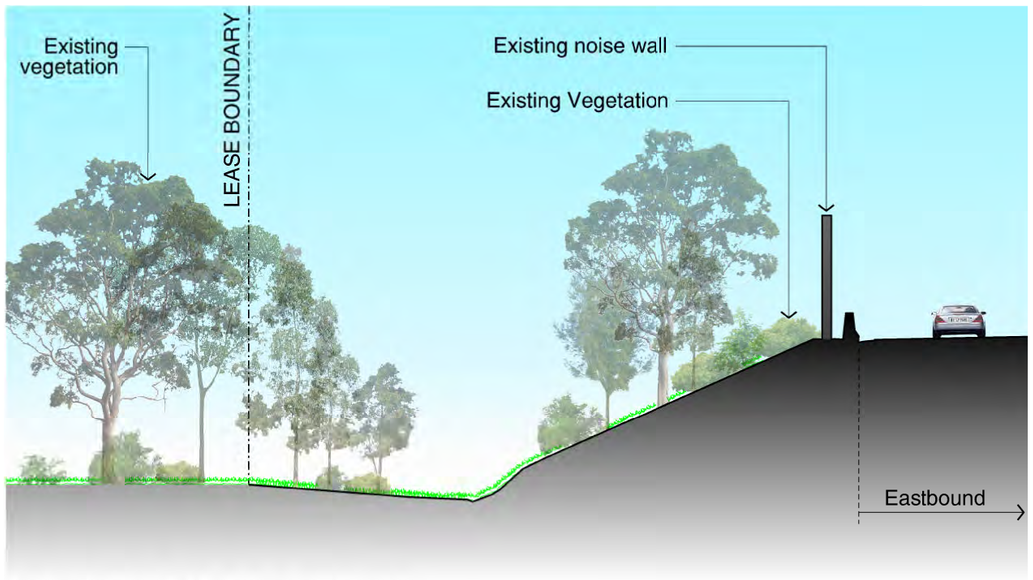


Figure 6.1.4 Stn 3750 Windsor Road off-ramp (eastbound) - Existing

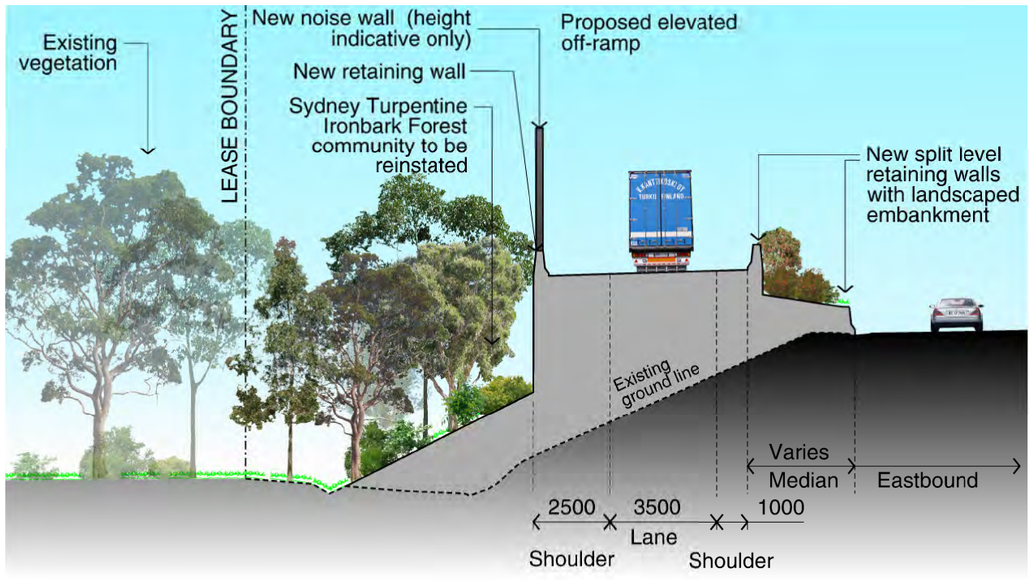


Figure 6.1.6 Stn 3750 Windsor Road off-ramp (eastbound) - Proposed

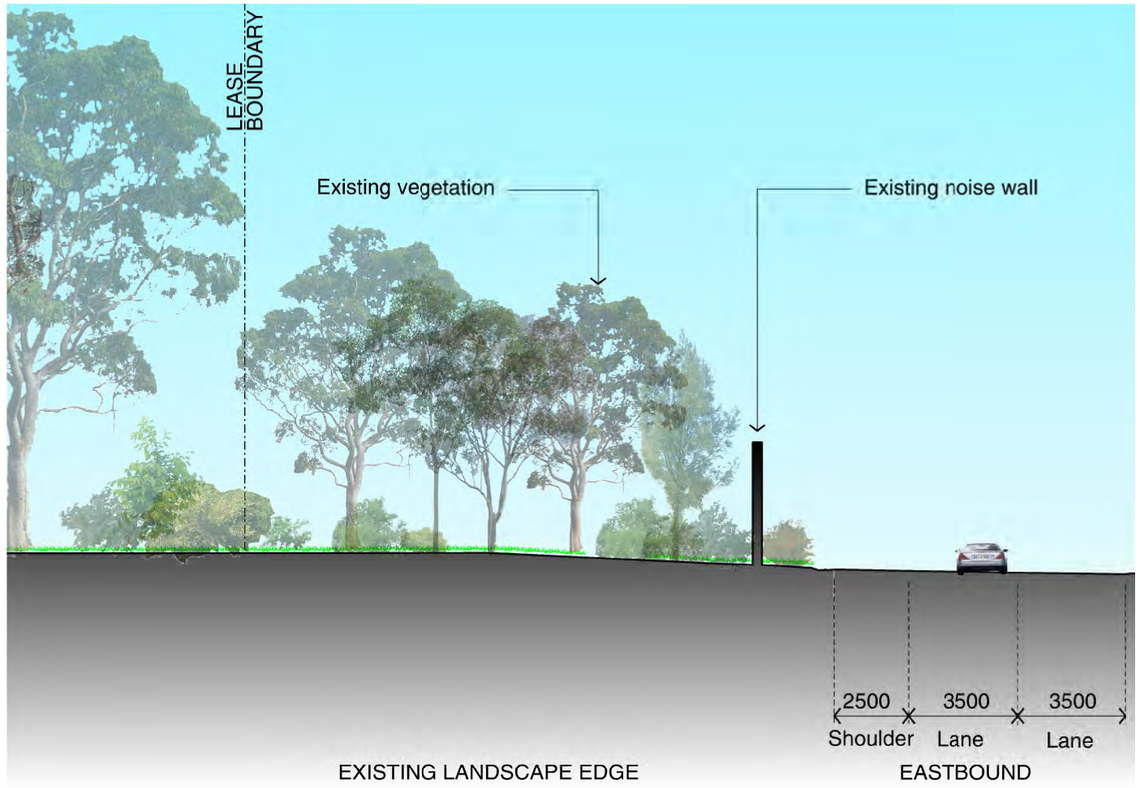


Figure 6.1.7 Stn 3850 Windsor Road off ramp (eastbound) - Existing

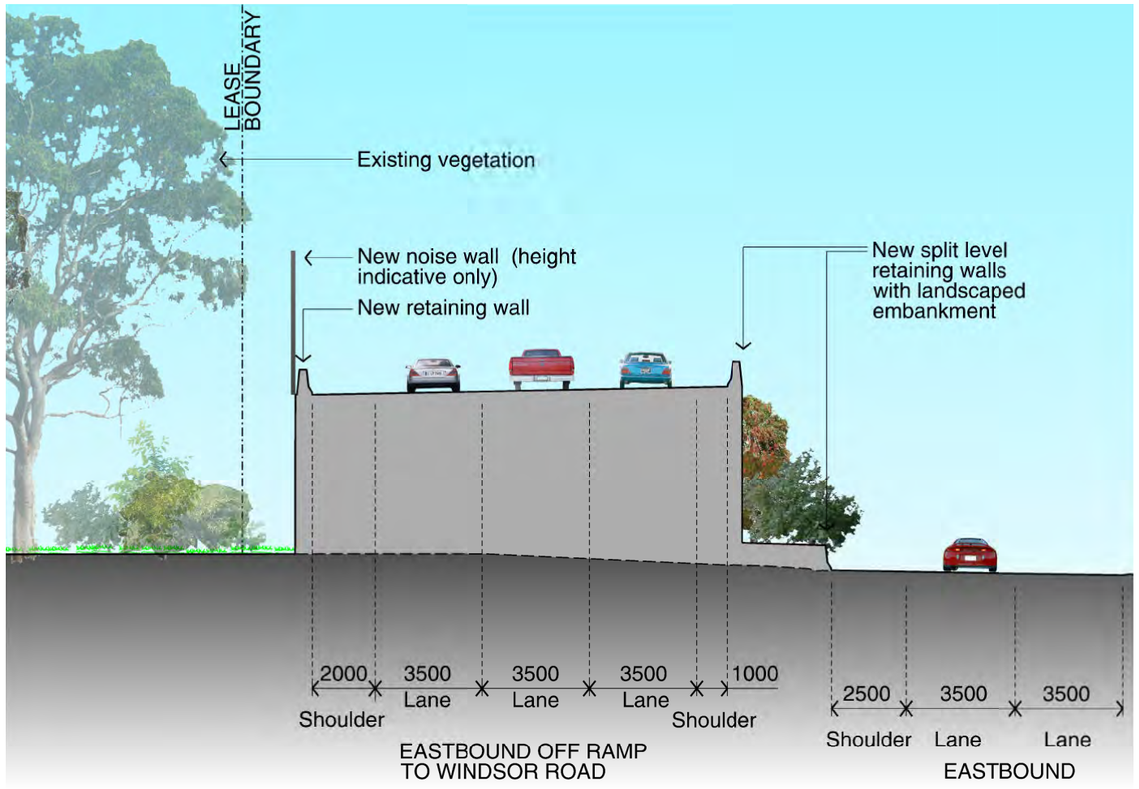


Figure 6.1.8 Stn 3850 Windsor Road off ramp (eastbound) - Proposed

Figure 6.1.9 Looking east towards Windsor Road Interchange - Existing

Figure 6.1.10 Artists perspective of proposed road upgrade, looking east towards Windsor Road Interchange, shown with mature landscaping (location of signage will be subject to detailed design).

Precinct 2 Windsor Road – Pennant Hills Road: Bushland Interface

Refer to Figures 6.1.11 to 6.1.19

The landscape approach adopted through this section is defined by the strong visual backdrop to the road provided by the bushland associated with Darling Mills Creek corridor and the Bidjigal Reserve. The landscape design is to integrate with this landscape, revegetating post construction.

The Hinterland Sandstone Gully Forest community is the dominant community within this precinct and this is recognised in the proposed revegetation works.

Sandstone cuttings form a significant visual element within the existing corridor and will continue to do so. Where sandstone exists this is retained and expressed as a key element of the road experience. The strategy for sandstone cuttings has to either maintain or steepen the cut profile where possible. However where the rock is heavily weathered the proposal has been to lay back the slope to allow revegetation to be achieved rather than introducing some form of engineering support.

The expansion of the Darling Mills Creek Crossing requires the widening of the existing bridge. While ultimately the vegetated area will not change significantly, there will be some clearance required to undertake the works. The reinstatement of any clearance operations will utilise the existing vegetation communities – Sandstone Riparian Scrub for the creekline vegetation and Hinterland Sandstone Gully Forest for the valley walls.

At Barclay Road the bridge is lengthened and with this the cut widened. Despite the widening of the cut the character of this corridor crossing is retained with sandstone revealed on the lower batter and the upper batters progressively revegetated using Hinterland Sandstone Gully Forest.

The alignment widening alternates from side to side as you pass through the Hinterland Sandstone Gully Forest, to minimise impacts on adjacent residential properties or environmental constraints. At Yale Close the existing bridge is widened , requiring an enhancement of the existing vegetation cover to ensure existing views are not impacted in the long term.

Like most of the corridor this section is constrained and noise walls generally are close coupled when located on fill. Care in the design and colour will ensure these noise walls form a strong visual element which fits within its context. When located above cuttings, noise walls will generally follow the ridge moving back from the road in relation to the cut embankment. Care is taken in the location of new walls to achieve a smooth flowing profile and reinstatement of screen planting to minimise impact on the adjoining landuse.

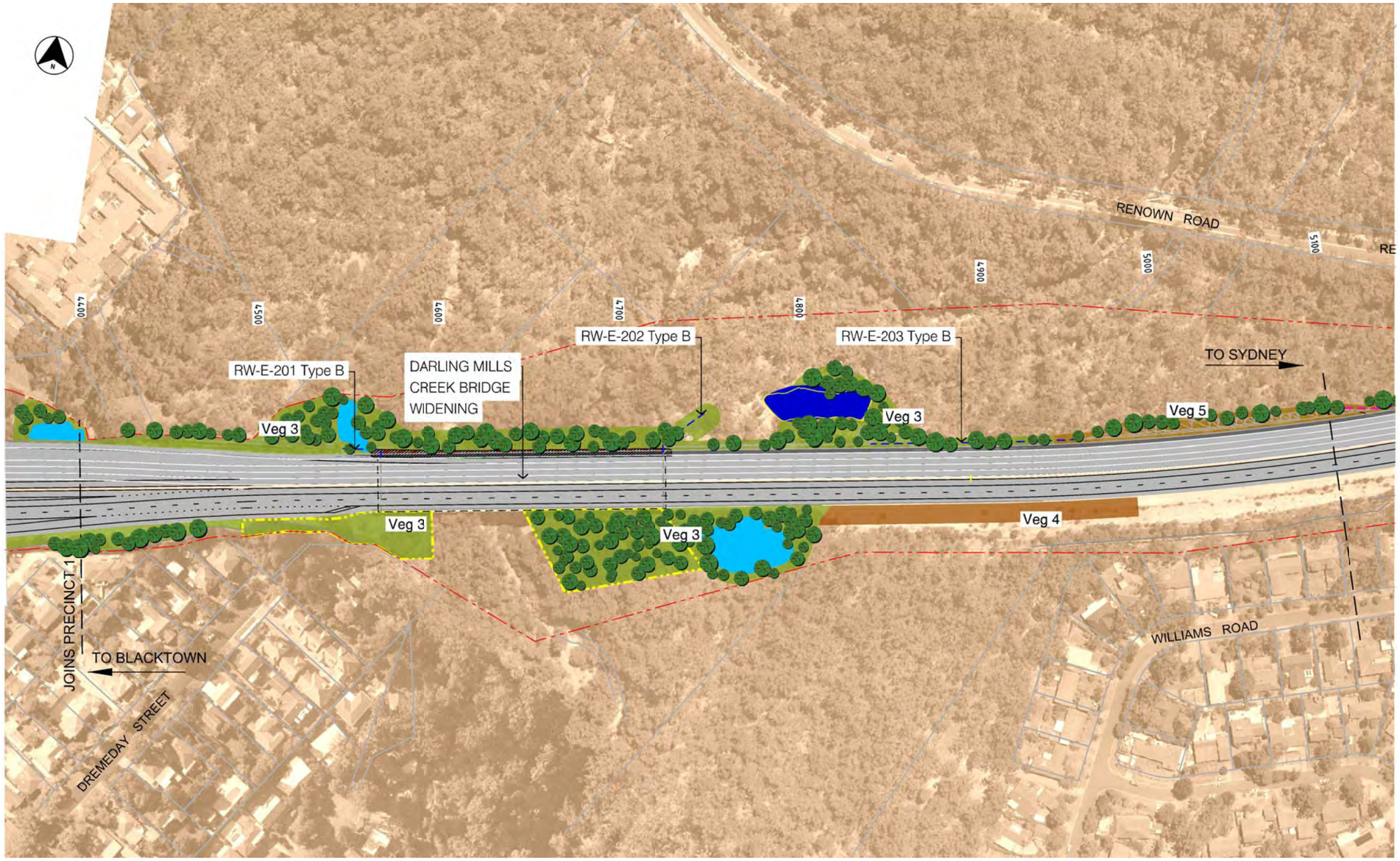


Figure 6.1.11 Alignment Plan 3

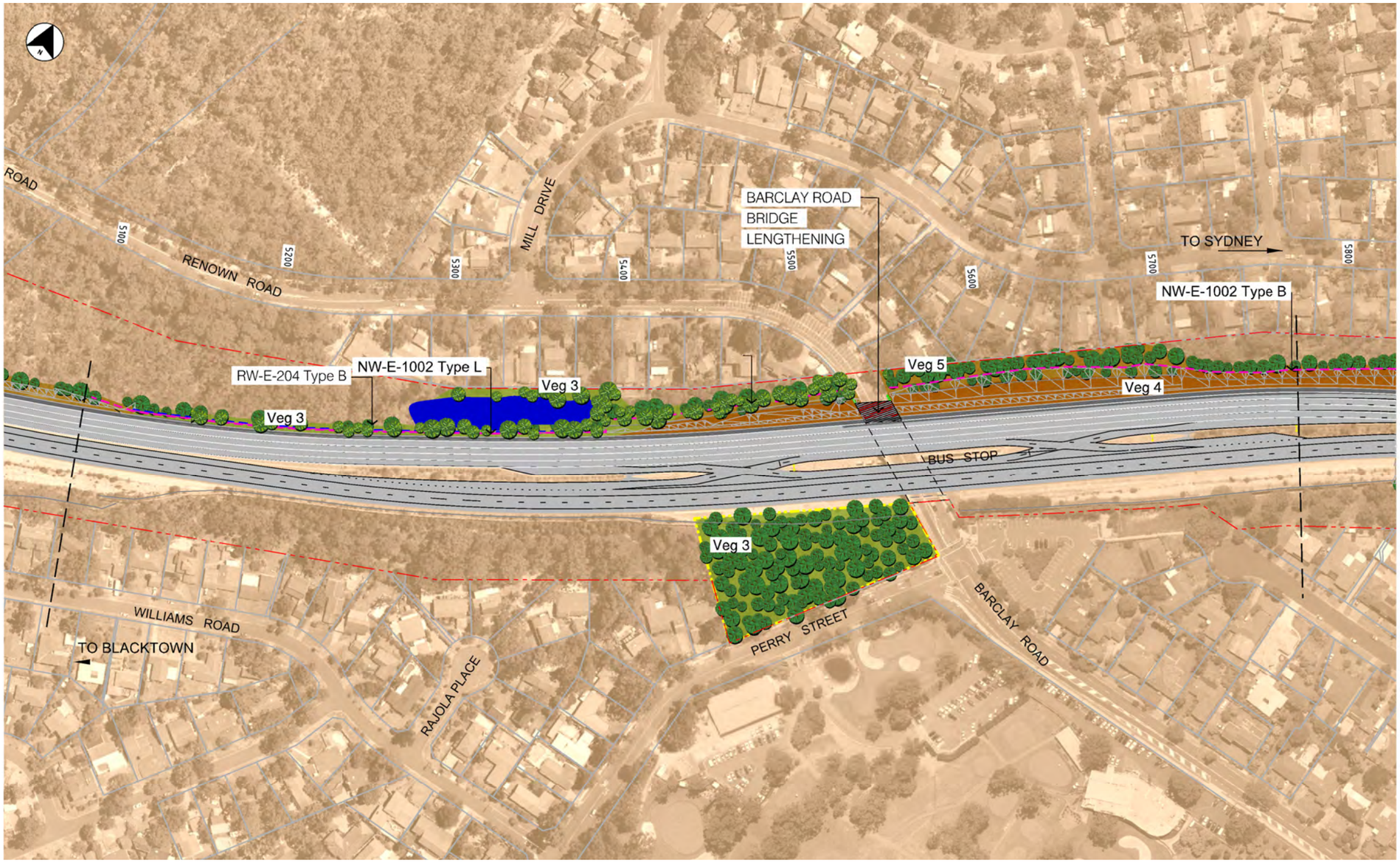


Figure 6.1.12 Alignment Plan 4

GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass
- NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.13 Alignment Plan 5

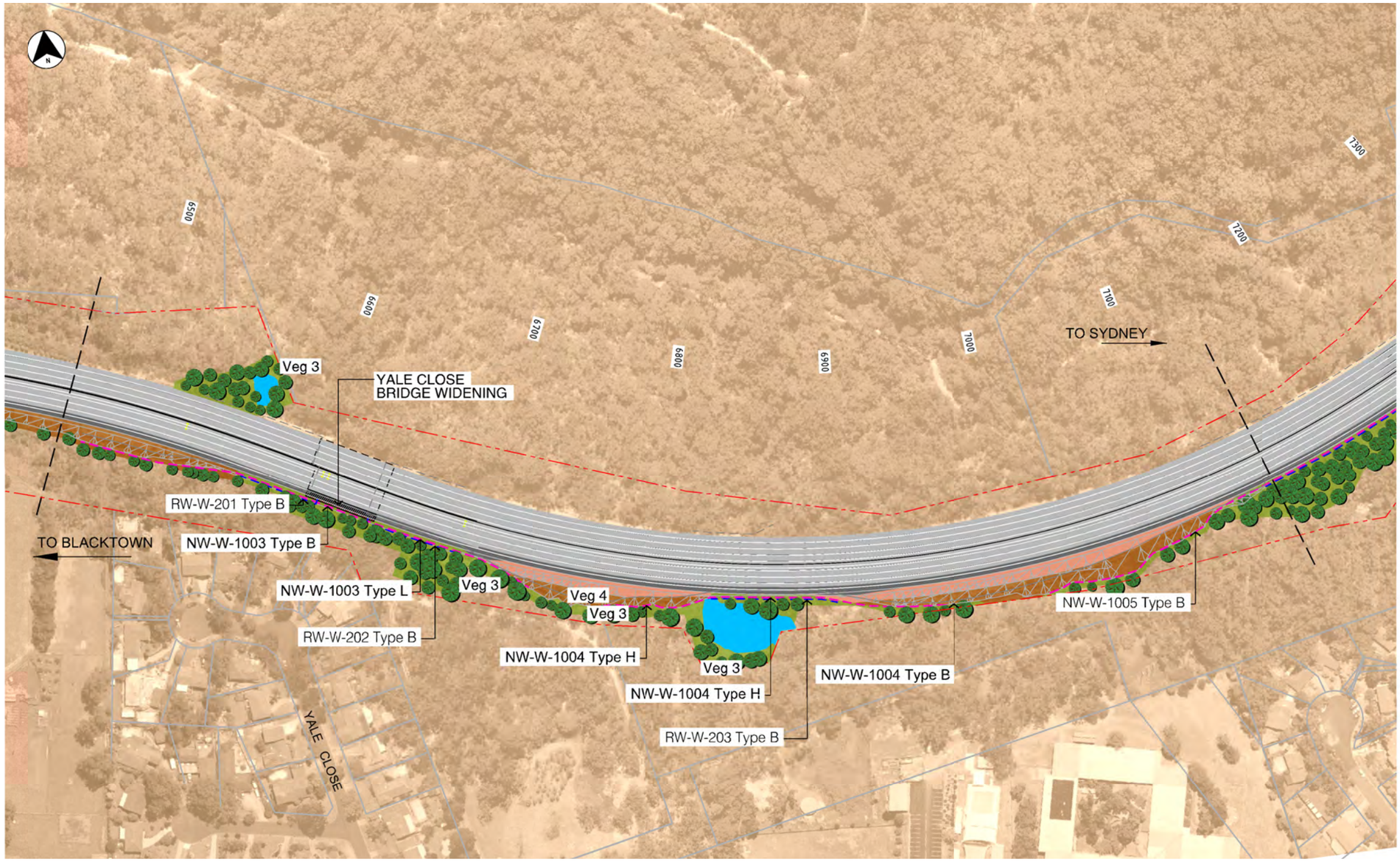
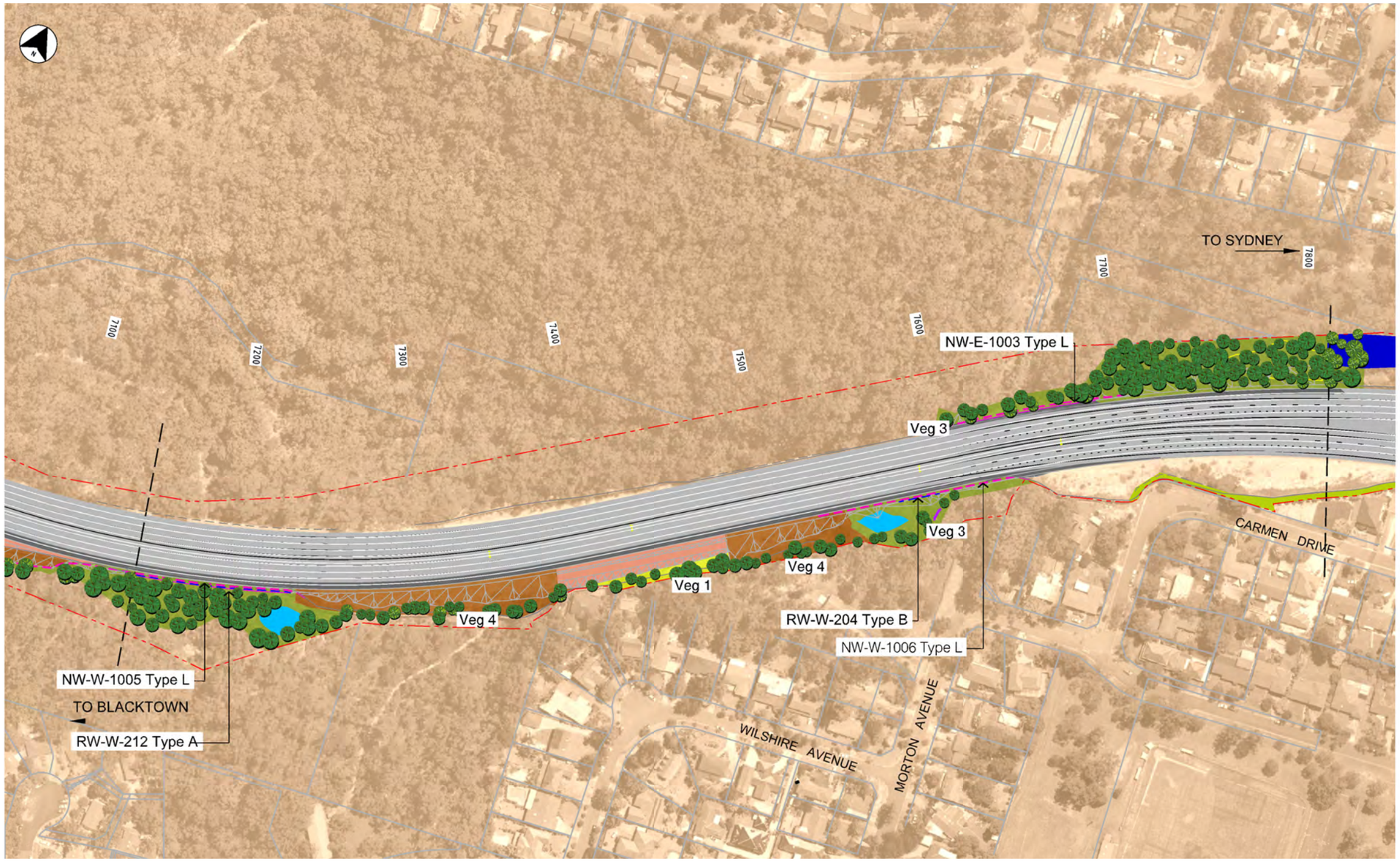


Figure 6.1.14 Alignment Plan 6



GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
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- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

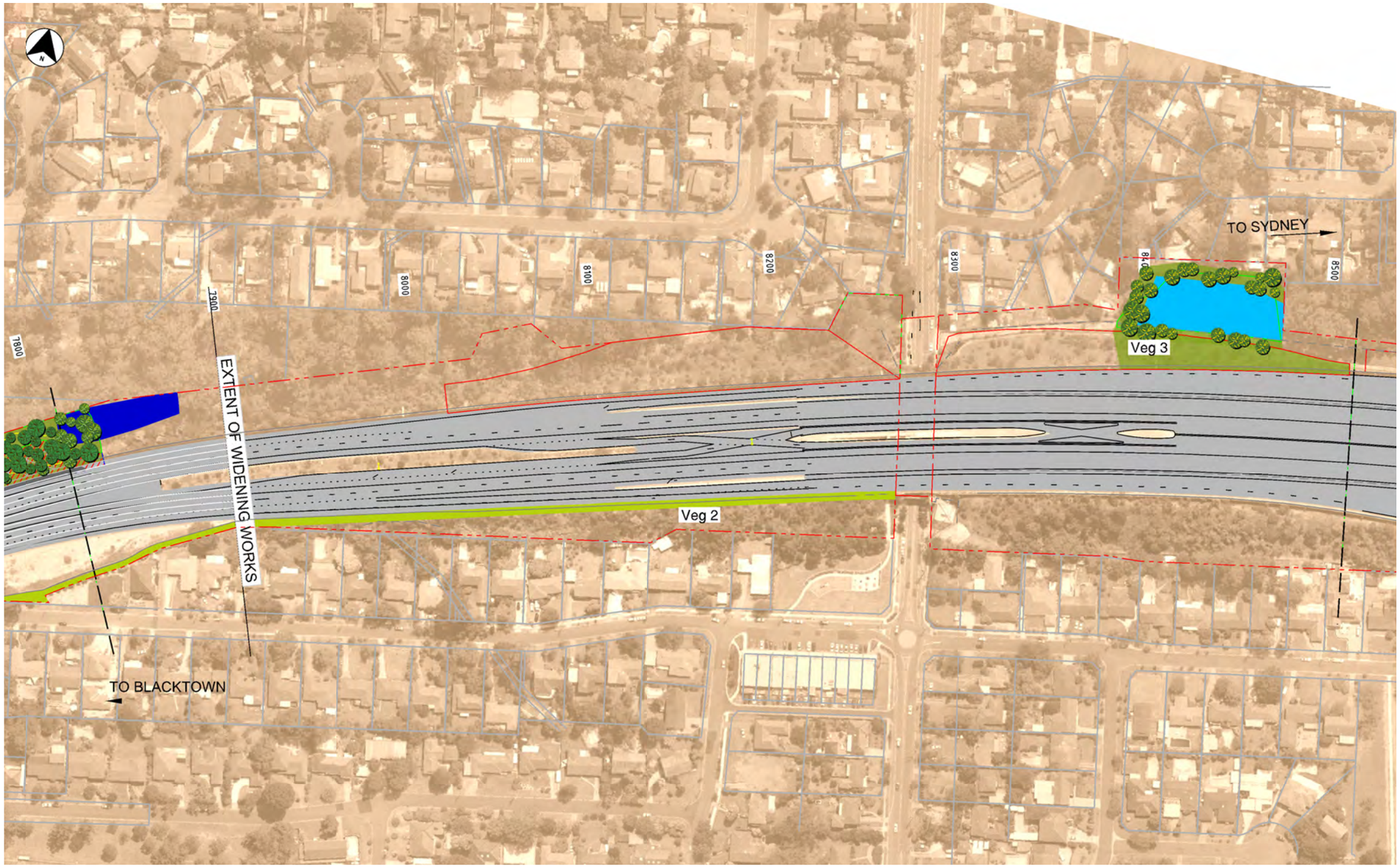
LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.15 Alignment Plan 7



GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

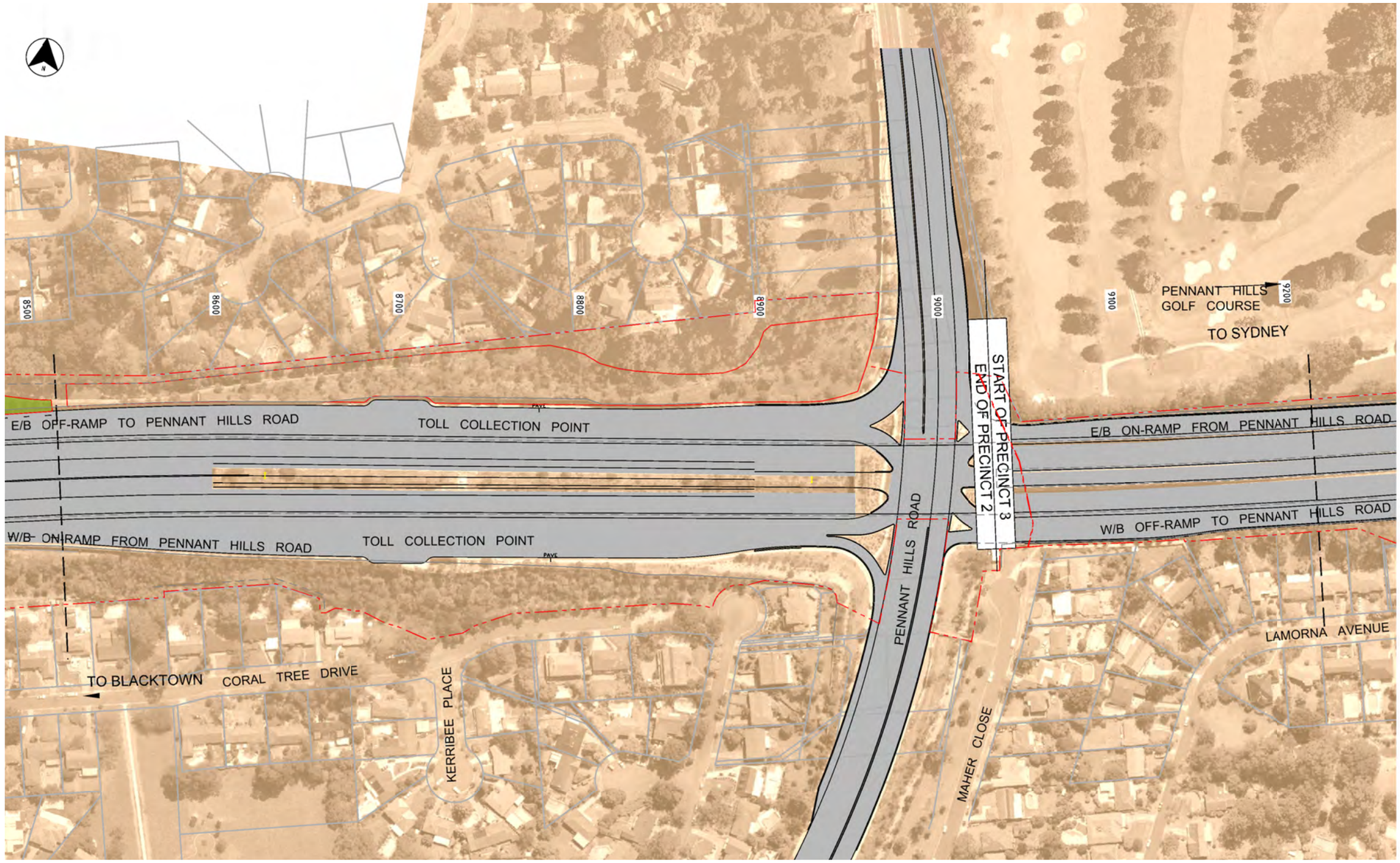
LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.16 Alignment Plan 8



GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.17 Alignment Plan 9

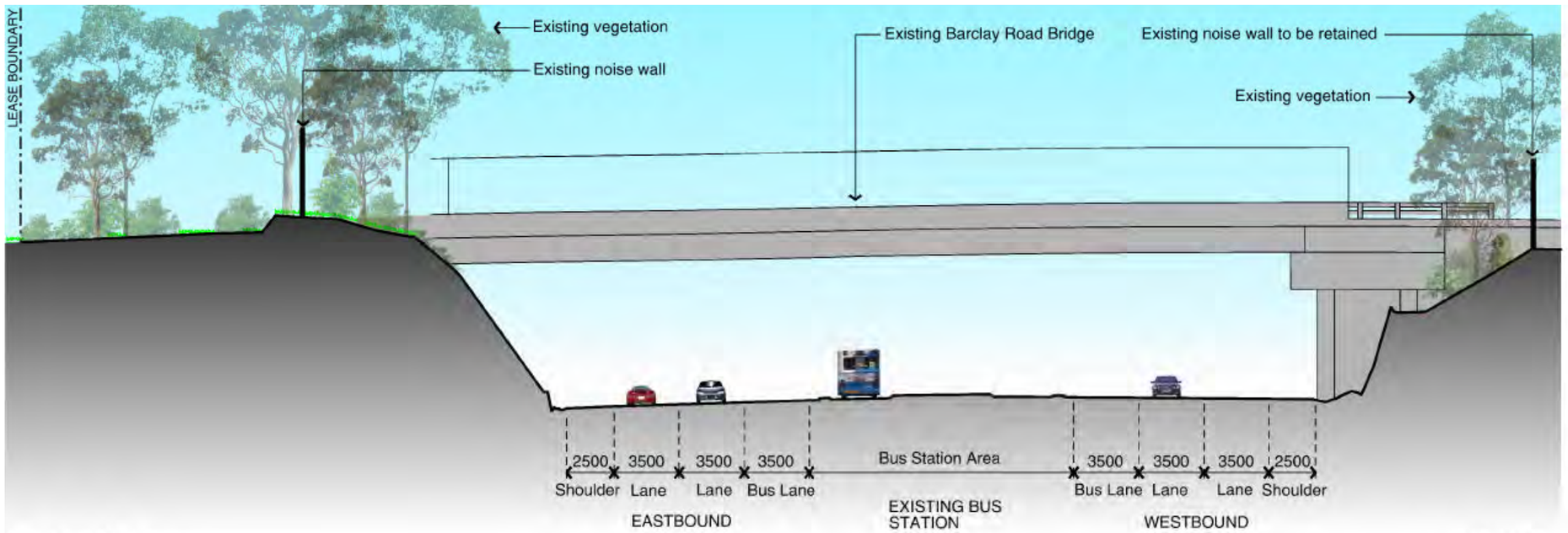


Figure 6.1.18 Stn 5550 Barclay Road Bridge - Existing

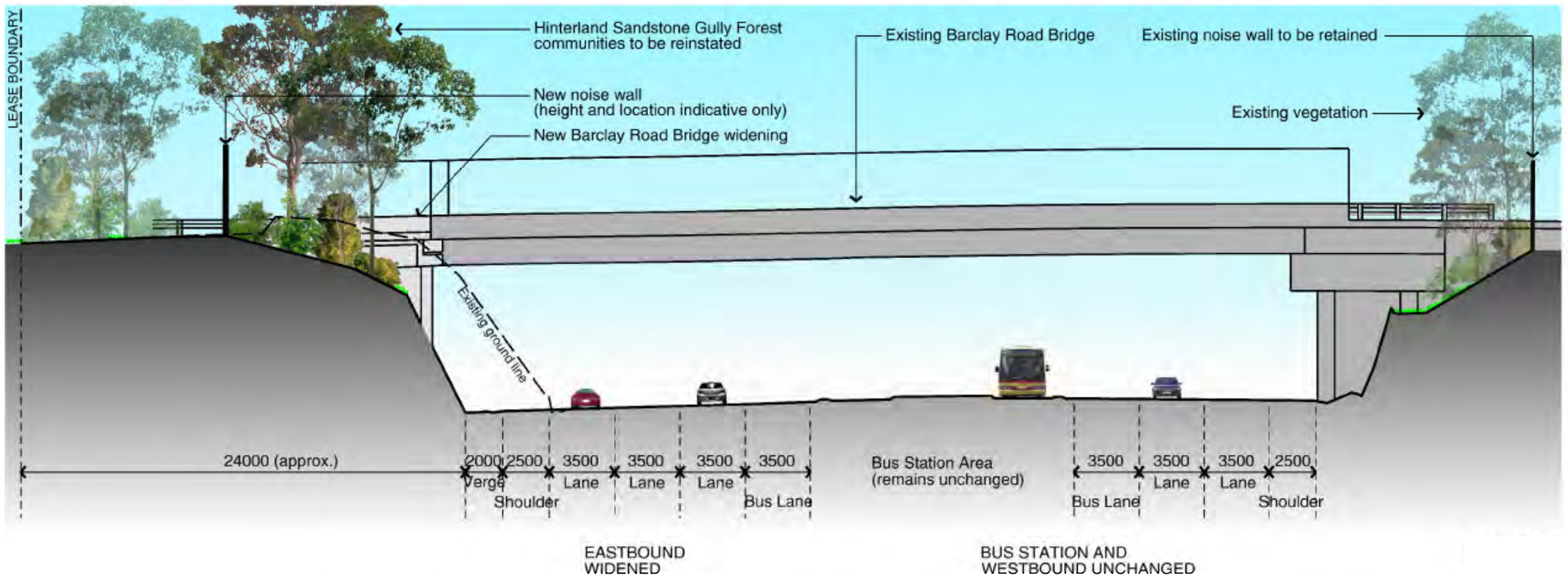


Figure 6.1.19 Stn 5550 Barclay Road Bridge - Proposed

Precinct 3 Pennant Hills Road – Beecroft Road: Suburban Forest Interface

Refer to Figures 6.1.20 to 6.1.31

Despite the area being relatively urban in its context it still retains a bushland character when viewed from the motorway.

Critical in this context is the handling of the interface between the existing residents and the road corridor. Noise walls in some instances are being relocated closer to properties putting greater emphasis on the buffer planting between wall and house. Like previous sections the emphasis has been on minimising change in proximity to houses. A key component of this is the minimisation of modifications to existing noise walls where possible.

Blue Gum High Forest is located to the north of the alignment adjacent the Pennant Hills Golf Course. This stand is an isolated remnant which is not impacted by the proposed alignment. Devlins Creek valley runs just east of this community before entering the corridor where it meanders from side to side of the corridor. Vegetation here is proposed to use Hinterland Sandstone Gully Forest reflecting the sheltered nature of the valley and the altered soil profile of the road corridor.

Apart from noise walls which are adjusted to reflect the changing alignment and embankment profiles, two bridges are modified.

Devlins Creek Bridge is widened to the south of the corridor and the median between the two bridges in filled. This results in reduced moisture and light beneath the bridges with the subsequent loss in vegetation cover. To ensure the space is still inviting and that the pedestrian link is maintained care needs to be taken both with the grading of the path but also the openness of the space under the motorway.

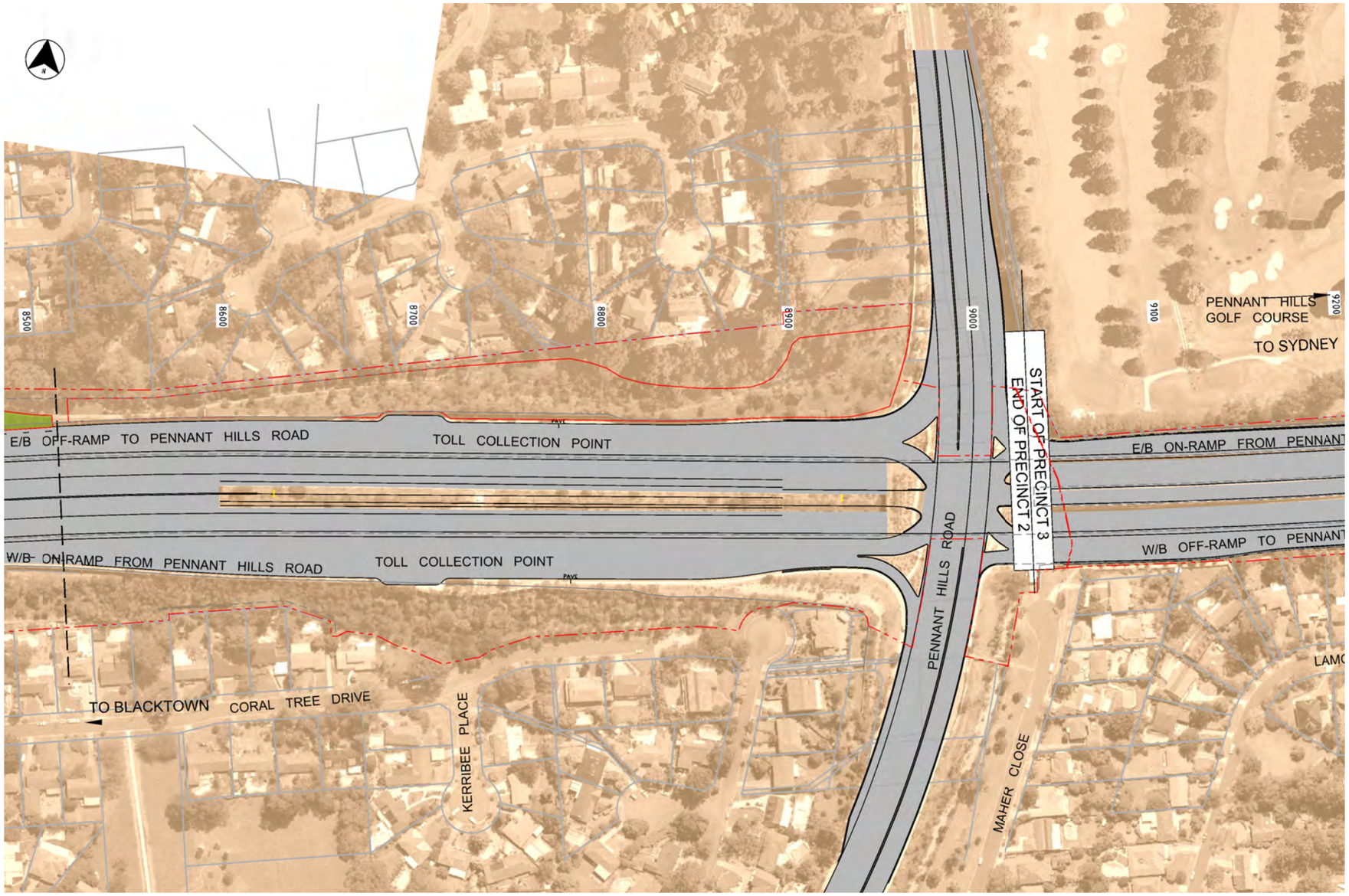


Figure 6.1.20 Alignment Plan 10

Figure 6.1.21 Alignment Plan 11

GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

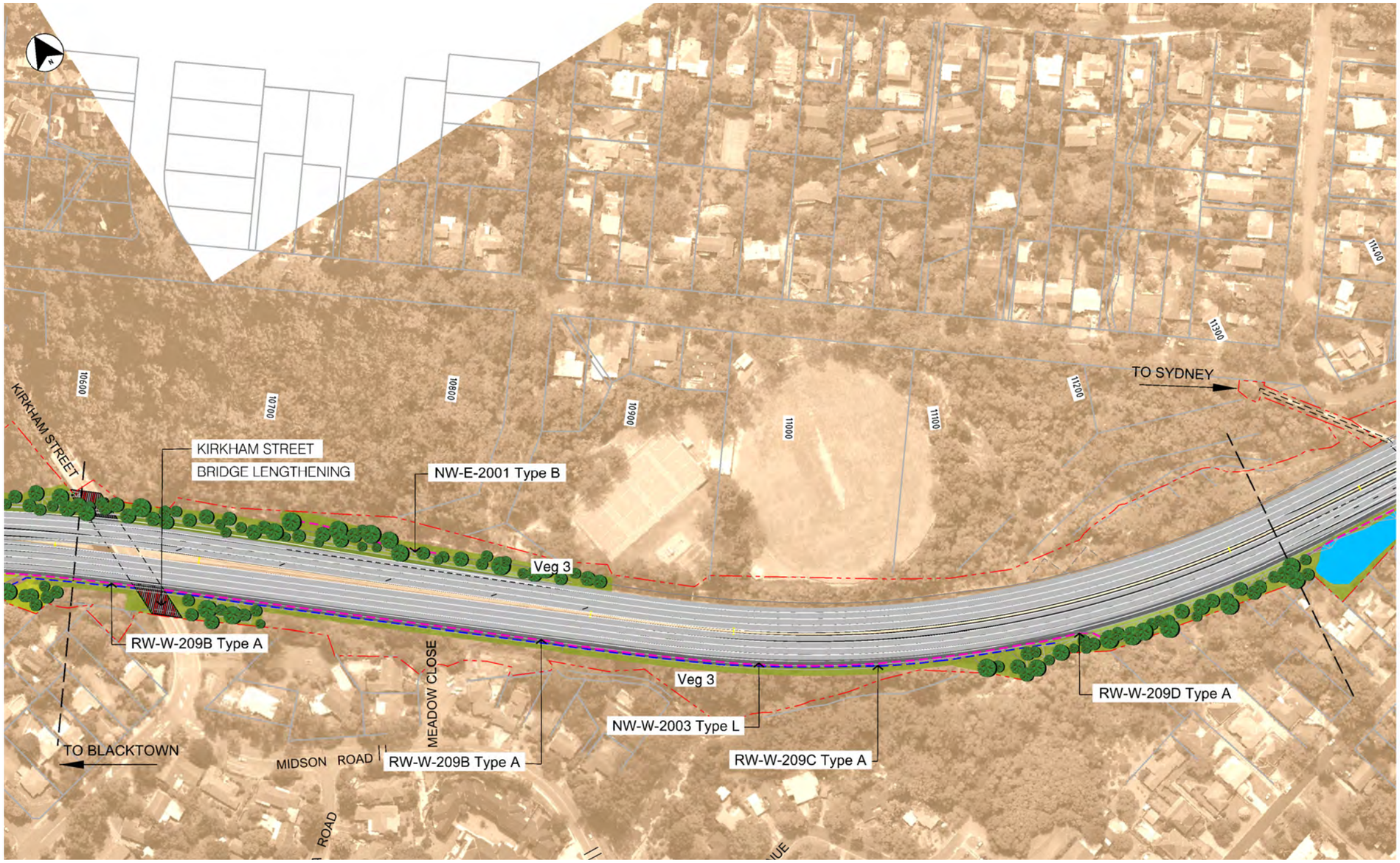
LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

Figure 6.1.22 Alignment Plan 12

Urban Design Concept



GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.23 Alignment Plan 13

GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.24 Alignment Plan 14

Existing

Proposed

Figure 6.1.25 Artists perspective from Kent Street Overbridge looking west - Existing and proposed views.
The noise wall is relocated and a new panel design implemented - there will be a loss of planting to the noise wall due to the road widening. Stepping of the new noise wall design provides a transition to the existing retained noise wall panels.

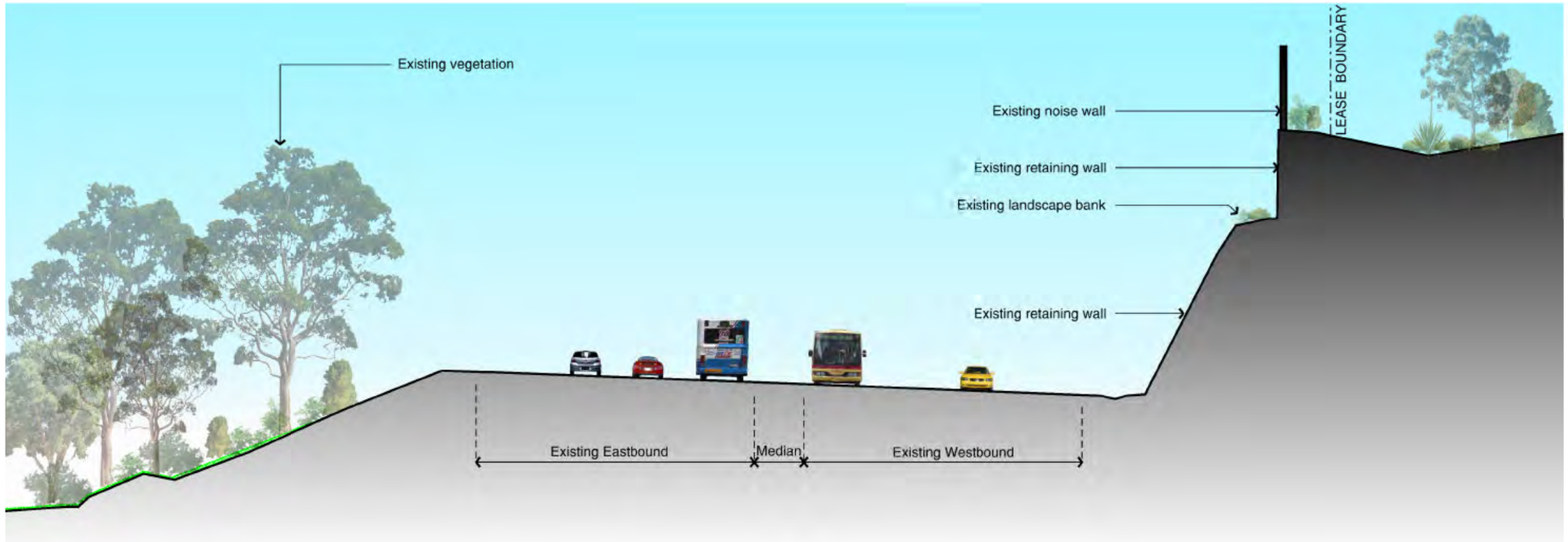


Figure 6.1.26 Stn 10350 Large cut with shotcrete - Existing

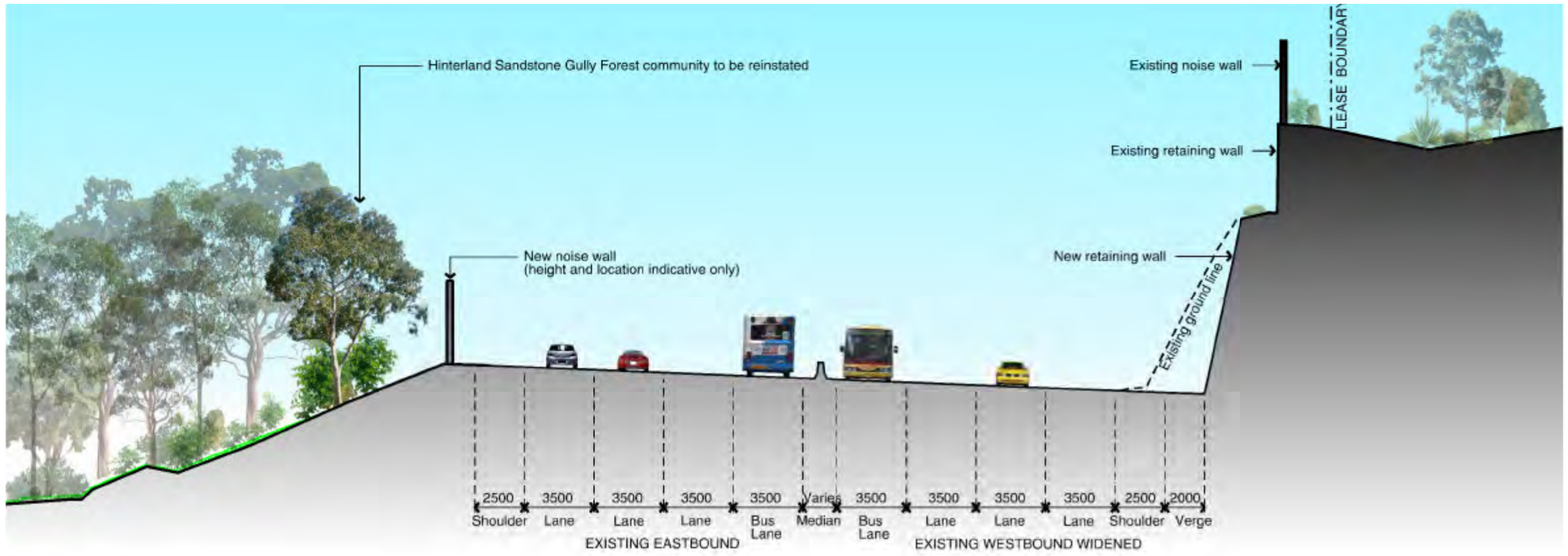


Figure 6.1.27 Stn 10350 Large cut with shotcrete - Proposed

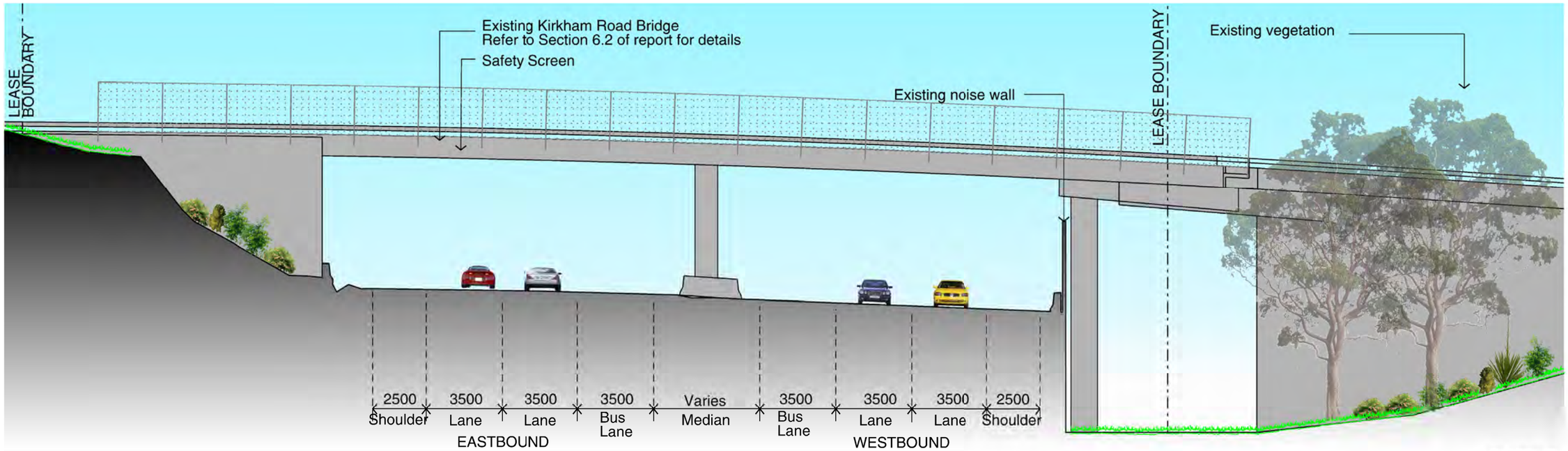


Figure 6.1.28 Stn 10600 Kirkham Street Bridge Area - Existing

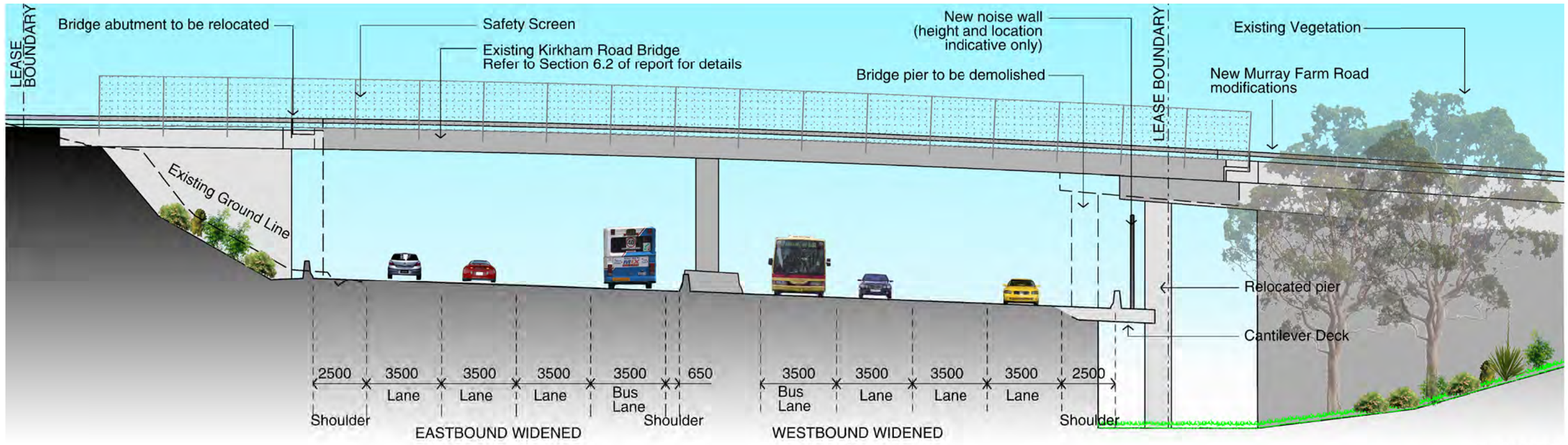


Figure 6.1.29 Stn 10600 Kirkham Street Bridge Area - Proposed

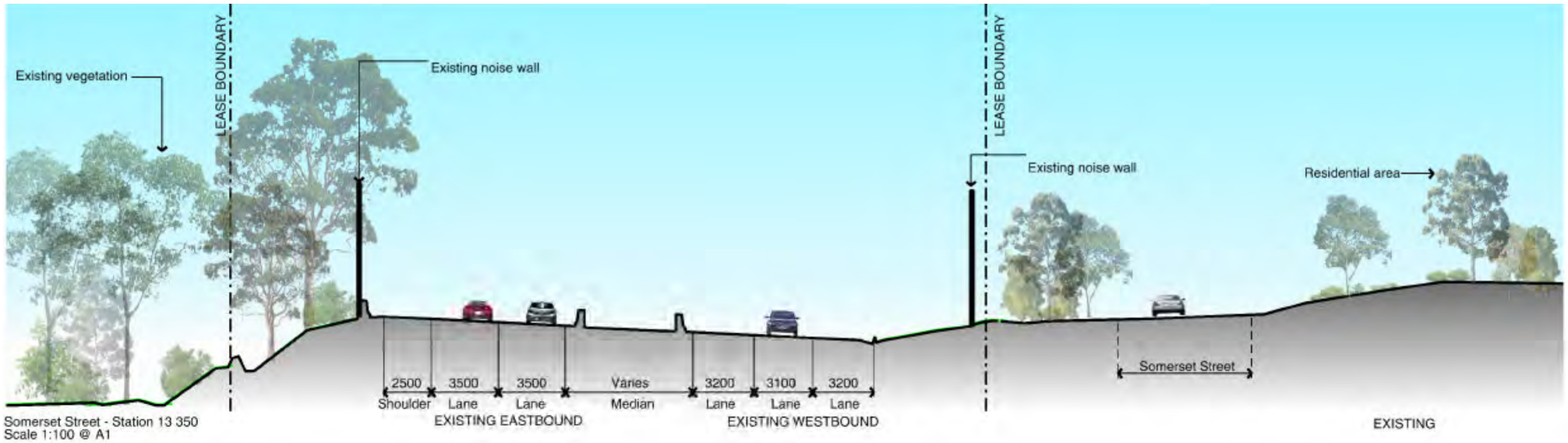


Figure 6.1.30 Stn 13350 - Existing

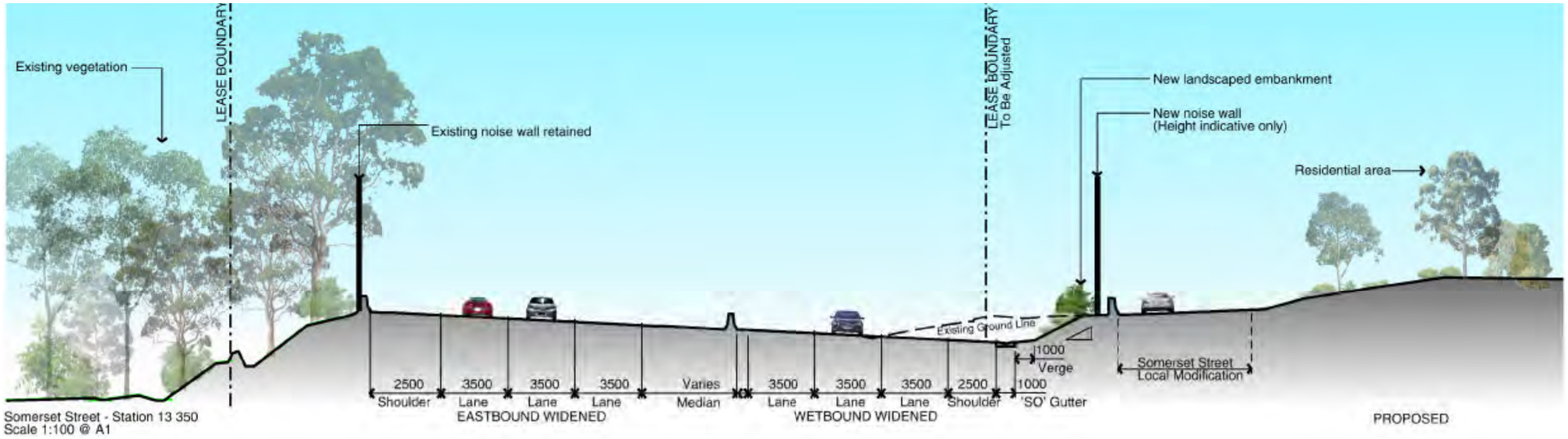


Figure 6.1.31 Stn 13350 - Proposed

Precinct 4 Beecroft Road /Devlins Creek – Terrys Creek /Crimea Road: Suburban Bushland Interface

Refer to Figures 6.1.32 to 6.1.40

The suburban character of Precinct 3 continues through into this precinct, and like Precinct 3, there is a dense canopy of trees creating a bushland feel. This section however adjoins Berriwerri Reserve at its eastern end, where the motorway crosses Terrys Creek, heightening this sense of bushland.

Vegetation communities are composed of Hinterland Sandstone Gully Forest with it transitioning to Coastal Sandstone Ridgetop Woodland. Strengthening of this character reinforces the perception of the motorway being in a bushland corridor and provides a sense of separation from adjacent properties.

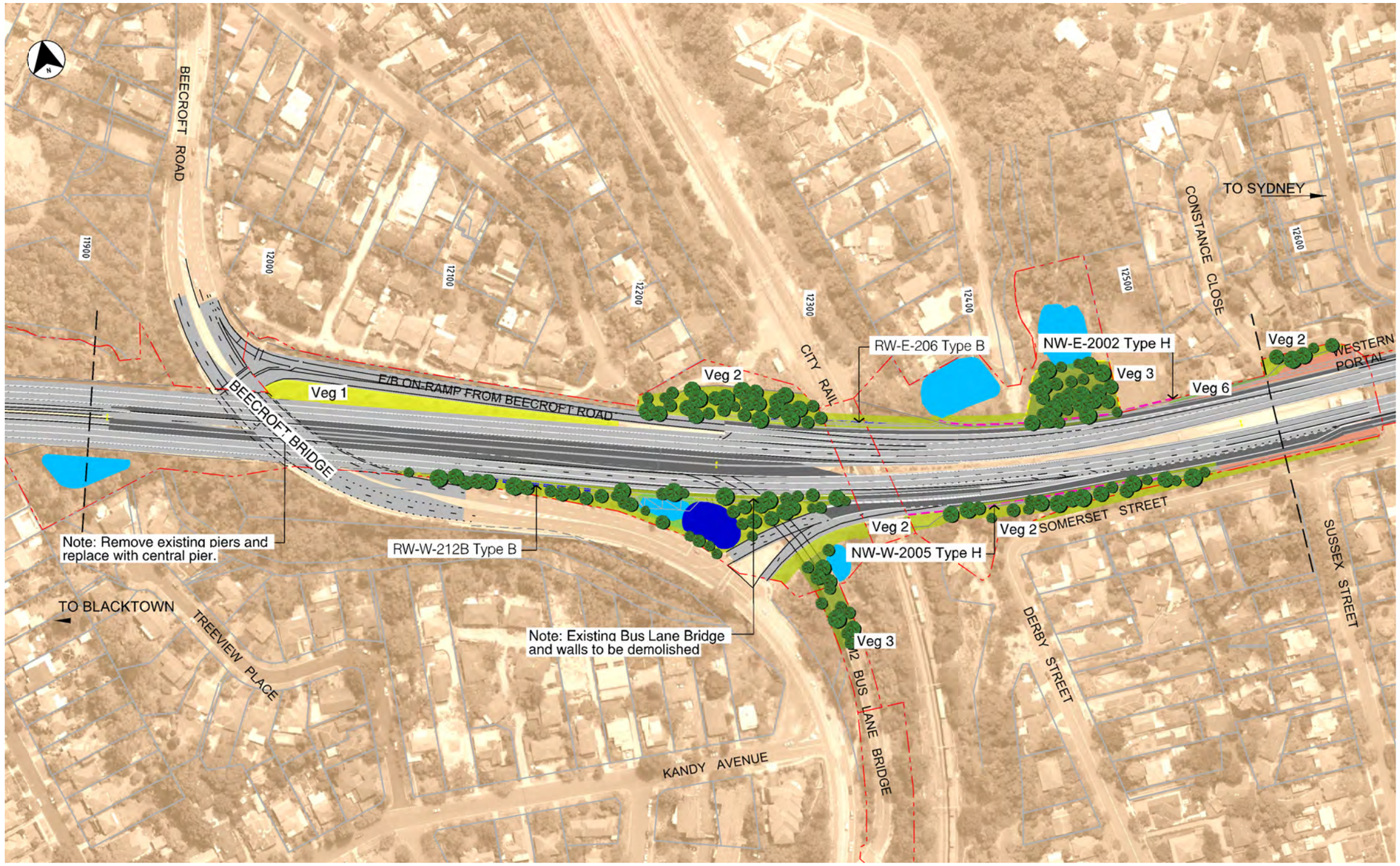
A significant portion of this precinct is in tunnel. The portals are dominated by sandstone and the expansion of the portals to accommodate the increased road width should be designed to enhance this through the use of materials and colours which capture the strong earthy look of this rock.

Key areas of planting are associated with:

Adjoining Beecroft Road, where the busway overbridge is to be removed provides the opportunity to be revegetated with Hinterland Sandstone Gully Forest. In doing so the edge of Beecroft Road and entry into Epping can be enhanced, reinforcing the suburb within the forest feel of the area. The removal of the overbridge also provides the opportunity to enhance the vegetation cover in the off ramp island around the detention basins. With careful design both basin and landscapes could be merged to provide a backdrop to the approaches to Beecroft Road.

Somerset Street and Woodvale Avenue where any loss in vegetation as a result of construction is to be reinstated so that the impacts of noise walls and structures are mitigated. Planting is to consist of a mix of long lasting shrubs which will provide a dense screen to reduce the visual impact of the walls, and canopy planting (where space permits) to provide a sense of scale and connection with the adjoining bushland.

Terrys Creek requires some clearing to facilitate the construction of a widened structure. Any loss of vegetation would be reinstated with species from the Hinterland Sandstone Gully Forest Community.



GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass
- NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.32 Alignment Plan 15

Urban Design Concept

GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.33 Alignment Plan 16

GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.34 Alignment Plan 17

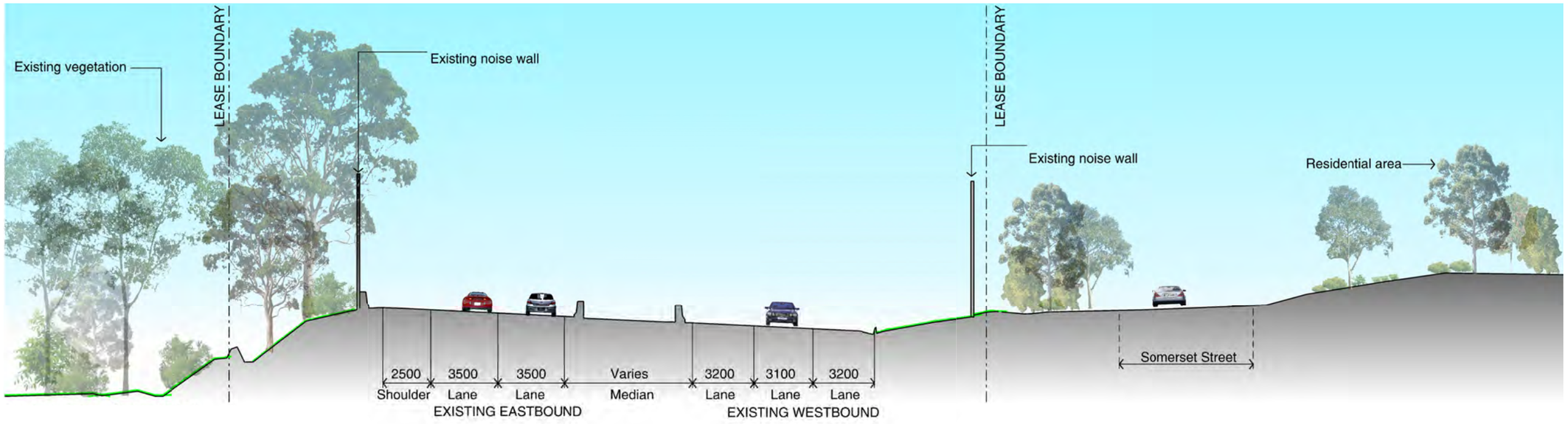


Figure 6.1.35 Stn 13350 Somerset Street - Existing

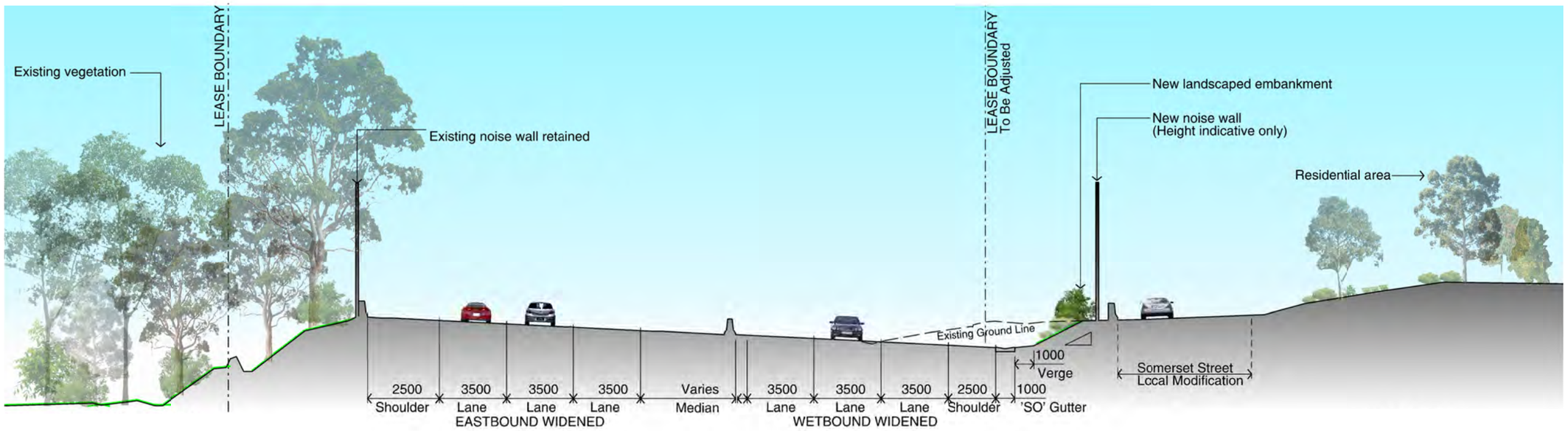


Figure 6.1.36 Stn 13350 Somerset Street - Proposed

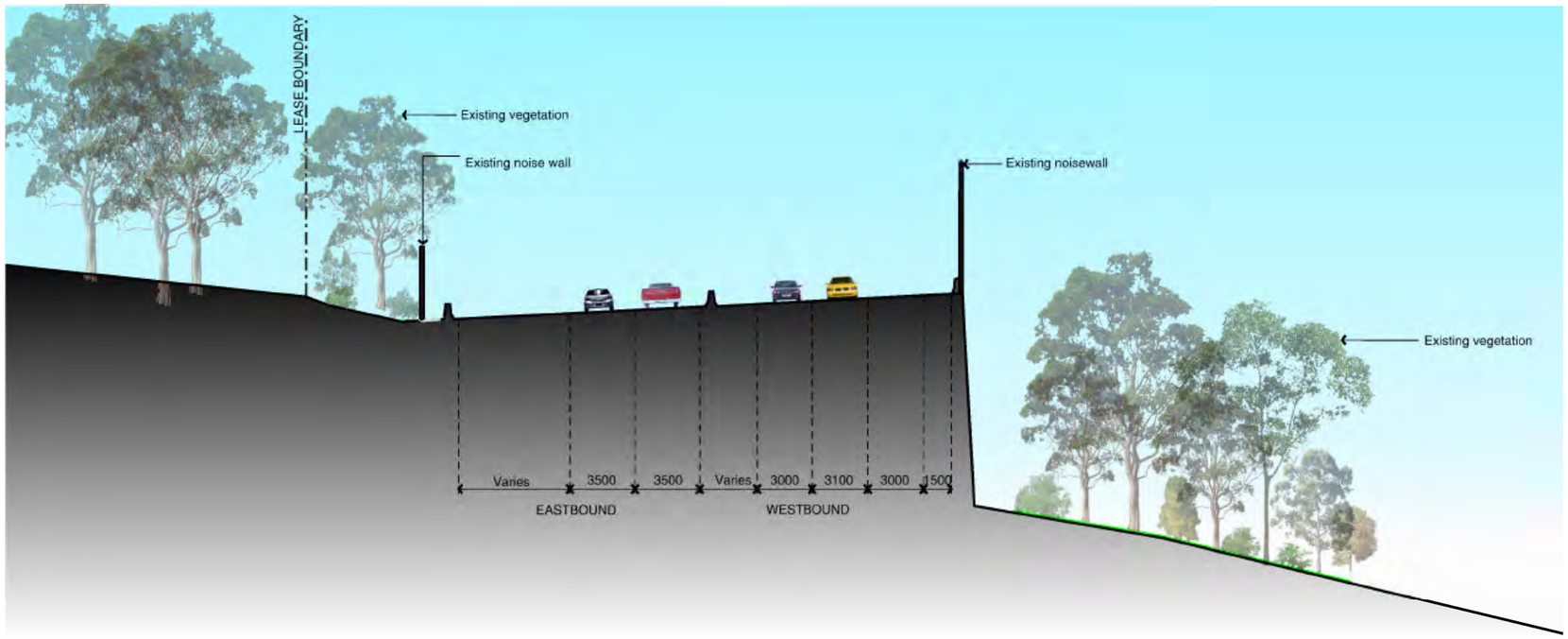


Figure 6.1.37 Stn 13600 Somerset Street east - Existing

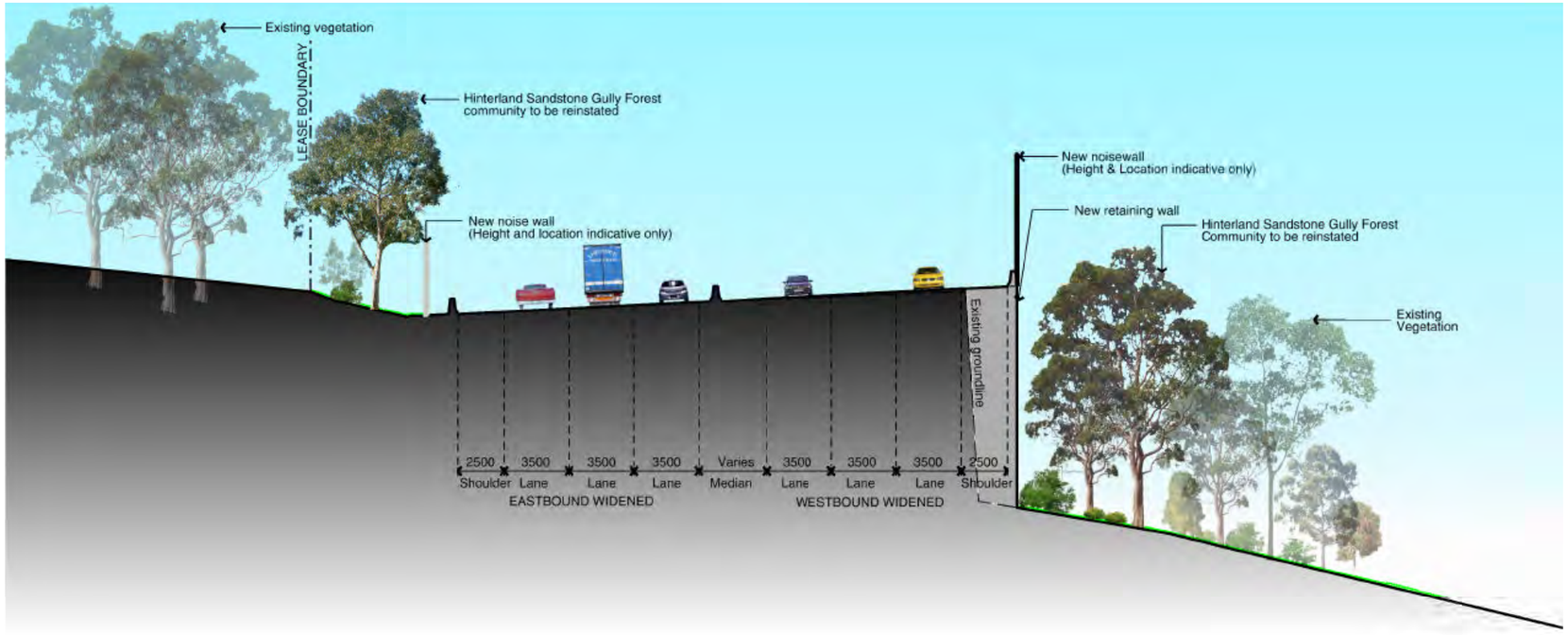


Figure 6.1.38 Stn 13600 Somerset Street east - Proposed

Figure 6.1.39 View of Beecroft Road and Rail Bridge looking west - existing

Figure 6.1.40 Artists perspective of Beecroft Road and Rail Bridge looking west (approximately Stn 12400) showing the removal of the bus lane bridge, cycleway on shoulder and new noise wall.

Precinct 5 Terrys Creek /Crimea Road – Delhi Road: Urban Bushland Interface

Refer to Figures 6.1.41 to 6.1.50.

This precinct is unlike any of the proceeding precincts in character and is a delineation between the natural and urban environment at the edge of the plateau.

North of the corridor is bushland associated with Lane Cove National Park, south is the built form of the commercial area of North Ryde.

Vertical cuttings are a common feature within this precinct and emphasise the edge between built form and natural landscape. Cuttings at Culloden and Christies Roads are to have the cut face steepened, and in the case of Christie Road one abutment moved back, to widen the clearance between abutments facilitating additional lanes.

The landscape response for this zone is focused on the creation of a bushland backdrop to the urban fabric of the road. The re-vegetation works focus on the recreation of the Coastal Sandstone Ridgetop Woodland community which occurs, before meeting the valley of the Lane Cove River. Landscape works are lineal in nature and are to areas where landscape is removed or damaged as a result of works. The Macquarie Park site compound, east of Christie Road provides the greatest opportunity to reinforce this character as part of the works by providing a verge of landscape which reflects this community and will blend with the Lane Cove National Park beyond.

GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.41 Alignment Plan 18

Urban Design Concept

GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.42 Alignment Plan 19

GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.43 Alignment Plan 20

GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.44 Alignment Plan 21

GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.45 Alignment Plan 22

Figure 6.1.46 Alignment Plan 23

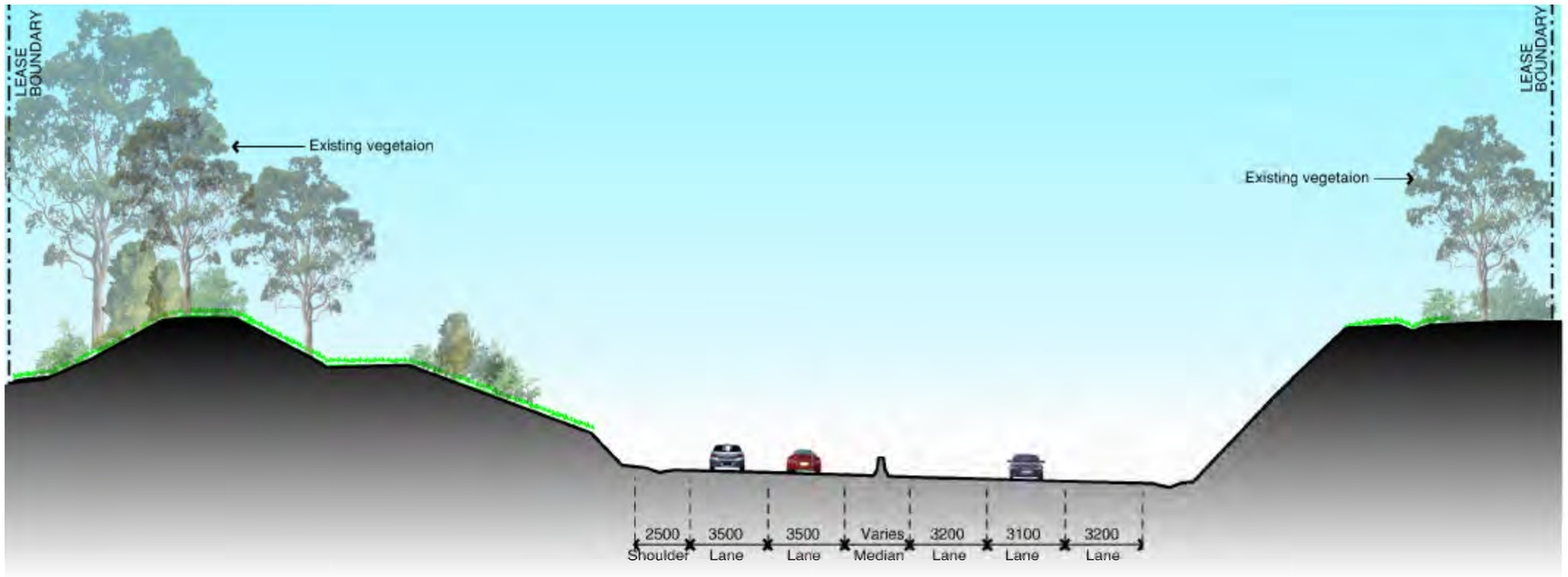


Figure 6.1.47 Stn 15100 Talavera Road - Existing

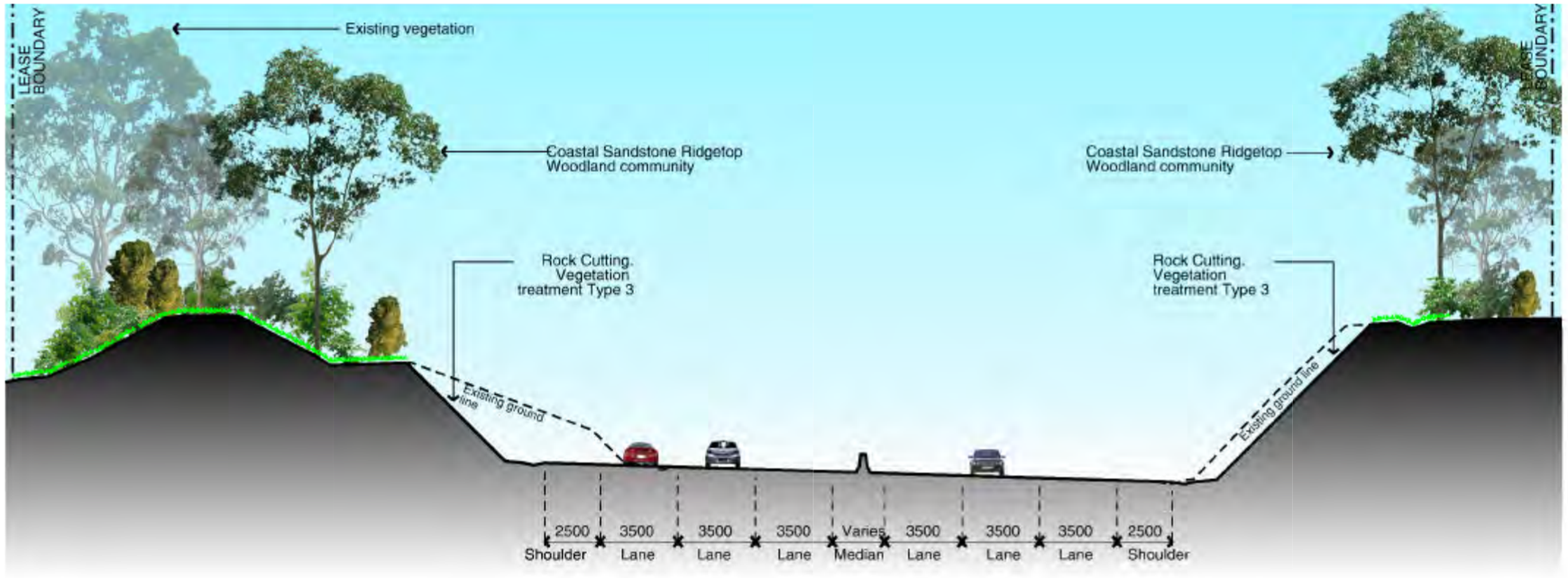


Figure 6.1.48 Stn 15100 Talavera Road - Proposed

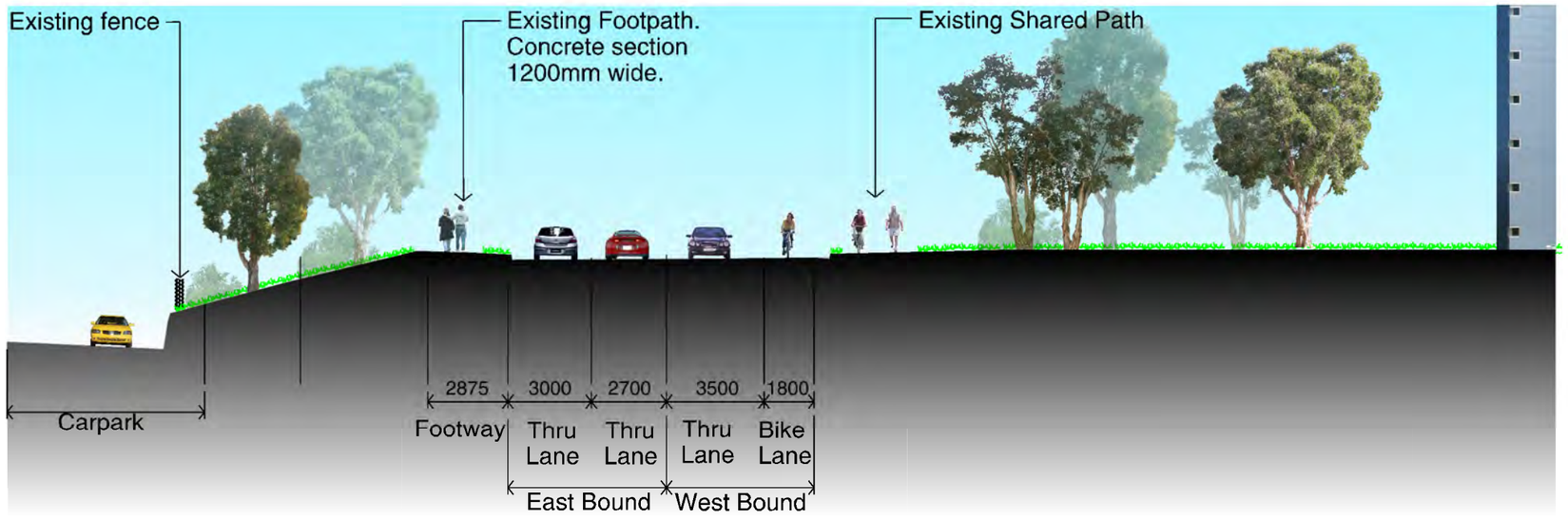


Figure 6.1.49 Talavera Road Between Christie and Herring Roads - Existing

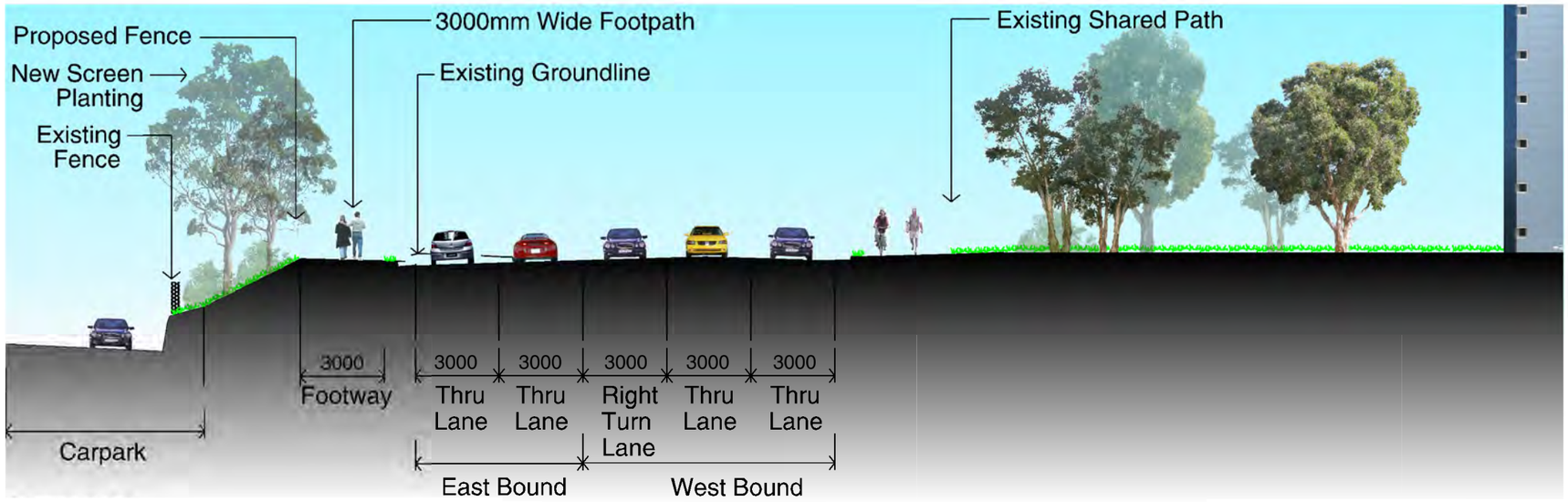


Figure 6.1.50 Talavera Road Between Christie and Herring Roads - Proposed

6.2 Built Elements

The broad urban design objective for all built elements is to identify and accentuate the natural and man-made features which are unique and significant to the M2 Motorway and to reinforce continuity with other sections of the motorway. The design principles are to preserve and enhance:

- Linear Identity – provide a continuous and consistent identity for the length of the upgrade and its seamless transition into the existing upgrade. Select paving and road furniture to reinforce continuity;
- Lateral integration – integrate the road corridor with the surrounding landscape, principally through identifying and responding to the identified landscape character of each of the five corridor precincts.

6.2.1 Bridges

Introduction

The existing bridges are generally consistent and recognisable as part of a 'family' of bridges on the M2 Motorway, despite the fact that they are not good quality urban design examples. As part of the M2 Motorway upgrade, individual interventions at particular bridges to accommodate additional travel lanes, will be required.

The strategy for the bridge design, where widening or lengthening of the bridge occurs, is to match existing construction methods as closely as possible and to match the existing detailing of parapets, piers, girder type and bridge furniture. Although, the project is unable to change the appearance of such bridges, it is intended that where the existing bridge has been poorly designed some consideration will be given to improving the appearance of the bridge or at the very least, not repeating past mistakes.

The strategy for new bridge design is to follow the RTA's Bridge Design Guidelines. It is important not to design and build to inferior standards simply to 'fit' with the existing bridges. A new bridge must be designed to improve upon the appearance of the existing bridges, despite the risk of standing out along the route.

Design Objectives

The primary objectives in the design of the bridges are to ensure that they:

- Meet all applicable structural requirements;
- Relate to their context and role in the total project composition;
- Are aesthetically pleasing for both road users and road neighbours; and
- Are elegant and refined yet robust, durable and low maintenance so that they retain an acceptable standard of appearance over time.

Design Principles

The urban design principles applied to the design of all bridges, renovated or new, are:

- Maximise views of the landscape underbridges.
- Maximise views from bridges towards the surrounding landscape setting.
- Structural bridge forms should be simple and elegant, with structural members as slender as possible.
- Give clear expression to the structural design concept.
- Integrate all bridge components (structure, abutments, parapets, railings, safety screens and lighting) into a coherent, ordered composition.
- Pay particular attention to design details.
- Select appropriate, durable materials and finishes which do not significantly degrade in appearance over time.
- Protect and recover natural vegetation.
- Treat abutment slopes under bridges to prevent erosion and create an attractive and durable surface which is integrated into the bridge composition and the landscaping design.
- The height of solid parapets should be kept as low as possible by using open rail or metal barrier systems.
- Concrete barriers should be simple pre-cast concrete units carefully proportioned in depth in relation to deck overhang & superstructure depth and be continuous past abutments.
- Slope parapet tops inwards towards the deck in order to minimise staining from rainwater on their outer faces.
- Angle the outer face of concrete parapets to better catch the light with the surface as smooth as possible and free of additional attachments.
- For bridges with drainage pipes, the bridge deck draining system to be discreet and concealed from all views. Under no circumstances are drainage pipes, services and future provision for services attached to the external visible surfaces of the bridges.

The Proposed Design

The proposed bridge designs generally comply with the requirements of the Project Scope of Works and Technical Criteria. In addition, the designs also reflect careful consideration of the RTA publication Bridge Aesthetics (January 2004). The proposed designs are consistent with the overall urban and landscape design vision established for the project.

Between Windsor Road and Lane Cove Road there are a total of 21 existing bridges and one tunnel. In order to accommodate the additional traffic lanes, the project includes the widening of 5 of the road bridges plus the lengthening of 2 of the vehicular overbridges, 1 vehicular bridge and 1 pedestrian underpass. Of the 21 bridges, 8 bridges require no change to the structure, however, the additional lanes will be accommodated at two overbridges by the removal of spill-through abutments, creating vertical walls or cuttings. Beecroft Road busway will also be demolished.

The accompanying table identifies all of the bridges on the project followed by descriptions of the changes. The urban design requirements for each individual bridge are discussed in the text following the table.

Table 6.2.1 Bridge Locations within Upgrade Area

Precinct	Area	Bridge No.	Bridge Location	Changes Required
Precinct 1 Cumberland Plain	1	1.1	Windsor Road Overbridge	Widening westbound with on and off ramps
Precinct 2 Bushland Interface	2	2.1	Darling Mills Creek Bridge	Widening
		2.2	Barclay Road Overbridge	Lengthening
		2.3	Yale Close Bridge	Widening
		2.4	Oaks Road Bridge	No change
		2.5	Pennant Hills Road Overbridge	No change
Precinct 3 Suburban Forest Interface	2	2.6	Devlins Creek Bridge	Widening
		2.7	Kirkham Street Overbridge	Lengthening
		2.8	Kent Street Pedestrian Overbridge	No change
		2.9	Beecroft Road Overbridge	No change
		2.10	Beecroft Road Busway	Demolished
Precinct 4 Suburban Bushland Interface	3		Norfolk Tunnel	Widening in both directions
Precinct 4 Suburban Bushland Interface	4	4.1	Terrys Creek Bridge	Widening
		4.15	Vimiera Road Pedestrian Underpass	Lengthening
		4.2	Busaco Road Bridge	Lengthening
		4.3	Culloden Road Overbridge	Cut back abutments to facilitate lane widening
Precinct 5	5	5.1	Christie Road Overbridge	Lengthening and widening, removal of spill through abutments
Precinct 5 Urban Bushland Interface	6	6.1	Khartoum Road Bridge	Widening
		6.2	Lane Cove River Overbridge	No change
		6.3	Wicks Road Bridge	No change
		6.4	Delhi Road Overbridge	No change

Urban Design Concept

PRECINCT 1/AREA ONE

Bridge No. 1.1 Windsor Road Overbridge (refer Figure 6.2.1 to 6.2.3)

This bridge is constructed with Super-T girders. The bridge requires widening on the western side to accommodate new west-bound on and off ramps. No changes occur on the eastern side of the bridge. The ramps require new retaining walls facing the alignment and also facing the neighbourhood and new noise walls. The composition of the bridge, retaining walls and noise walls will work together to form a complete whole. The following urban design requirements apply to changes to this bridge:

- Extend the central headstock & piers to match the existing;
- Depth of parapet to be consistent on all new edges;
- Shape the precast concrete edge beam to make it look like a Super-T girder;
- Pre-cast concrete parapet edge with downturn to cover the edge of the girder and deck and any drainage pipes;
- Safety screen to match existing and must extend around the edges of the new on and off-ramps;
- Junctions at parapet/retaining walls need to be carefully considered;
- Consider planting in the left over areas at the top of the walls, taking maintenance access into account;
- Avoid planting on the bridge deck and plant only once off the bridge; and
- Clad unsightly shotcrete retaining walls with precast concrete facing panels with vertical ribbed pattern (Type A) and extend, if possible, under bridge and further east. In combination with new noise walls, this will significantly update and improve the identity of the intersection.

Photo 6.2.1 Looking East towards Windsor Road Interchange

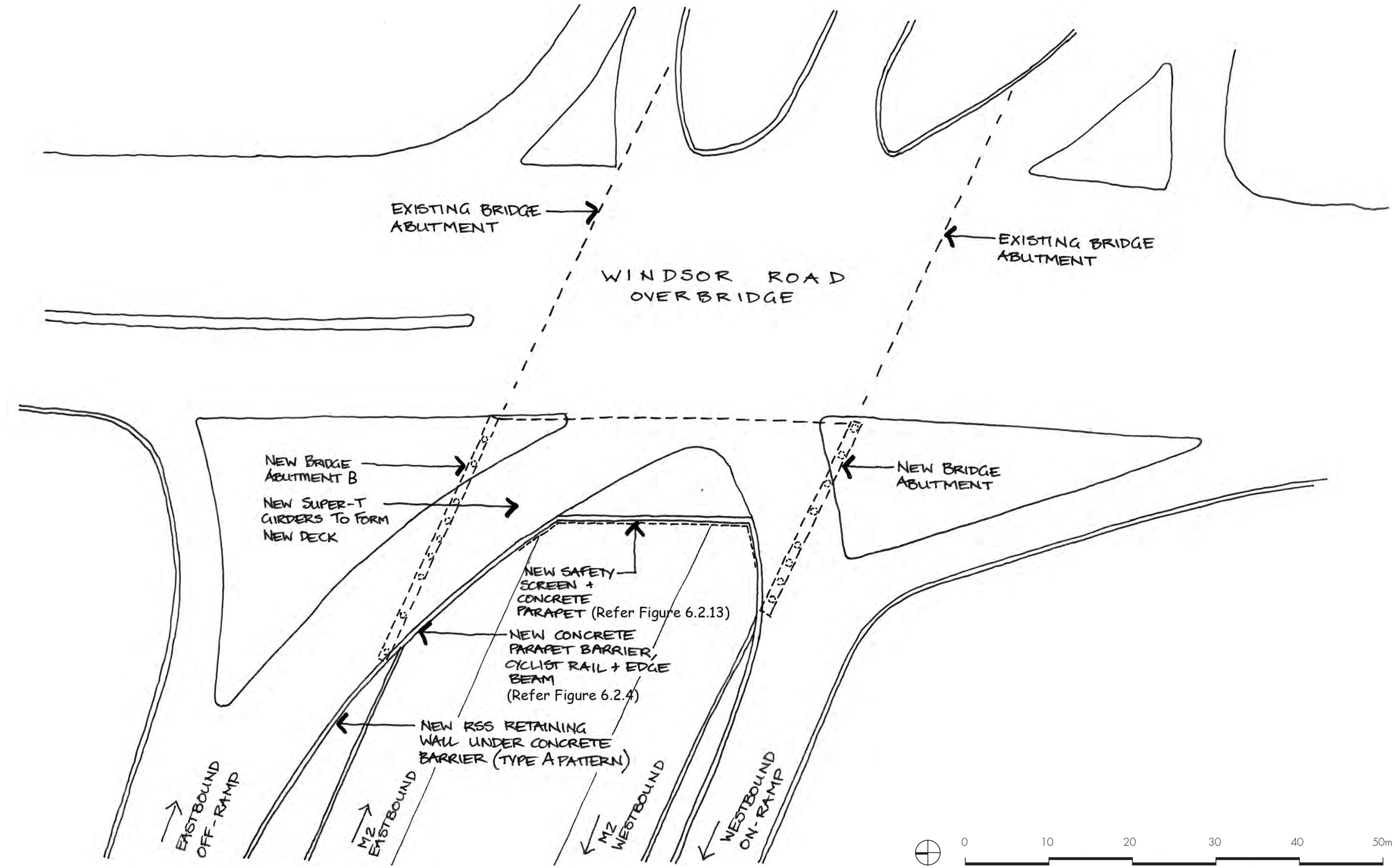


Figure 6.2.1 Windsor Road Overbridge - Plan

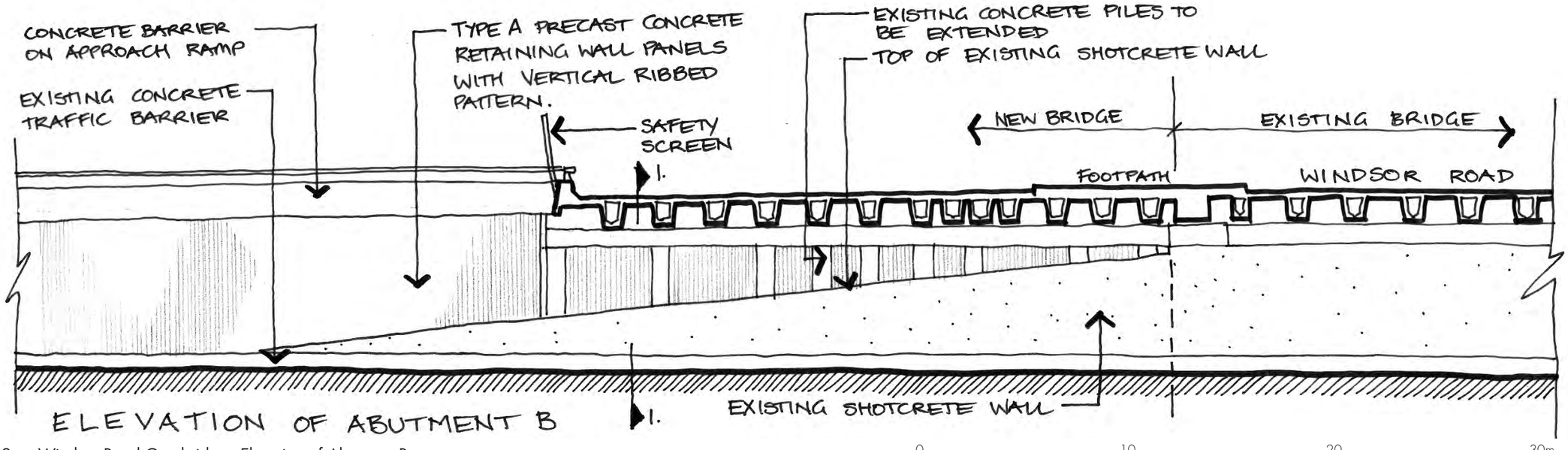


Figure 6.2.2 Windsor Road Overbridge - Elevation of Abutment B

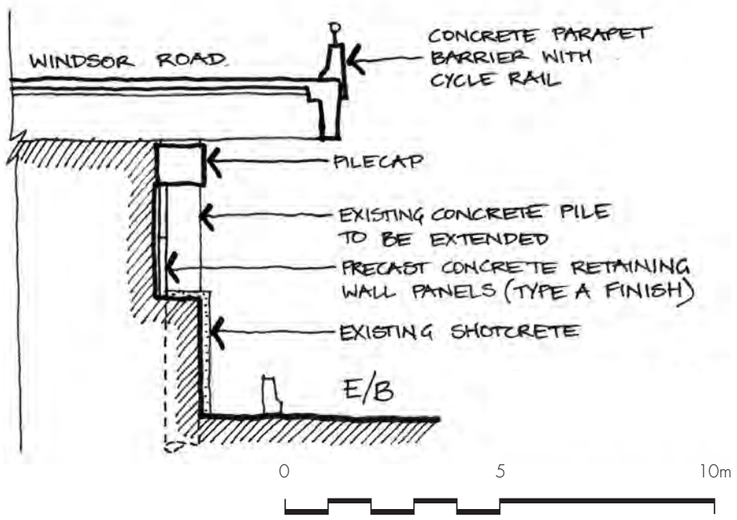


Figure 6.2.3 Windsor Road Overbridge - Section 1

PRECINCT 2/AREA TWO

Bridge No. 2.1 Darling Mills Creek Bridge

Refer Figure 6.2.4, 6.2.5 and 6.2.6.

This bridge is constructed with Super-T girders. The bridge requires widening on the east-bound side to accommodate the additional lane. The abutments which also require widening are retained earth with precast concrete panels. The following urban design requirements apply to changes to this bridge:

- Piers to be rectangular to match piers on existing bridge and dimensions to be equal to or smaller;
- Pre-cast concrete parapet edge with downturn to cover the edge of the girder, deck and any drainage pipes. No noise wall is located on this parapet edge;
- Super-T girder depth is to match existing girders depth;
- Headstock to be as simple as possible and is not to protrude past the edge of the parapet; and
- New retaining wall panels at abutments to match existing in shape, size, pattern and jointing.

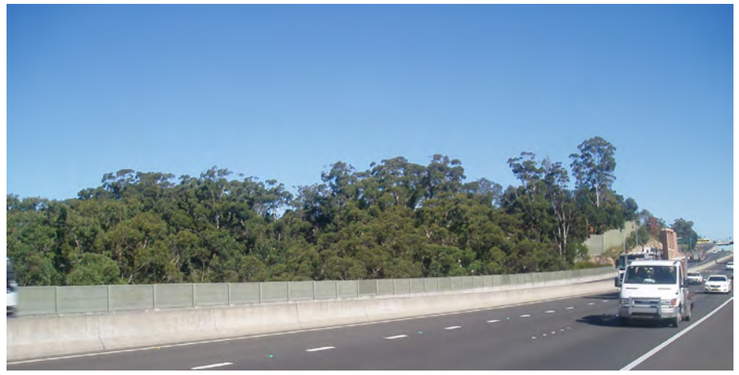


Photo 6.2.2 Darling Mills Creek Bridge

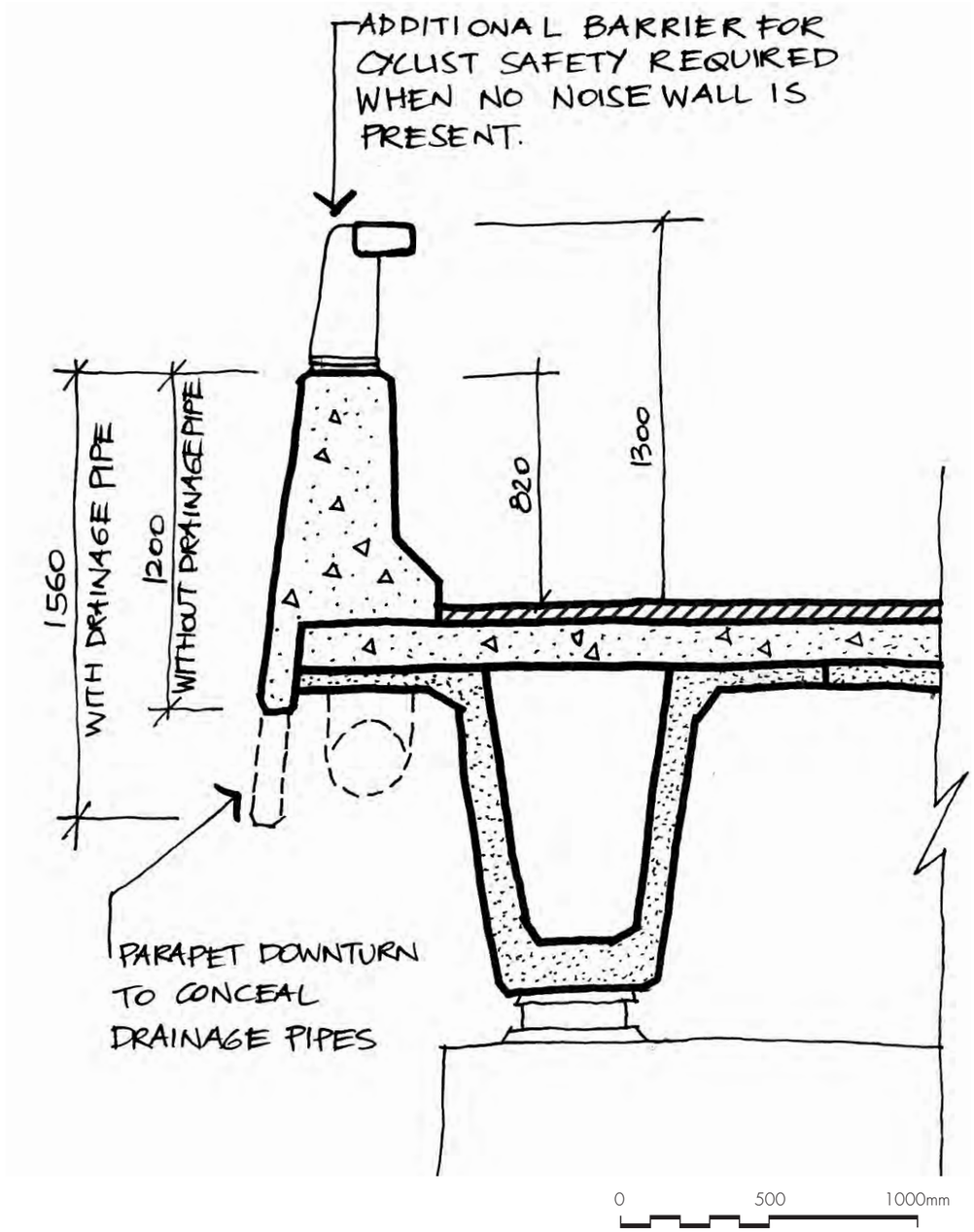


Figure 6.2.4 Typical Bridge - Parapet detail as used on Darling Mills Creek Bridge and Yale Close Bridge

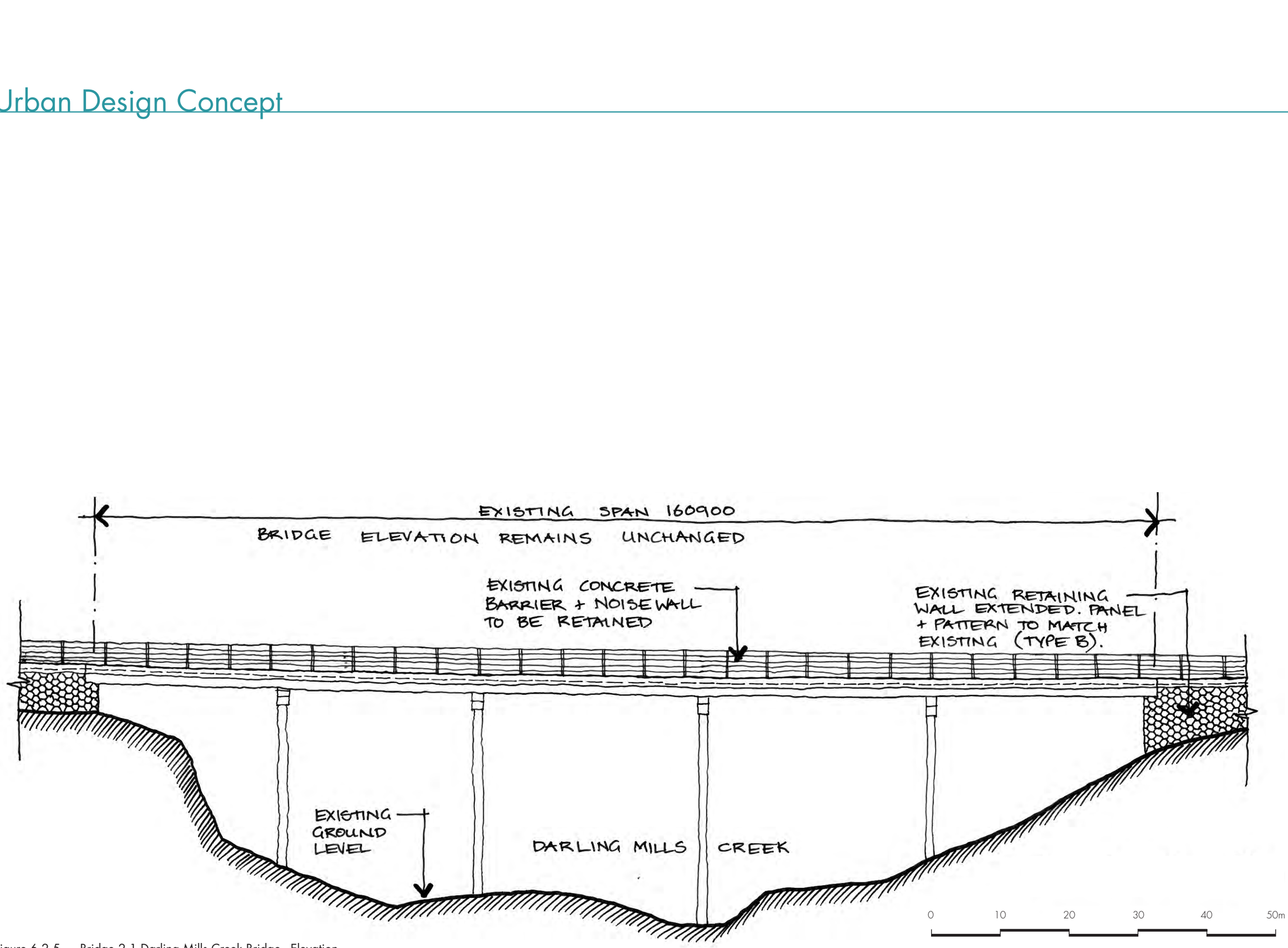


Figure 6.2.5 Bridge 2.1 Darling Mills Creek Bridge - Elevation

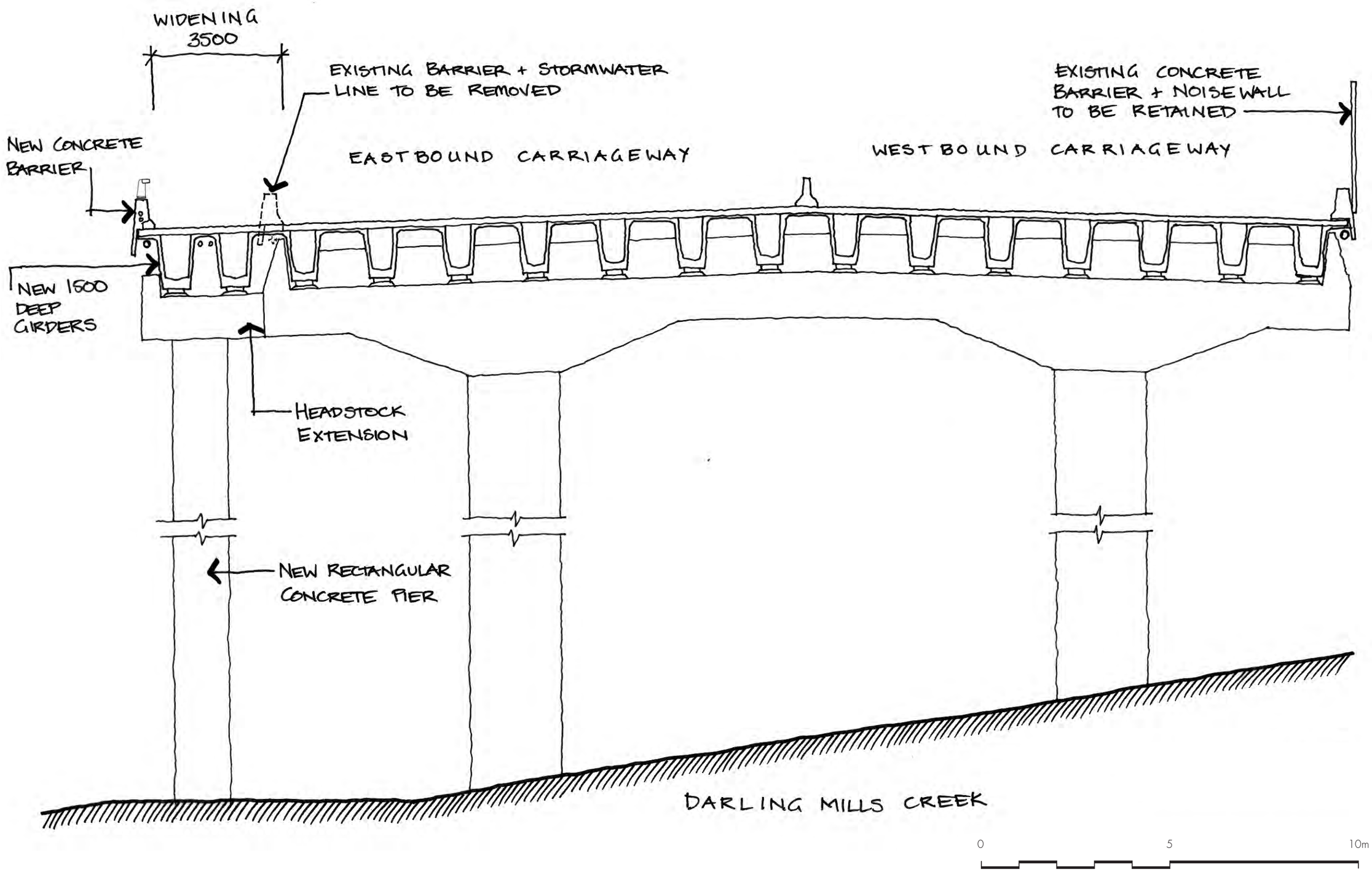


Figure 6.2.6 Bridge 2.1 Darling Mills Creek Bridge - Cross Section

Urban Design Concept

Bridge No. 2.2 Barclay Road Overbridge

Refer Figure 6.2.7, 6.2.8 and 6.2.9.

This bridge is a local road crossing the M2 Motorway and is constructed with Super-T girders. The bridge requires lengthening at the northern end to accommodate the additional lane beneath. The following urban design requirements apply to changes to this bridge:

- Parapet extension to match shape and size of existing and with the same profile and depth of overhang;
- Safety screen and railing detail to match existing;
- The junction of the Super-T girders and the new structure must be neatly resolved. Shape the edge of the new beam to look like the edge of a Super-T girder;
- The spacing and number of the piers must match the existing;
- Avoid replicating shotcrete stabilisation adjacent to abutment top corners by laying the cutting back further. The abutment wing walls would need to be extended to accommodate this; and
- Laying back top of cutting would also facilitate planting on top of vertical cut. See existing areas adjacent to this bridge as reference.

Photo 6.2.3 Barclay Road Overbridge

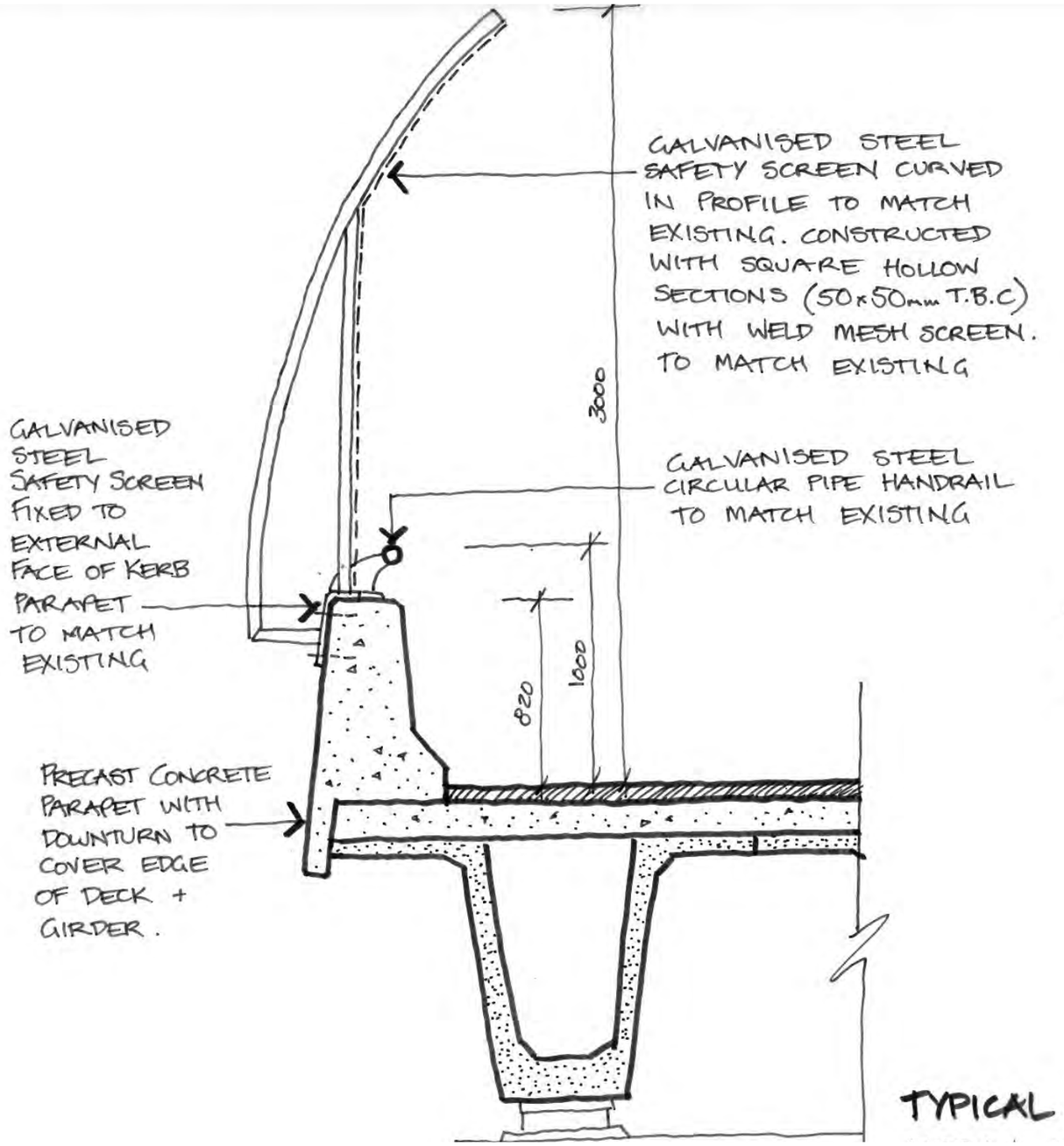


Figure 6.2.7 Typical Overbridge - Parapet detail on Barclay Road Bridge

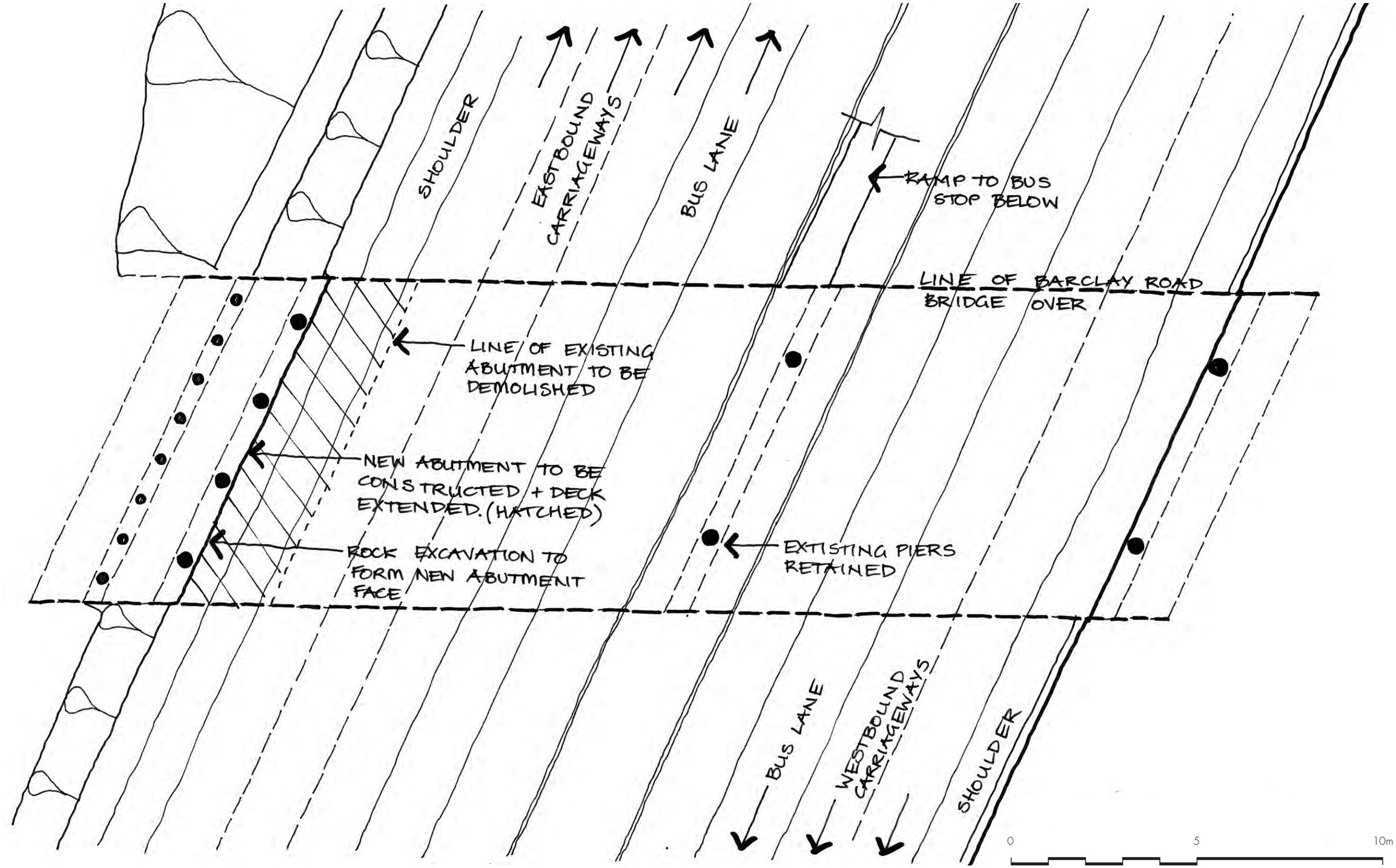


Figure 6.2.8 Bridge 2.2 Barclay Road Overbridge - Plan

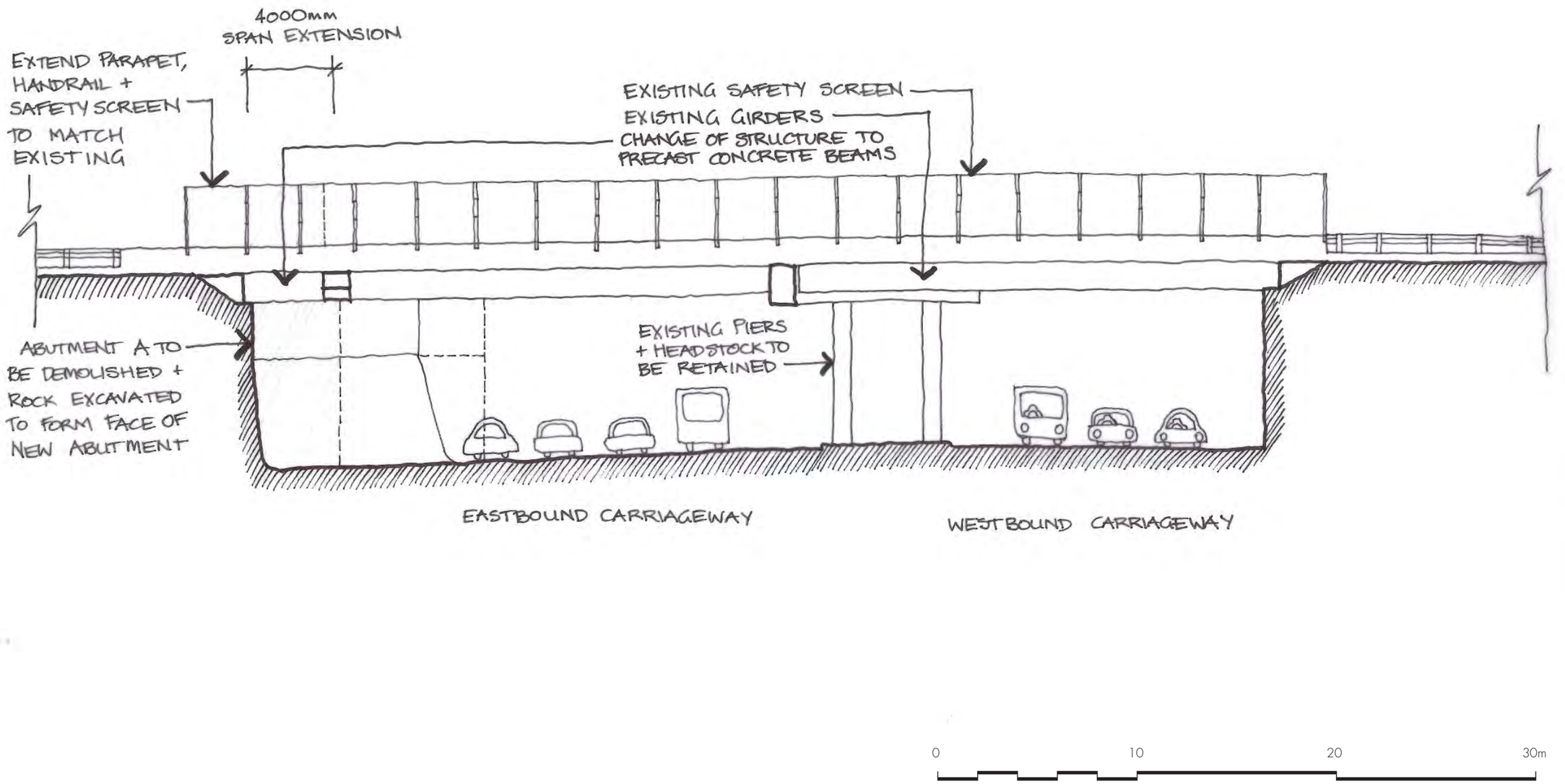


Figure 6.2.9 Bridge 2.2 Barclay Road Overbridge - Elevation

Urban Design Concept 6

Bridge No. 2.3 Yale Close Bridge

Refer Figures 6.2.4 and 6.2.10.

This bridge is a single span bridge over the local road and is constructed with Super-T girders. The bridge requires widening on the west-bound side of the bridge to accommodate the additional lanes. The following urban design requirements apply to the changes to this bridge:

- Pre-cast concrete parapet edge with downturn to cover the edge of the girder, deck and any drainage pipes; and
- New reinforced soil wall panels at abutments to match existing in shape, size, pattern and jointing.

Photo 6.2.4 Yale Close Bridge

Bridge No. 2.4 Oaks Road Bridge

No changes are required to this bridge as part of the M2 Motorway upgrade works

Bridge No. 2.5 Pennant Hills Road Overbridge

No changes are required to this bridge as part of the M2 Motorway upgrade works.

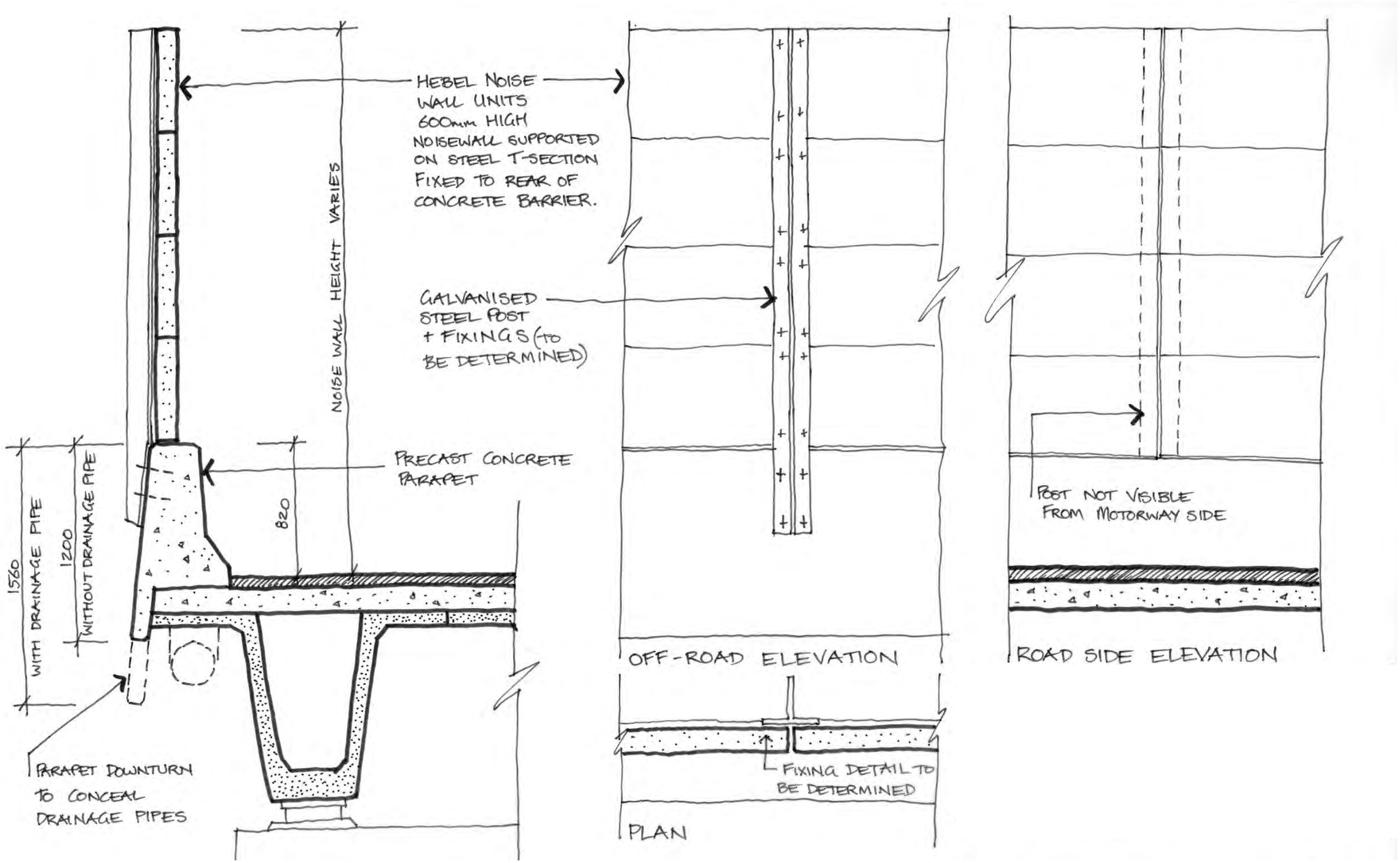


Figure 6.2.10 Typical Bridge Parapet Detail as used on Darling Mills Creek Road, Yale Close Bridge and Devlins Creek Bridge

Urban Design Concept 6

PRECINCT 3/AREA TWO

Bridge No. 2.6 Devlins Creek Bridge

Refer to Figure 6.2.10 and 6.2.11.

Devlins Creek Bridge is constructed with Super-T girders. The bridge requires widening on the west-bound side of the bridge and infilling between the existing two bridges to accommodate the additional lane. The abutments, which also require widening, are retained earth with precast concrete panels.

The following urban design requirements apply to changes to this bridge:

- Pre-cast concrete parapet edge with downturn to cover the edge of the girder, deck and any drainage pipes;
- New noise walls located on parapet edge;
- Super-T girders to match the existing girders in depth;
- Minimise protrusion of the headstock past the final girder;
- New circular piers to match the existing in diameter; and
- New retaining wall panels at abutments to match the existing in shape, size, pattern and jointing.

Transparent noise walls panels could be utilised in this location to improve the visual amenity, improve driver orientation and to introduce the bushland context as part of the travel experience.

Photo 6.2.5 Devlins Creek Bridge

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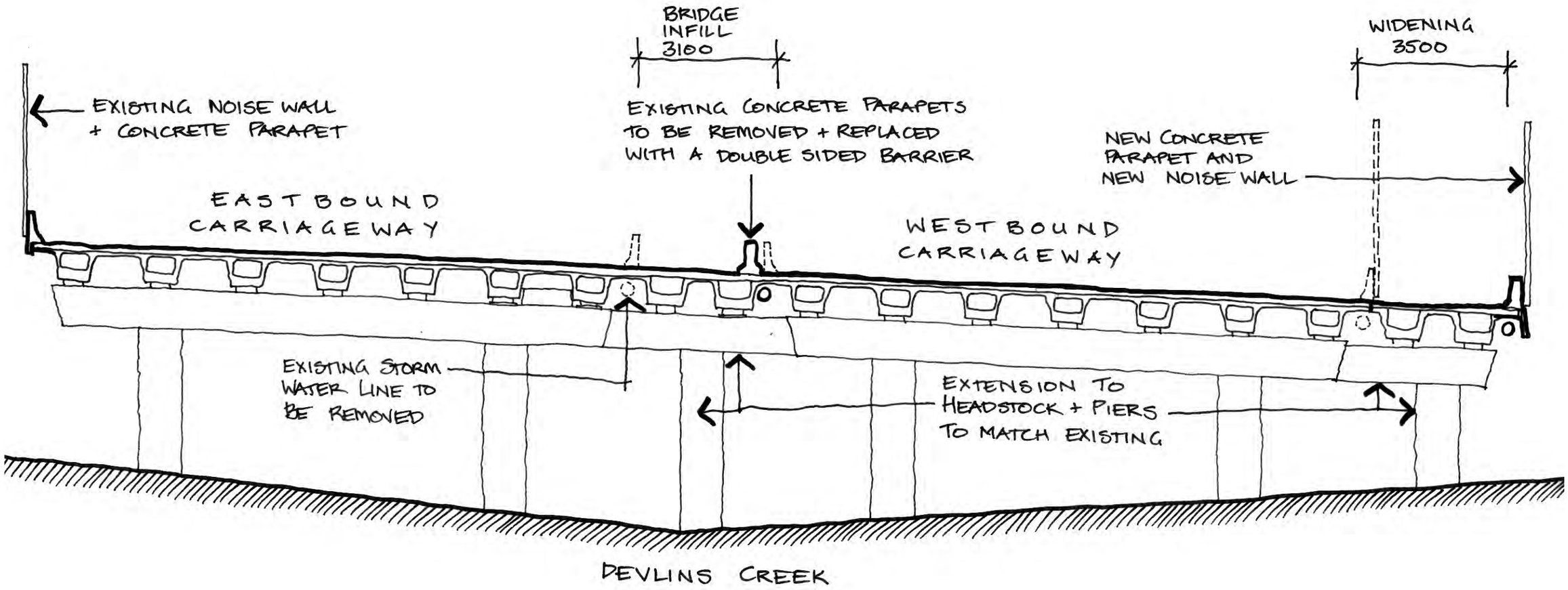

Figure 6.2.11 Bridge 2.6 Devlins Creek Bridge - Cross Section

Bridge No. 2.7 Kirkham Street Overbridge

Refer Figure 6.2.12, 6.2.13 and 6.2.14.

Kirkham Street is a local road crossing the M2 Motorway and is constructed with Super-T girders. The bridge requires lengthening at both ends to accommodate the additional lane beneath.

The following urban design requirements apply to the changes to this bridge: Parapet extension to match the shape and size of the existing and with the same profile and depth of overhang;

- Safety screen and hand rail extension to match existing;
- The junction of the Super-T girders and the new structure must be neatly resolved. Shape the edge of the new beam to look like the edge of a Super-T girder;
- The spacing and number of the piers must match the existing;
- Consider opportunities (surface finish, shape, extent) to improve appearance of abutment & concrete retaining wall; and
- Avoid replicating shotcrete stabilisation adjacent to abutment top corners by laying the cutting back further. The abutment wing walls would need to be extended to accommodate this.

Photo 6.2.6 Kirkham Street Overbridge..

Bridge No. 2.8 Kent Street Pedestrian Bridge.

No changes are required to this bridge.

Bridge No. 2.9 Beecroft Road Overbridge

No changes are required to this bridge as part of the M2 Motorway upgrade works.

Bridge No. 2.10 Beecroft Road Busway

No changes are required to this bridge as part of the M2 Motorway upgrade works.

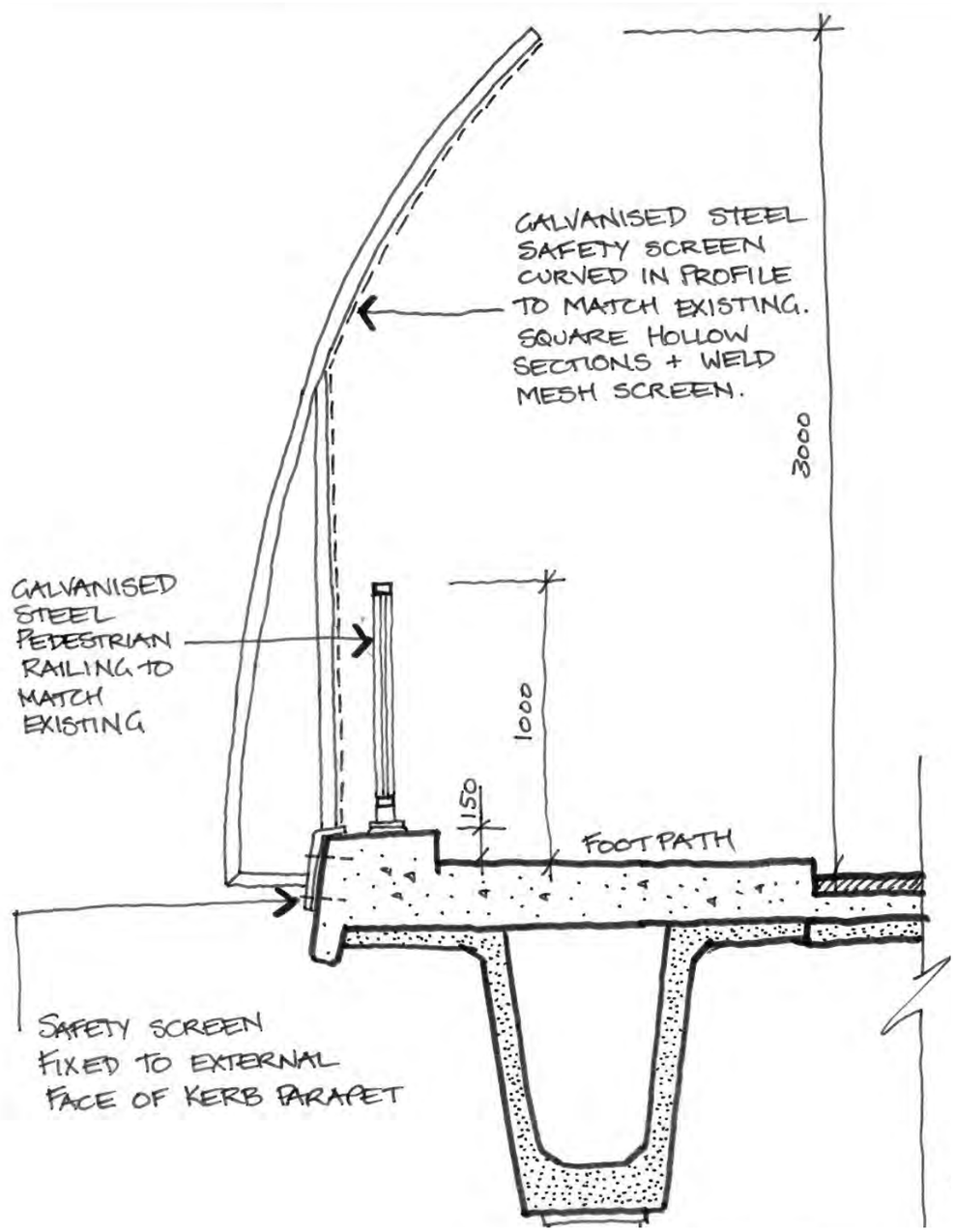

Figure 6.2.12 Typical Bridge - Parapet Detail on Kirkham Street Bridge

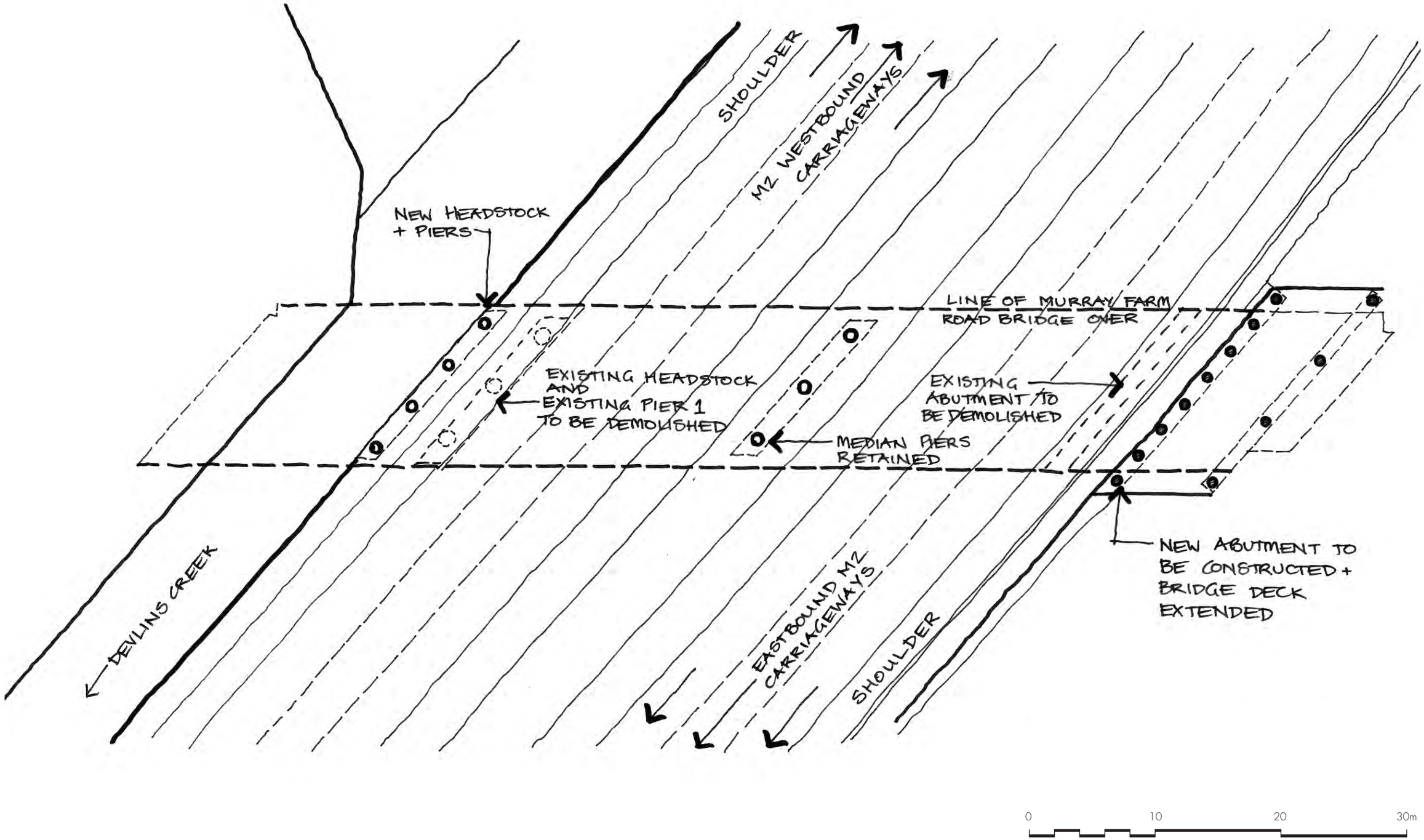

Figure 6.2.13 Bridge 2.7 Kirkham Street Overbridge - Plan

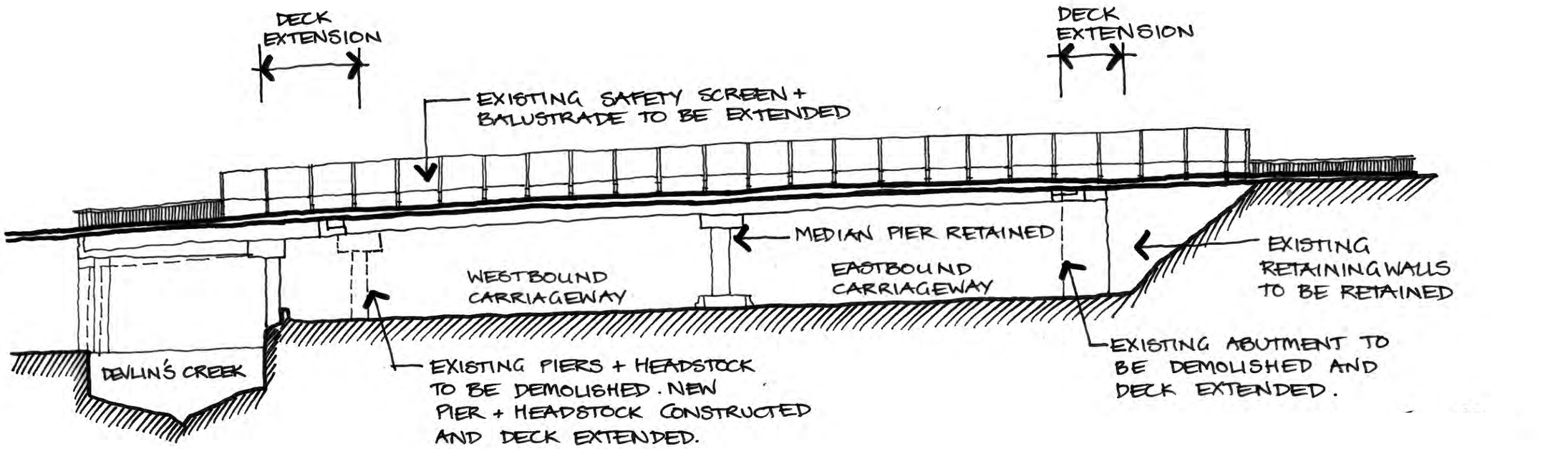

Figure 6.2.14 Bridge 2.7 Kirkham Street Overbridge - Elevation

Urban Design Concept

PRECINCT 4/AREA THREE

Norfolk Tunnel

Norfolk Tunnel is a major landmark on the M2 Motorway journey. The tunnel is being widened in each direction to cater for an additional traffic lane and breakdown shoulder, also for use by cyclists. The current tunnel portal entries are clean symmetrical arches framed by neat precast concrete units and set against the attractive backdrop of cut sandstone.

If practical construction requirements result in an asymmetrical rock excavation shape, then a design will be required to mask the uneven & asymmetrical rock excavation shape. Any changes to the portal needs to compliment the natural sandstone cutting, the existing noise wall design and also physically contribute to the Urban & landscape Design Vision for the M2 Motorway.

The other design considerations include:

- Maintaining airflow for the ventilation fans;
- The incorporation of extensive variable message and speed zone signage at the portal;
- The traffic envelope requirements;
- The filtering of the blinding effects of the strong low morning and evening sun;
- Screening the ends of the lighting suspension system from view; and

A steel mesh structure may be required above each tunnel portal to catch any rocks which fall from the cutting above.

Photo 6.2.7 Eastern portal of the Norfolk Tunnel.

PRECINCT 4/AREA FOUR

Bridge No. 4.1 Terrys Creek Bridge

Refer Figures 6.2.15 to 6.2.17.

This bridge is constructed with Super-T girders. The bridge requires widening on the east-bound side of the bridge to accommodate the additional lane. The abutments which also require widening are retained earth with precast concrete panels. The following urban design requirements apply to changes to this bridge:

- Pre-cast concrete parapet edge with downturn to cover the edge of the girder, deck and any drainage pipes;
- Piers to be rectangular to match the piers on the existing bridge and dimensions to be equal to or smaller;
- Minimise protrusion of the headstock past the final girder;
- Super-T girders to match the existing girders in depth;
- New reinforced soil wall panels to match the existing in shape, size, pattern and jointing;
- New noise walls located on both parapet edges; and
- New transparent noise walls panels are highly recommended to improve the visual amenity, improve driver orientation and to take full advantage of the bushland context.

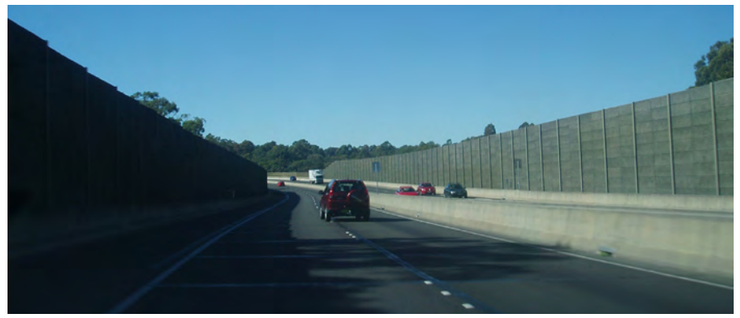

Photo 6.2.8 Terrys Creek Bridge

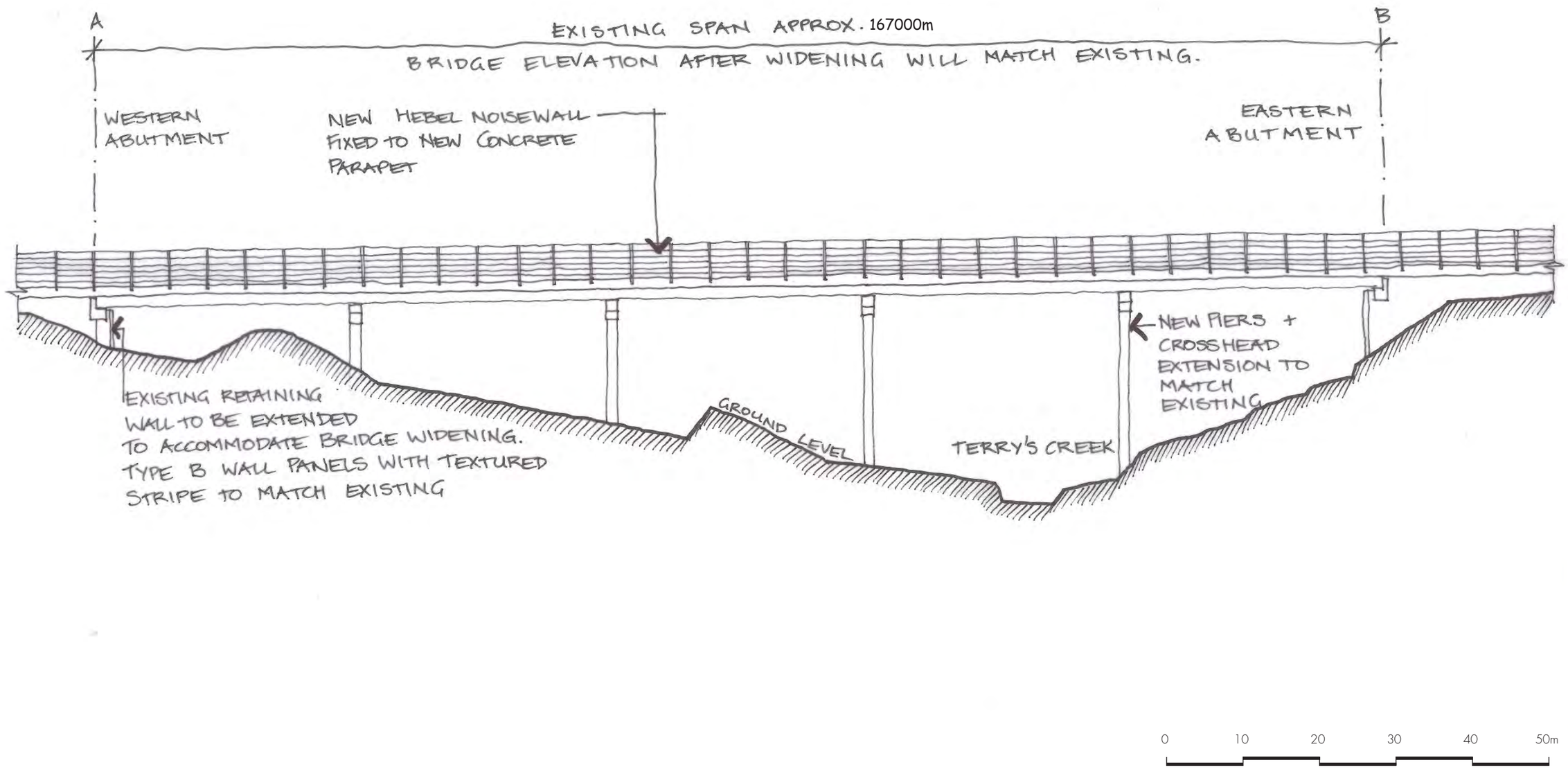

Figure 6.2.15 Bridge 4.1 Terrys Creek Bridge - Elevation

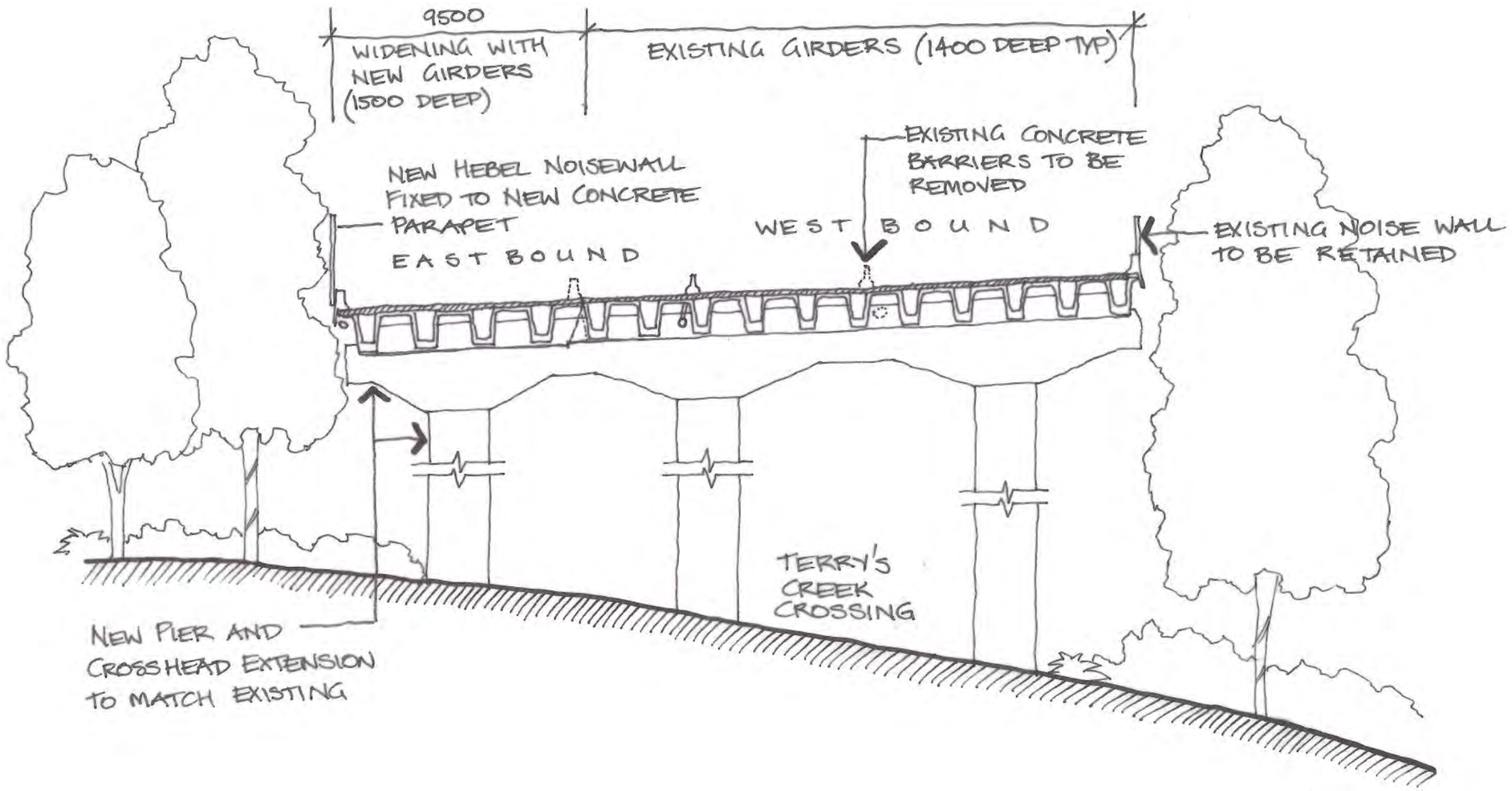

Figure 6.2.16 Bridge 4.1 Terrys Creek Bridge - Cross Section

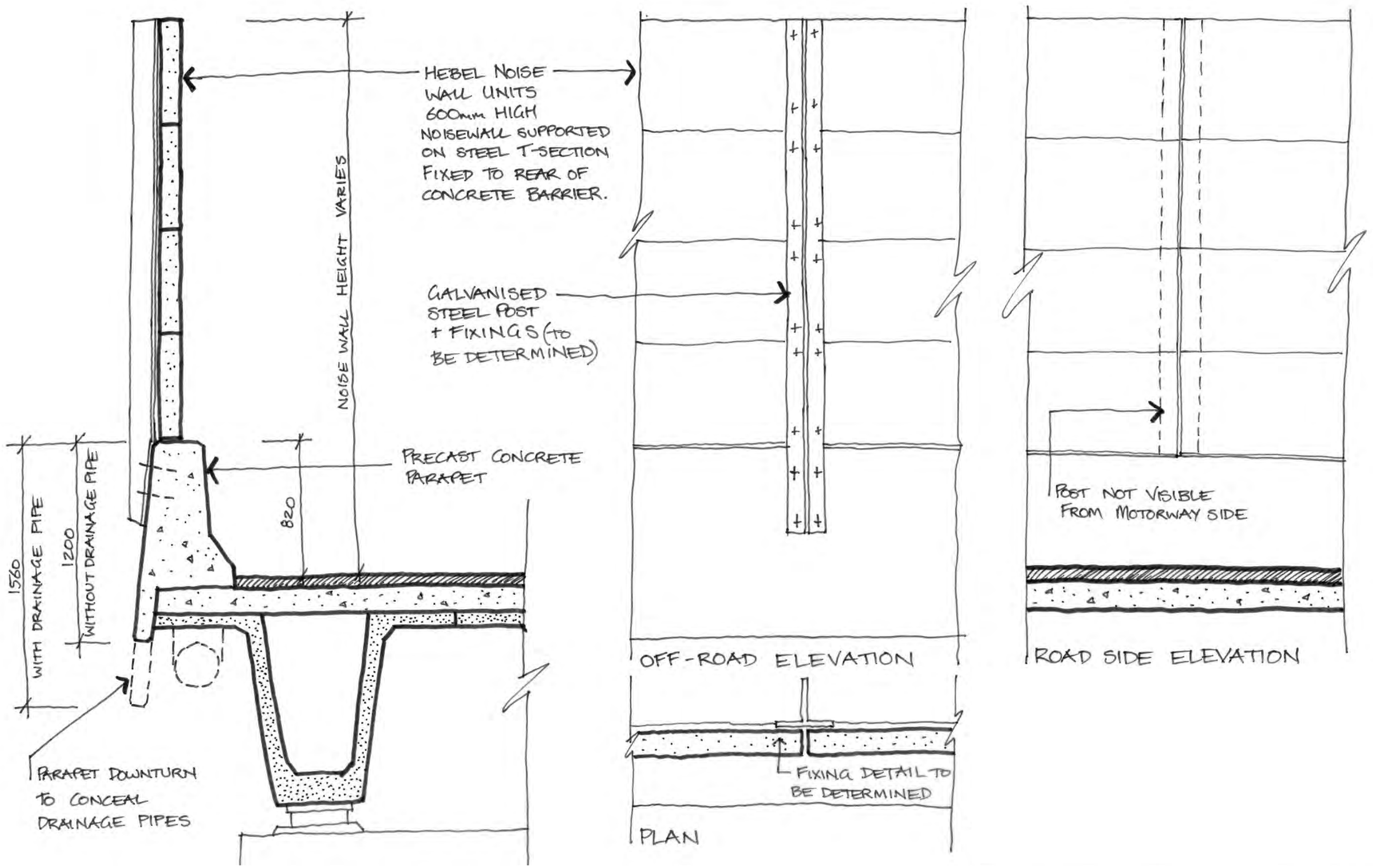

Figure 6.2.17 Typical Bridge Parapet Detail as used on Terrys Creek Bridge

Urban Design Concept

Bridge No. 4.15 Vimiera Road Pedestrian Underpass

This pedestrian underpass is a concrete culvert style 'tunnel underpass' which travels beneath the M2 Motorway. (Refer to photo 6.2.9) It requires lengthening at the northern end of the underpass. The following urban design requirements apply to the changes to this bridge:

- Underpass to be extended to the north in the same material and style;
- Splay concrete entry retaining walls and fencing to open up the approach view to the underpass. This will also visually reduce the length of the underpass;
- Improve/maintain lighting; and
- Improve appearance and safety at both ends of the underpass by upgrading fencing, lighting and landscape planting.

Photo 6.2.9 Vimiera Road Pedestrian Underpass

Bridge No. 4.2 Busaco Road Bridge.

This bridge is a "Bebo" arch structure which is being lengthened at the northern end to accommodate the additional lane. (Refer to Photo 6.2.10) The following urban design requirements apply to the changes to this bridge:

- Existing sandstone retaining boulders to be retained and re-used or extend the vertical wall at end of the arch similar to Shrimptons Creek;
- Improve appearance and safety at both ends of the underpass by upgrading fencing, lighting and landscape planting. Treated pine planter boxes to be removed from either end of the bridge; and
- Noise wall on northern side to be relocated to new parapet edge.

Photo 6.2.10 "Bebo" arch Bridge over Busaco Road

Bridge No. 4.3 Culloden Road Overbridge

Refer Figure 6.2.18.

This bridge is a local road crossing the M2 Motorway and is constructed with Super-T girders. Culloden Road & Christie Road Overbridges act as important entry and exit structures at either side of the M2 Motorway toll plaza. No bridge widening is required however the spill-through abutments are being removed and replaced by vertical walls/cuttings. The following urban design requirements apply to changes to this bridge:

- Lightweight CFC cladding panels or precast concrete facing panels are to be applied to the area directly under bridge to conceal any shotcrete stabilisation required and to improve the appearance of the bridge. The cladding will extend 2m past the edge of the bridge and will have a vertical emphasis to relate directly to the upgrade retaining walls

Photo 6.2.11 Culloden Road Overbridge

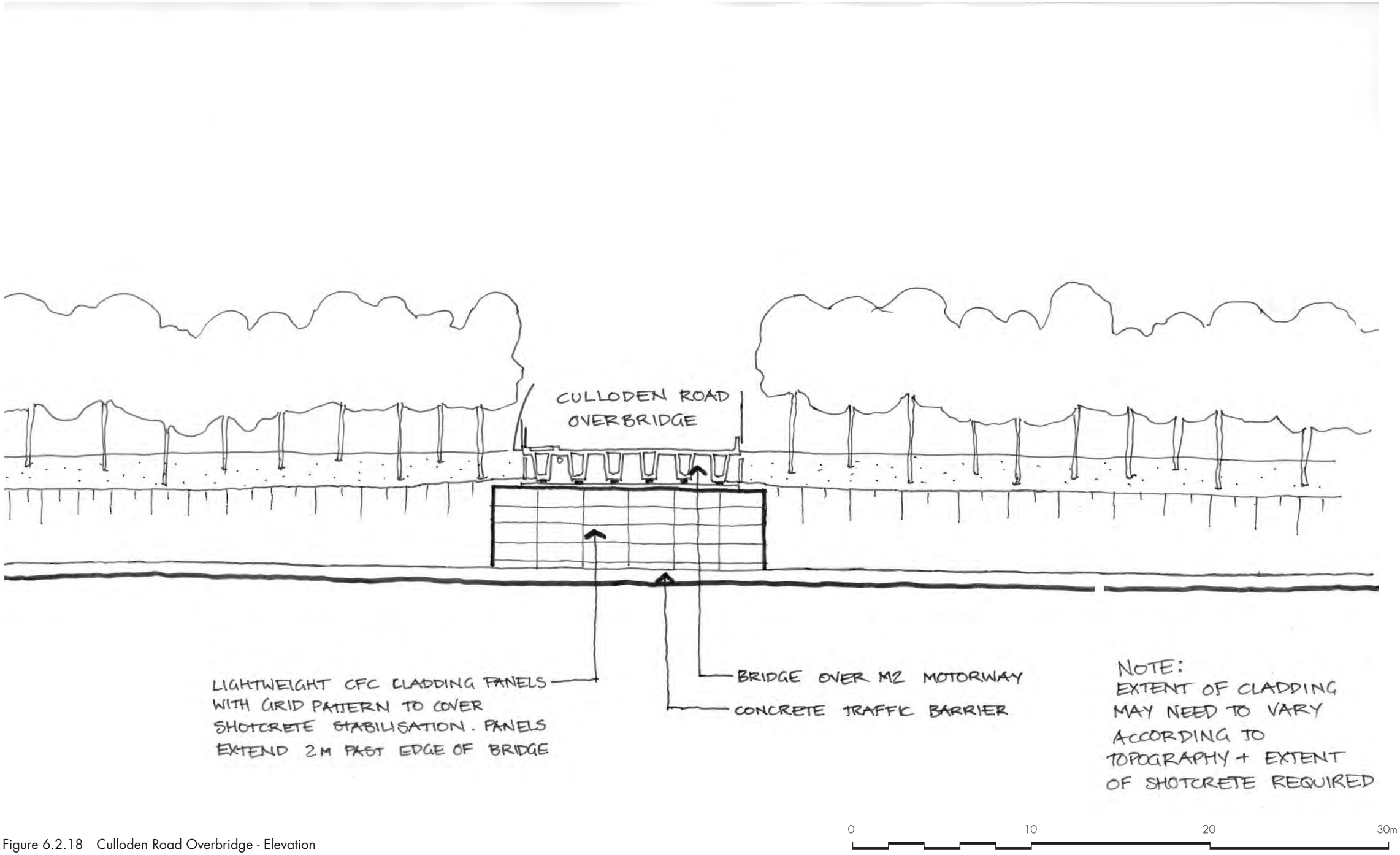

Figure 6.2.18 Culloden Road Overbridge - Elevation

Urban Design Concept

PRECINCT 5/AREA FIVE

Bridge No. 5.1 Christie Road Overbridge (refer Figure 6.2.19 to 6.2.21)

This bridge is a local road crossing the M2 Motorway and is constructed with Super-T girders. Christie Road & Culloden Road Overbridges act as entry and exit structures at either side of the M2 Motorway toll plaza. The bridge will be widened on both sides and lengthened and the abutments are being removed and replaced by vertical walls/cuttings. The following urban design requirements apply to changes to this bridge:

- Lightweight compressed fibre cement cladding panels or precast concrete facing panels are to be applied to the area directly under the bridge to conceal any shotcrete stabilisation required and to improve the appearance of the bridge. The cladding will extend 2 metres past the edge of the bridge and will have a vertical emphasis to relate directly to the upgrade retaining walls, and
- New throw screens will be required on both sides.

Photo 6.2.12 Christie Road Overbridge.

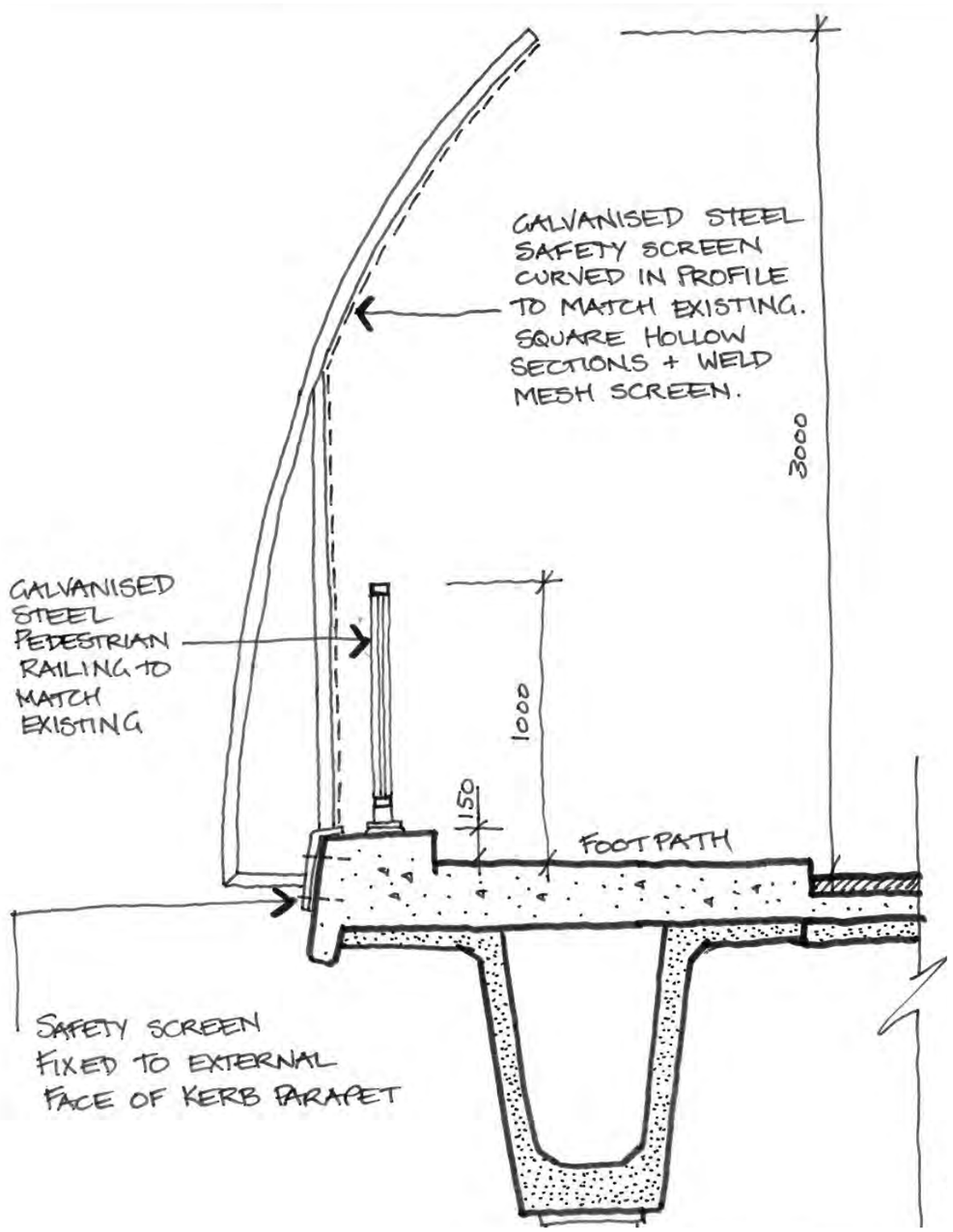

Figure 6.2.19 Typical Bridge - Parapet Detail on Christie Road Bridge

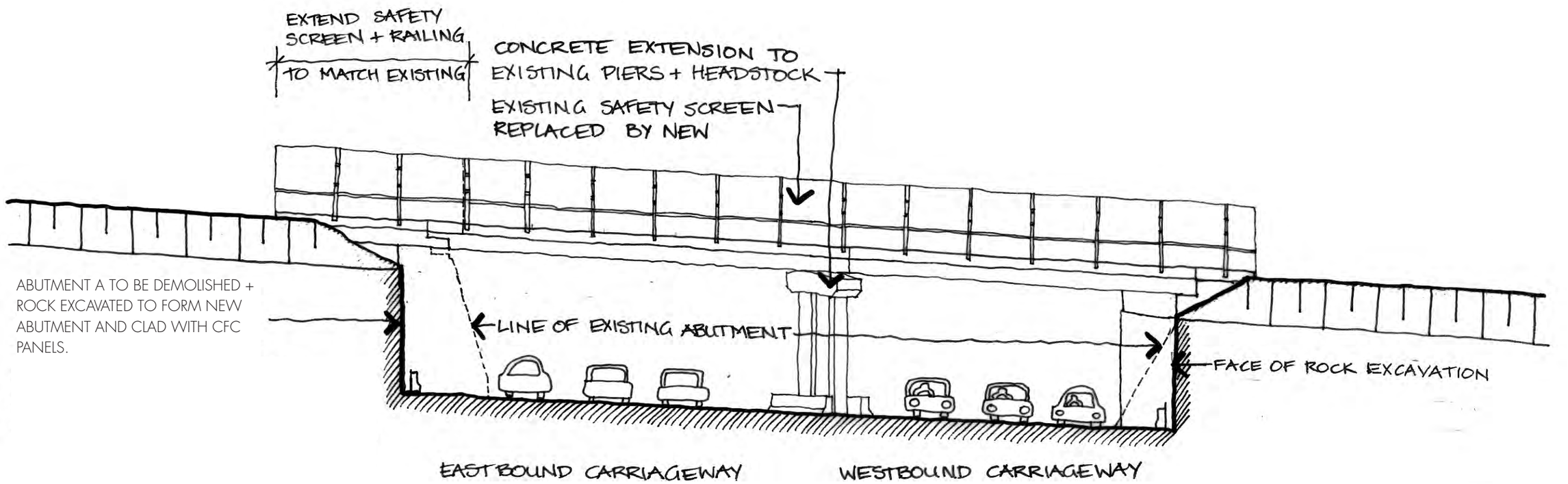

Figure 6.2.20 Bridge 5.1 Christie Road Bridge - Elevation

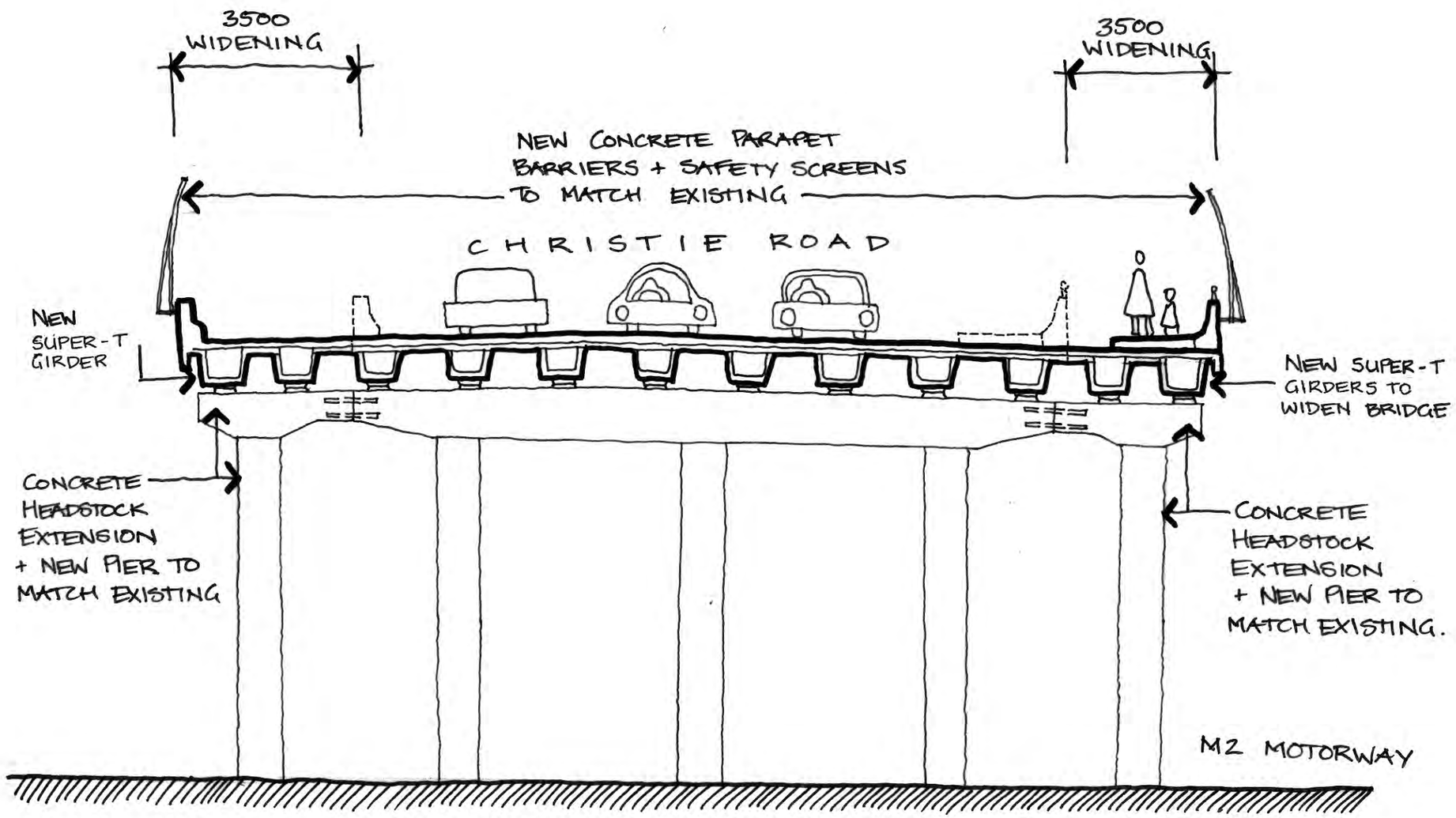

Figure 6.2.21 Bridge 5.1 Christie Road Bridge - Cross Section

PRECINCT 6/AREA SIX

Bridge No. 6.1 Khartoum Road Bridge

Refer to Figures 6.2.22 to 6.2.24.

This bridge is a single span bridge over the local road and is constructed with Super-T girders. The bridge requires widening on both sides of the bridge to accommodate the additional lanes. The following urban design requirements apply to changes to this bridge:

- Pre-cast concrete parapet edge with downturn to cover edge of the girder, deck and any drainage pipes;
- New reinforced soil wall panels at abutments to match the existing in shape, size, pattern and jointing; and
- Stabilisation of existing precast panels will take the form of evenly spaced dome shaped covers in stainless steel.

Bridge No. 6.2 Lane Cove River Overbridge

No changes are required to this bridge as part of the M2 Motorway upgrade works.

Bridge No. 6.4 Wicks Road Bridge

No changes are required to this bridge as part of the M2 Motorway upgrade works.

Bridge No. 6.5 Delhi Road Overbridge

No changes are required to this bridge as part of the M2 Motorway upgrade works.

Photo 6.2.13 Khartoum Road Overbridge.

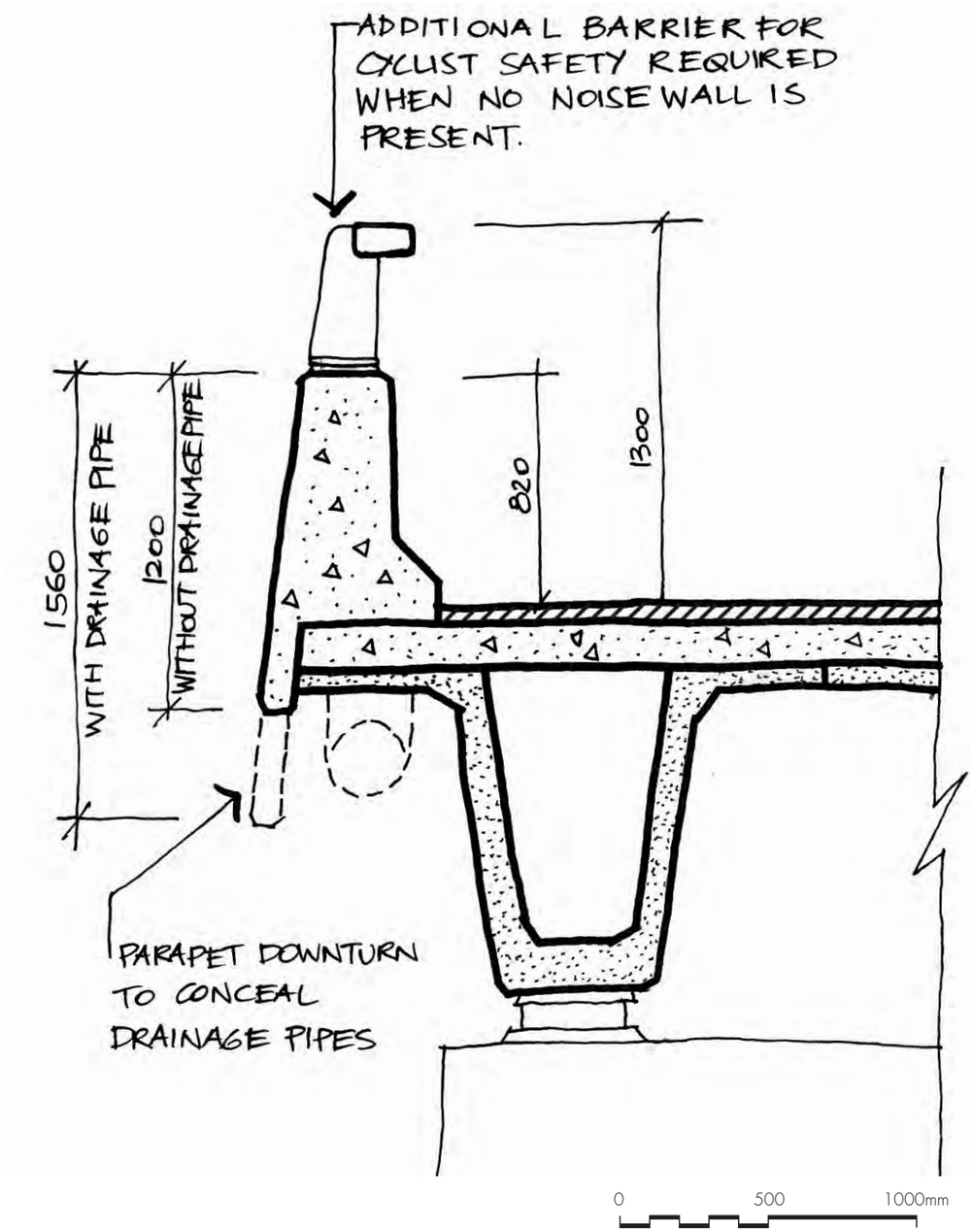

Figure 6.2.22 Typical Bridge - Parapet detail

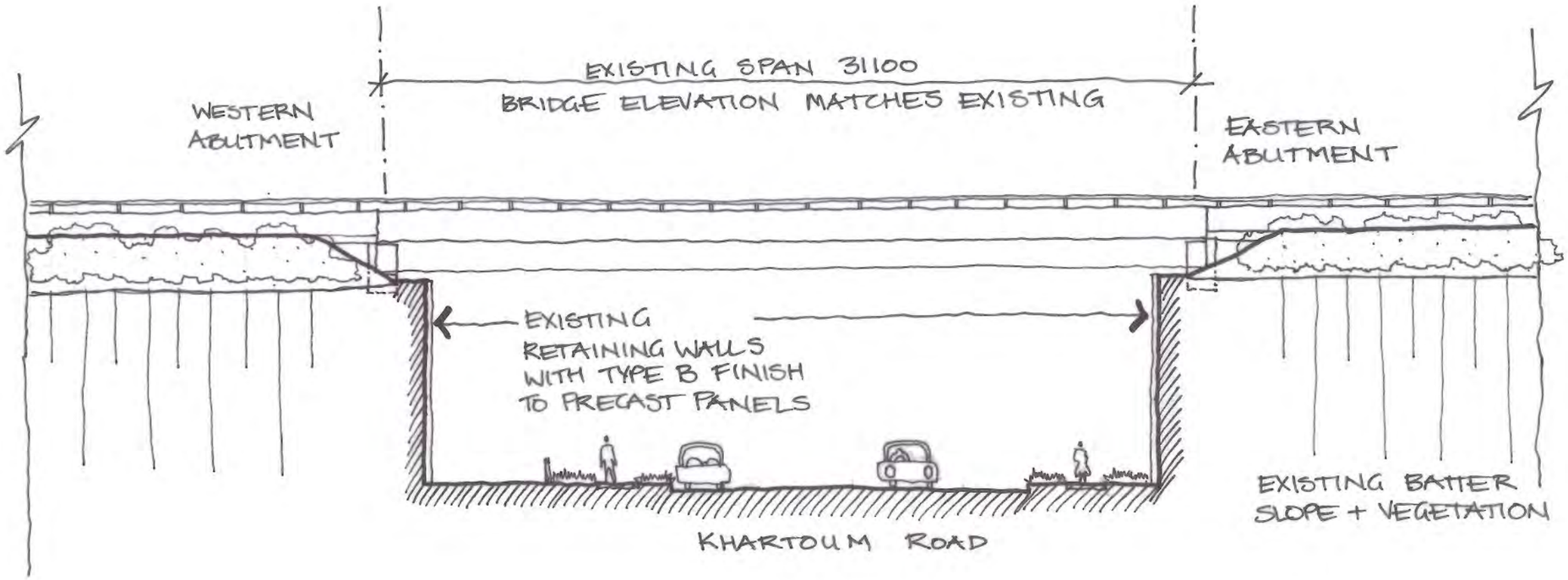

Figure 6.2.23 Bridge 6.1 Khartoum Road Bridge - Elevation

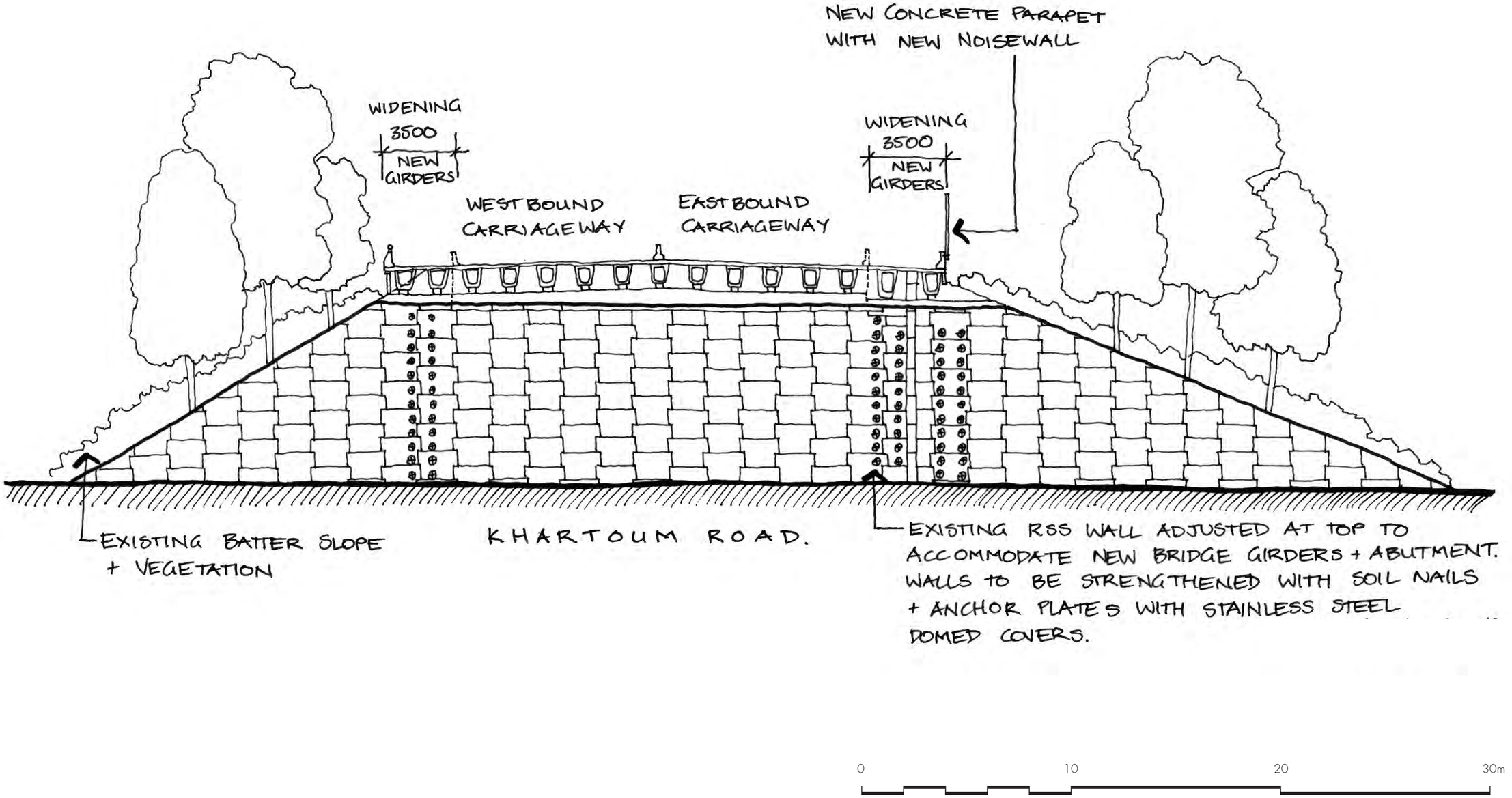

Figure 6.2.24 Bridge 6.1 Khartoum Road Bridge - Cross Section

6.2.2 Retaining Walls

Introduction

The existing retaining walls lack a consistent appearance along the length of the existing M2 Motorway. In many locations where ground stabilisation was required, rock anchors and shotcrete were used. A mix of cast in-situ concrete walls and shotcrete surfaces face the motorway, while walls facing away from the corridor range from patterned precast concrete panels to stacked sandstone boulders with no real distinction made between bushland and urban areas. The end result is one in which the walls, particularly those facing the motorway, are unattractive and visually dominating.

As part of the upgrade works, the widening of the corridor results in further cuttings, new or extended walls facing the motorway and new or extended walls facing outside the corridor, towards the bushland or residential neighbourhoods.

The urban design retaining wall strategy has assumed that apart from the existing walls that will remain unchanged in both form and colour, all other situations will result in the construction of new retaining walls. The strategy therefore has an emphasis on both sensitivity towards the existing retaining walls, and also a strong focus on high quality urban design for the new walls.

The new walls are one of the most visible and continuous built form elements along the route and provide one of the few opportunities to create a recognisable identity for the M2 Motorway. With form and alignment playing a major role, a secondary layer of information in the form of patterning and finish on the new retaining walls will create some linear identity for the motorway.

Design Objectives

The following design objectives for retaining walls are drawn from a number of sources, including the RTA publication "Beyond the Pavement" (2009). The primary aim in the design of retaining walls is, of course, to retain earth. The objectives are:

- To ensure that the design of retaining walls meets all applicable structural requirements;
- To ensure that visual impacts on the motorway's neighbours are minimised as far as reasonably possible;
- In general, make walls as visually unobtrusive as possible to minimise the effect of cutting off the motorway from its relationship to the topography;
- Relate walls to their context;
- Design walls to be aesthetically pleasing for both road users and road neighbours; and
- Design walls to be robust, durable and low maintenance so that they maintain an acceptable standard of appearance over time.

Design Principles

The urban design principles applied to the design of all retaining walls, renovated or new, are to:

- Visually integrate retaining wall finishes and detailing with the landscape design proposals and the immediate route context;
- Provide detailing and finishes which are consistent and integrated both for the retaining walls themselves and for the project's noise walls, to create overall compatibility in wall language;
- Within this overall language, craft the design of individual walls or classes of walls to respond to their immediate context and specific role in the project;
- Where appropriate, use landscaping to reduce their visual impact and perceived mass;
- Extend walls the full length to avoid messy terminations; and
- Walls are to disappear into a batter, mound or ground level.

Proposed Design

See alignment plans in Section 6.1 for retaining wall locations and Table 6.2.2 Retaining Wall Locations for a list of all new retaining walls.

The proposed retaining wall designs generally comply with the requirements of the Project Scope of Works and Technical Criteria. In addition, the designs also reflect careful consideration of the RTA publication "Beyond the Pavement" (1999). The proposed designs are consistent with the overall urban and landscape design vision established for the project.

Because of the variable topography of the motorway alignment, there are a significant number of retaining walls in this project. The longest wall stretches for approximately 455 metres and some are over 10 metres high. With the intention of minimising their perceived impacts, the proposed design seeks not to treat them all the same, but to differentiate them on the basis of their location, orientation, role and consistency with existing M2 Motorway walls.

Clear distinctions are made between:

- Walls which adjoin and are highly visible from the motorway; and
- Walls which are seen from bush reserves, residential areas and local roads (but essentially not from the Motorway)

As described below, separate but related designs are proposed for each of these types of walls. The accompanying table identifies and provides details about all of the retaining walls in the project.

Structural Wall Types

A number of structural solutions for retaining walls have been developed for the project. While in some cases the structural type may not be apparent to an observer of a finished wall, knowledge of these types is essential to understanding the finished outcome:

- In-situ concrete wall;
- Reinforced soil wall (structural pre-cast concrete panels); and
- Soil nail wall with precast concrete panel cladding.

Table 6.2.2 Retaining Wall Schedule

NUMBER	AREA	WALL NUMBER	WALL CHAINAGE	STRUCTURE TYPE (REFER KEY)	LENGTH	MAX HEIGHT	WALL FINISH TYPE	MATERIAL AND FINISH
1	1 Windsor Road Ramps	RW-W-101	3579-4018	RSW	455	12.7	Type A	Concrete panels, vertical ribbing
2	1 Windsor Road Ramps	RW-W-102	3747-3999	RSW	252	8.7	Type A	Concrete panels, vertical ribbing
3	2 Windsor Road to tunnel	RW-W-201	6582-6614 6614-6614	RSW	32 3.5	11.2	Type B	Concrete panels, textured stripe
4	2 Windsor Road to tunnel	RW-W-202	6646-6685 6646-6646	RSW	39 3.5	11	Type B	Concrete panels, textured stripe
5	2 Windsor Road to tunnel	RW-W-203	6833-6905	RSW	72	3.2	Type B	Concrete panels, textured stripe
6	2 Windsor Road to tunnel	RW-W-212A	7143-7235	RSW	92	3.5	Type B	Concrete panels, textured stripe
7	2 Windsor Road to tunnel	RW-W-204	7571-7594	RSW	23	5.5	Type B	Concrete panels, textured stripe
8	2 Windsor Road to tunnel	RW-W-206	9610-9845 9844-9844	RSW	235 4.0	10.7	Type B	Concrete panels, textured stripe
9	2 Windsor Road to tunnel	RW-W-207	10313-10374	Various	60.5	5	Type A	Concrete panels, vertical ribbing
10	2 Windsor Road to tunnel	RW-W-208	10466-10487	PW	21	10.5	Type A	Concrete panels, vertical ribbing
11	2 Windsor Road to tunnel	RW-W-209A	10561-10582	G, RC arches, RSW	32.1	7.1	Type A	Concrete panels, vertical ribbing
		RW-W-209B	10582-10684	CD	102	5.6	Type A	Concrete panels, vertical ribbing
		RW-W-209B	10684-10711	CD	27	1.9	Type A	Concrete panels, vertical ribbing
		RW-W-209B	10711-10879	CD	168	6.3	Type A	Concrete panels, vertical ribbing
		RW-W-209C	10879-11089	Colonnade	210	4.7	Type A	Concrete panels, vertical ribbing
		RW-W-209D	11089-11144	Precast RC	62	7.5	Type A	Concrete panels, vertical ribbing
13.1	2 Windsor Road to tunnel	RW-W-212B	12100-12163	Precast Panels	63	4.6	Type B	Concrete panels, textured stripe
14	4 Tunnel to Culloden Road	RW-W-401	13494-13645 13430-13494	RSW BS	159 64	16.4 9	Type B	Concrete panels, textured stripe
15	6 Christie Road to Delhi Road	RW-W-601	16932-16977	RSW	45	2.5	Type B	Concrete panels, textured stripe
16	6 Christie Road to Delhi Road	RW-W-602	17007-17167	RSW	150	4.3	Type B	Concrete panels, textured stripe
17	6 Christie Road to Delhi Road	RW-W-603	16212-16226	RSW	14	1.2	Type B	Concrete panels, textured stripe
20	9 Herring Road Ramps	RW-W-903	16400-16660	RSW	260	11.4	Type B	Concrete panels, textured stripe
22	1 Windsor Road Ramps	RW-E-101	3530-3908	RSW	385	9.5	Type A	Concrete panels, vertical ribbing

Key:

RSW	Reinforce Soil Wall	RC	Reinforced Concrete
PW	Piled Wall	CD	Cantilevered Deck
G	Gabion	BS	Bridge Structure

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Retaining Wall Locations (continued)

NUMBER	AREA	WALL NUMBER	WALL CHAINAGE	STRUCTURE TYPE (REFER KEY)	LENGTH	MAX HEIGHT	WALL TYPE	MATERIAL AND FINISH
23	1 Windsor Road Ramps	RW-E-102	3707-3981	RSW	275	8.9	Type A	Concrete panels, vertical ribbing
24	2 Windsor Road to tunnel	RW-E-201	4546-4567 4567-4567	RSW	21 3.5	7.5	Type B	Concrete panels, textured stripe
25	2 Windsor Road to tunnel	RW-E-202	4725-4743 4725-4725	RSW	25 3.5	9.3	Type B	Concrete panels, textured stripe
26	2 Windsor Road to tunnel	RW-E-203	4865-4929	RSW	78.7	7.7	Type B	Concrete panels, textured stripe
27	2 Windsor Road to tunnel	RW-E-204	5146-5311	RSW	166	14.4	Type B	Concrete panels, textured stripe
27.1	2 Windsor Road to tunnel	RW-E-207	10545-10547	N/A Local strengthening at top of wall	2	N/A	N/A	N/A
27.2	3 Tunnel	RW-E-206	12280-12352	RSW	72	2.4	Type B	Concrete panels, textured stripe
28	4 Tunnel to Culloden Road	RW-E-401	13552-13590	RSW	40	8.4	Type B	Concrete panels, textured stripe
29	4 Tunnel to Culloden Road	RW-E-402	13653-13680 13680-13680	RSW	28 7.5	9	Type B	Concrete panels, textured stripe
30	4 Tunnel to Culloden Road	RW-E-403	13842-13856 13842-13842	RC	19.9 10	12.5	Type B	Concrete panels, textured stripe
31	4 Tunnel to Culloden Road	RW-E-404	14247-14559	RSW	312	4	Type B	Concrete panels, textured stripe
32	4 Tunnel to Culloden Road	RW-E-405	14818-15054	RSW	236	3.5	Type B	Concrete panels, textured stripe
33	4 Tunnel to Culloden Road	RW-E-601	16890-16960	RSW	70	1.3	Type B	Concrete panels, textured stripe
34	6 Christie Road to Delhi Road	RW-E-602	17006-17061	RSW	55	0.6	Type B	Concrete panels, textured stripe
42	7 Local Roads	RW-E-701	16100-16400	TBA	TBA	TBA	TBA	TBA

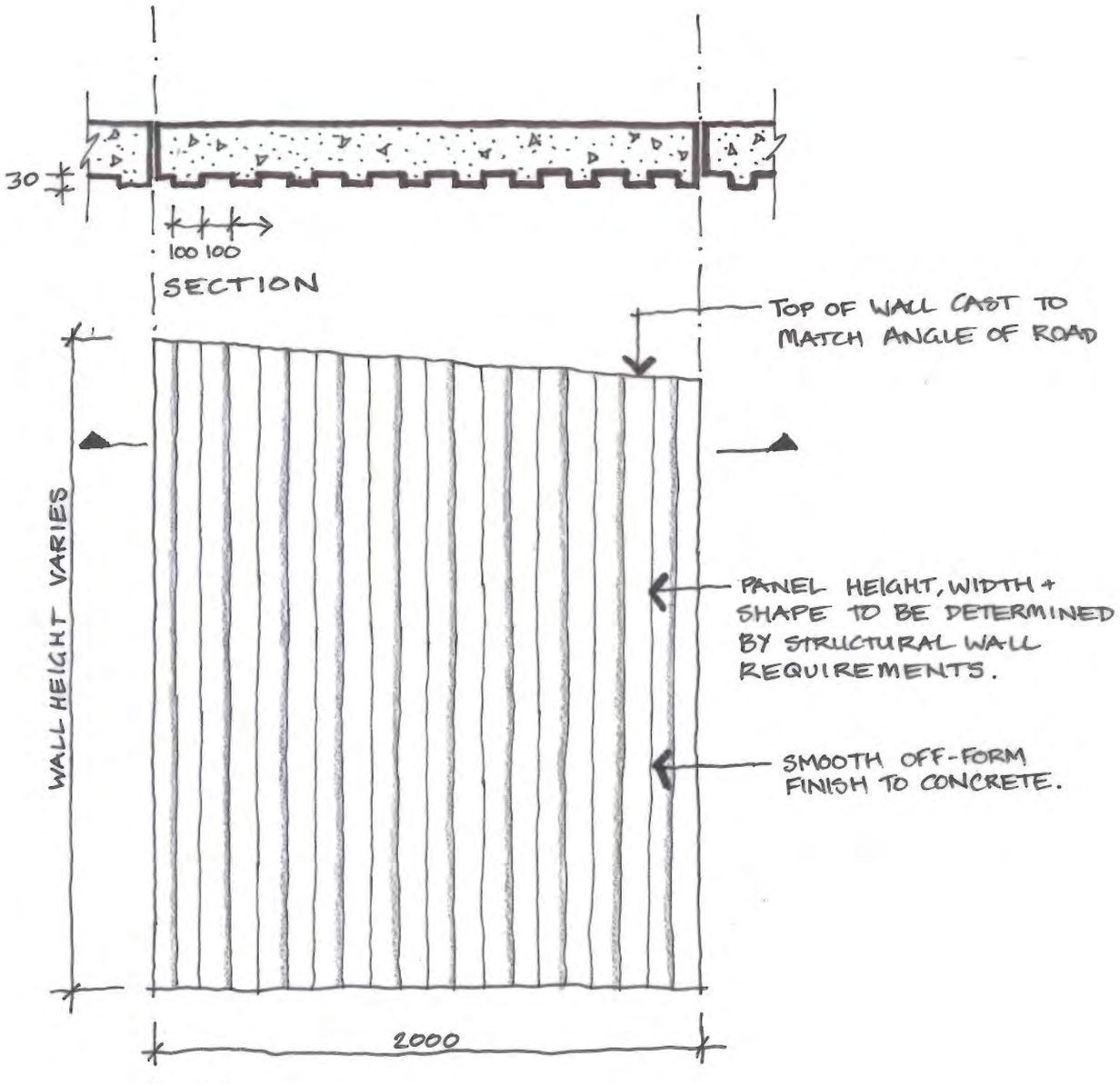

Figure 6.2.25 Type A Retaining Wall Section and Elevation Detail

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TYPE A Walls Facing Motorway

Walls facing the motorway are often close to the edge of the main alignment shoulder and travel parallel to it. The proposed walls will be precast concrete with a fine vertical ribbed pattern similar to the ribbing used on existing sections of the motorway and to the walls recently constructed as part of the Lane Cove Tunnel project (refer to Photo 6.2.14).

The users of the road will be in close proximity to these walls and they must be tactile and of high quality. The size, visual prominence and the materiality of these walls is a major consideration. The detailing of these walls will be intentionally simplified. It is important that the monolithic quality of these walls is read without complicated detail distracting from their simplicity. This will assist in creating a streamlined appearance and smooth flowing lines.

Due to the complexity of existing walls facing the road neighbours at the Windsor Road interchange (refer to Photo 6.2.15 and Figures 6.2.26 to 6.2.27) and the requirements for new noise barriers, the vertical ribbed pattern will also be used on the retaining walls facing the residential neighbourhood in this location only. This will aid in the creation of a recognisable identity for this major intersection.

Planting will be located in front of retaining walls wherever possible to soften their appearance and create a greener road corridor.

Photo 6.2.14 Vertical ribbed pattern

Photo 6.2.15 Existing wall facing Junction Road

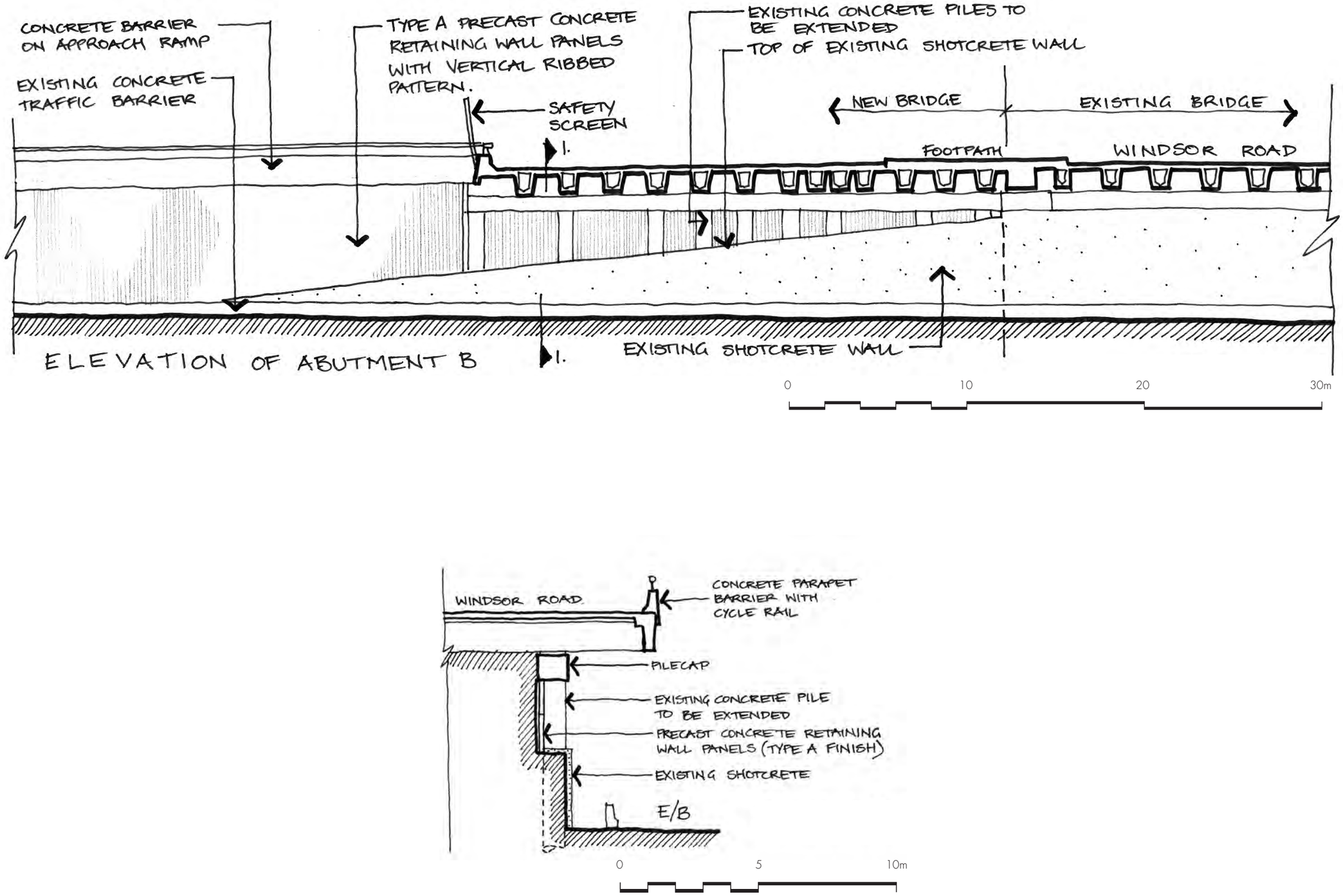

Figure 6.2.26 Type A Retaining Wall at Windsor Road Overbridge

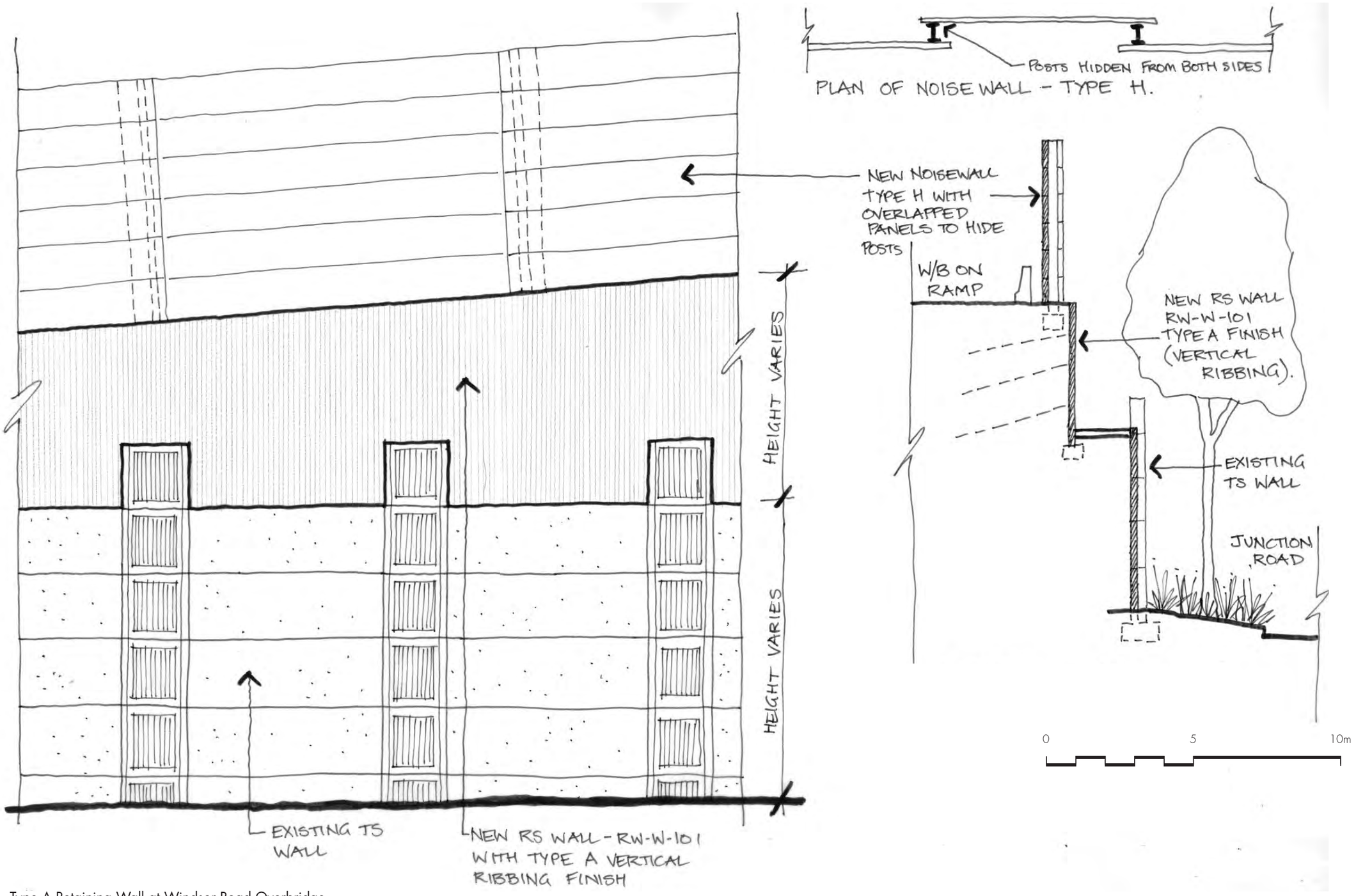

Figure 6.2.27 Type A Retaining Wall at Windsor Road Overbridge

Type B Walls Facing Away from the Motorway

- The retaining walls facing away from the motorway include:
- Abutment walls of bridges crossing creeks;
- Abutment walls of bridges crossing local roads;
- Walls of pedestrian bridges and underpasses; and
- Incidental walls facing residential areas.

Walls facing away from the motorway are often part of a bridge abutment or at the toe of a batter. The proposed walls will be precast concrete panels with a textured stripe pattern to match the pattern used on existing bridge abutments (refer to Figure 6.2.28 and Photos 6.2.16 and 6.2.17).

These walls are often highly visible and form the hard built edge of the motorway corridor and are the point of interaction with the neighbouring communities. The scale of the pattern, therefore, has been chosen as it is more suitable for use facing the bushland and residential neighbourhoods. It has a strong pattern and texture and the rough surface finish may discourage graffiti (refer to Photo 6.2.18).

Where walls are exposed to view, planting in front of these walls is important wherever possible to soften their appearance and reduce their visual impact.

Safety fencing may be required at the top of these walls to facilitate safe access for maintenance or to prevent unauthorised public access.

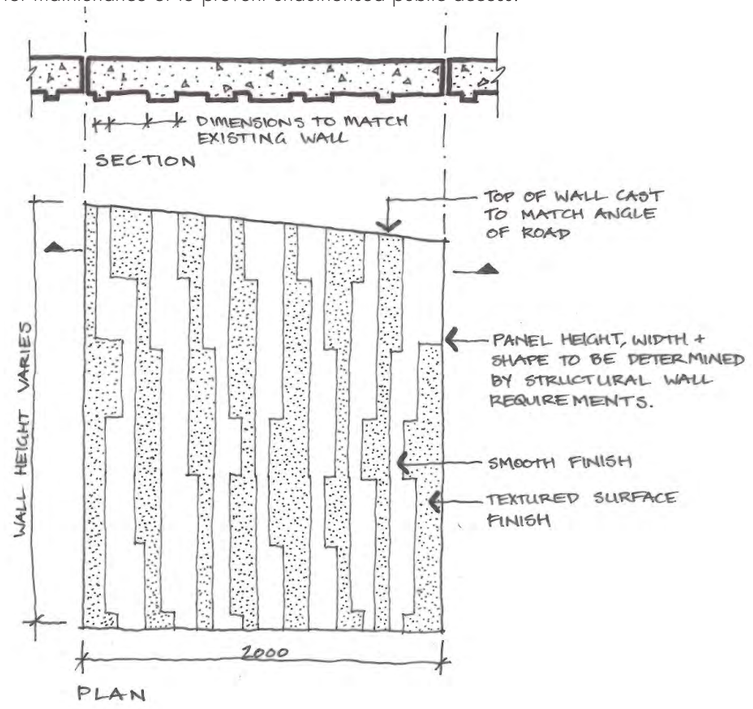

Figure 6.2.28 Retaining Wall Section and Elevation Detail

Photo 6.2.16 Wicks Road Bridge

Photo 6.2.17 Terrys Creek Bridge

Photo 6.2.18 Textured Stripe Pattern

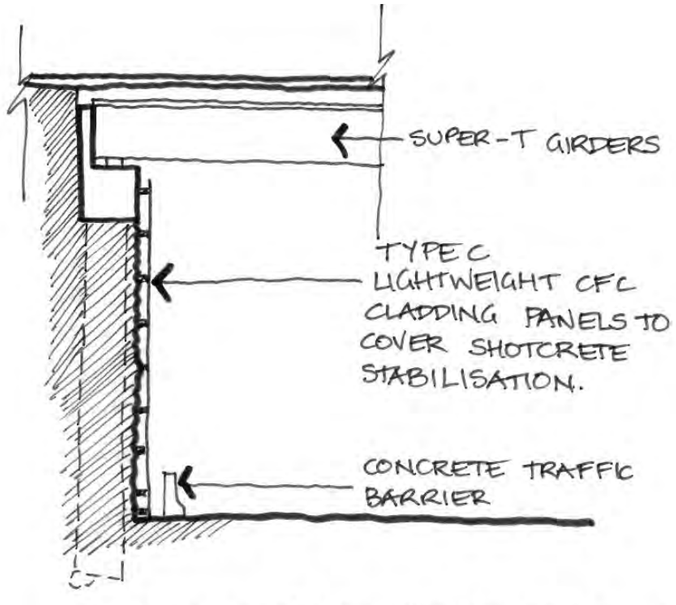

Figure 6.2.30 Type C retaining wall - Cross-section

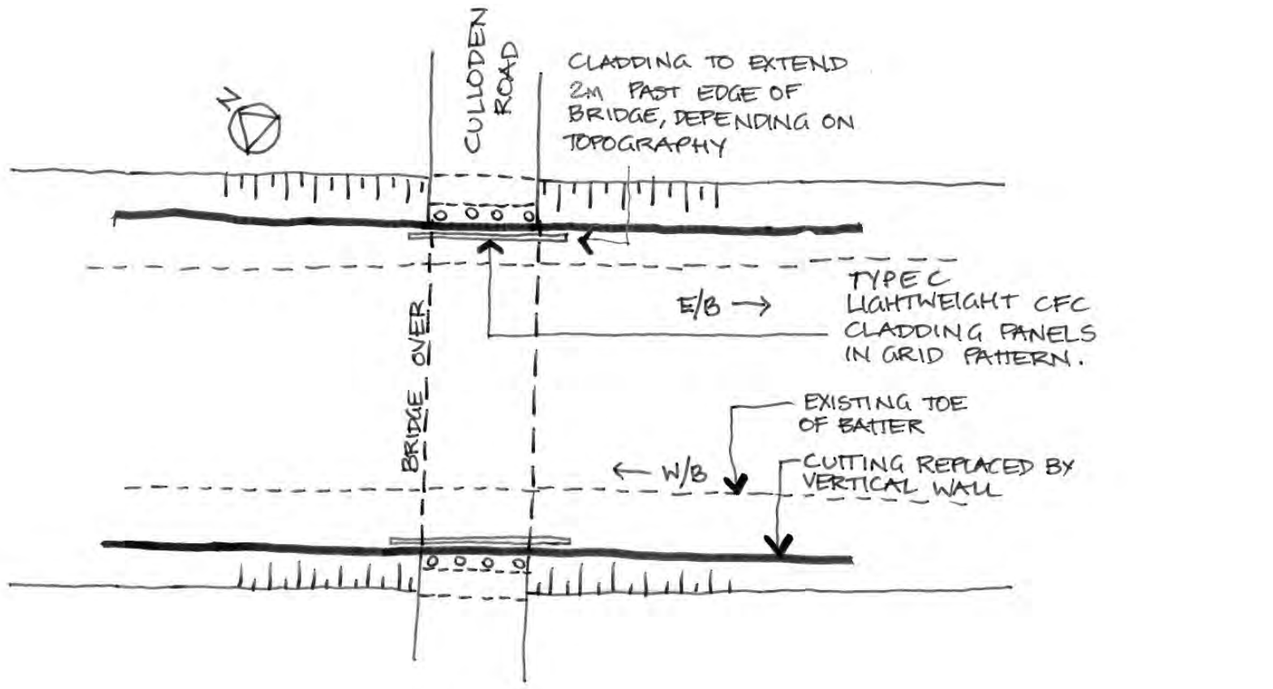

Figure 6.2.31 Type C retaining wall at Culloden Road Overbridge - Plan

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TYPE C Walls at Overbridges

Refer to Figures 6.2.30 to 6.2.32

Lightweight compressed fibre cement panels will be used to clad discrete sections of vertical cutting at Culloden and Christie Road bridges. These overbridges act as important entry and exit structures at either side of the M2 Motorway toll plaza. No bridge widening is required however the spill-through abutments are being removed and replaced by vertical walls/cuttings.

The lightweight compressed fibre cement cladding panels or precast concrete facing panels are to be applied to the area directly under the bridge to conceal any shotcrete stabilisation required and to improve the appearance of the bridge

The cladding will extend 2 metres past the edge of the bridge and will have a vertical emphasis to relate directly to the upgrade retaining walls.

Photo 6.2.19 Compressed Fibre Cement Cladding Panels

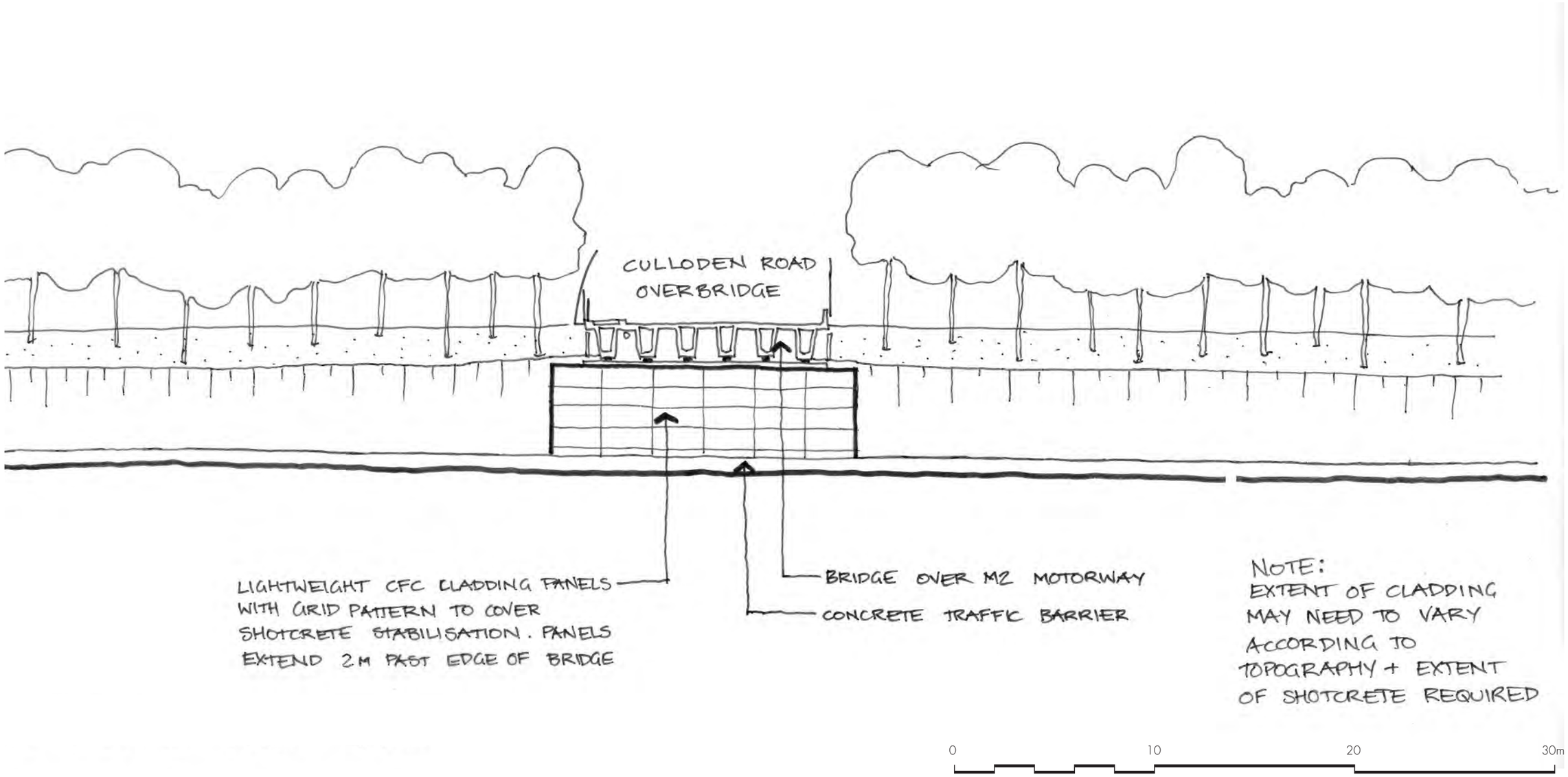

Figure 6.2.32 Type C retaining walls - Compressed Fibre Cement Cladding Panels at Culloden and Christie Road Overbridges

Type D Cast In-situ Concrete Walls

Small incidental walls may be constructed of cast in-situ reinforced concrete. If facing away from the motorway, these walls will have a widely spaced vertical ribbed pattern to match existing cast in-situ concrete walls within the motorway corridor.

Photo 6.2.20 Pennant Hills Road Interchange

Photo 6.2.21 In-situ concrete wall at pedestrian overpass at Kent Street

Rock Cuttings and Shotcrete Stabilisation

On many sections of the Motorway, rock cuttings through sandstone create a memorable experience however space constraints, poor quality sandstone and deep loose soil on top of the solid rock have resulted in cuttings being required to be stabilised by the use of shotcrete.

Every effort will be made to achieve batter stabilisation without the use of shotcrete. If its use cannot be avoided, shotcrete will comply with RTA Shotcrete Design Guidelines (June 2005). The following principles apply if the use of shotcrete cannot be avoided:

- The extent of shotcrete will be minimised;
- The edges of the shotcrete will be masked to avoid overspray;
- The colour and texture of the shotcrete will match the colour and texture of the adjacent rock (test panels will be provided);
- Shotcrete will be screened by plantings; and
- No shotcrete will be visible around the abutments of bridges.

Photo 6.2.22 Existing poor quality shotcrete at abutment of Barclay Road Overbridge

Photo 6.2.23 Better quality finish of coloured shotcrete used at Abbott Road Bridge

6.2.3 Noise Walls

Introduction

The existing noise walls lack consistency in colour, alignment and height contributing to a messy and unappealing composition. The same Hebel panel wall design with 4 metre post spacings is used for the entire length of the M2 Motorway showing no consideration of the adjacent context, the walls used in the bushland precincts are the same as those used in the more urban precinct. The green colour was obviously chosen in an attempt to camouflage the walls against the natural bush setting however the reality is that the walls actually contrast with the bushland. The end result is one in which the walls are unattractive and visually dominating.

As part of the upgrade works, not all noise walls along the corridor need replacement. The following situations exist:

- Existing noise walls that require no change;
- Existing noise walls that require an increase in height;
- Existing noise walls that require relocation and an increase in height; and
- New noise walls.

The urban design noise wall strategy has assumed that apart from the existing walls that will remain unchanged in both form and colour, all other situations will result in the construction of new noise walls.

The noise wall strategy therefore has an emphasis on both sensitivity towards the existing noise walls, and also a strong focus on high quality urban design for the new noise walls. The new walls are the most visible and continuous built form elements on the motorway and provide one of the few opportunities to create a recognisable identity for the M2 Motorway. With form and alignment playing a major role, a secondary layer of information in the form of patterning and colour on the new noise walls will reveal the changing environment for the motorway user.

Transparent noise walls on bridges have not been used due to vandalism considerations, design continuity issues (sometimes only one side is upgraded and they have not been used previously) and cost issues.

Design Objectives

The following design objectives for noise barriers are drawn from a number of sources, including the RTA's "Noise Wall Design Guidelines" (November 2006). The primary aim in the design of noise mitigation measures is to ensure that noise impacts on the motorway's neighbours are minimised as far as reasonably possible:

- Ensure that the design of noise barriers meets all applicable acoustic engineering requirements.
- In general, make barriers as visually unobtrusive as possible to minimise the effect of cutting off the Motorway from its surroundings.
- Relate walls to their context – where appropriate, use noise walls to make road users aware of the presence, and possibly the nature of, uses or activities beyond the walls.
- Design noise walls to be aesthetically pleasing for both road users and road neighbours.
- Design walls to be robust, durable and low maintenance so that they maintain an acceptable standard of appearance over time.

Design Principles

The noise barrier designs described below embody the following principles derived from the RTA Guidelines and the overall urban and landscape design philosophy established for the project. Quotations are from the RTA's "Noise Wall Design Guidelines":

- Integrate the design of noise barriers into the overall urban and landscape design, including the integration of existing noise walls with new noise walls and noise walls with retaining walls;
- Develop a design for walls which achieves a linear identity and continuity without excessive repetition;
- Walls are to be streamlined in plan. Except where road earthworks, corridor topography and/or boundary conditions require special positioning, make horizontal alignment of noise walls parallel to the outside edge of the adjoining carriageway. All transitions away from the edge of the road are to be smoothed off to create soft sinuous curves;
- Walls are to have a smooth top edge and to avoid stepped tops: "where the tops of noise walls run parallel to the road surface they are generally much more visually acceptable than the stepped variety";
- Walls heights to be rationalised to avoid random height changes. Subject to acoustic engineering requirements, make vertical alignment of noise walls parallel with the vertical alignment of the carriageways;
- If stepping on steep slopes is necessary, heights must be consistent and co-ordinated with urban design pattern treatment and colour;
- Walls are to have considered terminations and transitions. Avoid abrupt terminations by tapering noise walls down at their ends;
- Where walls are visible from outside the corridor, give equal weight to the design of both sides: "any noise wall has two sides with radically opposed design requirements and this might well become the basis of a design methodology";
- Where appropriate, use planting to soften the visual impact of barriers; and
- All supports and fixings are to be fully concealed.

Table 6.2.3 Noise Wall Schedule

WALL NO	CHAINAGE	HEIGHT (from Acoustic Engineer)	TOTAL LENGTH	WALL TYPE	WALL COLOUR
NW-E-1001	3500 - 3680 3680 - 3900	Varies 2.4-4.2m	415	Type L Type H	Dulux Juvenile (PG1E7) Dulux Silkwort (PG2C2)
NW-E-1002	5100 - 5380 5380 - 5950	Varies 4.2-4.8m	849	Type L Type B	Dulux Juvenile (PG1E7) Dulux Maximus (PG1E9)
NW-E-1003	7600-7700	4.2m	132	Type L	Dulux Juvenile (PG1E7)
NW-E-2001	10700-10800	Varies 2.4-4.2m	92	Type B	Dulux Maximus (PG1E9)
NW-E-2002	12350-12500	Varies 4.8-5.4m	134	Type H	Dulux Silkwort (PG2C2)
NW-E-2003	13300 - 13900	Varies 3.2-6m	606	Type H	Dulux Silkwort (PG2C2)
NW-E-3001	14850 - 15050	1.8m	208	Type U	Dulux Loveday (PG1C5)
NW-E-3002	16700-17100	Varies 3-4.2m	399	Type U	Dulux Loveday (PG1C5)
NW-E-3003	17450 - 17600	2.4m	170	Type U	Dulux Loveday (PG1C5)

WALL NO	CHAINAGE	HEIGHT (from Acoustic Engineer)	TOTAL LENGTH	WALL TYPE	WALL COLOUR
NW-W-1001	3500 - 3680 3680 - 4000	Varies 2.4-4.2m	491	Type L Type H	Dulux Juvenile (PG1E7) Dulux Silkwort (PG2C2)
NW-W-1002	5900 - 6115 6115 - 6200	4.2m	287	Type L Type B	Dulux Juvenile (PG1E7) Dulux Maximus (PG1E9)
NW-W-1003	6450 - 6490 6490 - 6500 6500 - 6700	Varies 3-5.4m	264	Type B Type L Type B	Dulux Maximus (PG1E9) Dulux Juvenile (PG1E7) Dulux Maximus (PG1E9)
NW-W-1004	6750 - 6800 6800 - 6810 6810 - 6950	Varies 6-7.2m	207	Type B Type H Type B	Dulux Maximus (PG1E9) Dulux Silkwort (PG2C2) Dulux Maximus (PG1E9)
NW-W-1005	7000 - 7200	7.2m	245	Type B	Dulux Maximus (PG1E9)
NW-W-1006	7526 - 7645	5.4m	120	Type L	Dulux Juvenile (PG1E7)
NW-W-2001	9600 - 10150	Varies 3.6-4.2m	560	Type H	Dulux Silkwort (PG2C2)
NW-W-2002	10440 - 10450	6m	16	Type B	Dulux Maximus (PG1E9)

WALL NO	CHAINAGE	HEIGHT (from Acoustic Engineer)	TOTAL LENGTH	WALL TYPE	WALL COLOUR
NW-W-2003	10550 - 11150	Varies 4.2-6m	634	Type L	Dulux Juvenile (PG1E7))
NW-W-2004	11300 - 11350	6m	76	Type H	Dulux Silkwort (PG2C2)
NW-W-2005	12350 - 12500	5.4m	144	Type H	Dulux Silkwort (PG2C2)
NW-W-2006	13250 - 13650	Varies 4.8-6m	417	Type H	Dulux Silkwort (PG2C2)
NW-W-3001	14250 - 14400	3m	140	Type H	Dulux Silkwort (PG2C2)
NW-W-3002	15250 - 15350	2.4m	110	Type B	Dulux Maximus (PG1E9)
NW-W-3003	15700 - 16050	2.4m	368	Type B	Dulux Maximus (PG1E9)

Note: Noise wall types and locations subject to refinement in detailed design.

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Figure 6.2.33 Perspective showing insertion of new Type H wall with existing noise walls.

Proposed Design

Refer to Figures 6.2.34 to 6.2.42.

The locations, types and colour of new noise barriers are listed in Table 6.2.3 Noise Wall Schedule.

The plans in Section 6.1 also show the position of the new and existing noise walls together with the retaining walls in the project, so that the relationships between all walls can be readily understood.

The existing walls along the M2 Motorway consist of lightweight aerated concrete (Hebel) 4 metre long panels. The walls vary dramatically in height and the exposed posts result in accentuating the verticality of the walls while also creating a repetitive rhythm as you travel down the road (refer to Photo 6.2.24). One of the fundamental design principles for the new noise walls is that the emphasis is horizontal and not vertical so the visual movement down the road is more directive and fluid. This horizontal focus also articulates the contrast with and accentuates the tall bushland surrounds. Refer to Photo 6.2.26 and colour palette overleaf.

All the walls will be constructed using light-weight aerated concrete panels (Hebel, or similar).

The new patterned walls create a foreground theme close to the road, behind which the existing walls become a background, effectively creating a continuous linear identity for the motorway. Refer to Figure 6.2.41.

The subdued, yet sophisticated, colour palette is responsive to the multiple existing green tones used for the walls and draws inspiration from the subtle blues and greys found in the surrounding bushland. Refer to Photo 6.2.26 and Figure 6.2.34.

The design features four different noise wall designs (Type B, Type L, Type H, Type U). Each of the identified character precincts has a predominant panel pattern that is carefully designed to reflect and be sympathetic to the surrounding environment (refer to Figure 6.2.35).

Photo 6.2.24 Existing green Hebel walls are inconsistent in colour and height

Photo 6.2.25 Photos showing existing bushland vegetation alongside the M2 Motorway. The proposed design is sympathetic to the bushland surrounds.

Photo 6.2.26 Photos showing colours in local Eucalypt barks which inspired the colour palette shown opposite

Photo 6.2.27 Hebel wall with horizontal pattern

EXISTING WALL PALETTE

PROPOSED WALL PALETTE

Maximus (PG1E9)

Juvenile (PG1E7)

Loveday (PG1C5)

Silkwort (PG2C2)

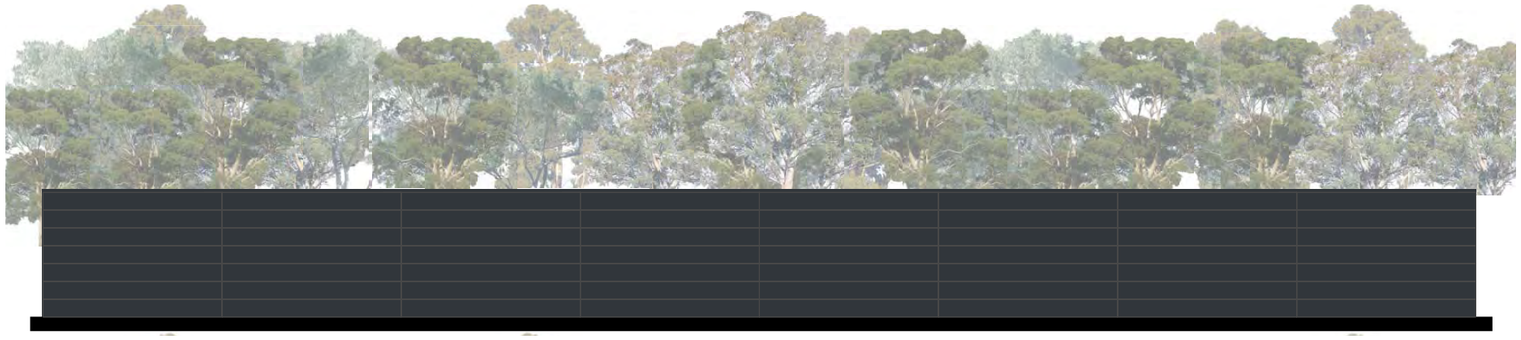
MATERIALS PALETTE

Galvanised Steel

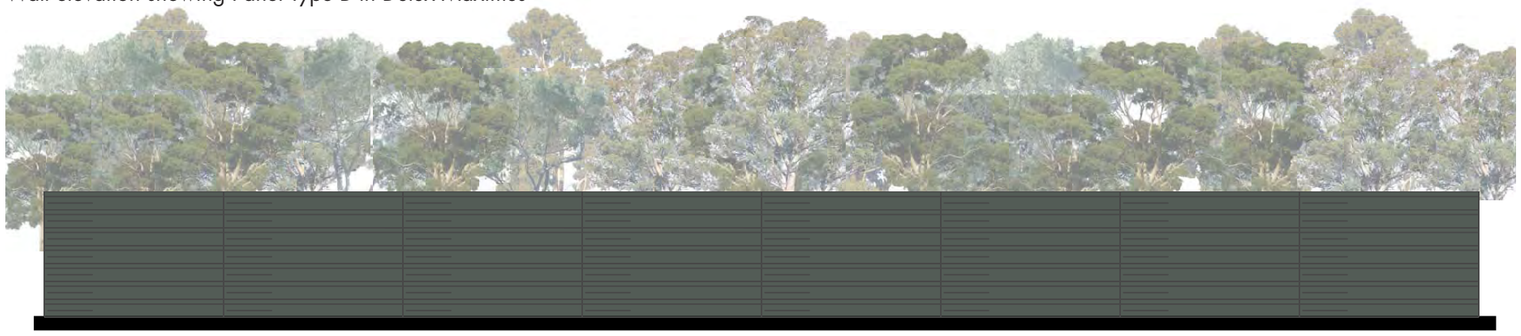
Asphalt

Concrete

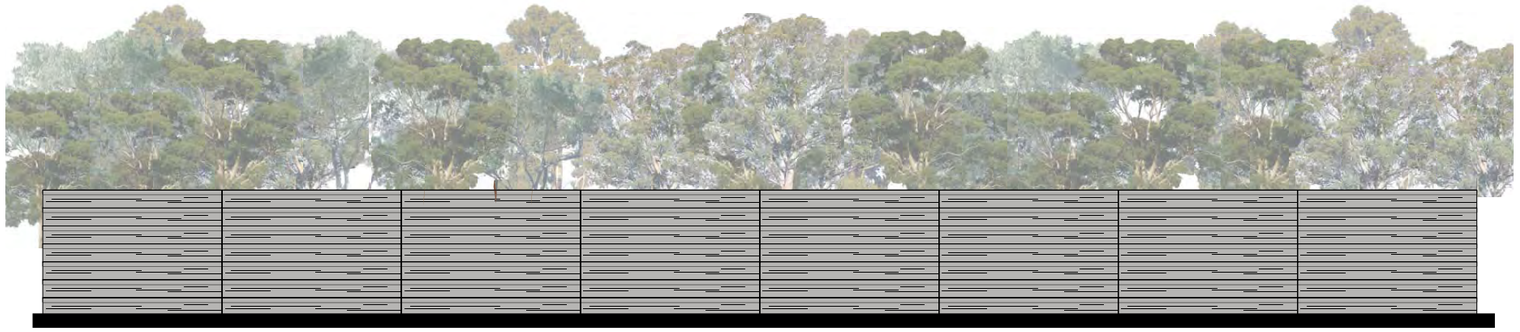
Figure 6.2.34 Colour Palettes and Elevations



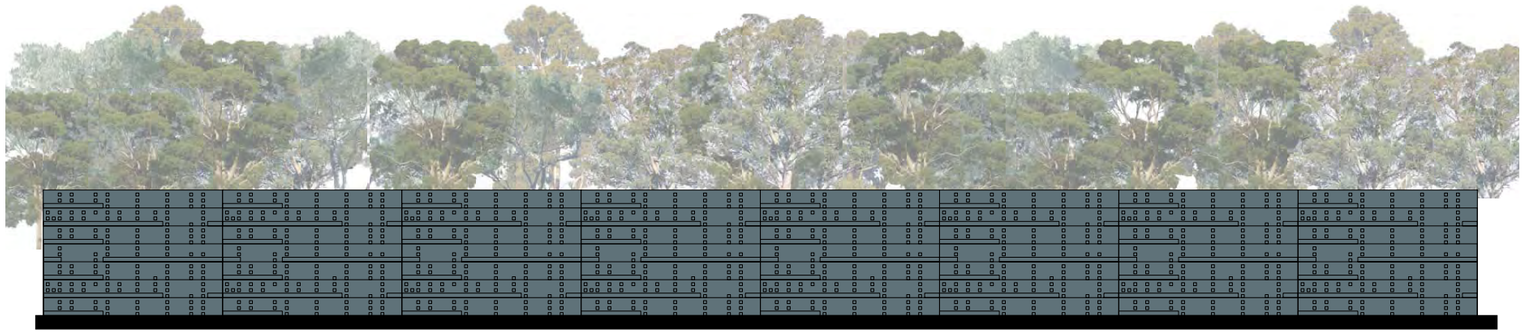
Wall elevation showing Panel Type B in Dulux Maximus



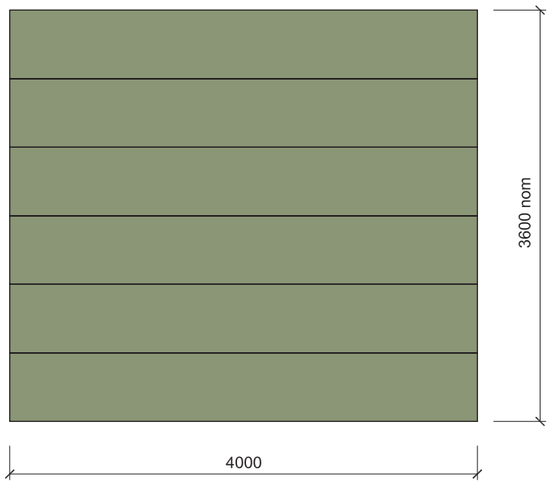
Wall elevation showing Panel Type L in Dulux Juvenile



Wall elevation showing Panel Type H in Dulux Silkwort

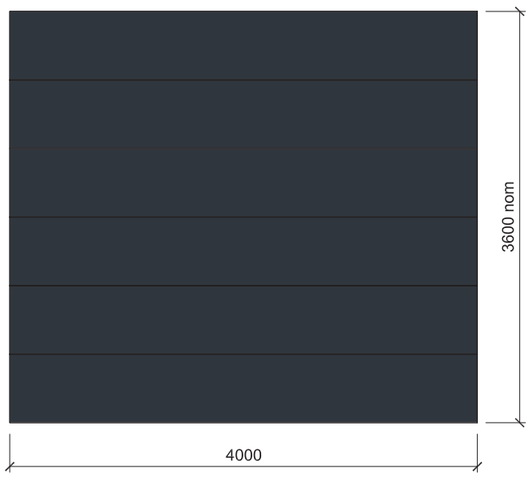


Wall elevation showing Panel Type U in Dulux Loveday



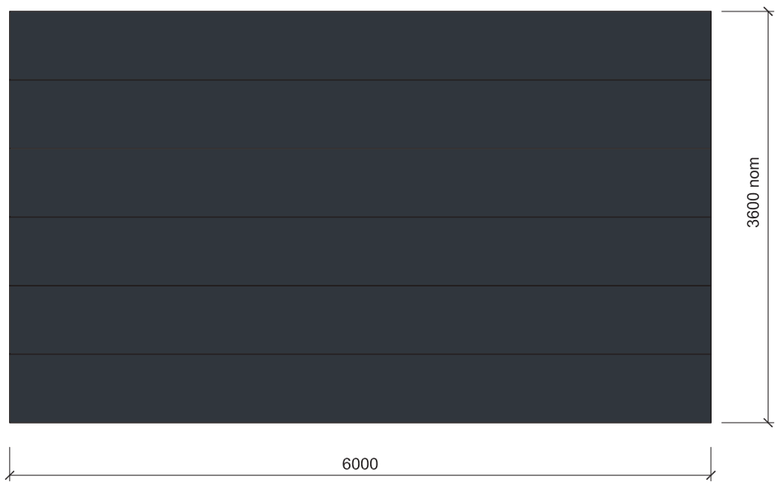
Existing Hebel Wall (E)

Colour: Various shades of green.
Existing hebel walls remain unchanged and existing colour is retained in the short term. In the longer term, the new colour palette is to be introduced as part of the maintenance regime.



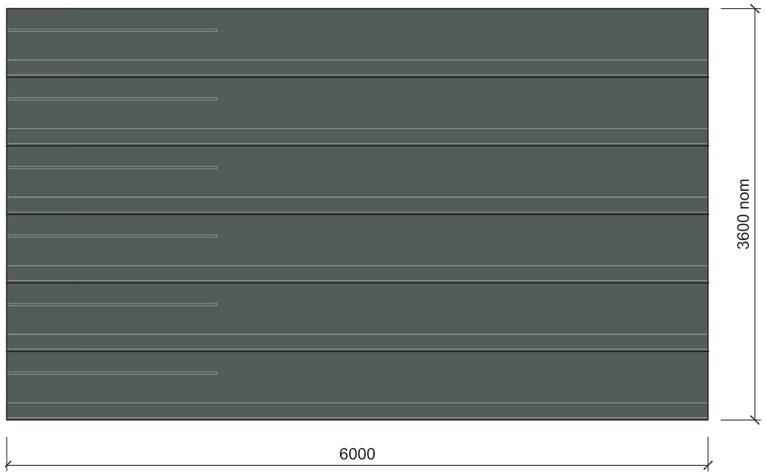
Basic Hebel Wall (B4)

Colour: Dulux Maximus
See SK-021 for details.
Used in all precincts where walls move away from edge of road and are on top of cuttings. 4000mm panels required where this wall connects into existing hebel walls.



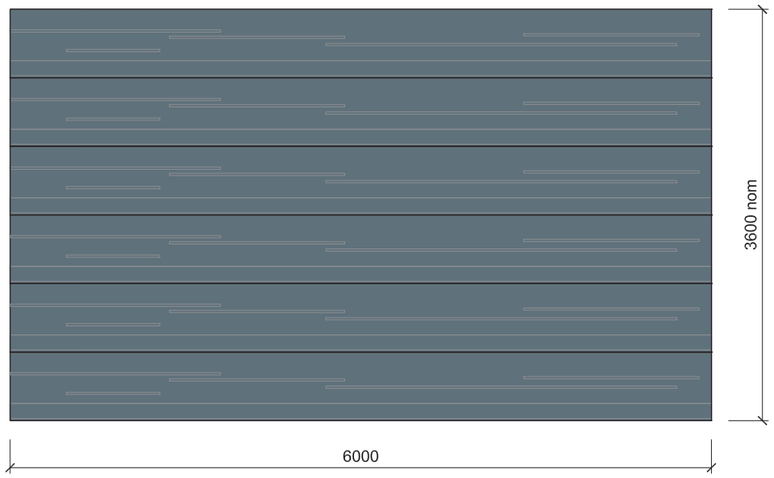
Basic Hebel Wall (B6)

Colour: Dulux Maximus
See SK-021 for details.
Used in all precincts where walls move away from edge of road and are on top of cuttings. 6000mm spacing required where this wall connects into new type L, H or U walls.



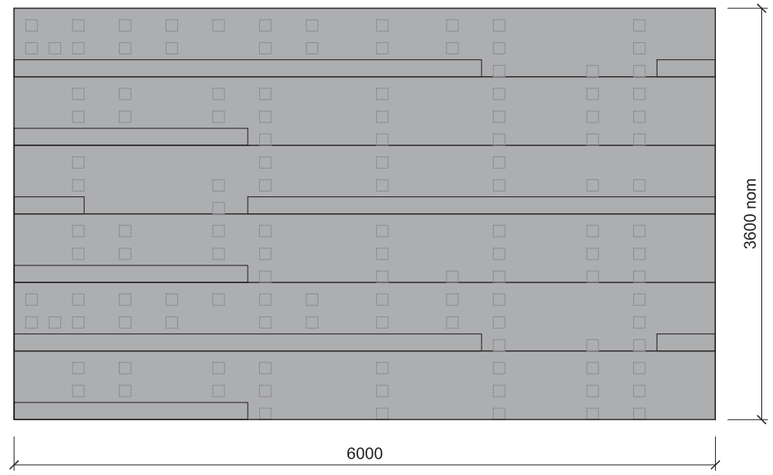
Light Stripe Hebel Wall (L)

Colour: Dulux Juvenile
See SK-022 for details.
Used predominantly in precinct 2.



Heavy Stripe Hebel Wall (H)

Colour: Dulux Silkwort
See SK-023 for details.
Used predominantly in precincts 3 and 4.

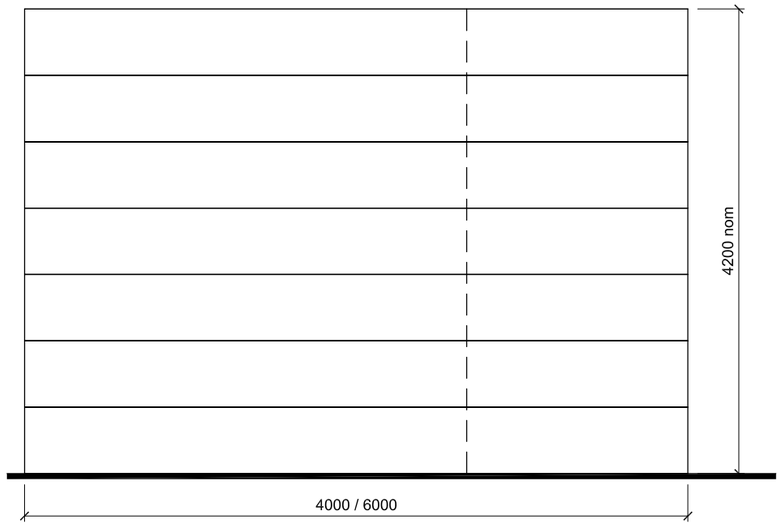


Heavy Stripe Hebel Wall (U)

Colour: Dulux Loveday
See SK-024 for details.
Used predominantly in precinct 5.

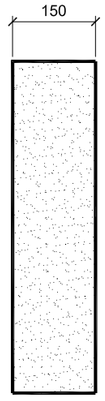
Figure 6.2.35 SK-020 Noise Wall Panel Types

Urban Design Concept 6



Elevation

0 .5M 1M 1.5M 2.5M
scale 1:50

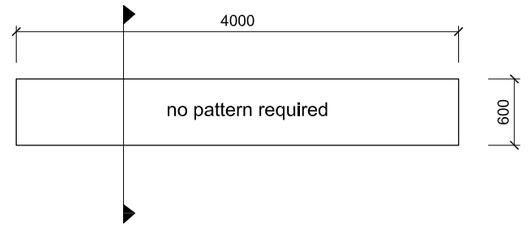


Section profile

0 .1M .2M
scale 1:10

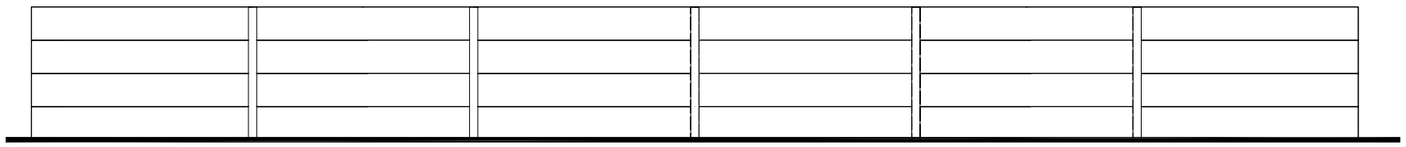
Panel Type B

Type B (basic) wall is a simple wall with a horizontal emphasis created by the joins in the Hebel panels and is painted a very deep midnight grey/blue. These walls are intended for use when the walls move away from the road and follow tops of cuttings as well as to compliment and extend existing walls. These walls are designed in both 4 metre and 6 metre panel sizes.



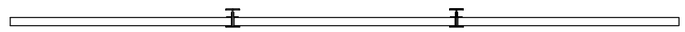
Single panel

0 .5M 1M 1.5M 2.5M
scale 1:50



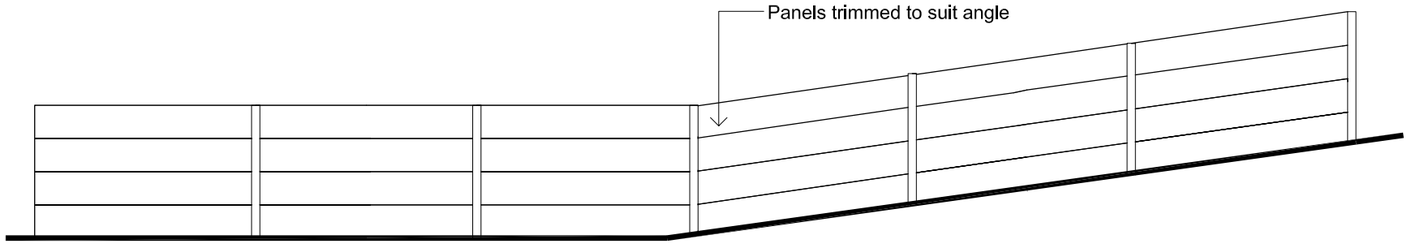
Wall along flat grade

0 1M 2M 3M 5M
scale 1:100



Wall in straight line

0 1M 2M 3M 5M
scale 1:100



Wall along slope change

0 1M 2M 3M 5M
scale 1:100

Wall in radius or at direction change

0 1M 2M 3M 5M
scale 1:100

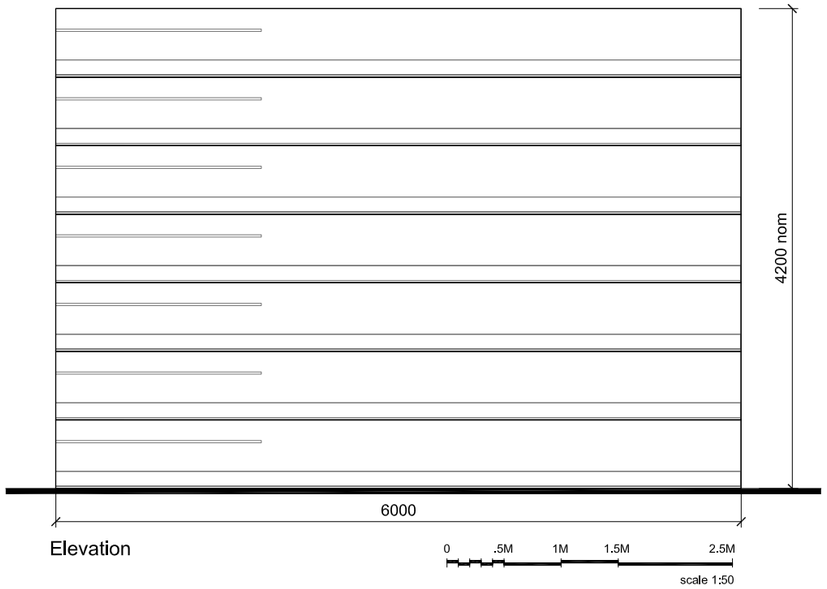
Basic Hebel Wall (B)

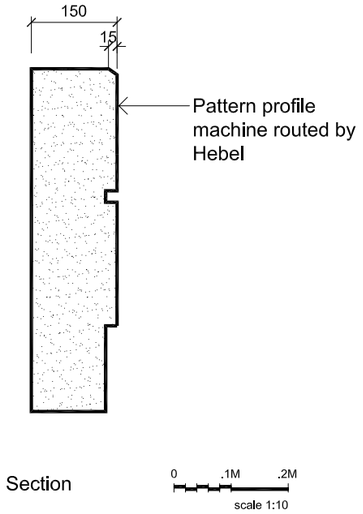
A simple wall with horizontal emphasis.
These walls are intended to form an uncomplicated recessive background in combination with existing walls. They are used where walls move away from the road edge and follow tops of cuttings. Used to extend existing walls and replace sections of walls where patterned panels are not being used.

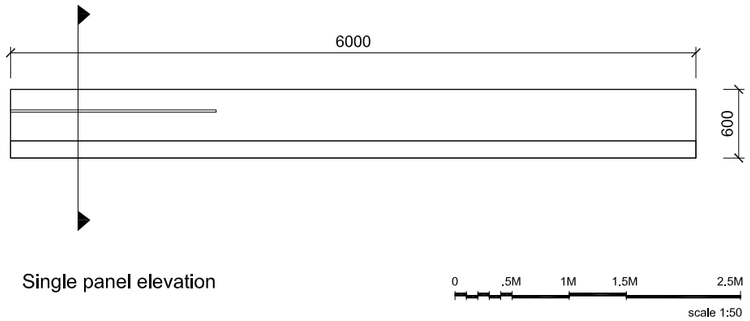
Figure 6.2.36 SK-021 Noise Wall Panel Type B

Panel Type L

Type L (light stripe) walls are used predominantly in Precinct 2 and consist of a repeated horizontal stripe pattern which is machine routed into the panel surface. The panel is designed to retain horizontal continuity if topography necessitates stepping at regular intervals. These walls are to be painted a rich olive green and are used increasingly in conjunction with the heavily striped walls as Precinct 3 approaches.







Light Horizontal Stripe Panel (Type L)

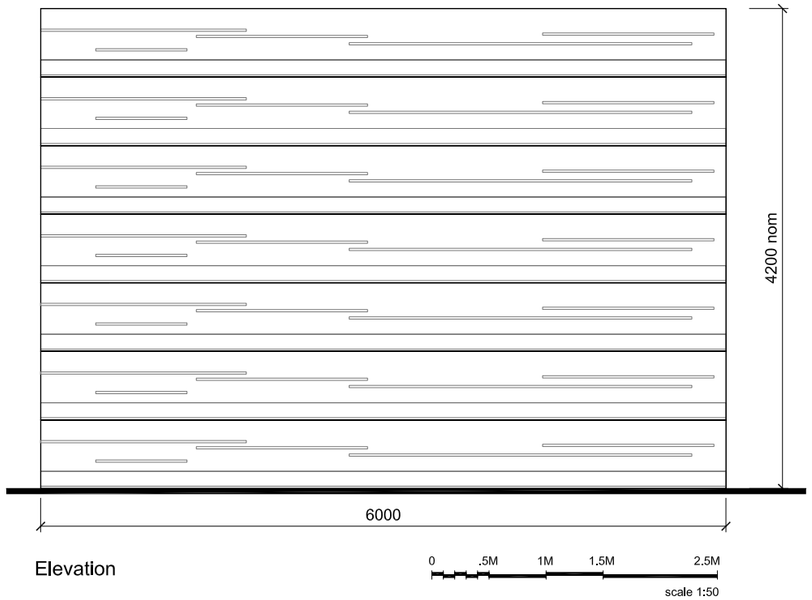
An elegant wall with repetitive horizontal elements.
Simple horizontal pattern based on one 6000 x 600mm Hebel panel with machine routed banding.
Used in areas close to edge of motorway and predominantly in Precinct 2. To ensure continuation of horizontal pattern, panels must be stepped 430mm or multiples of.

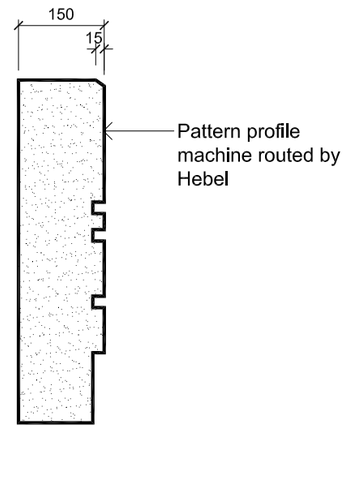
Figure 6.2.37 SK-022 Noise Wall Panel Type L

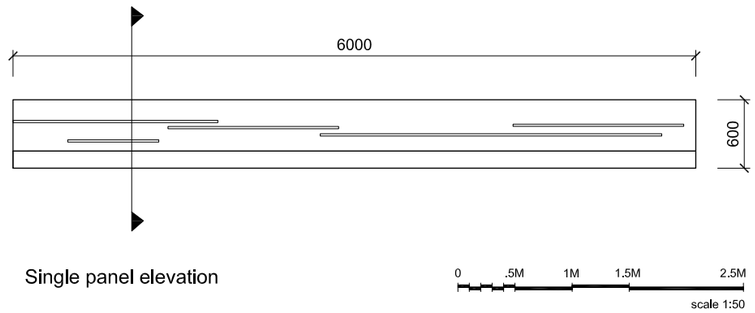
Urban Design Concept 6

Panel Type H

Type H (heavy stripe) wall is featured in Precincts 3 and 4 and is a visually interesting striped pattern which is machine routed into the panel surface. These walls are to be painted a light grey. Continuation of the pattern is also achieved with this panel when stepped at regular intervals. This wall compliments Type L and Type U walls and is often used in adjoining circumstances.





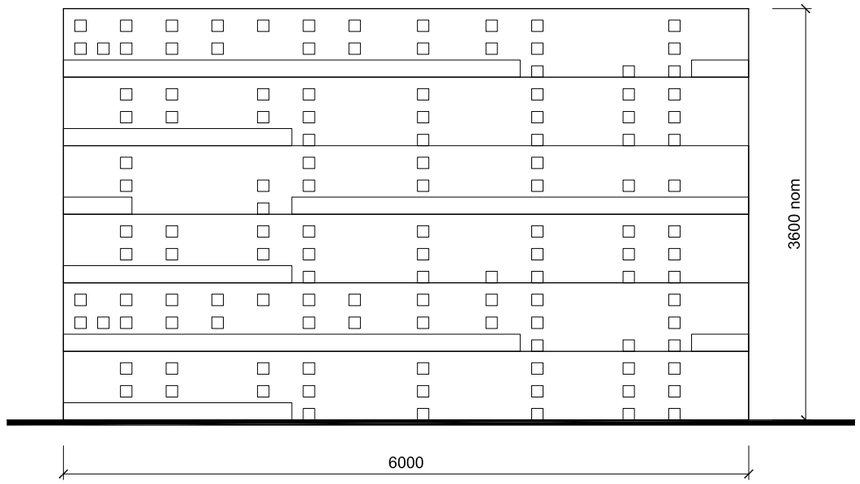


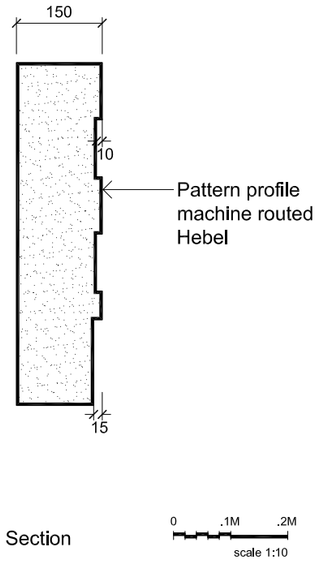
Heavy Horizontal Stripe Panel (Type H)

Visually interesting wall with more complex horizontal emphasis.
A development of horizontal panel L, this pattern is a repetition of a 6000 x 600mm Hebel panel with machine routed banding. Used in areas close to edge of motorway and predominantly in Precincts 3 and 4. To ensure continuation of horizontal pattern, panels must be stepped 200mm or multiples of.

Figure 6.2.38 SK-023 Noise Wall Panel Type H

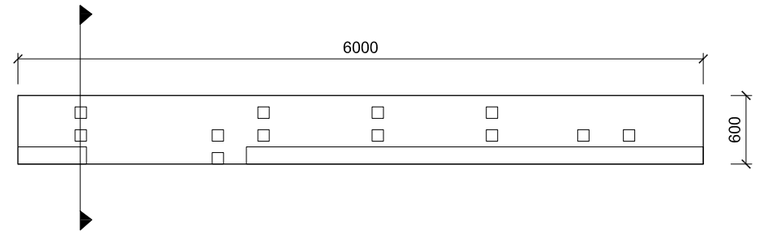
Urban Design Concept



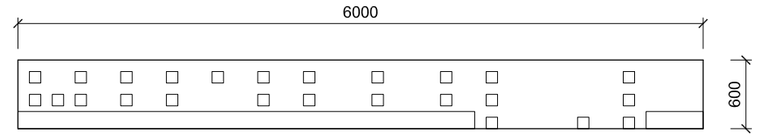


Panel Type U

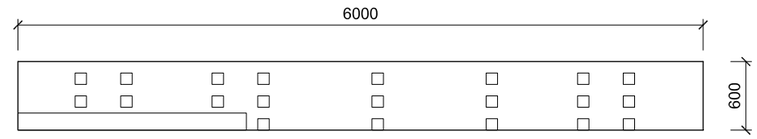
Type U (urban stripe) is used in Precinct 5 and introduces a vertical element into the horizontal pattern resulting in a more complex repetitive pattern. This highlights the increased urbanisation of this precinct. This panel is designed to be painted a steel blue colour.



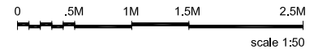
Single panel 1 elevation



Single panel 2 elevation



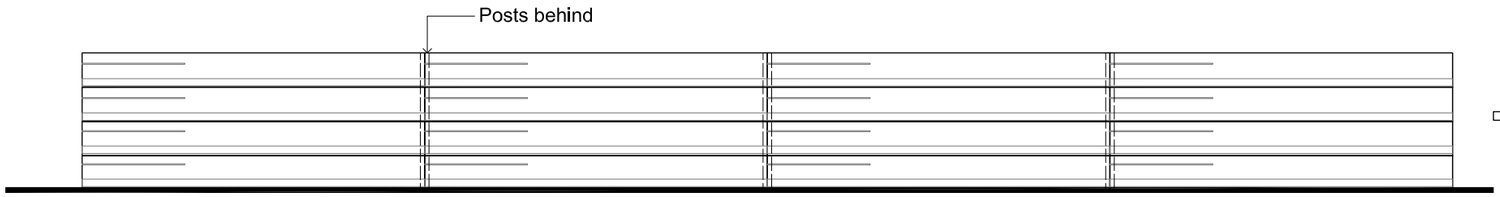
Single panel 3 elevation

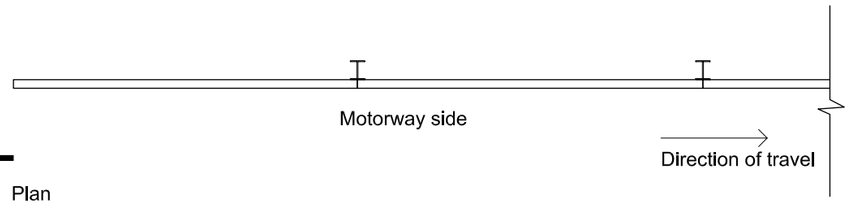


Urban Pattern Hebel Panel (Type U)

A visually interesting wall with horizontal and vertical emphasis. The more complex pattern is appropriate in more urban environments. A 6000 x 600mm Hebel panel with machine routed banding. Stepped panels will be at regular intervals of 600mm to ensure continuation of horizontal pattern.

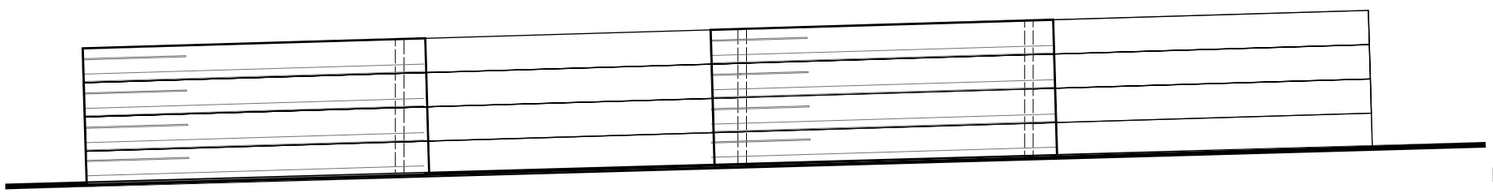
Figure 6.2.39 SK-024 Noise Wall Panel Type U

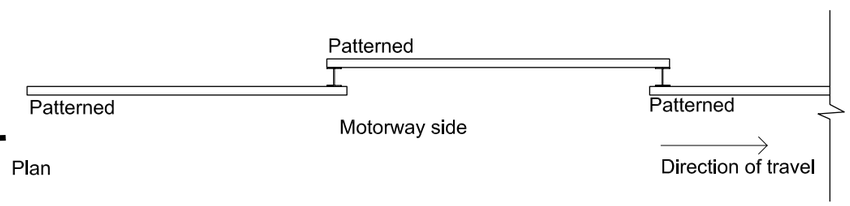




Elevation - Flat Grades

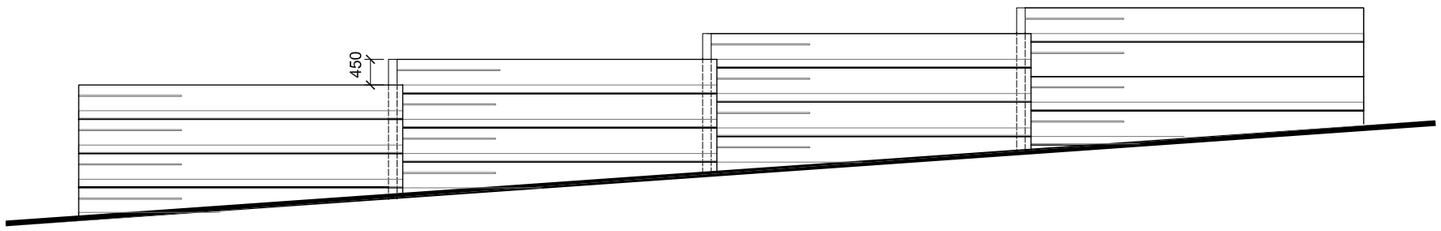
Posts positioned behind panels so pattern is not disturbed by visible vertical posts and horizontal direction is emphasised. Used where rear of wall is well screened and not visible to neighbourhood. Can accommodate a radius or change of direction in plan.

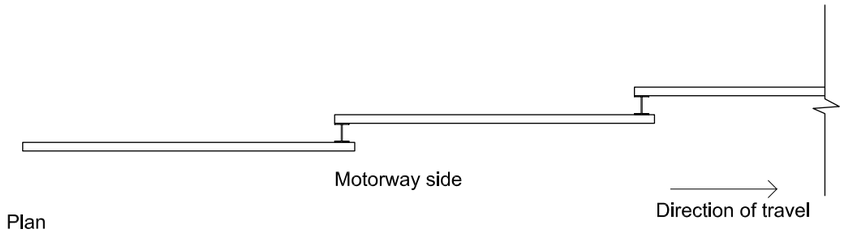




Elevation - Minor Grades

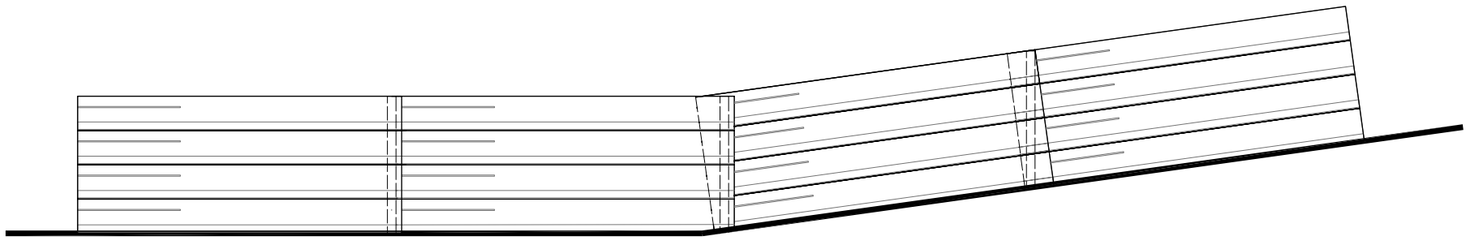
Panels fixed on alternate sides of posts to accommodate slope. Used where rear of wall is highly visible to neighbourhood. Can accommodate a radius or change of direction in plan.

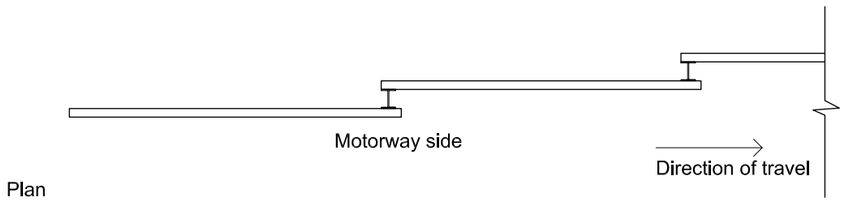




Elevation - Steep Grades

Panels overlap posts to accommodate slope. Panels may have consistent height steps, if required. Can accommodate a radius or change of direction in plan.

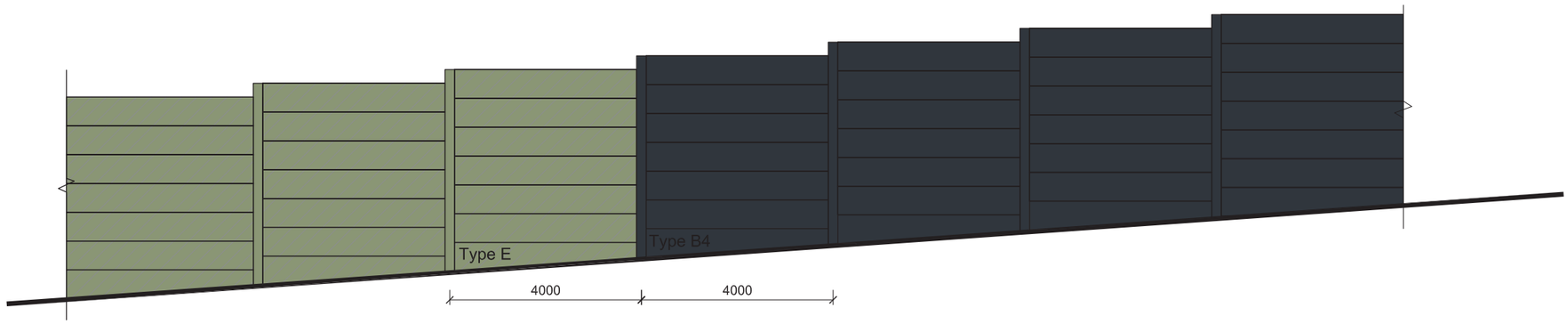




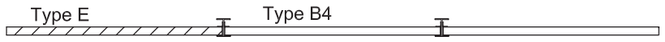
Elevation - Change of Grade

Panels overlap posts to accommodate change in grade. Panels run parallel to ground slope to create a smooth top edge line. Can accommodate a radius or change of direction in plan.

Figure 6.2.40 SK-026 Patterned Noise Wall Panels At Slope Changes



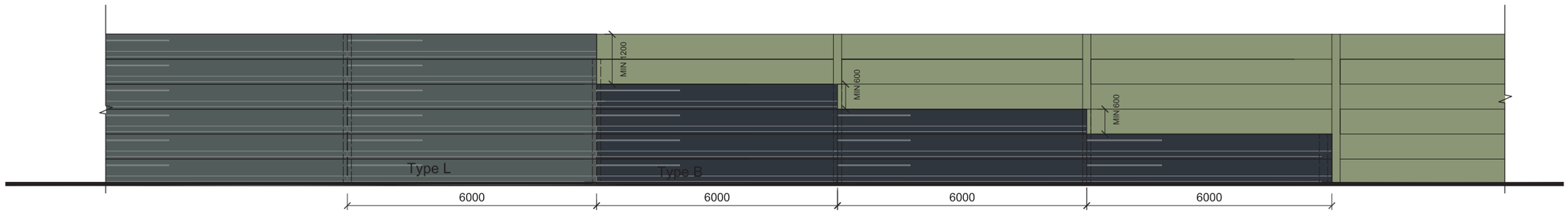
Elevation



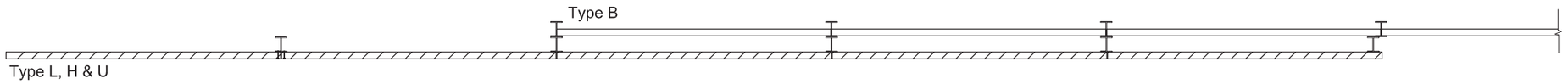
Plan

Existing Walls to New Type B Walls

No overlap required. Panel L and post match existing wall



Elevation



Plan

Type L, H & U Wall Transitions to Type B or Existing Walls

Patterned wall overlaps in front of existing or basic style wall. Patterned walls become foreground and visual focus. Both walls to have 6000mm post spacing.

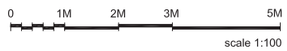
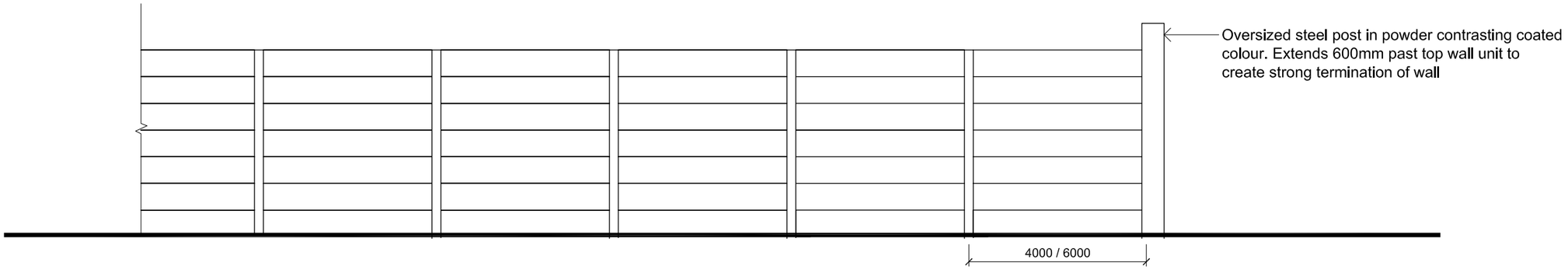
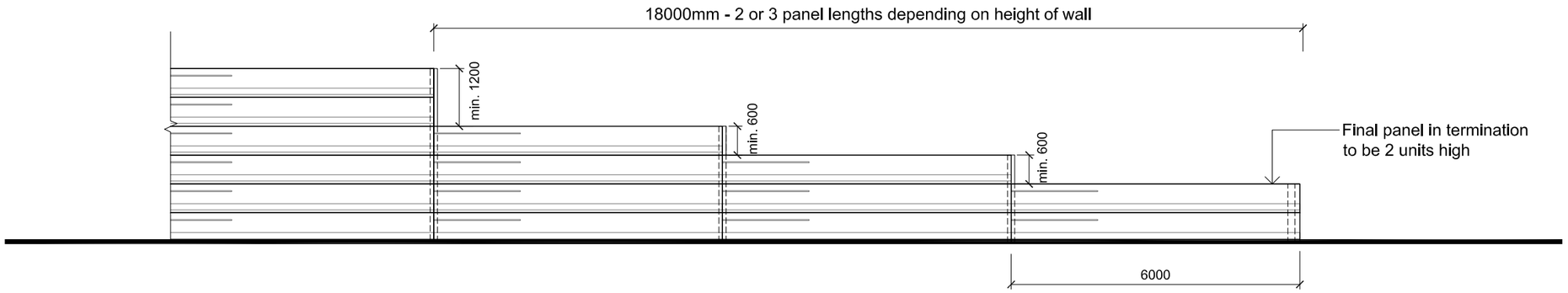


Figure 6.2.41 SK-027 Noise Wall Transitions



Type B Basic Wall Termination

Post termination ends wall in a strong visual composition.



Type L, H and U Patterned Wall Termination

To be used where space allows. Stepped 2 or 3 panel termination brings wall visually back to ground plane.

Figure 6.2.42 SK-028 Noise Wall Terminations

6.2.4 Road Furniture

In general, items of road furniture will be selected from manufacturers' existing product ranges. Selected items will be closely integrated with the overall design philosophy and character of the urban design scheme and are seen as essential design components.

Lighting

All lighting will conform to the Scope of Works and Technical Criteria and will minimise light spillage into sensitive areas, including Lane Cove National Park, Bidjigal Reserve and residential areas. The location of light poles is detailed in the engineering drawings.

Motorway

Motorway lighting is required at various locations along the route including on and off-ramps. The selected light pole is a galvanised steel tapered circular hollow section with a curved outreach arm to match existing light poles currently used on the M2 Motorway.

Local roads

Lighting will be provided on local roads at interchanges and intersections with the highway. The design and installation of lighting will be compatible with existing lighting systems and standards on adjacent roadways, walkways and public spaces and will comply generally with the requirements of the relevant Authorities and Councils. Where existing street lighting is modified, the final lighting will not result in a standard of lighting less than that existing prior to the modifications.

Bridges

Where required, street lighting on bridges will be fully integrated into the parapet and rail design. Lighting installed on the underside of bridges, if required, will be fully integrated into the soffit of the deck or girder or mounted on piers.

Pedestrian Underpasses

At Vimiera Road underpass (which is being lengthened) provision of light fittings will be vandal proof or housed in vandal proof enclosures, but not so that the enclosures will affect the lighting performance of the luminaires. The light fixture will be mounted on the bridge piers or underpass soffit, and located to ensure that light will wash the underside of the bridge, maximising the apparent height.

Signage

The graphic design of highway signs is an important element of road consistency. The design of all signage required for road safety and directional signage will be based on the RTA road sign standards and located according to their guidelines. The location of regulatory signs will be detailed in the engineering drawings. Wherever possible, signs will be located to minimise impacts on important views from the highway and to eliminate the use of excessive or unnecessary signage.

Safety Barriers

The selection of safety barriers will be carefully designed in regards to urban design, traffic safety, sightlines, context and consistency.

The urban design objectives for the safety barriers are:

- Consistency with existing barrier types used on the M2 Motorway or on local roads;
- Minimisation of types across the length of the project;
- Maintaining views and vistas by using transparent barrier types; and
- Importance of a smooth top edge for concrete barriers, as it is this that catches the eye

In addition to bridge parapets described in an earlier section of this report, barriers used in the project comprise wire rope safety barriers (Refer Photo 6.2.4.1), Type F concrete barriers (Refer Photo 6.2.4.2), G4 guard rails (Refer Photos 6.2.4.3) and thrie beam barriers (Refer Photo 6.2.4.4) at bridge approaches. In general, wire rope barriers should be used wherever possible because they are less visually intrusive than the other types and less disruptive of views from the motorway. Where bridges are being extended, the bridge parapet will match into the existing safety barrier on the local road.

Toll Gantries

Additional electronic toll gantries will be located at entry and exit points to the M2 Motorway. The style of gantry will be similar to that of the existing used on the motorway and the location will be carefully co-ordinated with retaining walls, noise walls, safety lighting and other built elements.

Photo 6.2.4.1 Wire Rope Barrier

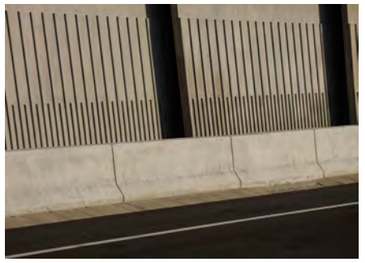


Photo 6.2.4.2 F Type Barrier

Photo 6.2.4.3 G4 Barrier

Photo 6.2.4.4 Thrie Beam Barrier

7.0 IMPLEMENTATION STRATEGY

7.1 Urban Design Implementation

The strategy adopted for the project to minimise risk is to ensure that the urban and landscape design consultants who have prepared this aspect of the concept design remain fully involved in the Project through to completion of construction.

The methodology proposed is:

- Full participation of the urban and landscape design consultants in all aspects of project design development, detailed design and documentation which are relevant to urban and landscape design. The consultants will be involved in engineering design team meetings and processes to the full extent necessary to achieve this commitment;
- Full construction documentation by the urban design consultant of all structures not documented by others. Where structures are documented by other members of the project team (primarily the engineering consultants), the urban designer will thoroughly and consistently review and mark up their construction drawings in relation to the urban design aspects of the structures to ensure appropriate outcomes which are consistent with the design principles and quality established in this report;
- Regular and comprehensive reviews of the design up to 100% Detail Design are required by the RTA's Urban Design representative; and
- Attendance at the construction site on a sufficiently frequent and as required basis to ensure that, for all urban design components, design changes which arise during construction, construction standards generally, the quality of materials and finishes and the selection of colours and finishes not already specified are all in accordance with the construction documents and/or to the level of quality envisaged in this proposed design and established in the detailed design.

7.2 Landscape Implementation

The upgrade nature of this project makes the implementation of landscape works both piecemeal and subject to existing conditions. Despite this, landscape re-vegetation works need to consider the implementation strategy as a whole considering all inputs from ground conditions, slopes and access to create a sustainable and long-term solution. The soil preparation will form a critical component of this response particularly where addressing the management of cut slopes.

7.2.1 Clearing and Construction Protocol

Seed for planting or seeding operations is to be collected as part of the works from remnants within the corridor and/or from adjoining reserves. Collection of local seed will ensure that the community is maintained and enhanced along the corridor. The ability to collect seed will be influenced by the timing of construction and the need for seed for re-vegetation. In some instances, stock seed may need to be used to achieve construction objectives. In such instance seed should be sourced from the Sydney Basin as a minimum.

Clearing limits will be restricted to the footprint of the works, plus a 5 metre margin for movement and operational envelopes, in order to minimise disturbance and reconstruction on adjoining landscape zones. This extent will be delineated by the use of construction paraweb fencing or similar with signage indicating that the area is an "environmental area with no construction work allowed".

Generally material cleared from site (both vegetative and soil) should be disposed of off site. This reflects the presence of significant weed populations within the corridor and the difficulty in managing the control of these weeds and storage within the work area.

Large native trees required to be cleared could be used for habitat creation, hardwood milling or mulched if space and time makes this an effective operation.

7.2.2 Cultivation of Sub-grade

The cultivation of sub-grade is a critical component of the soil preparation in terms of successful plant growth. If a compacted soil or rock profile is present it may be difficult to both successfully key in topsoil but also to maintain a level of moisture to the plant and sufficient media to ensure stability of the plantings in the long term. In preparing the sub-grade it should be ripped to a depth of 200mm to facilitate the achievement of this objective.

Prior to ripping, the slope should be assessed by the project geotechnical engineer and landscape architect, in terms of stability and the potential for landscape rehabilitation. Re – vegetation of batter slopes will only occur where the exposed material is weak and is unlikely to be stable in the long term and is at a slope flatter than 1:2.

To ensure the support of strong stable plant growth, the assessment of slope material strength and potential for amelioration will be undertaken progressively as part of the implementation process. Design response may need to be varied to reflect conditions discovered on site.

7.2.3 Topsoiling and Fertiliser

Topsoil is to be imported for all landscape works. This is based on the altered nature of the site soils, the lack of potential material stripped from site and the significant weed presence within the corridor.

Generally spread soils at the following depths;

- Landscape Treatment Type 1 - 200mm of quality garden bed mix 60% loam: 20% sand: 20% organic material.
- Landscape Treatment Type 2 - 150mm General Garden bed mix
- Landscape Treatment Type 3 - 150mm General Garden bed mix
- Landscape Treatment Type 4 - n/a
- Landscape Treatment Type 5 - 75mm General Garden bed mix
- Landscape Treatment Type 6 - 150mm Turf Underlay composed of 80% loam: 20% sand

General garden bed mix should be a low phosphorous, low nitrogen mix suited to native plants. A mix with low nutrient levels should also limit weed potential enhancing the ability to resist weed growth. The potential to utilise sandstone quarry fines as a mix will be investigated in the design development phase.

Testing of soil to be used for the project is to be done prior to delivery to the site.

The application of organic fertiliser will be undertaken to all areas and will be included as part of the hydro mulching application or as part of soil amelioration.

7.2.4 Mulching

Mulching will be provided for all garden beds, and planted areas. Imported woodchip mulch will be used for all mass plantings, medians and individual plantings.

Site mulch if able to be sourced from grubbing and clearing will be used as a mulch ring at 50-75mm deep to all individual plantings. Mulch rings are to be 1 metre diameter.

7.2.5 Plant Material

A temporary vegetation cover crop is to be sown on all disturbed areas, soils stockpiles and interim works at a rate of 65kg per hectare. For longer term stockpiles a perennial crop will be used.

7.2.6 Seed Mixes

Seed collection is to be carried out by experienced seed collectors in a manner that preserves the parent plant and that removes only a small percentage of reproductive material from the overall population in a particular area, in accordance with Flora Bank guidelines.

Seed shall be gathered from remnant vegetation within the corridor or from reserves adjoining the corridor.

Propagated material will be used to re-vegetate disturbed areas located adjacent to the naturally occurring population of this species if habitat conditions are suitable.

The following planting methods and plants sizes will be installed as part of the re-vegetation works. Seeding Mixes are composed of the component listed in Table 7.2.6 Seeding Mixes.

A number of different mixes are to be developed to reflect the various plant communities along the route. These mixes are based around the core mix parameters, defined above, and are to be implemented as a hydromulch mix.

Table 7.2.6 Seeding Mixes

SEED	QUANTITY
Cover Crop	
Japanese Millet (Sep-Mar)	35 kgs/ha
Rye Corn (Apr-Aug)	35 kgs/ha
Eclipse/Crusader Rye	25 kgs/ha
Red Clover	5 kgs/ha
Native Grass	
Microlaena stipoides "Griffin" seed	2 kgs/ha
Themeda "Tangara" seed	1 kgs/ha
Native Seed Mix	
Native trees, shrubs and ground covers	5 kgs/ha**
Fertiliser	
Organic Fertiliser	250 kgs/ha

Table 7.2.7 Key Species for Vegetation Communities

SANDSTONE RIDGE TOP COMMUNITY	
Angophora costata	Smooth-barked Apple
Eucalyptus haemastoma	Scribbly Gum
Eucalyptus gummifera	Red Bloodwood
Eucalyptus oblonga	Narrow-leaved Stringybark
Eucalyptus piperita	Sydney Peppermint
Allocasuarina littoralis	Black She-oak
Banksia integrifolia	Coast Banksia
Banksia serrata	Old Man Banksia
Hakea sericea	Needlebush
Hakea teretifolia	Dagger Hakea
Kunzea ambigua	Tick Bush
Leptospermum attenuatum	Slender Tea Tree
Leptospermum flavescens	Swamp Tea tree

TURPENTINE IRON BARK AND TURPENTINE IRON BARK MARGIN FOREST	
Corymbia gummifera	Red Bloodwood
E. creba	Narrow-leaved Ironbark
E. fibrosa	Red Ironbark
E. punctata	Grey Gum
E. saligna	Sydney Blue Gum
Syncarpia glomulifera	Turpentine
Acacia falcata	Sickle leafed wattle
Acacia floribunda	Wattle
Acacia implexa	Hickory Wattle
Acacia parramattensis	Wattle
Breynia oblongifolia	
Dodonaea triquetra	Hop Bush
Leucopogon juniperinus	
Notelaea longifolia	
Ozothamnus diosmifolius	
Pittosporum revolutum	
Pittosporum undulatum	Sweet Pittosporum
Polyscias sambucifolia	
Maytenus silvestris	
Austrostipa pubescens	
Dianella caerulea	Blue Flax Lily
Dichondra repens	Kidney Weed
Entolasia stricta	Wiry Panic
Lomandra longifolia	Matt Rush
Poa affinis	
Themeda australis	Kangaroo Grass
Glycine clandestina	
Pandorea pandorana	

BLUE GUM HIGH FOREST AND GULLIES	
Angophora costata	Smooth-barked Apple
Eucalyptus pilularis	Blackbutt
Eucalyptus saligna	Sydney Blue Gum
Allocasuarina torulosa	Forest Oak
Acmena smithii	Lily Pilly
Austromyrtus tenuifolia	
Backhousia myrtifolia	
Callicoma serratifolia	Black 'Wattle'
Ceratopetalum apetalum	Coachwood
Ceratopetalum gummiferum	Christmas Bush
Clardendron tomentosa	
Cyathea cooperi	Treefern
Dodonaea triquetra	Hop Bush
Elaeocarpus reticulatus	Blueberry Ash
Pittosporum undulatum	Sweet Pittosporum
Tristaniopsis laurina	Water Gum

HINTERLAND SANDSTONE GULLY FOREST	
Angophora costata	Smooth-barked Apple
Corymbia gummifera	Red Bloodwood
Eucalyptus pilularis	Blackbutt
Syncarpia glomulifera	Turpentine
Allocasuarina littoralis	She Oak
Allocasuarina torulosa	Forest Oak
Banksia serrata	Old Man Banksia
Ceratopetalum gummiferum	Christmas Bush
Elaeocarpus reticulatus	Blueberry Ash
Acacia linifolia	Wattle
Dodonaea triquetra	Hop Bush
Grevillea linearifolia	Grevillea
Leptospermum trinervium	Tea Tree
Persoonia linearis	Narrow leafed Geebung
Pultanea flexilis	
Pittosporum undulatum	Sweet Pittosporum

Sandstone Riparian Scrub	
Acmena smithii	Lily Pilly
Austromyrtus tenuifolia	
Backhousia myrtifolia	Carrol, Grey Myrtle
Callicoma serratifolia	Black 'Wattle'
Ceratopetalum apetalum	Coachwood
Ceratopetalum gummiferum	Christmas Bush
Dodonaea triquetra	Hop Bush
Pittosporum undulatum	Sweet Pittosporum
Tristaniopsis laurina	Water Gum
Adiantum aethiopicum	Maiden Hair
Blechnum ambiguum	
Calochlaena dubia	
Sticherus flabellatus	
Lomandra longifolia	Matt Rush

7.2.7 Bush Regeneration

While the bulk of works is likely to involve the re-establishment of a naturalistic community, the focus of the revegetation works, potential exists for the undertaking of bush regeneration activities. The focus of these activities is the encouragement of natural processes to maintain and enhance the natural diversity of the remnant communities. These activities are only proposed for where a robust, intact bushland setting exists and changes in natural ground profile are minimal.

Implementation issues associated with this zone include:

- Topsoiling - The stripping and direct return of bushland topsoil to the location from which it was removed within 6 months. This provides the greatest potential for the natural soil seed bank to influence natural regeneration.
- Planting and Seeding - the implementation of a complete suite of species, sourced using only local provenance material which together constitute the full structural layers of the community being reinstated.
- Maintenance and management - area to be managed using bush regeneration techniques which minimise disturbance and maximise regeneration of the natural plant communities so as to achieve a robust, species diverse landscape outcome.

7.2.8 Planting Rates and Sizes

Plant material is to be planted at a range of sizes to create a balance in terms of initial impact and cost. The following sizes are nominated to be used:

- Virotubes
- Forest Tube
- Semi Advanced - 2.5 litre
- Advanced - 5 litre
- Super Advanced - 25 litre
- Semi advanced and super advanced sizes are to be used in interchange garden beds.

Planting rates and sizes are as follows:

- Virotube planted at 9 plants per m2
- Forestry Tubes/ semi advanced planted at the rate of 1 plant per 1.5 m2 for shrub plantings
- Forestry Tubes/ advanced planted at the rate of 1 plant per 4 m2 for tree plantings
- Rates of planted areas have been assessed based on the following assumption.

Trees are only to be planted to ensure appropriate distribution, cover and compliance with sightlines and clear zones. The use of trees within the seed mix is generally not proposed, except where clear breaks in implementation exist such as benches on cuts.

Details of the plants scientific and common name are provided with different mix types outlined in Table 7.2.7. Key species for vegetation communities with colour illustrations is provided on the following pages.

7.2.9 Turf

Turf is to be used at interchanges. The selection of turf has considered the appearance and maintenance requirements for its proposed location. Zoysia ''Empire" has been selected as the most appropriate with minimal mowing requirements and drought tolerance as key aspects of this grass.

Where works adjoin public spaces the grass species may need to be reviewed to match the adjacent species.

7.2.10 Stakes and Ties

Staking is to be provided for initial support and to act as a marker for plantings. This enables monitoring of plant response/performance. The following plant sizes are to be tied with hessian webbing ties 50mm wide.

- Forestry tube - bamboo stake, heavy duty
- Semi Advanced - bamboo stake, heavy duty
- Advanced - hardwood stake
- Super Advanced - hardwood stake

7.2.11 Construction Compound Sites

Construction compound sites are temporary work areas on land generally leased from another owner. To ensure provision is made for the revegetation of the land to a stable state, theses areas have generally been indicated as being grassed. Grasses may either be native grasses or exotic depending on context. Final treatment for these lots will be determined as a part of lease agreements. Where construction compounds occur within the corridor, the areas will be revegetated back to reflect the natural community.

7.2.12 Maintenance

The appearance of the landscape of the corridor affects the appearance of the motorway as a whole. It is vital that landscape works are implemented in such a way that they are able to establish and thrive. As part of the project works a Landscape Maintenance Plan (LMP) must be prepared and implemented to ensure that the ongoing management of the landscape achieves the design outcomes and that weed growth is managed and contained.

Regular maintenance inspections are to be undertaken of the new works required as part of the proposal and a log of activities maintained to record actions being undertaken to achieve the design outcome. In the first year inspections should be undertaken quarterly to ensure that response is as expected and that potential weed infestations are managed before they dominant the emergent landscape.

Activities should include, but not limited to the following:

- Areas of weed infestation must be managed and remedial landscape works undertaken to minimise potential for re-infestation;
- Failed planting should be replaced where losses are higher than 20%;
- Areas of bare soil should be prepared and retreated to match;
- Grassed areas to be mown to maintain a well kept appearance;
- Mulch beds maintained weed free;
- Noxious weeds to be managed and removed from new works;
- Short comings in canopy development identified and remedial actions identified and actioned.

Landscape activities must minimise risk to contractor and road user. Works need to be timed to minimise disruption to traffic flows and appropriate traffic controls put in place.

Implementation Strategy

Sandstone Ridge Top Community

Angophora costata
Smooth-barked Apple

Eucalyptus haemastoma
Scribbly Gum

Eucalyptus gummifera
Red Bloodwood

Eucalyptus oblonga
Narrow-leaved Stringybark

Eucalyptus piperita
Sydney Peppermint

Allocasuarina littoralis
Black She-oak

Banksia integrifolia
Coast Banksia

Banksia serrata
Old Man Banksia

Hakea sericea
Needle Bush

Hakea teretifolia
Dagger Hakea

Kunzea ambigua
Tick Bush

Leptospermum attenuatum
Slender Tea Tree

Turpentine Iron Bark and Turpentine Iron Bark Margin Forest

Eucalyptus globoidea
White Stringybark

Eucalyptus paniculata
Grey Ironbark

Eucalyptus resinifera
Red Mahogany

Syncarpia glomulifera
Turpentine

Acacia falcata
Hickory Wattle

Acacia floribunda
Wattle

Banksia ericifolia
Heath-leaved Banksia

Hakea sericea
Needlebush

Kunzea ambigua
Tick Bush

Leptospermum flavescens
Swamp Teatree

Acacia implexa
Hickory Wattle

Acacia longifolia
Wattle

Blue Gum Forest and Gullies

Angophora costata

Smooth-barked Apple

Eucalyptus pilularis

Blackbutt

Eucalyptus saligna

Sydney Blue Gum

Allocasuarina torulosa

Forest Oak

Acmena smithii

Lily Pilly

Austromyrtus tenuifolia

Backhousia myrtifolia

Callicoma serratifolia

Black 'wattle'

Ceratopetalum apetalum

Coachwood

Ceratopetalum gummiferum

Christmas Bush

Cyathea cooperi

Treefern

Tristaniopsis laurina

Water Gum

Dodonaea triquetra

Hop Bush

Elaeocarpus reticulatus

Blueberry Ash

Pittosporum undulatum

Mock Orange

Implementation Strategy

Western Sandstone Gully Forest

Angophora costata

Smooth-barked Apple

Eucalyptus gummifera

Red Bloodwood

Eucalyptus pilularis

Blackbutt

Allocasuarina torulosa

Forest Oak

Acmena smithii

Lily Pilly

Austromyrtus tenuifolia

Backhousia myrtifolia

Grey Myrtle

Callicoma serratifolia

Black ‘Wattle’

Ceratopetalum apetalum

Coachwood

Ceratopetalum gummiferum

Christmas Bush

Dodonaea triquetra

Hop Bush

Tristaniopsis laurina

Water Gum

7.3 Landscape Management

7.3.1 Maintenance

Weed Control

Weed control is to be an integral part of the construction process, with weed management prior to construction defined in the documentation. The ongoing management plan will be implemented during and post construction to minimise regeneration or infestation of weeds. This systematic approach will reduce the weed potential into the future.

Weed control is to be carried out by the contractor in all areas re-vegetated/ planted as part of the contract works for a period of 12 months beyond practical completion.

Supplementary Watering and Mulching

Planting will be watered and maintained until plants have become established. If extended periods without rain are experienced, during the establishment period, then watering over and above normal construction practise will be required to supplement natural rainfall.

Follow-up Fertiliser

Fertilising post planting may be required where specific nutrient deficiencies are identified. The need for additional fertiliser has been minimised by the use of slow release fertiliser.

Pruning and Thinning

Pruning and thinning is likely to form a minor component of maintenance. Pruning may be required to ensure retention of sightlines where seeded shrubs have grown obscuring signage or views around bends.

Pests and Diseases

Generally pest / disease management are not viable over large areas. Planting will rely on developing an environmental balance through the establishment of improved habitat conditions. Should an outbreak be identified which will impact on the establishment of landscape outcomes an appropriate action plan will be determined.

Plant Replacements

Dead, diseased or dying plants are to be replaced to ensure 90% of planting has established after 12 months.

Monitoring and Evaluation

The ongoing surveillance of the road corridor for weed management and landscape establishment is required.

7.3.2 Occupational Health and Safety

The design of the highway needs to consider the safety of workers during construction and the ongoing maintenance of the road. Both periods provide distinct, as well as overlapping risks.

Slopes are a key risk and the alignment has a number of areas of concern;

- Slopes of 1V:2H are not easily traversed by vehicle or on foot resulting in construction and maintenance access issues.
- Bridge abutments and culverts where slopes increase and drops may pose risks in terms of public and maintenance a need to be addressed in the design.

Maintenance risks are associated with the conflict of workers adjacent to traffic. The design needs to consider issues such as sightlines, the need for lane closures and other activities adjacent to the road when workers are completing the following activities;

- Maintenance of garden beds in medians/ interchanges
- Mowing of verges and turf areas
- Weed management.

Although it is not possible to completely eliminate all maintenance risks, they can be minimised by reducing the frequency of the occurrence, which can be addressed through appropriate plant selection and density.

Implementation Strategy

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8.0 REFERENCES

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- Draft Flora & Fauna Assessment Report for the Proposed Cycleway and Widening of the M2 Motorway between Terrys Creek, Marsfield and Delhi Road, North Ryde, AES Environmental Consultancy, 2004.
- Urban Bushland in the Ryde LGA, Prepared for Ryde City Council by Oculus, April 2001.
- Interpretation Guidelines for the Native Vegetation Maps of the Cumberland Plain Western Sydney, NSW National Parks and Wildlife Service, October 2002
- Soil Landscapes of the Sydney 1:100,000 Sheet, Soil Conservation Service of NSW, Chapman, G.A and Murphy, C.L. (1989)
- Soil Landscape of the Penrith 1:100,000 Sheet, Soil Conservation Service of NSW, Bannerman, S.M and Hazelton, P.A (1989).
- Vegetation of the Cumberland Plain Western Sydney, NSW National Parks and Wildlife Service, October 2002

The documents to be reviewed, referenced and sourced during the design process include, but are not limited to, the following:

- Beyond the Pavement – RTA Urban and Regional Design Practice Notes, RTA, 2009
- NSW Bicycle Guidelines, RTA, November 2003
- Bridge Aesthetics, RTA, July 2003
- Shotcrete Design Guidelines, RTA, June 2005
- Noise Wall Design Guideline, RTA, Nov 2006
- Landscape Guideline, RTA, April 2008
- Guide to Traffic Engineering Practice – Part 13 Pedestrians, Austroads, 1995
- Guide to Traffic Engineering Practice – Part 14 Bicycles, Austroads, 1999

FINAL

Leighton Contractors Pty Limited
15 April 2010

AECOM

M2 Upgrade Project

Preliminary Aboriginal Heritage Assessment

Quality Information

Document	**M2 Upgrade Project**	
Ref	S7011801 S7011801_RPTFinalRev01_15Apr10	
Date	15 April 2010	
Prepared by	Rick Bullers	Author Signature _____
Reviewed by	Neville Baker	Technical Peer Reviewer Signature _____

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Revision History

Revision	**Revision Date**	**Details**	**Authorised**	
			Name/Position	**Signature**

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Glossary of Terms

Alluvial	Pertaining to sediment mass deposited from transport by channelled stream flow or over-bank stream flow.
Archaeological Potential	The likelihood of the presence of archaeological evidence ascertained through physical evaluation (survey, test excavations) and historical research.
Artefact Scatter	A collection of artefacts usually distributed across the surface of the ground.
Aboriginal Object	*'…any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains'* (s.5 NPW Act)
Aboriginal Place	Any place declared to be an Aboriginal place under s.84 of the *National Parks and Wildlife Act 1974* (NPW Act) because the place is or was of special significance with respect to Aboriginal culture. It may or may not contain Aboriginal objects.
Aboriginal Rockshelter	A covered area, usually in the form of a rock overhang, with evidence of Aboriginal activity including one or more Aboriginal stone artefacts, evidence of rock art or evidence of Aboriginal grinding grooves.
Aboriginal Scarred Tree	A tree that bears a scar or scars which are wounds formed from the deliberate removal of bark or wood by Aboriginal people. Aboriginal scarred trees are often an indicator of an activity area.
Aboriginal Site	In this study, the term is used to define the present physical extent of visible Aboriginal archaeological material.
Artefact	Any object that is physically modified by humans.
Assemblage	A collection of artefacts associated by a particular place or time and assumed generated by a single group of people. An assemblage can comprise different artefact types.
Attribute	A well defined feature of an artefact that cannot be further subdivided. Archaeologists identify types of attributes, including form, style and technology, in order to classify and interpret artefacts.
Axe	A stone-headed axe characteristically containing two ground surfaces which meet at a bevel.
Backed Artefact	A stone tool where one margin of a flake is retouched at a steep angle and that margin is opposite a sharp edge.
Background Scatter	A term sometimes used to describe a low density scatter of isolated finds that are distributed through the landscape without any obvious focal point.
Burra Charter	The Burra Charter provides guidance for the conservation and management of places of cultural significance Australia. It sets a standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance, including owners, managers and custodians. Australia ICOMOS (the Australian National Committee of ICOMOS) adopted the most recent version of the Burra Charter on 26 November 1999.
Chert	A crypto-crystalline sedimentary siliceous rock commonly used in the manufacture of stone implements.
Conservation	As defined in The Burra Charter, conservation means all the processes of looking after a place so as to retain its cultural significance.
Conservation Management Plan	A document that outlines the cultural heritage significance of an object or area and policies, guidelines, maintenance and strategies for the conservation of the object or area.
Contact Site	A site that displays an interaction between early colonists and Aboriginal Australians.

Core	A piece of flaked stone which has one or more negative flake scars but no positive flake scars.
Country	A term used by Aboriginal people to refer to the land to which they belong.
Cultural significance	Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations (Australia ICOMOS Burra Charter Article 1.2).
Desktop Survey	A study that does not involve any field-based activity and only involves background research and reporting.
Effective Coverage	A quantifiable estimate of the area in which archaeological materials are "detectable", i.e. exposed ground surface area.
Excavation	An archaeological field method that involves the disturbance of the earth to reveal previously buried archaeological materials.
Exposure	An area of land surface where the ground surface is visible, usually as the result of thinner vegetation cover, erosive forces or human-caused disturbance. In archaeological surveys, the percentage of ground surface that is visible is recorded. These percentages of exposure are then used to calculate effective coverage.
Feature	An artefact that cannot be normally removed from a site, e.g. foundations.
Flake	Any piece of stone struck off a core. It has a series of characteristics showing that it has been struck off. The most indicative of these features are ring cracks, showing where the hammer hit the core. Also the ventral surface may be deformed in characteristic fashion.
Flaked Piece/Waste Flake	An unmodified and unused flake, usually the by product of tool manufacture or core preparation.
Grinding Groove	A depression formed in rock from the sharpening of a stone hatchet head or use of a muller (topstone).
Ground Visibility	A term used to describe the area of the ground's surface that is visible during archaeological field surveys.
Hammerstone	A stone that has been used to strike a core to remove a flake, often causing pitting or other wear on the stone's surface.
Heritage	The word 'heritage' is commonly used to refer to our inheritance from the past. Heritage can be used to cover natural environment as well, for example the Natural Heritage Charter. In this document, cultural heritage refers to all Indigenous places and objects, and associated values, traditions, knowledge and cultures.
Holocene	The geological period covering the last 10,000 years.
Indurated Mudstone	Indurated mudstone (sometimes referred to as "tuff") is a general term that encompasses sedimentary rocks from very fine mud-sized particles that are invisible to the naked eye. The term may also encompass siltstones and claystones.
In Situ	In the natural or original position. Applied to a rock, soil, or fossil when occurring in the situation in which it was originally formed or deposited.
***In situ* conservation**	Strategies and initiatives designed for the preservation and conservation of historical archaeological materials without the need to collect or excavate materials from their archaeological context.
Isolated Find	A single artefact not located with any other.
Landform Element	A small area of the landscape, within an area of 30 m, with particular geomorphic attributes.
Lithics	Of, or pertaining to, stone.
Manuport	An object that is unmodified but has been transported to its location by humans.
Midden	A deposit of occupation debris, rubbish, or other by-products of human activity.
Natural Transformation	Change in the archaeological record as a result of natural processes.
Object	See Aboriginal object.

Place	See Aboriginal place.
Pleistocene	The geological period equivalent to the last ice age and preceding the Holocene from about 2 million years to 10,000 years ago. The Late Pleistocene generally refers to the period of time from 40,000 – 10,000 years ago.
Post-depositional	After deposition. A term commonly used with reference to factors affecting the preservation of artefacts and archaeological features.
Potential Archaeological Deposit	An area of the landscape that is believed to contain subsurface archaeological deposit.
Quartz	A hard transparent mineral commonly used in the manufacture of stone artefacts.
Quartzite	A metamorphic siliceous rock commonly used in the manufacture of stone artefacts.
Retouched Flake	A flake that has been flaked again in a manner that modifies an edge, commonly for the purpose of resharpening that edge.
Rockshelter	A covered area, usually in the form of a rock overhang, that may have been occupied by Aboriginal people in antiquity. No material evidence of occupation, c.f. **Aboriginal rockshelter**.
Scarred Tree	A tree that bears a scar or scars, which are wounds formed from a range of natural, accidental or deliberate impacts that cause damage to living plant tissue on a trunk or limb. See also *Aboriginal Scarred Tree*.
Settlement Pattern	Distribution of human settlement on the landscape.
Significance	A term typically used to define the level of importance of a heritage site or place.
Silcrete	A siliceous rock commonly used in the manufacture of stone artefacts.
Site	An area where archaeological evidence is observed.
Surface Site	A site where artefacts are found on the ground surface.
Survey Coverage	The area of a study area surveyed, usually expressed as a percentage. See also Effective Coverage.
Test Excavation	Excavation of small sections of an area to determine the archaeological remains and significance.
Tuff	Solidified volcanic ash. Used by some archaeologists to refer to indurated mudstone.
Usewear	The wear displayed on an artefact as a result of its use.

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Abbreviations and Acronyms

AFT	Artefact. Used in the AHIMS database to refer to an Aboriginal site feature/s comprising stone artefacts.
ACHMP	Aboriginal Cultural Heritage Management Plan.
AHIMS	Aboriginal Heritage Information Management System. Database of recorded Aboriginal sites across NSW managed by DECCW.
DECCW	Department of Environment, Climate Change and Water.
DoP	Department of Planning.
GDG	Grinding Groove. Used in the AHIMS database to refer to an Aboriginal site feature/s comprising stone artefacts.
ICOMOS	International Council on Monuments and Sites.
LEP	Local Environmental Plan.
LGA	Local Government Area.
MGA	Map Grid of Australia.
NHL	National Heritage List
NNTT	National native Title Tribunal.
PAD	Potential Archaeological Deposit.
TRE	Scarred/Carved Tree. Used in the AHIMS database to refer to an Aboriginal site feature/s comprising Aboriginal scarred or carved trees.

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Executive Summary

Aboriginal Cultural Heritage

Director-General's Requirements

The Environmental Assessment must include an assessment of the potential Aboriginal cultural heritage impacts of the project, including an assessment of objects, places of significance, natural and landscape values of the corridor and surrounding area, taking into account the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation *(DEC, July 2005).*

AECOM Australia Pty Ltd (AECOM) was commissioned by Leighton Contractors Pty Limited to prepare a preliminary Aboriginal heritage assessment of the proposed M2 Upgrade Project. The M2 Motorway is located in the north western suburbs of Sydney between North Ryde and Baulkham Hills. The project proposes to upgrade the existing M2 infrastructure by establishing a third lane to both eastbound and westbound carriageways (including Norfolk Tunnel) between Lane Cove Road and Windsor Road, provide new on-off ramps at Windsor Road and Herring Road and upgrade the motorway's Intelligent Transport Systems.

The preliminary heritage assessment involved the preliminary inspection of lands directly impacted by the project with particular emphasis on lands where ground impacts are expected, together with inspections of all known Aboriginal sites in the study area. Lands outside the current motorway lease boundary were not assessed.

The assessment was conducted in accordance with the draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005), and the *RTA Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (RTA n.d.). The inspections conducted in March April 2009 were conducted in consultation with the Metropolitan Local Aboriginal Land Council. The inspections in December 2009 were conducted in consultation with the Aboriginal community in accordance with Department of Environment, Climate Change and Water's *Interim Community Consultation Requirements for Applicants* (DEC2004).

Existing environment

The environmental conditions of the study area can be summarised as an area of temperate climate with rugged, rolling to very steep hills, hillcrests and ridges on Hawkesbury Sandstone, and medium density drainage net of waterways. Soils are generally prone to erosion and in some instances water-logging. Large areas of the study area have been impacted by urban development, however, relatively undisturbed landscapes and vegetation occur in nature reserves and some steeper sections of the study area. This remaining vegetation supports a diverse range of fauna.

The study area lies in predominantly sandstone country with valleys and gullies with sandstone margins. The predominant archaeological sensitivity of these areas lies in their suitability for the formation of sandstone-based sites such as rockshelters, grinding-grooves and, to a lesser extent, art sites (including both pigment and engravings). Areas that contain extant native vegetation, such as in the major creeklines and reserves, may also contain culturally modified (scarred) trees.

The generally rocky conditions within the landscape are less suitable for open camp sites compared to the flatter and low undulating country of the Cumberland Plain further west. Furthermore, the soils in the study area are generally shallow and skeletal. These soils have little potential for the formation of subsurface archaeological deposit due to the highly erodible nature of the soils.

Urban development, including the development of the M2 itself, has also reduced the archaeological sensitivity of the study area. However whilst some areas have been extensively disturbed, others have not. Areas of steep-sided valleys and gullies have not been developed due to their unsuitable geography, and still retain a large portion of their original vegetation. Many of these areas have also been set aside as reserves and are exempt from development. It is these areas that are considered to hold the greatest archaeological sensitivity. Such areas include the Lane Cove Recreation Area; Berriwerri Reserve; Chilworth Recreation Reserve; Darling Mills State Forest; and Bidjigal Reserve.

A total of 15 registered or known Aboriginal sites occur within 100 m of the M2 Motorway. All sites were inspected during field inspections conducted during March/April 2009 and December 2009, with the exception of one site which was found to have erroneous coordinates recorded in AHIMS and is well south of the M2. Areas identified in 1989-1992 archaeological reports as being of potential archaeological constraint were also inspected, as were areas of construction impact in the vicinity of known Aboriginal sites.

Impact assessment

Sites that are considered to have potential to be impacted are:

- AHIMS 45-5-1005 is an isolated artefact that lies in very close proximity to the Beecroft Road bus off-ramp. The current proposal to remove the off-ramp is likely to disturb the ground where the artefact is said to occur. However, the artefact is not considered to be in situ, is completely out of archaeological context and consequently is considered to hold low significance.
- Site M2A1, a set of grinding grooves that were identified during the Phase 1 field inspections and occur directly beneath the Terrys Creek bridges. Whilst all construction work is intended to occur on the northern side of the M2, the current construction plan proposes to provide vehicle access from the southern side. Consequently, there is potential for indirect impact to the site through sedimentation and/or physical impacts through earthworks.
- In addition, Aboriginal stakeholders consider there is potential for indirect impact to one rockshelter (CF3; AHIMS 45-5-2161) through vibration impacts. Although previous monitoring suggests that such impacts are unlikely, it is recommended that technical advice from an expert in noise and vibration. Aboriginal stakeholders request that monitoring take place during construction works in the vicinity.

It is considered that there will be no direct impacts and unlikely to be indirect impacts to the other sites resulting from the upgrade works. However, it is considered prudent to erect some form of protective fencing at rockshelters within 50 m of M2 construction works to minimise the potential for indirect impacts resulting from access by construction workers. The sites considered to be within 50 m of construction works are: AHIMS 45-6-2097, 45-6-2160, 45-6-2161, 45-6-2162, 45-6-2163, 45-6-2543, 45-6-2544 and DC1.

Mitigation measures

The following recommendations are made in light of the initial findings of the preliminary Aboriginal heritage assessment:

1. should Aboriginal objects be identified during the course of construction, work should cease in that part of the study area and DECCW, MLALC and DLALC should be notified immediately;
2. should Aboriginal skeletal material be identified during construction, work should cease immediately and Police, DECCW and the relevant LALC should be notified immediately;
3. the proponent should prepare an Aboriginal Heritage Management Plan (AHMP) for the 15 known sites within the study area. The AHMP should provide guidance on the management of the sites both during the construction phase of the M2 Upgrade Project, and during the subsequent operational phase of the M2 Motorway. The AHMP will provide more detailed guidance than outlined in this report (e.g. detailed location mapping, fencing specifications, etc). The AHMP should include, but not be limited to, the following protective measures:
    a) the proponent should erect temporary protective fencing at Aboriginal rockshelters within 50 m of the M2 construction works to minimise the potential for inadvertent damage by construction workers. The sites include: AHIMS 45-6-2097, 45-6-2160, 45-6-2161, 45-6-2162, 45-6-2163, 45-6-2543, 45-6-2544 and DC1;
    b) the proponent should erect temporary sedimentation barriers and fencing along the banks of Terrys Creek, on the southern side of the bridges to minimise potential for indirect impacts to site M2A1 through sedimentation and/or personnel access during construction;
    c) Aboriginal stakeholders have requested that monitoring take place at sites during construction works. However, this assessment considers that further impacts to, or identification of, Aboriginal objects is unlikely. Therefore further monitoring is not considered necessary;

d) the Aboriginal community have requested that an exclusion zone be placed around site M2A1 on the southern side of the M2 bridge and the proponent should take steps to avoid any construction activity on that side of the bridge. If possible, access to the areas should be afforded from the northern side of the M2. If this is not possible, and access is required on the southern side (passing under the bridge) then access should be made as close as possible to the concrete abutment;

e) the proponent should ensure that regular toolbox talks are conducted with emphasis on Aboriginal cultural heritage and the potential for impacts to the sites.

4. AHIMS 45-5-1005 is not considered to hold cultural heritage significance, and the absence of the single artefact suggests that it has been lost from the area, and therefore the site has already been effectively destroyed. The impact from the M2 is therefore impact on a destroyed site. The AHIMS register should be amended to reflect this status.

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1.0 Introduction

AECOM Australia Pty Ltd (AECOM) was commissioned by Leighton Contractors Pty Limited (LeiCon) to prepare an Environmental Assessment (EA) of the proposed M2 Upgrade Project, one component of which was a preliminary Aboriginal heritage assessment. The M2 Motorway is located in the north western suburbs of Sydney between North Ryde and Baulkham Hills (**Figure F1**: Regional Context

). The project proposes to upgrade the existing M2 infrastructure by establishing a third lane to both eastbound and westbound carriageways (including Norfolk Tunnel), provide new on-off ramps at Windsor Road and Herring Road and upgrade the Motorway's Intelligent Transport Systems (**Figure F2**: Project Proposal

).

The preliminary heritage assessment involved the preliminary inspection and impact assessment of lands directly impacted by the project, with particular emphasis on lands where ground impacts are expected. Lands outside the current Motorway lease boundary were not assessed (see **Section 2.0**).

The preliminary Aboriginal heritage assessment was prepared in accordance with relevant guidelines including the *Aboriginal Cultural Heritage: Standards & Guidelines Kit* (NPWS 1997), draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005), the *RTA Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (RTA 2008) and the *Burra Charter* (Australia ICOMOS 1999). The Aboriginal consultation process for this project followed the Department of Environment, Climate Change and Water's (DECCW) *Interim Community Consultation Requirements for Applicants* (DEC 2004). Legislation regarding management of the Aboriginal heritage values of the study area, summarised further in **Section 8.0**, is the *National Parks and Wildlife Act 1974*.

1.1 Project Background

The Department of Main Roads publication *Roads 2000* (1987) identified the M2 Motorway as a priority section of Sydney's Orbital network, providing a key role in linking Sydney's north west to the lower north shore and Sydney's CBD. The M2 Motorway opened in 1997. Since then, land use density has increased within the motorway catchment particularly in Sydney's north west. The current proposal to upgrade the motorway seeks to relieve current congestion, thereby facilitating more efficient movement of people and goods and would also be consistent with potential future development of an M2 or F3 connection.

Owner / operator of the motorway, Transurban, initially presented the current M2 Upgrade proposal to the RTA in July 2007. Following collaborative scope refinements, between Hills M2 and the RTA, the project application report was submitted to the Department of Planning in February 2009 and consultation with the community commenced.

As part of the overall EA process, AECOM commenced a program of Aboriginal heritage assessment. This report documents the findings of that assessment.

Director General's Requirements (DGRs) were issued by the Department of Planning (DoP) on 6 April 2009. The DGRs identified Aboriginal Cultural Heritage as a key issue and stated that:

> *The Environmental Assessment must include an assessment of the potential Aboriginal cultural heritage impacts of the project, including an assessment of objects, places of significance, natural and landscape values of the corridor and surrounding area, taking into account the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC, July 2005).*

As part of the agency submissions for the DGRs, DECCW requires:

> *An assessment of impacts on Aboriginal cultural heritage in consultation with relevant Aboriginal communities, and the protection measures to be adopted during construction of the facility.*

1.2 Aims

The overall aim of this assessment was to identify the Aboriginal heritage values of the project land, identify potential development impacts on those values and provide suitable management recommendations. To achieve these aims the following objectives were established:

- to consult with the relevant local Aboriginal community groups regarding the specific social value of land in the study area;
- to understand the regional research context of any Aboriginal sites or objects in the study area;
- to identify and inspect documented Aboriginal heritage sites/objects within the study area;
- to identify and record any unrecorded Aboriginal sites and objects within the study area;
- to assess the cultural significance of Aboriginal sites and objects in the study area in consultation with the Aboriginal stakeholders; and
- to prepare recommendations on the management of Aboriginal heritage values within the study area, when compared with the proposed development footprint.

1.3 Study Area

The study area consists of the M2 Motorway within the M2 lease boundary, specifically between Windsor Road at Baulkham Hills and Lane Cove Road at North Ryde. Furthermore, the study area only encompasses those areas where construction impacts will occur or where known Aboriginal sites occur within 100 m of the M2 Motorway.

1.4 Project Team

The Project Team consists of archaeologists and other specialists from AECOM, and representatives of the local Aboriginal community. Rick Bullers (Professional Archaeologist) managed the project, participated in the second round of field inspections and co-wrote this report. Neville Baker (Associate Director Archaeologist) participated in the first round of field inspections and provided technical and QA review of this report. Geordie Oakes (Archaeologist) conducted background research, participated in the first preliminary field investigation and co-wrote this report. Tessa Corkill (Archaeologist) participated in the second field inspection program and provided advice on the previous archaeological investigations. Lee-Anne Bishop and Tim Osborne provided administrative and drafting support. Craig Niles (Associate Director Planning and Design) managed the overall EA project. John Fisher was the client's representative.

1.5 Report Structure

The report structure relates to the sections of the report and their contribution to the study.

- **Section 2.0** describes the assessment methodology employed including the methodology and results of consultation with the Aboriginal community;
- **Section 3.0** provides the environmental context of the study area;
- **Section 4.0** provides ethno-historical and archaeological contextual information;
- **Section 5.0** discusses the results of the desktop survey including database searches;
- **Section 6.0** discusses the results of the field inspection;
- **Section 7.0** discusses the impacts to Aboriginal heritage values in the study area;
- **Section 8.0** describes legislation guiding Aboriginal heritage management; and
- **Section 9.0** provides succinct management recommendations regarding the Aboriginal heritage values of the study area.

1.6 Acknowledgements

The project team are indebted to Tessa Corkill who gave freely of her time, advice and an extensive range of her reports regarding the Aboriginal archaeological survey of the study area in the early 1990s. Many of her reports were not available from other sources.

1.7 Limitations

Predictions have been made about the probability of subsurface archaeological materials occurring within the study area. It is possible that materials may occur in any landscape context, and the assessment of subsurface materials refers to the likelihood of occurrence based on surface indications and environmental context.

AECOM has undertaken a search of the Aboriginal Heritage Information Management System (AHIMS) held by Department of Environment, Climate Change and Water (DECCW). The search results are provided in **Section 5.4**, although Grid References have been omitted from the Public Exhibition copy for security reasons. Register searches are constrained by the amount of data in the register and the quality of that data (for example grid references can be inaccurate). Large areas of NSW may not have been systematically searched and may contain Aboriginal objects and other heritage values not recorded on AHIMS.

Additionally, the AHIMS reports database can only be searched by the title of the report, which may not indicate the geographical location of the area covered. This means that it is possible that some known sites and some reports may have been omitted from this study. Sites and reports are regularly added and removed from AHIMS and therefore the accuracy of information provided from AHIMS is only valid on the day the register is searched.

A summary of the statutory requirements regarding Aboriginal and historic heritage is provided in **Section 8.0**. This is provided based on experience with the heritage system in NSW and does not purport to be legal advice. It should be noted that legislation, regulations and guidelines change over time, and users of the report should satisfy themselves that the statutory requirements have not changed since the report was written.

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2.0 Assessment Methodology

AECOM undertook the assessment of the study area in accordance with the draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005), the draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005) and the *RTA Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (RTA 2008), which consists of a staged process:

1) a preliminary assessment (desktop assessment) and field inspection; and
2) if heritage constraints are identified, a full heritage assessment.

This report documents the findings of the initial investigation (preliminary Aboriginal heritage assessment).

The assessment was conducted in accordance with appropriate State legislation, namely the *NSW National Parks and Wildlife Act 1974 and Environmental Planning and Assessment Act 1979*, and additional guidelines, specifically the *Aboriginal Cultural Heritage Standards and Guidelines Kit* and (NPWS 1997) and the *Interim Community Consultation Requirements for Applicants* (DEC 2004) (ICCRs).

2.1 Preliminary Assessment

The methodology used in the preliminary assessment consisted of a desktop assessment to identify whether any Aboriginal heritage values are associated with the study area followed by a series of field inspections to ground-truth the desktop assessment.

The following tasks were undertaken by AECOM during the preliminary assessment:

- a desktop assessment to identify whether there were any initial constraints, including:
  - an Aboriginal site and report keyword search of DECCW's AHIMS database to identify registered Aboriginal sites within 1,000 m either side of the M2 corridor (**Figure F3:** M2 Motorway Alignment and AHIMS Site Locations);
  - a review of existing Aboriginal heritage reports and documents for the study area and nearby area to provide a regional and local picture on the heritage issues likely to occur in this area (**Section 5.1**); and
  - preparation of a heritage constraints map (**Figure F4:** Motorway Aboriginal Heritage Preliminary Heritage Constraints Mapping – Western Section to **Figure F6:** M2 Motorway Aboriginal Heritage Preliminary Constraints Mapping – Eastern Section);
- consultation with relevant Aboriginal stakeholders in accordance with the *Interim Community Consultation Requirement for Applicants* (DEC 2004) (**Section 2.3**); and
- field inspection in conjunction with the Aboriginal community to:
  - ground-truth existing AHIMS-registered sites;
  - inspect lands in proximity to known Aboriginal sites, or on landforms that suggest archaeological potential, where direct impacts are expected (construction of sediment ponds, culverts, site compounds, temporary vegetation clearance);and
  - inspect lands within the study area previously identified as having potential archaeological value.

Where constraints are identified during the preliminary assessment, a full heritage assessment is normally conducted in accordance with the DEC (2005) Part 3A guidelines. Although there are two sites that have potential to be impacted by the project (see **Section 7.1.1**), a full heritage assessment is not considered warranted for the following reasons:

- the study area has been extensively surveyed previously during the lead up to the initial M2 construction;
- the preliminary assessment was conducted in full consultation and involving full participation of the Aboriginal community; and
- areas of direct ground impact were inspected during the preliminary assessment and the impact assessment did not identify any impacts to Aboriginal heritage other than those outlined above.

It should also be noted that one of the aims of this assessment was to identify *archaeological* issues for the study area (i.e. archaeological 'sites' or material evidence such as rockshelters, stone tools, grinding grooves, or other tangible evidence of Aboriginal occupation). However, the concept of Aboriginal heritage is not confined to material evidence. Instead, it is much broader in scope, encompassing such factors as language, stories and ritual. To investigate Aboriginal heritage values *not* related to archaeological sites relies on contact with the local Aboriginal community for advice. The usual avenue for this is to follow DECCW's guideline on Aboriginal community consultation for Part 6 approvals – *Interim Community Consultation Requirements for Applicants* (ICCRs) (DEC 2004). Details of the consultation process undertaken as part of this preliminary assessment are provided in **Section 2.3**.

2.2 Field Inspection Methodology

The method used for the field inspection was based on the results of an initial constraints mapping program (**Section 5.6**). Effort was made to inspect all AHIMS-registered sites within close proximity of the M2 corridor (within 100 m of the motorway) to assess their location in relation to the M2 and specifically in relation to the footprint of the proposed upgrade works.

The majority of the existing sites are located in steep and/or heavily vegetated terrain and access to the sites was by foot only. Geographic coordinates for each site were extracted from AHIMS and used to re-identify the sites using Differential Global Positioning System (DGPS)[1]. Where the AHIMS coordinates were found to be in error, the corrected MGA coordinates were noted.

Areas of potential constraint, as determined from analysis of landform and from previous archaeological surveys of the M2 corridor, were traversed on foot to identify any previously unrecorded sites. The inspection was limited to targeted areas that included known registered Aboriginal sites and their surroundings, situated on landforms that are considered to have a higher archaeological potential (e.g. ridgelines, creek banks, etc) and in close proximity of the M2 corridor (i.e. no inspections were carried out more 100 m from the corridor). Inspection emphasis was placed on the footprint of the proposed upgrade works. These surveys concentrated on areas of sandstone outcrop suitable for the formation of rockshelters and overhangs that may have been used by Aboriginal people, as well as suitable areas where open camp sites might be expected, such as elevated areas in close proximity to creeks. The surveys also inspected areas of sandstone bedrock in and around creeklines that may have been used to form axe grinding grooves and mature trees for evidence of cultural scarring.

Notes on site type, condition and proximity to the M2 corridor were recorded. Records consisted of descriptive notes, DGPS positions (MGA format), and photographs. Where rockshelters were re-identified, the physical attributes were compared to those identified in the AHIMS site cards

A methodology/briefing letter was presented to registered Aboriginal stakeholder groups during a Focus Group Meeting (further detail provided in **Section 2.3**).

[1] *Trimble GEO-XM, employing GPS Pathfinder Office software.*

2.3 Aboriginal Consultation

The Aboriginal heritage assessment was conducted in accordance with DECCW's Draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005). Furthermore, the RTA has its own comprehensive guidelines: *RTA Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (RTA 2008). Both these documents stipulate a two-part Aboriginal heritage assessment process and recommend that Aboriginal community consultation be undertaken in accordance with DECCW's *Interim Community Consultation Requirements for Applicants* (ICCRs) the DEC (2004), a process that was followed in this investigation.

The ICCRs outline a process of inviting Aboriginal groups to register their interest in being party to consultation (including local newspaper advertising), seeking responses on proposed assessment methodology, and seeking comment on proposed assessments and recommendations. The guidelines require proponents to allow ten working days for Aboriginal groups to respond to invitations to register, and then 21 days for registered Aboriginal parties to respond to a proposed assessment methodology.

An Aboriginal community consultation log is attached at **Appendix B**.

2.3.1 Preliminary Assessment

The desktop assessment identified areas of potential archaeological value based on the results of the AHIMS search and areas of archaeological potential identified in previous archaeological assessments of the M2 corridor. Consequently, a map of existing Aboriginal sites and areas of archaeological potential was produced (**Figure F4:** M2 Motorway Aboriginal Heritage Preliminary Constraints Mapping – Western Section to **Figure F6:** M2 Motorway Aboriginal Heritage Preliminary Constraints Mapping – Eastern Section). A field inspection was deemed necessary to ground-truth the sites and areas of archaeological potential.

Metropolitan Local Aboriginal Land Council (MLALC) was contacted by telephone on 18 March 2009 and advised of the project, and the need for a field inspection. Mr Alan Madden was identified by MLALC as their representative for the project. A subsequent telephone conversation with Mr Madden on 23 March 2009 established that due to previous commitments he would be unable to attend site induction and the field inspection. Mr Madden advised AECOM that the field inspection should proceed without him, and advise him if any items of significance were found or any other issues were identified.

A field inspection was carried out within all areas of potential constraint on 30-31 March and 6-8 April 2009. No Aboriginal heritage items or areas of constraint were identified within areas to be impacted within the M2 corridor during that inspection. However, subsequent alterations to aspects of the project design warrants further inspection to ensure that no cultural heritage values are compromised. Aboriginal consultation following the ICCR process will also be conducted.

2.3.2 Full Consultation

Under the DECCW Part 3A guidelines (DECC 2005) and RTA Aboriginal heritage assessment guidelines (RTA 2008) consultation with the Aboriginal community is also a staged process. Where no constraints are identified in the preliminary assessment, there is no further requirement for consultation and assessment. However it is intended to allow the wider Aboriginal community to provide information on the socio-cultural values of the study area. A program of full Aboriginal consultation was instigated in late October 2009 to seek wider Aboriginal community input into the project.

The purpose of the full Aboriginal consultation is to seek information on the cultural (social) heritage values of the study area.

The following subsections outline a staged process of consultation in accordance with the ICCRs and the RTA guidelines.

Notification and Registration of Interest

Appropriate organisations were notified of the project with requests for information on suitable Aboriginal stakeholders to be consulted. Specifically, notification consisted of the following:

- advertisement of the project in the following newspapers, inviting Aboriginal groups to register interest:
  - *Northern District Times* newspaper on Wednesday 28 October 2009;
  - *Hills News* newspaper on Tuesday 3 November 2009;
  - *The Koori Mail* on Wednesday 4 November 2009; and
  - The *National Indigenous Times* on Thursday 29 October 2009.
- letters were sent to the following organisations requesting advice on Aboriginal stakeholders to consult and any known heritage issues to be taken into consideration (mailed or faxed 3 November 2009):
  - Department of Environment, Climate Change and Water (DECCW);
  - Department of Aboriginal Affairs;
  - Metropolitan Local Aboriginal Land Council (MLALC);
  - Deerubbin Local Aboriginal Land Council (DLALC);
  - NSW Aboriginal Land Council;
  - NTSCORP (formerly Native Title Services);
  - National Native Title Tribunal;
  - Registrar of Aboriginal Owners
  - Ryde City Council;
  - Baulkham Hills City Council; and
- known Aboriginal organisations and individuals around the study area were contacted, as a result of advice received from the above organisations (refer **Table 1**).

The National Native Title Tribunal responded on 4 November 2009 advising that they were unable to narrow down the search results for the M2 expansion area. They provided search results for the Baulkham Hills, Parramatta, Ryde and Hornsby local government areas. The results identify Native Title Claim No. NC97/8 over several parcels of land in the Greater Sydney Basin. Several small parcels occur in the vicinity of the M2 corridor, but are not within the M2 lease area.

The study area traverses two Local Aboriginal Land Council (LALC) areas, the boundary of which passes along Darling Mills Creek. Deerubbin LALC occupies the area west of Darling Mills Creek, and Metropolitan LALC occupies the area east of Darling Mills Creek (i.e. the majority of the study area). The Deerubbin Local Aboriginal Land Council responded on 4 November formally registering their interest in consultation. They did not provide any further information on potential Aboriginal stakeholders. The Metropolitan Local Aboriginal Land Council did not formally respond to the invitation to register, but were registered as a stakeholder anyway.

The Baulkham Hills Shire Council responded on 9 November 2009 recommending six Aboriginal individuals from four organisations for consultation, including DTAC and DLALC who had already registered. Notification letters were sent to the other two organisations on 10 November 2009.

The Office of the Registrar of Aboriginal Owners responded belatedly on 9 December (received 18 December) noting that there were no Registered Aboriginal Owners in the study area.

As a result of this process, and after the 10-day response period required under the ICCRs, a total of five Aboriginal groups registered their interest in being consulted.

Table 1: Aboriginal Stakeholders Identified for this Project

Organisation	Contact Name
Metropolitan Local Aboriginal Land Council (MLALC)	Alan Madden
Deerubbin Local Aboriginal Land Council (DLALC)	Steve Randall
Darug Tribal Aboriginal Corporation (DTAC)	Sandra Lee
Yarrawalk Enterprises (Yarrawalk)	Scott Franks
Darug Custodian Aboriginal Corporation (DCAC)	Leanne Watson
Darug Aboriginal Cultural Heritage Assessments (DACHA)	Celestine Everingham/Gordon Morton
Darug Land Observations (DLO)	Gordon Workman

Briefing Letter/Methodology Advice and Focus Group Meeting

Briefing letters were sent to all registered Aboriginal stakeholders on advising the proposed methodology for the assessment (example in **Appendix B**) on 26 November 2009. The letters advised that the assessment will be conducted in stages as per the relevant guidelines for RTA and Part 3A projects. The briefing letters advised that field inspections had previously been conducted in March 2009 in consultation with MLALC, and no heritage constraints were identified. Stakeholders were also asked to provide any information they could on the Aboriginal socio-cultural heritage values of the study area.

The briefing letter also described the methodology used to conduct the field inspection including the use of a targeted sampling regime that investigates areas of potential heritage constraint as identified during the desktop assessment. These included areas of archaeological potential including creeklines, ridgetops, and sandstone outcropped slopes within 100 m of the M2 corridor.

An Aboriginal Focus Group meeting was held on Friday 11 December 2009 and all registered Aboriginal stakeholder groups were invited to take part. During the meeting a PowerPoint presentation of the initial results of the preliminary assessment (i.e. the desktop assessment and Phase 1 field inspections) was given (copy in **Appendix B**). All Aboriginal stakeholders were requested to comment on the results.

The briefing letter also included a response form that stakeholders could use to respond to the methodology. The response form provided space for stakeholders to endorse the methodology or to provide feedback on alternative methods, and to provide any information on the cultural (social) values.

Table 2 below lists the Aboriginal stakeholders that took part in the Focus Group meeting.

Table 2: Aboriginal Stakeholders Represented at the Aboriginal Focus Group Meeting on 11 December 2009

Organisation	Contact Name
Metropolitan Local Aboriginal Land Council (MLALC)	Alan Madden
Yarrawalk Enterprises (Yarrawalk)	Scott Franks
Darug Custodian Aboriginal Corporation (DCAC)	Leanne Watson
Darug Aboriginal Cultural Heritage Assessments (DACHA)	Gordon Morton
Darug Land Observations (DLO)	Gordon Workman

DLALC and DTAC were unable to take part in the Focus Group meeting. Two main issues were raised at the meeting by Aboriginal stakeholders:

- During the briefing, it was mentioned that the Aboriginal sites in close proximity to the M2 Motorway had been monitored (for physical impacts) for a period of 10 years since the construction of the motorway in 1997. Aboriginal groups stated that they were unaware of any monitoring taking place and expressed dissatisfaction that no Aboriginal groups appear to have been involved in the monitoring process. Leanne Watson of DCAC advised that a Care Management Agreement was in place with Baulkham Hills Council that required Aboriginal participation in a program of monitoring (see **Section 5.1** and **Appendix C**)
- Objection was raised that field inspections had been conducted during the first round of fieldwork without Aboriginal community involvement. Despite explanations that the field inspections were conducted in consultation with MLALC and were done in accordance with the DEC (2005) and RTA (PACHCI) guidelines, Aboriginal groups stated that the inspections could only comment on archaeological values, not socio-cultural values. A second round of field inspections had already been planned, but it was agreed that previously inspected sites would be re-inspected during the second field inspection so that Aboriginal stakeholders had the opportunity to familiarise themselves with the previously inspected sites.

Fieldwork

Field inspections were conducted in two stages:

1) The first round of field inspections was conducted by AECOM archaeologists Neville Baker and Geordie Oakes in March and April 2009. MLALC were invited to take part but declined the invitation and suggested the inspection be undertaken without MLALC (Alan Madden) and to advise them if anything significant was found.
2) The second round of field inspections was conducted from 15 to 17 December 2009 by AECOM archaeologists Rick Bullers and Tessa Corkill, in conjunction with registered Aboriginal stakeholders. **Table 3** below identifies the stakeholders and their representatives that took part in the field inspections.

Table 3: Aboriginal Stakeholders that took part in the Field Inspections 15 December to 17 December 2009

Organisation	Contact Name	Day/Dates		
		Tues 15 Dec	Wed 16 Dec	Thurs 17 Dec
DLALC	Steve Randall	☑	☑	☑
DTAC	John Reilly	☑	☑	☑
Yarrawalk	Scott Franks	☑	☑	☑
	Danny Franks			☑
DCAC	Leanne Watson	☑	☑	☑
	Jessica Wright	☑	☑	☑
DACHA	Gordon Morton	☑	☑	☑
	Tim Wells	☑	☑	☑
DLO	Gordon Workman	☑		☑
	Ron Workman	☑	☑	☑

Six of the seven registered stakeholder organisations took part in the field inspections. MLALC elected not to take part in the second round of field inspections.

Aboriginal Stakeholder Field Survey Reports

In accordance with the RTA's PACHCI guidelines (RTA 2008), all Aboriginal stakeholder organisations that participated in the field inspections were requested to provide a written field survey report using PACHCI template No 3. A copy of the reports provided by the Aboriginal stakeholders are provided in full in **Appendix D**, and the recommendations have been incorporated into the final draft of this report. **Table 4** below provides a summary of stakeholder recommendations. Aboriginal stakeholders were requested to have their reports submitted by 12 January 2010. Follow up telephone calls and/or emails were made/sent on 19 January 2010 asking stakeholders to submit their reports.

Table 4: Summary of Aboriginal Stakeholder Recommendations

Organisation	Date	Recommendations	Comments
YW	21 Dec 09	Terrys Creek not be disturbed and a 100 to 200 m exclusion zone be placed around M2A1; Monitoring should occur if further development is considered in areas other than those in the current construction plan; The proponent should consider an offset in regard to any destruction; and The proponent should agree to a Heritage Management Plan and strategy.	Subsequent discussions with Yarrawalk agreed that any exclusion around M2A1 should occur on the southern side of the Terrys Creek bridge (where the site is) and the exclusion zone will not extend to the northern side of the bridge where works are to occur.
DLO	22 Dec 09	Works will not impact upon site M2A1, but DLO wants to be involved in any works in that area; Indirect impacts to CF3 (AHIMS 45-6-2161) may occur through vibration during construction. Periodic monitoring should occur.	
DTAC	19 Jan 2010	All sites identified in the study area must be monitored whist construction occurs in the vicinity.	
DACHA			Did not submit field survey report.
DCAC			Did not submit field survey report.
DLALC			Did not submit field survey report.

Circulation of Draft Report

A complete draft copy of the preliminary Aboriginal heritage assessment report was circulated to the registered Aboriginal stakeholder groups on 5 February 2010 seeking comments on the results of the preliminary assessment, as well as to seek information to inform a socio-cultural heritage significance assessment.

Aboriginal stakeholders were requested to make written comment on the draft report by 5.00 pm on 19 February 2010. A follow up email (or fax) was sent to all registered Aboriginal stakeholders on 15 February 2010 as a reminder of the closing date for comment.

Written responses were received from three of the registered Aboriginal stakeholder groups. A summary of responses is provided in **Table 5**. Recommendations made by the Aboriginal stakeholders were incorporated in to the final management commitments where relevant.

Table 5: Summary of Aboriginal Stakeholder comments regarding the Draft Preliminary Aboriginal Heritage Assessment Report

Organisation	Representative	Date Received	Comments
DLO	Gordon Workman	15 Feb 2010	Agrees with report recommendations but requests monitoring of construction activities in vicinity of CF3, and wants to be involved in any works carried out on this job site.
DACHA	Gordon Morton	19 Feb 2010	Generally agrees with the report recommendations except for recommendation 3 (iii) - DACHA requests monitoring at all known sites within 50 m of the M2 and ensure that fencing is erected. Requests special care and appropriate controls developed around M2A1 due to potential impacts.
DCAC	Leanne Watson	19Feb 2010	Generally agrees with report findings and is happy with consultation process. DCAC is unhappy with previous survey and management of sites in the M2 buffer (but not with this project), relating to the lack of a holistic approach to site assessment and lack of consultation in subsequent site monitoring. DCAC wants site 45-6-2543 AHIMS recording to be extended to include the adjacent rockshelter and is unhappy with the condition of 45-6-0977.
YW			Did not provide comment on the draft report.
DTAC			Did not provide comment on the draft report.
DLALC			Did not provide comment on the draft report.
MLALC			Did not provide comment on the draft report.

3.0 Environmental Context

Investigations of the distribution of Aboriginal objects and places include an analysis of information on the natural resources available in a region to gain an understanding of the range of cultural remains that can be expected. Resources are linked to the hydrology, geology and soil types in a region.

Water availability is a major influence on the intensity of Aboriginal occupation. Evidence, usually in the form of flaked stone artefacts, is often associated with permanent or semi-permanent water sources.

Soil types are influential as accumulating sediments can cover cultural remains while areas of sediment removal through erosion can either uncover buried archaeological material or transport small items away from the original depositional context. Soil analysis has important ramifications for archaeological research through the potential impact of different soils on human activity (such as agricultural exploitation) and the impact of the soils on archaeological evidence (such as post-depositional movement). The soils known to occur throughout the study area are identified in order to delineate their nature and impact on the survival and location of archaeological material.

A detailed section on the ethno-historical and archaeological context of the study area is also presented below in **Section 4.0** to provide context for this assessment.

Information on the geology and soil landscapes and topography in the region of the study area is presented below. This data was used in the development of the fieldwork methodology and discussion on the results of the field inspection at the end of this report.

3.1.1 Climate

The study area has a temperate climate consisting of warm to hot summers and cool to mild winters. The warmest month is January, with an average temperature range between 18.6-25.8°C. The coolest winter month is July, with average temperatures between 8-16°C. However, daily temperatures can reach considerably higher or lower than these ranges. The average annual rainfall for this area is 1132.6mm (Bureau of Meteorology 2009).

3.1.2 Topography and Hydrology

The study area passes through several topographic environments as it winds it way across a number of Sydney's north-western suburbs. From the western extent of the M2 in the suburb of Baulkham Hills to the eastern end near Lane Cove the study area passes through the physiographic regions known as the Hornsby Plateau and the Harbour Foreshores. These regions are part of the greater Sydney Basin an area of Triassic sediments that dip gently from the east and north to a central lowland area south-west of Parramatta. The topography of these regions can be generally characterised as rugged, rolling to very steep hills, hillcrests and ridges on Hawkesbury Sandstone (Chapman and Murphy 1990). Local relief ranges from 20-120m with slopes of 5-25%.

Due to the study area's physical extent, a number of watercourses intersect with and/or run adjacent to it. A small un-named water course, running in a north to south direction, is located approximately 1 km east of Windsor Road. Further east, a complex of connected watercourses includes Morinda Creek to the west, Darling Mills Creek in the centre and Blue Gum Creek at the eastern edge drains southwards into the Parramatta River. Devlins Creek occurs about 1 km east of Pennant Hills Road and crosses the study area at several points. Terrys Creek crosses the M2 about 1.5 km east of Beecroft Road and runs generally parallel to the M2 as it meets Lane Cove River to the north of the M2. Further east Mars Creek and Shrimptons Creek also cross the M2 and drain northwards into Lane Cove River (**Figure F3:** M2 Motorway Alignment and AHIMS Site Locations); the banks of these two creeks has been heavily modified by the Macquarie Park developments.

Drainage lines are found on exposed bedrock and often contain deposits of up to 100 cm of gravel, loose quartz sand or other transported sedimentary material (Chapman and Murphy 1990).

3.1.3 Geology and Soils

The broad geology of the Sydney region is dominated by the Triassic Narrabeen Group which outcrops in the Erina Hills along the coast north of Narrabeen and the Middle Triassic Hawkesbury Sandstone that outcrops extensively on the Hornsby Plateau and the McDonald ranges. The Triassic Narrabeen Group consists of interbedded laminate, shale, quartz sandstone and lithic sandstone. The Middle Triassic Hawkesbury Sandstone overlies the Narrabeen Group and consists of medium to coarse-grained quartz sandstone with minor shale and laminate lenses (Chapman and Murphy 1990: 2).

Chapman and Murphy's (1990) studies of soil landscapes in the Sydney region indicate the study area crosses numerous types of soil environments. These include Gymea (gy), Blacktown (bt), Glenorie (gn), Hawkesbury (ha), Lane Cove (lc) and Luddenham (lu). These are summarised below:

- Gymea (gy) soils occur extensively throughout the Hornsby Plateau. They consist of shallow to moderately deep (30-100 cm) yellow earths and earthy sands on crests and inside of benches; shallow (<20 cm) siliceous sands on leading edges of benches; localised gleyed podzolic soils and yellow podzolic soils on shale lenses; shallow to moderately deep (<100 cm) siliceous sands and leached sans along drainage lines. These present a high erosion hazard (Chapman and Murphy 1990: 64);
- Blacktown (bt) soils occur extensively on the Cumberland Lowlands and occupy small parts of the western boundary of the study area near Baulkham Hills. They consist of shallow to moderately deep (<100 cm) red and brown podzolic soils on crests, upper slopes and well drained areas; deep (150-300 cm) yellow podzolic soils and soloths on lower slopes and in areas of poor drainage (Chapman and Murphy 1990: 30);
- Glenorie (gn) soils occur north of the Parramatta River on the Hornsby Plateau in Baulkham Hills, Hornsby, Kuring-Gai, and Ryde local government areas. They consist of shallow to moderately deep (<100 cm) red podzolic soils on crests; moderately (70-150cm) red and brown podzolic soils on upper slopes; deep (>200 cm) yellow podzolic soils on lower slopes and humic gleys, yellow podzolic soils and gleyed podzolic soils along drainage lines. These soils are a high erosion hazard (Chapman and Murphy 1990: 68);
- Hawkesbury (ha) soils occur on the steep, rugged, Hawkesbury Sandstone slopes and ridges of the Mcdonald Ranges, Hornsby Plateau and Hawkesbury Valleys. These consist of shallow (>50 cm), discontinuous lithosols/siliceous sands associated with rock outcrop; earthy sands, yellow earths and some yellow podzolic soils on the inside of benches and along joints and fractures; localised yellow and red podzolic soils associated with shale lenses; siliceous sands and secondary yellow earths along drainage lines. These soils are subject to erosion (Chapman and Murphy 1990: 44);
- Lane Cove (lc) soils occur on the floodplain of the Lane Cove River and its tributaries which includes parts of North Ryde, West Killara, West Chatswood and Lane Cove West, and only account for a minor part of the study area. These consists of deep (>200 cm) alluvial loams and various buried alluvial and marine soils. These areas are subject to flooding and present a high soil erosion hazard and seasonal water logging (Chapman and Murphy 1990: 86); and
- Luddenham (lu) soils occurs primarily towards the south and the west in the Cumberland Lowlands. These consist of shallow (<100 cm) dark podzolic soils or massive earthy clays on crests; moderately deep (70-150cm) red podzolic soils on upper slopes; moderately deep (<150 cm) yellow podzolic soils and prairie soils on lower slopes and drainage lines. These soils are subject to high soil erosion, (Chapman and Murphy 1990: 63).

3.1.4 Flora and Fauna

Much of the study area's original natural vegetation has been extensively cleared for agriculture and urban development. Originally wet and dry sclerophyll woodland and open-forest dominated the study area but this vegetation is now largely confined to ridges and upper slopes. However, areas of Lane Cove and west of Baulkham Hills still retain tracts of wet sclerophyll forest or woodland. Common species include red bloodwood (*Eucalyptus gummifera*), yellow bloodwood (*E. eximia*), scribbly gum (*E. haemastoma*), brown stringybark (*E. captellata*), old man banksia (*Banksia serrata*), Sydney blue gum (*E. salinga*) and blackbutt (*E. pilularis*).

A search of the Atlas of NSW Wildlife lists 515 faunal species located in the general region of the study area. Species recorded include 30 amphibian species, 329 bird species, two gastropod species, three insect species, 96 mammal species and 54 reptile species.

Common species include the common eastern froglet (*Crinia signifera*), red-browed finch (*Neochmia temporalis*), silvereye (*Zosterops lateralis)*, bush rat (*Rattus fuscipes*), common brushtail possum (*Trichosurus vulpecular*) and the grey-headed flying-fox (*Pteropus poliocephalus*).

Although the current flora and fauna inhabiting the study area are not necessarily representative of the range and quantity present prior to non-Indigenous settlement, the composition of flora and fauna species present are indicative that there were probably sufficient resources to support a population of hunter-gatherers.

3.1.5 Past Land Use

Much of the study area has been heavily impacted by past agricultural land use and urban development, including the construction of the current M2 Motorway. As a result, considerable areas of natural vegetation and topography have been cleared and/or considerably altered. Today, areas running adjacent to the northern and southern edges of the M2 Motorway consist of low to high density residential housing and/or light to heavy industrial complexes.

However, some areas have undergone a lesser degree of alteration, and still retain their original geography. These tend to be steeper sections of the landscape which are often used for recreational purposes and in many cases have substantial remnant vegetation. Such areas include the Lane Cove Recreation Area; Berriwerri Reserve; Chilworth Recreation Reserve; Darling Mills State Forest; and Bidjigal Reserve.

3.1.6 Implications for Aboriginal Archaeology

The environmental conditions of the study area can be summarised as an area of temperate climate with rugged, rolling to very steep hills, hillcrests and ridges on Hawkesbury Sandstone, and a medium density drainage net of waterways. Soils are generally prone to erosion and in some instances water-logging. Large areas of the study area have been impacted by urban development, however, relatively undisturbed landscapes and vegetation occur in nature reserves and some steeper sections of the study area. This remaining vegetation supports a diverse range of fauna.

The study area lies in predominantly sandstone country with valleys and gullies with sandstone margins. The predominant archaeological sensitivity of these areas lies in their suitability for the formation of sandstone-based sites such as rockshelters, grinding-grooves and, to a lesser extent, art sites (including both pigment and engravings). Areas that contain extant native vegetation, such as in the major creeklines and reserves, may also contain culturally modified (scarred) trees.

The generally rocky conditions within the landscape are less suitable for open camp sites compared to the flatter and low undulating country of the Cumberland Plain further west. Furthermore, the soils in the study area are generally shallow and skeletal. These soils have little potential for the formation of subsurface archaeological deposit due to the highly erodible nature of the soils.

Urban development, including the development of the M2 itself, has highly impacted the study area. However whilst some areas have been extensively disturbed, others have not. Areas of steep-sided valleys and gullies have not been developed due to their unsuitable geography, and still retain a large portion of their original vegetation. Many of these areas have also been set aside as reserves and are exempt from development. It is these areas that were targeted for closer inspection during this investigation.

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4.0 Ethno-Historical and Archaeological Context

4.1 Ethno-history

Much of what is known about the Aboriginal inhabitants of an area comes from ethno-historical accounts. However, ethno-historical records of the Aboriginal people of the Sydney region are relatively sparse and often open to debate. The first written descriptions of the Aboriginal people in the Sydney region come from the writings of early explorers, such as Cook, Banks and Sydney Parkinson. There were few subsequent observations until the lack of fertile soils in the Port Jackson area led Governor Phillips to explore large areas of the Sydney region in the hope of locating arable land.

The expansion of European settlement in the Sydney region introduced a period of rapid decline in Aboriginal population numbers through introduced disease, conflict and dispossession of land and few attempts had been made to record the customs and languages of 'tribes' in the Sydney region (AECOM 2007: 14). Consequently, observations of Aboriginal life in south western Sydney were made largely after the massive social disruption following near population collapse and very little is known about the Aboriginal occupants of the Cumberland Plains at the time of first contact (Haglund 1982; Ross 1988).

Language and Territory

According to Attenbrow (2002: 22-35) Aboriginal groups in the Sydney region can be divided into five distinct language groups, each broken into smaller clans (local descent groups) and bands. The people occupying the study area belonged to the Darug language group (Attenbrow 2002: 23), which occupied the Sydney peninsula (Darug *Coastal*) and much of the central Cumberland Plain west of Parramatta (Darug *Hinterland*).

The boundaries of the language group lands are not always precise lines and many cultural customs relating to land use and responsibilities for Country mean boundaries are 'blurred' zones and can change over time (Sutton 1995, cited in Attenbrow 2002: 29). However, the people inhabiting the study area were well within the area generally accepted as being Darug.

Population

Early colonial records suggest that Aboriginal population densities west of Parramatta were lower than along the coast (Hunter 1793, cited in Attenbrow 2002: 17). Kohen (1995: 81) estimates the inland population density at about 0.5 persons/ sq. km, and the total population in the greater Sydney region (including the lower Blue Mountains) as between 4-5,000 and 8,000. The 1789 smallpox epidemic killed many Aboriginal people even before Phillip's 1791 expedition crossed the Cumberland Plain. By the 1820s Reverend William Walker listed nine 'tribes' in the Sydney region, but only three as "numerous".

Economy, Resource Use and Material Culture

Aboriginal people generally moved regularly across the land in small family groups subsisting predominantly on plant foods such as yams from the river plains and other plant foods such as the flowers of Banksias and pounded roots of ferns. Kangaroos, wallabies, possums, koalas, bandicoots, dingos, wombats, echidnas, fruit bats and other smaller mammals such as rats and mice, were among the wide range of animals that were available to Aboriginal hunters (Attenbrow 2002: 70). These animals are generally non-migratory and seasonal abundance did not vary markedly, with the exception of possums, which are most easily caught from tree hollows in winter when they are less active. The method of hunting involved building a fire at its hollow base to smoke the possum out, which would be clubbed on emergence. A regular part of the men's toolkit observed at contact was the stone headed hatchet slung from a string belt which was particularly useful in chopping footholds in trees for this purpose. Complex traps were built to hunt birds and large nets were used for hunting kangaroos.

Trade in various goods is well documented in parts of south eastern Australia. Items such as axe heads, wooden implements, coastal shell goods, hair string and lumps of resin or beeswax for hafting were typical trade items. In some parts of Australia craft specialisations were developed in the manufacture of stone tools from particular sources. Stone knives and spear points from certain quarries in the Northern Territory were traded as far as Victoria.

4.2 Regional Archaeology

The study of Aboriginal archaeological sites did not commence in the Sydney region until the late 19th century (Attenbrow 2002: 5). Since then, over 4,000 archaeological sites have been recorded across the region, and hundreds have been excavated (Attenbrow 2002: 48). These sites commonly contain midden material, stone artefacts and engraved or pigmented images. They occur as open artefact scatters, isolated artefacts, or in and around rockshelters. Plant materials rarely survive in Sydney region sites aside from small amounts of hafting material, such as resin, small fragments of twine, and some paperbark fragments (Attenbrow 2002: 97).

Present archaeological evidence suggests that human occupation of Australia began between 60,000 and 40,000 years BP, however these dates have not been universally accepted (Attenbrow 2002: 152). Radiocarbon determinations of over 100 sites in the region have revealed that occupation begins in the early Pleistocene with archaeologically visible occupation beginning in the early Holocene (c.10,000 BP) (McDonald 2008: 36). Rockshelter SF2 (AHIMS 45-6-2097) at Darling Mills Creek was occupied around 10,000 years and Attenbrow (2002: 154) conjectures that occupation there was a result of Aboriginal people beginning to move to higher ground as sea levels rose. This site is the only site listed on the AHIMS register within a 1 km radius of the study area that has been subject to dating analysis, but it is likely the other sites in the surrounding area, including the rockshelters in the study area, have similar dates to SF2.

Stone tool manufacture underwent a change from the largely Pleistocene-Holocene sequence of core tool and scraper tradition to the small tool tradition prevalent during the mid to late Holocene. Artefacts found at Darling Mills Creek site SF2 dated to c.10,000 BP show that the larger stone tool types prevalent during the Pleistocene continued to be used in the Early Pleistocene, but in greater numbers. In addition, new stone 'backed' asymmetrical implements (such as Bondi points) began to appear. From the Late Holocene (commencing approximately 5,000 BP), backed implements became the characteristic tool type. These implements, such as Bondi points, geometric microliths, Elouera and other retouched flakes, became much smaller than previously manufactured and formed the 'Small Tool Tradition'.

5.0 Heritage Search Results

5.1 Native Title

In 1994 a Native Title claim was lodged with the National Native Title Tribunal (NNTT) by Ian (Bundeluk) John Watson on behalf of the descendents of the Darug people (claim number NC94/6). Claim No. NC94/6 covers an area of land and waters in the Baulkham Hills Shire LGA and the Sydney Metropolitan area (see map in NNTT Search Results in **Appendix B**). The application area includes Excelsior Park and the land comprising the remainder of the Darling Mills State Forest (now known as "Bidjigal Reserve") adjacent to the M2 Motorway at the western end of the M2 Motorway corridor.

At a meeting on 15 September 2001, persons identifying as Darug descendents unanimously resolved to support the Bidjigal Reserve Agreement and to authorise Ian (Bundeluk) John Watson and Colin Gale to represent all Darug descendents (Colin Gale subsequently withdrew his representation of Darug descendents in August 2002).

In 2003 Deed of Agreement for Bidjigal Reserve was entered into between the Native Title Claimants and the NSW government to identify lands within the Bidjigal Reserve, to establish a Reserve Trust and to provide for the withdrawal of Native Title Application NC94/6 (**Appendix C**).

5.2 Previous Archaeological Studies

In order to develop a predictive model of the distribution, density and site types that occur in the study area it is necessary to review archaeological work previously undertaken in that environment. A number of surveys and excavations have been carried out in the vicinity of the study area. The majority of these assessments and excavations have been undertaken in support of the development of the M2 Motorway (formerly known as the F2 or Castlereagh Freeway).

The most relevant of these assessments are summarised below.

Haglund (1989) undertook a preliminary survey for Aboriginal sites along the F2 (Castlereagh Freeway) and Pennant Hills Road to Lane Cove River for the then Department of Main Roads (RTA), NSW. One previously recorded site (AHIMS 45-6-977) was re-identified and six new sites were found, including two rockshelters with middens, two rockshelters with potential occupation deposits and two engraving sites. A further 19 areas were identified for further investigation.

Haglund (1991) undertook an assessment of Aboriginal heritage for the RTA. The study area covered part of the F2 from Pennant Hills Road at Beecroft to Pittwater Road at Ryde. Four archaeological sites were identified (LC/1, LC/2) during the survey and one previously recorded site was re-identified (AHIMS 45-6-977). These were all rockshelter sites: two rockshelter complexes with art and stone artefacts, two rockshelters with stone artefacts and one rockshelter with artefacts and possible art. Seven rockshelters with potential archaeological deposits (PAD) and three rockshelters with habitation potential were also identified.

Corkill (1991) undertook *A Survey of the CSIRO Site in North Ryde, NSW* for the Rice Daubney Group. The intention of the survey was to locate any Aboriginal archaeological sites with the CSIRO site at Delhi Road, North Ryde. The survey relocated CSIRO Site (AHIMS 45-6-1854) and recorded it in greater detail. In addition, a rockshelter with PAD was found and recorded and several sandstone exposures were identified as possible venues for rock engravings.

Corkill (1992) undertook a *Darling Mills Creek Stormwater Management Strategy Preliminary Survey for Aboriginal Archaeological Sites* for the Upper Parramatta River Catchment Trust. The fieldwork resulted in the identification of two and possibly three new archaeological sites in addition to the relocation of two previously known sites in the Darling Mills Creek area. Twelve new and six previously known PAD sites were found. A total of 25 potential habitation rockshelters were also flagged. Of the new archaeological sites, two were rockshelters with deposits and one was a rockshelter in which two possible Aboriginal stencils were found.

Attenbrow (1992) undertook an archaeological excavation of a rockshelter (AHIMS 45-6-2097) of considerable significance located at the western end of the study area. Several thousand stone artefacts were recovered, plus a large component of faunal remains. The raw materials of the artefacts recovered include silcrete, chert, indurated mudstone, quartz, quartzite and basalt. Artefact types included were flakes, flaked pieces, cores and bipolar pieces. The lower floor levels of the deposit were dated to 6,700 BP and possibly over 10,000 BP (Attenbrow 1992, 1993), although there may be some discrepancy in the dating (T. Corkill, pers. comm, 2009).

Corkill (1993) excavated five rockshelters in the Darling Mills Creek Valley area, including two rockshelters with deposit (DMC 1, AHIMS 45-6-2548; DMC 6, AHIMS 45-6-2542) and three rockshelters with PAD (PAD 3, PAD 5 and PAD 6). The excavations confirmed two of the PADs as sites: PAD 5 was redesignated DMC 7 (AHIMS 45-6-2543) and PAD 6 was redesignated DMC 8 (AHIMS 45-6-2544). The test excavations only yielded a total of 40 artefacts, of which 16 are suspect, and more still may be fragments of the same tool. No sign of habitation was found in PAD 3. Corkill concluded that the sites have been disturbed to various levels by flooding, roof-fall and public visitation. The sites were assessed as having low significance.

Corkill (1994) undertook a survey for archaeological sites at Toongabbie Creek to fulfil an earlier recommendation (Corkill 1990b) that Toongabbie Creek should be surveyed once the final route of the M2 was identified. The survey found one Aboriginal site: TC1 (AHIMS 45-5-0970), consisting of eight stone artefacts on the creek bank. Subsequent test excavations at the site by Edgar (1994) yielded a total of 117 stone artefacts. Edgar concluded that the site was highly disturbed and there was little that remained in context. He recommended that a Consent to Destroy be issued.

Corkill (1995a) assessed a series of rock piles that were alleged to be Aboriginal burials in the path of the M2 at Devlins Creek. The investigation concluded that they were European in origin, most likely relics of WWII army training that had occurred in that area. The only definite Aboriginal site assessed was the rockshelter DC1 previously assessed and excavated by Haglund (1995).

Corkill (1995b) conducted a final Aboriginal heritage assessment of the western end of the M2 Motorway corridor between Toongabbie Creek and Windsor Road following rerouting as a result of previous recommendations (Corkill 1990; Haglund 1990). The survey identified two artefact scatters (WH1 and WH2) approximately 1 and 1.8 km east of Old Windsor Road respectively. The sites were in disturbed contexts with low significance, and Corkill recommended Consents to Destroy be issued for the two sites. Neither site appears in the AHIMS register (see **Section 5.4**). Erosion from a site located uphill from this site has been attributed to their occurrence.

Corkill (1995c) conducted test excavations at a possible Aboriginal rockshelter site that had been identified as a PAD previously. The excavations confirmed the site (redesignated CF6) as an Aboriginal rockshelter. A total of 137 Aboriginal stone artefacts were recovered during the excavation. The dominant raw material of recovered artefacts was quartz (91) and followed by silcrete (40), chert (5) and basalt (1). The site was highly disturbed and a variety of 20th century European material was recovered from the surface and excavated material. including fibro, lino, masonite, plastic, nails, (copper and iron), glass, ceramics, bottle tops, metal strips, filter tips, brick fragments and part of a perfume bottle. Excavations of the shallow floor deposits indicated an extremely disturbed stratigraphy and Corkill concluded that the rockshelter was of “minimal” scientific significance. Corkhil recommended a Consent to Destroy be issued.

Crew (1995) undertook an *Archaeological Survey for Aboriginal Sites Delhi Road – Main Road No 191. Northern Suburbs Crematorium to River Avenue, Lane Cove, NSW* for the NSW Roads and Traffic Authority. The survey resulted in the identification of one potential habitation shelter in the eastern end of the survey area.

Haglund (1995) undertook *The Proposed M2 Motorway: Investigation of Aboriginal Heritage Significance Test Excavation of Rock Shelter PAD1/DC1on Devlins Creek, Pennant Hills – Beecroft* for the NSW Roads and Traffic Authority. The excavation of the rockshelter site (AHIMS number unnown) resulted in the recovery of approximately 602 artefacts from two 50 x 50 cm test pits. The base of the excavation was dated to *c*.1,400BP. The majority of the artefacts were quartz and silcrete.

Guider (1995) undertook an *Aboriginal Site Survey – M2 Tollway, Terrys Creek, NSW* for local residents. Three rockshelters were found within the immediate vicinity of the M2 and all were classified as having Potential Archaeological Deposits within them. No sites were found to be disturbed by the M2 Tollway.

Guider (1995) undertook an *Aboriginal Site Survey – M2 Tollway, Darling Mills Creek, NSW* for local residents. Ten rockshelters were found within the vicinity of the Darling Mills Creek. One rockshelter site contain 11 artefacts and a white hand stencil. The remaining nine sites were classified as having Potential Archaeological Deposits. The survey also identified several trees as potentially being Aboriginal scarred trees. One previously excavated site was identified.

Corkill (1996) set up a monitoring program for sites DMC 7 (AHIMS 45-6-2543), DMC 8 (AHIMS 45-6-2544) and PAD 8, to assess the affects of periodic flooding resulting from the construction of a flood retarding basin in the Darling Mills Valley. The first two sites were low in the valley and were likely to experience periodic flooding, whilst the third rockshelter was higher and out of the flood zone and could act as a control site. The report recommended analysis of data after five years (i.e. 2001).

Corkill and Edgar (1996) undertook an *Aboriginal Archaeology of M2 Motorway Salvage Excavation of Rockshelter Site CF6 Darling Mills State Forest Carlingford, NSW* for the NSW Roads and Traffic Authority. A total of 895 Aboriginal stone artefacts were salvaged from rockshelter CF 6 (AHIMS #45-6-2472). The dominant raw material of recovered artefacts was quartz (471) followed by silcrete (344), Chert (41), quartzite (22), basalt (9), mudstone (6), and lastly fine grained siliceous (2).

Corkill (1997a) conducted an assessment of the handstencils at two sites: CF3 (AHIMS 45-6-2161) and CF4 (AHIMS 45-6-2162) adjacent to the M2 corridor. In 2007, during the subsequent monitoring program for sites adjacent to the motorway, Corkill observed that a second modern hand stencil had appeared at CF4.

Corkill (1997b) undertook a *Test Excavation of Rockshelter, CSIRO PAD 1, Site 2 Riverside Corporate Park, North Ryde, NSW* for Australia Pacific Projects. Ten pits were excavated to bedrock. Fourteen small silcrete, chert and indurated mudstone artefacts were recovered. Along with the Aboriginal artefacts, 19th and 20th century European material was also present, mainly in the form of glass from brandy bottles (Corkill 1997:3). The European material was present both on the surface and in excavated surface units in almost all sample squares. Little evidence remains at this site to be able to determine past usage. From the interpretation of the stratigraphic and cultural components of the rockshelter, there may have been an original upper layer that has been removed from the rockshelter and its immediate surrounds. The low number of artefacts recovered from the excavation and lack of art means that this site is probably of low significance and was not frequently used.

Corkill and Haglund (1998-2008) undertook monitoring of Aboriginal archaeological sites identified as part of the M2 Motorway project. Monitoring occurred from July 1998 till May 2008 and was aimed at determining whether known rockshelter sites were being adversely affected by runoff or vibrations from the M2 Motorway. Two rounds of monitoring were performed each year. The program found that none of the sites being monitored were being significantly impacted as a result of the M2 Motorway. Erosional issues related to natural water seepage and the accumulation of rubbish were two issues reported.

Corkill (2000) conducted an analysis of the artfactual assemblage excavated by Attenbrow (1992) at the rockshelter site DMSF2 (AHIMS 45-6-2097). The rockshelter, measuring 22 x 5.5 x 3 m on a low cliffline, was excavated 1992 and radio carbon dating of two pits was 2,500 and 10,000 years BP. A total of 2,079 artefacts of mostly quartz material with lower percentages of silcrete and volcanic material was found.

Irish (2004) undertook an *Aboriginal Archeological Monitoring Report Lane Cove Tunnel Project: Mowbray Park Worksite, Lane Cove, NSW* for Theiss John Holland. It was determined by both the Consultant Archaeologist and the MLALC that there were no archaeological constraints to the sub-surface works.

Corkill (2008) provided a final (31st) monitoring report of rockshelter sites along the M2 Motorway. The rockshelters consist of seven sites (CF1, AHIMS 45-6-2160; CF2, AHIMS 45-6-2097; CF3, AHIMS 45-6-2161; CF4, AHIMS 45-6-2162; DMC 7, AHIMS 45-6-2543 and DMC8, AHIMS 45-6- 2544) in close proximity to the M2 corridor. Monitoring was instigated to determine any ongoing detrimental effects to the rockshelters attributable to the M2. None were identified.

5.3 Summary of Regional and Local Archaeology

Previous regional and local archaeological studies in the study region indicate that the predominant site type for the area is rockshelters associated with water courses and containing archaeological deposits. As the Sydney Basin is one of the richest archaeological provinces in Australia, with more than 3,000 rockshelters containing cultural deposits or art, these results are not surprising (Mulvaney and Kamminga 1999:376). Many of these sites have been dated to less than 5,000 years old. Artefactual material for this period and region generally consists of stone tools including backed implements and associated manufacturing by-products.

5.4 Registered Aboriginal Sites

A search of the DECCW AHIMS register indentified 53 sites within 1 km of the M2 Motorway (**Figure F3:** M2 Motorway Alignment and AHIMS Site Locations). However another site, Aboriginal rockshelter DC1, did not appear in the AHIMS search results despite the site being excavated by Haglund (1995) under a Section 87 permit (#653) issued by DEC in 1994 (Corkill, pers comm.). This site occurs under the Devlin Creek M2 bridge (it is not known why DC1 does not appear on the AHIMS database). Of the 54 known sites, two were identified as duplicates of other sites reducing the total of individual sites to 52 (45-5-0886 is a duplicate of 45-6-2548 and 45-6-2513 is a duplicate of 45-6-2472). **Table 6** shows the relative frequency of different site types in the AHIMS search area. **Appendix A** and **Figure F3** shows the entire list of sites within the AHIMS search area, their site type and there location in relation to the study area.

Table 6: Summary of archaeological site types within the study area

Site Type	Number of Sites	Percentage
Axe Grinding Grooves	3	6
Isolated Find	1	2
Open Camp Site	6	12
PAD	1	2
Rock Engravings	3	6
Shelter with Art	2	4
Shelter with Deposit	31	58
Shelter with Midden	2	4
Unknown*	3	6
Total	**52****	**100%**

* Site card unavailable; site type unknown

** Sites include 53 AHIMS-registered sites and one additional known site (DC1) less the two duplicate site cards.

Three site cards (AHIMS 45-5-2892, 45-6-0981 and 45-6-1887) were missing from the DECCW library and as a result the site types are unknown, although the site name for AHIMS 45-6-1887 suggests that it is a grinding groove site and discussions with archaeologist Mary Dallas confirmed that AHIMS 45-5-2892 is a rockshelter.

Many sites consist of multiple site types, particularly rockshelters which often have associated sites such as art (either pigment or engraved), archaeological deposit, middens and/or axe grinding grooves. One open camp site, AHIMS site 45-5-0970, has an existing Section 90 AHIP over it. Rockshelter sites AHIMS 45-6-2472, 45-6-2097, 45-5-0886, 45-5-2542, 45-5-2543 and 45-5-2544 have been excavated as has one PAD site 45-6-2653.

Two additional Aboriginal sites occur in the general vicinity (but not within the study area. These sites are known to the Aboriginal community and were identified as a result of and abortive development proposal to construct an adventure playground facility within the Darling Mills Creek area. The sites consist of:

- scarred tree on Excelsior Creek north of the M2; and
- rockshelter with deposit, also several hundred meters north of the M2

These sites are not currently recorded within the AHIMS database (L. Watson, DTAC, pers. comm).

5.4.1 Registered Sites within the Study Area (100 m Buffer)

The sites identified in the AHIMS search were plotted on a map (**Figure F4:** M2 Motorway Aborigibal Heritage Preliminary Constraints Mapping – Western Section to **Figure F6:** M2 Motorway Aboriginal Heritage Preliminary Constraints Mapping – Eastern Section) and sites within the study area (i.e. within 100 m of the M2 Motorway) were identified. Site DC1 (see above) also occurs within the study area. However, two registered sites (45-6-2472 and 45-6 2513) are separate recordings of the same site. Therefore there are a total of 15 known Aboriginal sites within the study area (**Table 7**).

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Table 7: Aboriginal Sites within the Study Area Identified in the AHIMS Search

AHIMS No.	Site Name	AHIMS Site Type	MGA Easting*	MGA Northing*	Description	Within 100 m of the Study Area?
45-5-1005	IFCH1;	Isolated Find			Corkill (1996a). Single stone artefact near Beecroft Road found in excavation trench. Artefact left in situ. Condition: very disturbed.	Yes
45-5-2892	PHGC 1 (Hills Golf Course)	Unknown			Site card not available. Rock shelter recorded by Mary Dallas in 1996 (Corkill, pers. com.).	Yes
45-6-0977	Epping;Lane Cove River;little bloodwood;	Shelter with Deposit			Taplin (1960s); Attenbrow & Cutmore (1989). Shelter above small freshwater creek, rubble deposit, artefacts recorded 1960s but none observed 1989.	Yes
45-6-1854	L C/2 Lanecove 2 Epping Road Bridge	Shelter with Midden			Haglund (1989); Attenbrow (1989), Lane Cove River. Shallow overhang 10 x 1 x 5 m. Shell material, orange pigment on back wall.	Yes
45-6-1855	L C/1 Lanecove 1	Shelter with Midden			Haglund (1989), Lane Cove River. Shelter with two parts, 2 m apart: 1) 8.3 x 2 x 3 m, shell material; 2) 6.5 x 1.6 x 3.5-4 m, sandy floor, no surface material.	Yes
45-6-1953	Pages Creek Cave;	Shelter with Deposit			Guider (1990), Pages Creek. Shelter, approx 24 x 3.3 x 4.5 m with large midden and stone artefacts and grinding grooves associated.	Yes
45-6-2097	Darling Mills S. F. 2 - CF2	Shelter with Deposit			Attenbrow & Edgar (1989); Corkill (2000, 2008), Darling Mills Creek. Shelter 22 x 5.5 x 3 m, low cliffline, deposit on floor, two surface artefacts. Site excavated 1992 (Attenbrow) and radio carbon dating of two pits was 2,500 and 10,000 years BP. A total of 2,079 artefacts ofmostly quartz material with lower percentages of silcrete and volcanic material. Condition: disturbed - graffiti, campfires, frequent use by public. Continued monitoring to 2008 identified no impacts associated with the M2 Motorway. Glass "tell-tales" inserted in wall cracks by M2 construction crew were all broken as a result of vandalism.	Yes
45-6-2160	CF1 a b;Cumberland S.F.;	Shelter with Deposit			Corkill (1990, 2008); two shelters, 3.5 m apart – 1) 14 x 4 x 2.1, no art, 4 silcrete artefacts; 2) 2 x 2.9 x 1.2 m; charcoal art on 18 x 53 cm area of back wall. Condition: fair to good. Continued monitoring to 2008 identified no impacts associated with the M2 Motorway.	Yes

AHIMS No.	Site Name	AHIMS Site Type	MGA Easting*	MGA Northing*	Description	Within 100 m of the Study Area?
45-6-2161	CF3;Cumberland S. F.;	Shelter with Deposit			Corkill (1990, 1997, 2008); 30 m north of M2 corridor. Deep shelter 10 x 3.5 x 2 m, deposit with two surface artefacts at dripline. Charcoal on roof may be art. Very faint hand stencil recorded in 1997. Condition: disturbed: graffiti on roof; rubbish, frequently visited by locals. Continued monitoring to 2008 identified no impacts associated with the M2 Motorway, 30 m to the south.	Yes
45-6-2162	CF4 a b;Cumberland S.F.;	Shelter with Deposit			Corkill (1990, 1997), Darling Mills Creek. Two shelters 14 m apart; 1) shelter 12 x 5 x 1.5 m, sandy deposit, two artefacts, hand stencil; 2) shelter 5 x 3 x 5 m, sandy, charcoal-rich deposit, very faint hand stencil covered in graffiti on back wall. Condition: disturbed, graffiti. Continued monitoring to 2008 identified no impacts associated with the M2 Motorway, 40 m to the south. New white hand stencil observed in 2008.	Yes
45-6-2163	CF5;Cumberland S.F.;	Shelter with Deposit			Corkill (1990); Shelter with 8 x 1-2 m deposit. Wall too rough for art. One quartzite flake, three quartz pebbles	Yes
45-6-2472	CF6;	Shelter with Deposit			Corkill (1995c); Corkill and Edgar (1996), tributary/Darling Mills Creek. Shelter 10 x 3.5 x 1.5-1.7 m. loose sandy deposit. Test excavation indicates deposits disturbed and little stratigraphy, low scientific significance; S90 **Consent to Destroy (#739)** issued in 1995. Salvage excavation in 1996 retrieved a total of 895 artefacts with a similar assemblage to similar sites in the Sydney region.	Yes
45-6-2513	See 45-6-2472;				Same site as 45-6-2472 (Attenbrow)	-
45-6-2543	Darling Mills Creek 7;DMC 7; (formerly PAD 5)	Shelter with Deposit			Corkill (1993, 1996, 2008), Moorinda Creek/Darling Mills Creek. Rockshelter, 5 x 3 x 3 m, small area of deposit, subject to flooding. Test excavations in 1993 found about four artefacts of Bondaian age. Program set up in 1996 to monitor affects of flooding by Flood Retarding Basin. Continued monitoring to 2008 identified no impacts associated with the M2 Motorway 20 m to the south.	Yes

AHIMS No.	Site Name	AHIMS Site Type	MGA Easting*	MGA Northing*	Description	Within 100 m of the Study Area?
45-6-2544	Darling Mills Creek 8;DMC 8; (formerly PAD 6)	Shelter with Deposit			Corkhill (1993, 1996, 2008), Moorinda Creek/Darling Mills Creek. Rockshelter, 10 x 5.5 x 1.8 m, sandy deposit, subject to flooding. Test excavations in 1993 found only one artefact. Program set up in 1996 to monitor affects of flooding by Flood Retarding Basin. Continued monitoring to 2008 identified no impacts associated with the M2 Motorway, 25 m to the south.	Yes
Unknown**	Devlin Creek 1; DC1	Shelter with Deposit			Haglund (1995), Devlins Creek, directly under the M2 bridges. Rockshelter. Test excavations in 1995 under permit #653; however site did not appear in AHIMS search results. Continued monitoring to 2008 found site to be periodically flooded; physical impacts to the shelter appear to be minimal, although the M2 structures may have resulted in greater visitation and graffiti (Haglund 2008).	Yes

* Location coordinates have been removed from the Public Exhibition version of this report for site security reasons.

** Site DC1 did not appear on the AHIMS search results despite the site having been excavated under a Section 87 permit. Leila Haglund was contacted for further information, but she was unable to remember the AHIMS number; she was away on extended fieldwork in Queensland and did not have access to files.

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5.5 Study Area Site Prediction

Based on the distribution of known Aboriginal sites provided by previous studies and an AHIMS register search, and the types of landform elements found in the study area, statements can be made about the likelihood of archaeological sites being present within the study area, and what they may constitute.

Large parts of the study area have been subjected to significant modification due to urban and infrastructure development, particularly at the eastern end of the M2 around Macquarie Park and North Ryde. Lower density development has occurred in the centre and western sections of the M2 and consists largely of residential development and recreational development (e.g. Pennant Hills Golf Course), occurring mostly on higher ridges and plateaux along the route. Areas of less disturbed landscape occur in relation to some of the waterways in the study area, notably Darling Mills Creek, Blue Gum Creek, Devlin Creek and Terrys Creek, although minor impacts have occurred such as drainage modification and track construction. Creeklines at the eastern end (e.g. Mars Creek and Shrimptons Creek) have been highly impacted by urban development.

The following broad statements relating to site prediction can be made:

- rockshelters, or rock overhangs are naturally occurring rock formations and commonly occur in the study area, usually in association with creek valleys with sandstone bedrock outcrops. As indicated by previous research and AHIMS search results, these natural geological formations were often used by Aboriginal people for shelter and consequently often contain artefactual material. Monitoring studies of sites along the M2 between 1998 and 2008 have found that there has been no physical impacts to the sites from the development and operation of the M2;
- inland waterways are often a source of fresh water and home to a great variety marine life. Previous studies and known Aboriginal sites show that site distribution is dominated by the presence of waterways such as Darling Mills Creek, Blue Gum Creek, Devlins Creek, Terrys Creek, Mars Creek and Shrimptons Creek. As such, these waterways form likely areas of Aboriginal occupation; and,
- areas adjacent to the M2 Motorway that have been significantly disturbed by urban development reduce the likelihood of finding Aboriginal sites *in-situ.*

In light of the above statements, it can be concluded that the water courses in the study area occur as generally deeply cut valleys and gullies in Hawkesbury Sandstone geology, the erodible nature of which is conducive to the formation of rockshelters suitable for occupation as rockshelters. The number of rockshelters recorded during previous archaeological surveys shows that occupation of the valley sides occurred. Test excavations at several of the rockshelters suggests that artefacts are present where sufficient soil occurs in a habitable shelter. Open campsites are considered less likely to occur in these areas where there are abundant rockshelters and the lack of recorded sites supports this.

Other site features within the study area and the surrounding region include stone tools, shell middens and rock art. However, as many parts of the study area have been subjected to large-scale land disturbances associated with urban development the integrity of potential sites may have been compromised. In-situ archaeological remains are more likely to occur in areas of less landscape disturbance.

5.6 Preliminary Mapping of Archaeological Potential

A preliminary map of archaeological potential was produced (F**igure F4:** M2 Motorway Aboriginal Heritage Preliminary Constraints Mapping – Western Section to **Figure F6:** M2 Motorway Aboriginal Heritage Preliminary Constraints Mapping – Eastern Section), to determine the likelihood of possible impacts to recorded sites in the study area. Of the 53 site records in the AHIMS search area, 15 were deemed to be of interest during analysis of constraints based on their proximity within 100 m to the M2 corridor (**Table 7**). One site has two separate recordings giving a total number of actual sites of 14. The remaining 38 registered sites within the AHIMS search area were deemed to be too far from the construction works to be of any further interest.

A review of the reports described in **Section 5.1** identified several areas along the M2 corridor that those authors considered warranted further investigation. Those areas included:

- areas around Devlins Creek (Mount King Ecological Surveys 1988; Haglund 1989, 1992);
- Devlins Creek north of Barombah Road (Haglund 1989, 1992);
- Devlins Creek at the west end of Somerset Street
- Devlins Creek at west end of Beecroft Road (Haglund 1992);
- Terry's Creek – east and west banks (Hagland 1989, 1992)
- Terry's Creek along Somerset Street (Hagland 1989);
- the slopes of Mars Creek (Hagland 1989);
- Shrimptons Creek west of Alma Road (Haglund 1989);
- Shrimptons Creek (Haglund 1992);
- Chilworth Reserve below Welham Street;
- between Woodvale Avenue and Somerset Street (Haglund 1992);
- west of Crimea Road (Haglund 1992); and
- west of Busaco Road, North of Talavera Road (Haglund 1992).

These areas, along with the existing AHIMS site records, were compiled into a preliminary map of archaeological potential that was used to inform the field inspection (F**igure F4:** M2 Motorway Aboriginal Heritage Preliminary Constraints Mapping – Western Section to **Figure F6:** M2 Motorway Aboriginal Heritage Preliminary Constraints Mapping – Eastern Section). The areas were inspected, but only where they occurred within 100 m of the M2 Motorway.

6.0 Field Inspection Results

6.1 Registered Site Inspection

A site inspection program was conducted by AECOM in two distinct phases:

a) Phase 1, conducted in March and April 2009; and

b) Phase 2, conducted with Aboriginal stakeholders in December 2009.

6.1.1 Phase 1 Field Inspections

The first phase of field inspections were conducted by archaeologists Neville Baker and Geordie Oakes over five days on the 30-31 March and 6-8 April 2009 in consultation with MLALC. The inspections aimed at relocating previously recorded sites and confirming their location by use of DGPS. The inspections were not an archaeological survey for discovery purposes.

A total of nine previously recorded Aboriginal sites within the study area were visited during the first field inspection (**Table 8**). Seven sites were not inspected: AHIMS 45-5-1005, 45-5-2892, 45-6-1953, 45-6-2162, 45-6-2472(2513), 45-6-2544 and site DC1. These sites were not inspected due to difficulties in relocation, with the exception of:

- 45-6-1953 which clearly had incorrect coordinates registered in AHIMS and is well outside the study area. The registered site coordinates for AHIMS 45-6-1953 suggests that the site is approximately 50 m north of the M2. However, the site card clearly describes the site being well south of the M2 on Pages Creek. The area where the AHIMS coordinates place the site was inspected and no site was identified; and
- 45-6-2472 (2513) which was previously destroyed under an s90 permit.

6.1.2 Phase 2 Field Inspections

Following consultation with the Aboriginal community (see **Section 2.3.2**), a second site inspection program was conducted over three days from 15 to 17 December 2009.

The second phase of inspections aimed to re-identify sites that were missed during the first phase and involve the Aboriginal community in the field inspections. Tessa Corkill, the archaeologist that had previously identified the majority of rockshelters near the M2, was also engaged to provide background information on the sites and to assist with the inspections due to her extensive knowledge of the sites.

A total of nine registered sites were inspected during the second phase, including six of the sites that were not inspected during the first phase (**Table 8**). No physical impacts to the sites were observed as a result of the M2.

One previously unrecorded site was identified during the inspection:

Site M2A1, Terrys Creek

This site consists of an area of grinding grooves on a sandstone bedrock platform in the Terrys Creek channel. The site is located on the southern side of the M2 commencing directly beneath the southern edge of the westbound bridge. The site extends approximately 20 x 5 m, and consists of a series of grinding grooves and hollowed-out grinding dishes. Some grooves are angled perpendicular to the waterflow, whilst others (at the downstream end of the platform) run with the waterflow (**Plates 1** to **3**).

The site is possibly associated with rockshelter (AHIMS 45-6-0977) located approximately 90 m south east on the eastern side of the Terrys Creek gully.

Site M2A1 has been registered on AHIMS as (AHIMS 45-6-2949).

6.1.3 Areas of Previously Identified Site Potential

In addition to the previously registered Aboriginal sites, a series of areas with site potential were identified based on the findings of previous archaeological reports (**Section 5.6;** F**igure F4:** M2 Motorway Aboriginal Heritage Preliminary Constraints Mapping – Western Section to **Figure F6:** M2 Motorway Aboriginal Heritage Preliminary Constraints Mapping – Eastern Section). These areas are predominantly associated with Devlins Creek, Terrys Creek, Mars Creek and Shrimptons Creek.

These areas were traversed on foot to identify additional and unrecorded Aboriginal sites in close proximity to the M2 corridor. The areas were inspected to a maximum distance of 100 m from the M2 corridor. The areas were inspected during both phases of field inspections.

No additional Aboriginal sites were identified.

Table 8: Known Aboriginal Sites Inspected During the Field Inspections

Site Surveyed	Proximity to M2 (m)	AHIMS Site Type	AHIMS MGA Easting*	AHIMS MGA Northing*	Corrected MGA Easting*	Corrected MGA Northing*	Results Field Inspection 1	Results Field Inspection 2
45-5-1005	10 m west of bus off-ramp	Isolated Find					This site was not inspected.	Inspection of the area did not reveal any surface artefacts in the area. The creekline in this area has been extensively disturbed and in situ artefact deposits are not considered likely to occur (**Plate 4**).
45-5-2892	Unknown, >100 north of M2	Shelter with Deposit					This site was not inspected.	Site could not be re-identified. Searches of the area of golf course and Devlin Creek within 100 m of M2 did not relocate the site. Discussion with original recorder (Mary Dallas) suggests that the site may be further north than recorded in AHIMS (**Plate 5**).
46-6-0977	c. 60 m south of M2, east side of Terrys Creek	Shelter with Deposit					No artefacts observed. Rubbish.	Description of shelter conforms to site card description. Extensive rubbish. No artefacts. No physical impacts observed (**Plate 6**).
45-6-1854	c. 40 m north of M2	Shelter with Midden					Matches site card description. Midden shell observed. "Ochre" patch likely to be natural growth (**Plate 7**).	Not re-inspected; outside of study area.
45-6-1855	c. 60 m south of M2	Shelter with Midden					Matches site card description, except no midden observed. Signs of recent habitation.	Not re-inspected; outside of study area.

Site Surveyed	Proximity to M2 (m)	AHIMS Site Type	AHIMS MGA Easting*	AHIMS MGA Northing*	Corrected MGA Easting*	Corrected MGA Northing*	Results Field Inspection 1	Results Field Inspection 2
45-6-1953	Unknown, well south of M2	Shelter with Deposit					*Coordinates incorrect. Site card clearly describes a Pages Creek location south of Epping Road. More than 100m from M2.*	Not re-inspected; outside of study area.
45-6-2097	c. 30 m north of M2	Shelter with Deposit					Matches site card description. Very large box-like rockshelter, 20 m SSW of powerlines.	Matches site card description. High on gully side at same level as M2. No signs of any physical impact (**Plate 8**).
45-6-2160	c. 60 m north of M2	Shelter with Deposit					No evidence of artefacts. Site further east than mapped by Corkill. Corrected MGA coordinates are: 318018E 6262574 N.	Both shelter sections observed. No physical impacts observed. Two silcrete manuports and one quartz blade observed. No physical impacts to shelters observed (**Plates 9** to **11**).
45-6-2161	c. 40 m north of M2	Shelter with Deposit					Shelter description as per site card. No artefacts observed, but heavy leaf litter. Corrected MGA position is 317123E 6262357N. Hand stencil in shelter.	Shelter description as per site card. Some graffiti. No physical impacts observed, though traffic vibration noticeable through ground (**Plate 12**).
45-6-2162	c. 30 m north of M2	Shelter with Deposit					Site not inspected.	Shelter description as per site card. New hand stencil has chipped off considerably; original hand stencil still intact although some graffiti around it. No other physical impacts to site observed (**Plates 13** to **14**).

Site Surveyed	Proximity to M2 (m)	AHIMS Site Type	AHIMS MGA Easting*	AHIMS MGA Northing*	Corrected MGA Easting*	Corrected MGA Northing*	Results Field Inspection 1	Results Field Inspection 2
45-6-2163	c. 30 m north of M2	Shelter with Deposit					No artefacts observed.	Northern side of Blue Gum Creek. No artefacts observed. No physical impacts observed (**Plates 15** to **16**).
45-6-2472 (45-6-2513)	Unknown	Shelter with Deposit					Site not inspected. Site destroyed under S90 permit.	Site not inspected. Site destroyed under S90 permit.
45-6-2542	c. 120 m north of M2	Shelter with Deposit					No artefacts observed. Floor deposit disturbed by uprooted tree. Outline of old test pits evident. *More than 100 m from M2*. Identified set of axe grinding grooves in creek bed 20 m east of site (**Plates 17** to **18**).	Site not re-inspected.
45-6-2543	c. 20 m north of M2	Shelter with Deposit					No artefacts observed.	Site description as per site card. No artefacts observed. Shelter extends a further 20 m to the west of the recorded site (**Plates 19** to **20**).
45-6-2544	c. 30 m N of M2						Site not inspected.	Site description as per site card. One small quartz flaked piece identified. No physical impacts to site observed (**Plate 21**).

Site Surveyed	Proximity to M2 (m)	AHIMS Site Type	AHIMS MGA Easting*	AHIMS MGA Northing*	Corrected MGA Easting*	Corrected MGA Northing*	Results Field Inspection 1	Results Field Inspection 2
DC1	Directly beneath M2 bridge						Site not inspected.	Site description as per site card. Site located directly beneath the westbound M2 bridge near eastern abutment. Site occurs on the southern bank of Devlins Creek. Outlines of two former test pits visible; smoke blackened ceiling. No physical impacts to site observed despite proximity to M2.

* Location coordinates have been removed from the Public Exhibition version of this report for site security reasons.

7.0 Impact Assessment

This section provides a review of the environmental and archaeological contexts of the study area, together with the results of heritage searches, to provide an analysis of the archaeological potential of the study area and consequent heritage constraints (if any).

7.1 Project Description and Assessment of Impacts

The M2 Upgrade Project is designed to ease the current congestion along the M2 corridor resulting from an increase in urban density in Sydney's north west since the M2 opened in 1997.

The proposed upgrade would include the following components:

- widening and/or provision of a third lane along sections of the eastbound and westbound carriageways between Windsor Road and Lane Cove Road;
- provision of new on/off ramps at Windsor Road, Christie Road and Herring Road;
- widening and provision of a third lane eastbound and westbound in the Norfolk Tunnel;
- restoration of westbound breakdown lane from Beecroft Road to Lane Cove Road;
- removal of the Beecroft Road bus on/off ramp;
- improvement and widening of local arterial roads, Windsor Road and Talavera Road;
- widening of the Christie Road bridge and provision of new traffic control signals; and
- upgrades to the Motorway's Intelligent Transport Systems (ITS).

The proposed works will occur wholly within the current lease boundary for the M2 carriageway. The construction works with the highest potential for impacts to archaeological material are:

- the areas of temporary clearing: these areas will be stripped of all existing vegetation and the areas used for material stockpiling and the installation of temporary construction compounds. There will be no disturbance to the subsoils in these areas and, in the case of stockpiles, a geotextile membrane will be installed to separate the stockpiles from the natural soils. These stockpile areas will be subject to soil compaction;
- the construction of new, and extension of existing, sedimentation basins; and
- the construction of new culverts.

Assessment of impacts from these works will be completed following the second field inspection.

7.1.1 Impacts to Known Aboriginal Sites

Table 9 below provides a summary of the assessed impacts to registered Aboriginal sites within the study area.

Table 9: Assessment of Impacts to Registered Aboriginal Sites within 100 m of the M2 Corridor Inspected

Site Surveyed	Proximity to M2 (m)	AHIMS Site Type	Direct Impact?	Indirect Impact?
45-5-1005	10 m west of bus off-ramp	Isolated Find	Yes	No
45-5-2892	Unknown, >100 north of M2	Shelter with Deposit	No	Unlikely
46-6-0977	c. 60 m south of M2	Shelter with Deposit	No	No
45-6-1854	c. 40 m north of M2	Shelter with Midden	No	No
45-6-1855	c. 60 m south of M2	Shelter with Midden	No	No
45-6-1953	Unknown, well south of M2	Shelter with Deposit	No	No
45-6-2097	c. 20 m north of M2	Shelter with Deposit	No	Unlikely
45-6-2513 (45-6-2472)	c. 20 north of M2	Shelter with Deposit	No (Destroyed)	No (Destroyed)

Site Surveyed	Proximity to M2 (m)	AHIMS Site Type	Direct Impact?	Indirect Impact?
45-6-2160	c. 60 m north of M2	Shelter with Deposit	No	No
45-6-2161	c. 40 m north of M2	Shelter with Deposit	No	No
45-6-2162	c. 30 m north of M2	Shelter with Deposit	No	Unlikely
45-6-2163	c. 50 m north of M2	Shelter with Deposit	No	No
45-6-2542	c. 120 m north of M2	Shelter with Deposit	No	No
45-6-2543	c. 20 m north of M2	Shelter with Deposit	No	Unlikely
45-6-2544	c. 30 m north of M2	Shelter with Deposit	No	Unlikely
DC1	Beneath M2 bridges	Shelter with Deposit	Unlikely	Unlikely
M2A1 (45-6-2949)	Beneath M2 bridges	Axe Grinding Grooves	Unlikely	Possible

The assessment of impacts used above is based on the following parameters"

Table 10: Impact Assessment Criteria

Criteria	Meaning
No impact	It is considered that there will be no impacts resulting from the development.
Unlikely	The site is in close proximity to the M2, but is well clear of the construction zone; therefore it is considered unlikely that there will be impacts. However, mitigation measures will be established to minimise the potential for impact.
Possible	There is a possibility that impacts to a site may occur, due to its proximity to the construction zone. Mitigation measures will be established to minimise the potential for impact.
Yes	There will be impact to the site as a result of the development.

An extensive program of monitoring occurred between 1998 to 2008 aimed at determining whether known Aboriginal rockshelter sites were being adversely affected by runoff or vibrations from the M2 Motorway (Corkill and Haglund 1998-2008). Two rounds of monitoring were performed each year and found that none of the sites being monitored were being physically impacted as a result of the M2 Motorway. Erosion issues were attributed to natural water seepage.

Sites that are considered to have potential to be impacted are:

- AHIMS 45-5-1005 is an isolated artefact that lies in very close proximity to the Beecroft Road bus off-ramp. The current proposal to remove the off-ramp is likely to disturb the ground where the artefact is said to occur. However, the artefact is not considered to be in situ, is completely out of archaeological context and consequently is considered to hold low significance.
- Site M2A1 (AHIMS 45-6-2949), a set of grinding grooves that were identified during the Phase 2 field inspections and occur directly beneath the Terrys Creek bridges. Whilst all construction work is intended to occur on the northern side of the M2, the current construction plan proposes to provide vehicle access from the southern side. Consequently, there is potential for indirect impact to the site through sedimentation and/or physical impacts through earthworks. However, this can be readily avoided by fencing (access) and sediment barriers.

It is considered that there will be no direct impacts and unlikely to be indirect impacts to the other sites resulting from the upgrade works. However, it is considered prudent to erect some form of protective fencing at rockshelters within 50 m of M2 construction works to minimise the potential for indirect impacts resulting from access by construction workers. The sites considered to be within 50 m of construction works are: AHIMS 45-6-2097, 45-6-2160, 45-6-2161, 45-6-2162, 45-6-2163, 45-6-2543, 45-6-2544 and DC1.

7.2 Summary

Given the extent of previous survey along the M2 Motorway corridor it is considered unlikely that further, un-recorded Aboriginal rockshelters will occur in the study area. Due to the nature of the landscape, it is considered unlikely that any further archaeological material (i.e. artefacts comprising open sites) will be encountered within the study area.

Previous monitoring, in conjunction with the inspections of registered sites during this project, indicates that there has been no physical impacts to the sites since the construction of the M2 and its subsequent operation. An assessment of areas of direct impact (i.e. construction of ramps, sediment ponds, site compounds, culverts and temporary vegetation clearance suggests that there is not likely to be any direct or indirect impacts to Aboriginal cultural heritage values.

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8.0 Legislative Framework

8.1 Commonwealth Legislation

8.1.1 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The purpose of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Heritage Protection Act) is the preservation and protection from injury or desecration of areas and objects in Australia and in Australian waters that are of particular significance to Aboriginal people in accordance with Aboriginal tradition.

Under the Heritage Protection Act the responsible Minister can make temporary or long-term declarations to protect areas and objects of significance under threat of injury or desecration. The Act can, in certain circumstances, override state and territory provisions, or it can be implemented in circumstances where state or territory provisions are lacking or are not enforced. The Act must be invoked by or on behalf of an Aboriginal or Torres Strait Islander or organisation.

The Act is administered by the Department of the Environment, Water, Heritage and the Arts.

8.1.2 Environment Protection and Biodiversity Conservation Act

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides for the establishment of two heritage lists:

- The National Heritage List (NHL) is a list of places with outstanding heritage value to Australia, and includes places overseas.
- The Commonwealth Heritage List (CHL) is a list of places managed or owned by the Australian Government, and includes places, or groups of places in Commonwealth lands or waters, or under Commonwealth control, and are identified by the Minister as having Commonwealth heritage values.

There are no items in the study area listed on either of these lists.

8.2 New South Wales Legislation

The following New South Wales legislation protects aspects of cultural heritage and is relevant to development activities in the study area.

8.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) requires that consideration be given to environmental impacts as part of the land use planning process. In NSW environmental impacts are interpreted as including cultural heritage impact. Three parts of the EP&A Act are most relevant to Heritage. Part 3 relates to planning instruments, including those at local and regional levels; Part 4 controls development assessment processes; and Part 5 refers to approvals by determining authorities.

Part 3A provides an approvals regime applying to all major projects. Major projects are defined under *State Environmental Planning Policy (Major Projects) 2005* (SEPP 2005). It also applies to those projects which the Minister believes are required to deliver particular government plans or programs, known as critical infrastructure projects. Part 3A applies to all projects where the Minister has the approval role. Under Part 3A, the Minister can issue a project approval or a concept approval. Both maintain the requirement for consultation with the community and relevant State Government agencies, however the requirement for certain other permits and licences is removed under Part 3A.

Section 75B(2) of the EP&A Act makes provision for 'major projects' to be identified through various means, including by way of declaration as a listed project in SEPP 2005, or by notice in the Gazette.

This project is classified as a 'major project' under Part 3A.

8.2.2 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act), administered by DECCW, is the primary legislation for the protection of Aboriginal cultural heritage in NSW. One of the objectives of the NPW Act is:

> *The conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including but not limited to: (i) places, objects and significance to Aboriginal people…* (Section 2A(1)(b))

Part 6 of the NPW Act provides specific protection for Aboriginal objects and places by making it an offence if impacts are not authorised. An Aboriginal Heritage Impact Permit (AHIP) should be obtained if impacts on Aboriginal objects and places are anticipated. AHIPs can be issued under Sections 87 and 90 of the NPW Act.

Sections 86 and 87

Under Section 86 of the NSW *National Parks and Wildlife Act 1974* (NPW Act) it is an offence to:

1) disturb or excavate any land, or causes any land to be disturbed or excavated, for the purpose of discovering an Aboriginal object; or
2) disturb or move on any land an Aboriginal object that is the property of the Crown, other than an Aboriginal object that is in the custody or under the control of the Australian Museum Trust.

…except in accordance with the terms and conditions of an AHIP issued under Section 87 of the NPW Act.

Section 90

Under Section 90 of the NPW Act it is an offence to:

> *knowingly destroy, deface or damage, or knowingly cause or permit the destruction or defacement of or damage to, an Aboriginal object or Aboriginal place…*

…unless under an AHIP issued by the Director-General under Section 90, subject to such conditions and restrictions as are specified in the AHIP. Therefore an AHIP issued under Section 90 should be obtained if impacts on Aboriginal objects and places are anticipated.

For the purposes of the Act:

- An Aboriginal object is any deposit, object or material evidence (that is not a handicraft made for sale) relating to Aboriginal habitation of NSW, before or during the occupation of that area by persons of non-Aboriginal extraction (and includes Aboriginal remains).
- An Aboriginal place is a place declared so by the Minister administering the NPW Act because the place is or was of special significance to Aboriginal culture. It may or may not contain Aboriginal objects.

Under Section 75U of the EP&A Act, projects approved under Part 3A do not require a permit under s.87 or a consent under Section 90 of the NPW Act. However, for the preparation of an EA, the Director-General will issue environmental assessment requirements under Section 75F, in consultation with other relevant public authorities and have regard to the need for the requirement to assess any key issues raised by those public authorities. In practice this usually means that Part 3A still requires assessment of potential impacts to European and Indigenous heritage and such assessment is generally equivalent to the normal assessment process under the NPW Act and Heritage Act.

Consultation with the Aboriginal communities is required under DECCW policy when an application for an approval under Part 6 of the NPW Act, or Part 3A of the EP&A Act, is considered. The consultation process used in this study is outlined in more detail in **Section 2.3**.

8.3 Local Government

Under the provisions of the EP&A Act, Local Environmental Plans (LEP) and Regional Environmental Plans (REP) are prepared by a Local Government Council. An LEP defines some of the rules relating to the development of an area or a particular site. It contains information on the zoning of land and any special provisions relating to the development of the land. An LEP is enforceable after it is published in the Government Gazette (i.e. “gazetted”) by the NSW Minister for Planning.

Typically, LEPs and REPs have provisions that protect items of environmental heritage.

9.0 Management Commitments

The findings of this preliminary Aboriginal heritage assessment are:

- a total of 14 previously recorded Aboriginal sites and one newly recorded Aboriginal site occurs within 100 m of the M2 Motorway (one site has been recorded twice);
- two phases of field inspection re-identified all but two of the recorded sites. Of these two sites, one (45-6-2472(2513) was previously destroyed and another (45-6-1953) occurs much further south than AHIMS suggests and is not within the study area;
- inspections of areas considered to have archaeological potential in previous archaeological reports suggest that there is unlikely to be any impact to Aboriginal cultural heritage;
- inspections were conducted of areas to be impacted by construction in the vicinity of known Aboriginal sites and it is considered that there is unlikely to be any direct or indirect physical impact to the sites, with the exception of 45-5-1005 and site M2A1;
- landforms, together with analysis of previous archaeological investigations in the region, suggest that there is a low potential for any unregistered open campsites to occur in the study area;
- extensive previous surveys, together with the results of this preliminary assessment, suggest there is a low potential for further sandstone-based Aboriginal sites (e.g. Aboriginal rockshelters, grinding grooves and art sites) to occur close to the M2;
- areas of developed land traversed by the M2 have been impacted to such an extent that archaeological evidence is likely to have been destroyed;
- on the basis of this assessment the proposed development is considered unlikely to encounter further Aboriginal objects, or impact known Aboriginal sites, with the exception of 45-5-1005 and site M2A1;
- 45-5-1005 is a single stone artefact located in a highly disturbed context. The object can no longer be located and it is not considered likely that it will be located; and
- it is considered unnecessary to proceed to a full heritage assessment.

The following recommendations are made in light of the initial findings of the preliminary Aboriginal heritage assessment:

1. should Aboriginal objects be identified during the course of construction, work should cease in that part of the study area and DECCW, MLALC and DLALC should be notified immediately;
2. should Aboriginal skeletal material be identified during construction, work should cease immediately and Police, DECCW and the relevant LALC should be notified immediately;
3. the proponent should prepare an Aboriginal Heritage Management Plan (AHMP) for the 15 known sites within the study area. The AHMP should provide guidance on the management of the sites both during the construction phase of the M2 Upgrade Project, and during the subsequent operational phase of the M2 Motorway. The AHMP will provide more detailed guidance than outlined in this report (e.g. detailed location mapping, fencing specifications, etc). The AHMP should include, but not be limited to, the following protective measures:
    a) the proponent should erect temporary protective fencing at Aboriginal rockshelters within 50 m of the M2 construction works to minimise the potential for inadvertent damage by construction workers. The sites include: AHIMS 45-6-2097, 45-6-2160, 45-6-2161, 45-6-2162, 45-6-2163, 45-6-2543, 45-6-2544 and DC1;
    b) the proponent should erect temporary sedimentation barriers and fencing along the banks of Terrys Creek, on the southern side of the bridges to minimise potential for indirect impacts to site M2A1 through sedimentation and/or personnel access during construction;
    c) Aboriginal stakeholders have requested that monitoring take place at sites during construction works. However, this assessment considers that further impacts to, or identification of, Aboriginal objects is unlikely. Therefore further monitoring is not considered necessary;
    d) the Aboriginal community have requested that an exclusion zone be placed around site M2A1 on the southern side of the M2 bridge and the proponent should take steps to avoid any construction activity on that side of the bridge. If possible, access to the areas should be afforded from the northern side of the M2. If this is not possible, and access is required on the southern side (passing under the bridge) then access should be made as close as possible to the concrete abutment;

e) the proponent should ensure that regular toolbox talks are conducted with emphasis on Aboriginal cultural heritage and the potential for impacts to the sites; and

4. AHIMS 45-5-1005 is not considered to hold cultural heritage significance, and the absence of the single artefact suggests that it has been lost from the area, and therefore the site has already been effectively destroyed. The impact from the M2 is therefore impact on a destroyed site. The AHIMS register should be amended to reflect this status.

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Figures

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PROJECT ID S70118
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Regional Context

NSW Roads and Traffic Authority
Preliminary Heritage Assessment:
M2 Upgrade Project
Lane Cove Road to Windsor Road
Sydney, NSW

Figure
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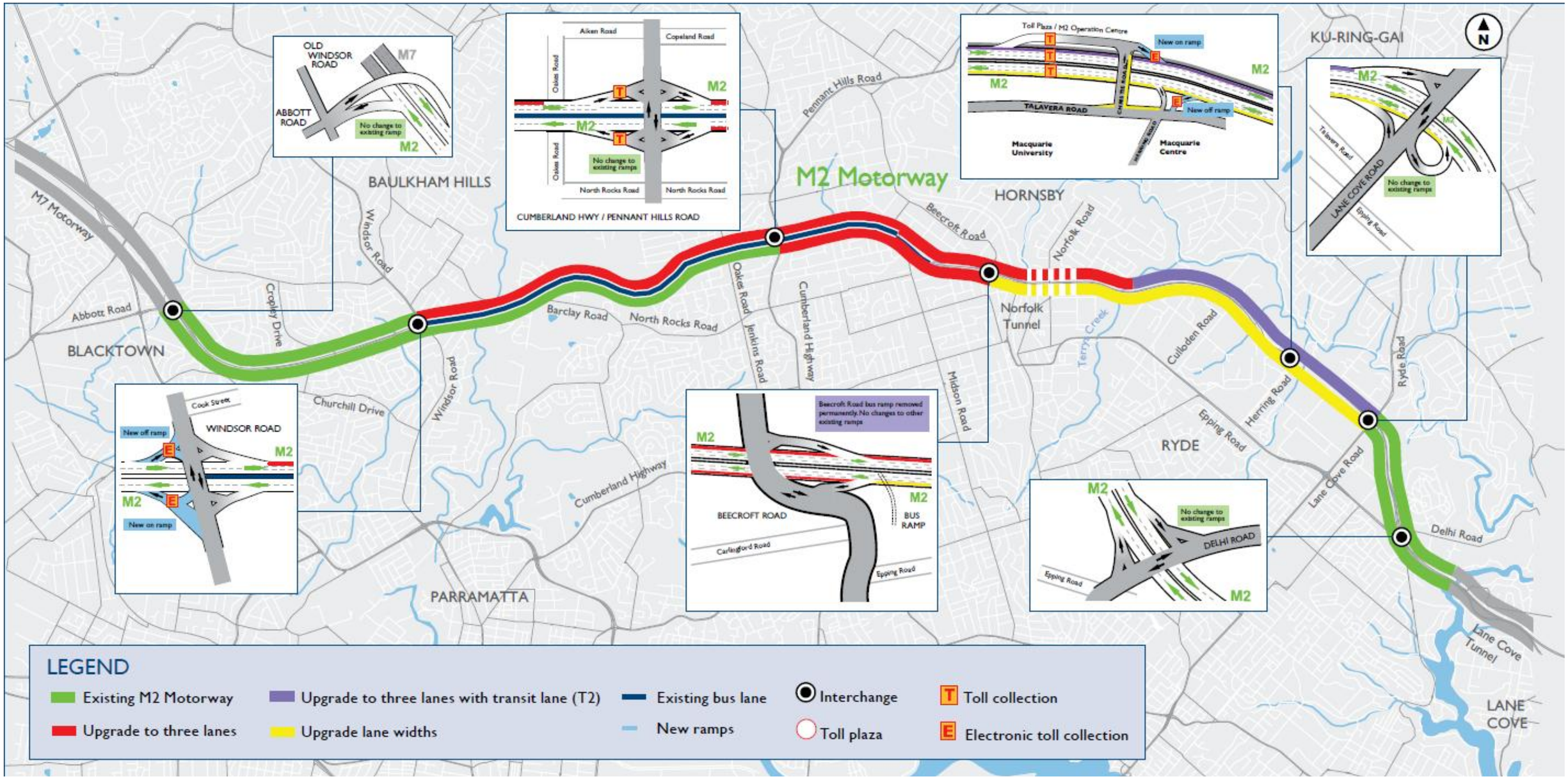

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Project Proposal

NSW Roads and Traffic Authority
Preliminary Heritage Assessment:
M2 Upgrade Project
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0 3km

- M2 Motorway alignment
- 100m Buffer area
- AHIMS site search boundary (1km)
- NPWS Estate
- River/Creekline
- Main Road
- M2 Motorway lease boundary

- Axe Grinding Grooves
- Isolated Find
- Open Camp Site
- PAD
- Rock Engravings
- Shelter with Art
- Shelter with Deposit
- Shelter with Midden
- Unknown

M2 Motorway Alignment and AHIMS Site Locations

NSW Roads and Traffic Authority
Preliminary Heritage Assessment:
M2 Upgrade Project
Lane Cove Road to Windsor Road
Sydney, NSW

Figure
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AHIMS No: 45-5-2892
Site type: Details unknown
Approx distance from M2: Details unknown
Approx area: Details unknown
Condition: Details unknown

AHIMS No: 45-6-2160
Site type: Rock-shelter + deposit + art
Approx distance from M2: 100m
Approx area: 14 x 4 x 2.1m
Condition: Disturbed

AHIMS No: 45-6-2542
Site type: Rock-shelter + deposit
Approx distance from M2: 100m
Approx area: N/A
Condition: N/A

AHIMS No: 45-6-2544
Site type: Rock-shelter + deposit
Approx distance from M2: 100m
Approx area: N/A
Condition: N/A

AHIMS No: 45-6-2548
Site type: Rock-shelter + deposit
Approx distance from M2: >200m
Approx area: 4 x 1.5 x 1.5m
Condition: Disturbed

45-6-2041

AHIMS No: 45-6-2163
Site type: Rock-shelter + deposit
Approx distance from M2: 100m
Approx area: 10 x 6 x 4.5m
Condition: Minor disturbance

AHIMS No: 45-6-2543
Site type: Rock-shelter + deposit
Approx distance from M2: 200m
Approx area: N/A
Condition: N/A

AHIMS No: 45-6-2162
Site type: Rock-shelter + deposit + art
Approx distance from M2: 50m
Approx area: 12 x 5 x 1.5m
Condition: Disturbed

AHIMS No: 45-6-2161
Site type: Rock-shelter + deposit
Approx distance from M2: <100m
Approx area: 10 x 3.5 x 2m
Condition: Weathered

AHIMS No: 45-6-2097
Site type: Rock-shelter + deposit
Approx distance from M2: 50m
Approx area: 22 x 5.5 x 3m
Condition: Stable

AHIMS No: 45-6-2472
Site type: Rock-shelter + deposit
Approx distance from M2: 50m
Approx area: 12 x 3 x xxm
Condition: Disturbed

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0 750m

- M2 Motorway alignment
- 100m Buffer area
- AHIMS site search boundary (1km)
- NPWS Estate
- River/Creekline
- Main Road
- M2 Motorway lease boundary
- Cleared area
- Sediment basin works
- Temporary clearing
- Areas of potential (identified in previous reports)
- General AHIMS site location

M2 Motorway Aboriginal Heritage Constraints Mapping - Western Section

NSW Roads and Traffic Authority
Preliminary Heritage Assessment:
M2 Upgrade Project
Lane Cove Road to Windsor Road
Sydney, NSW

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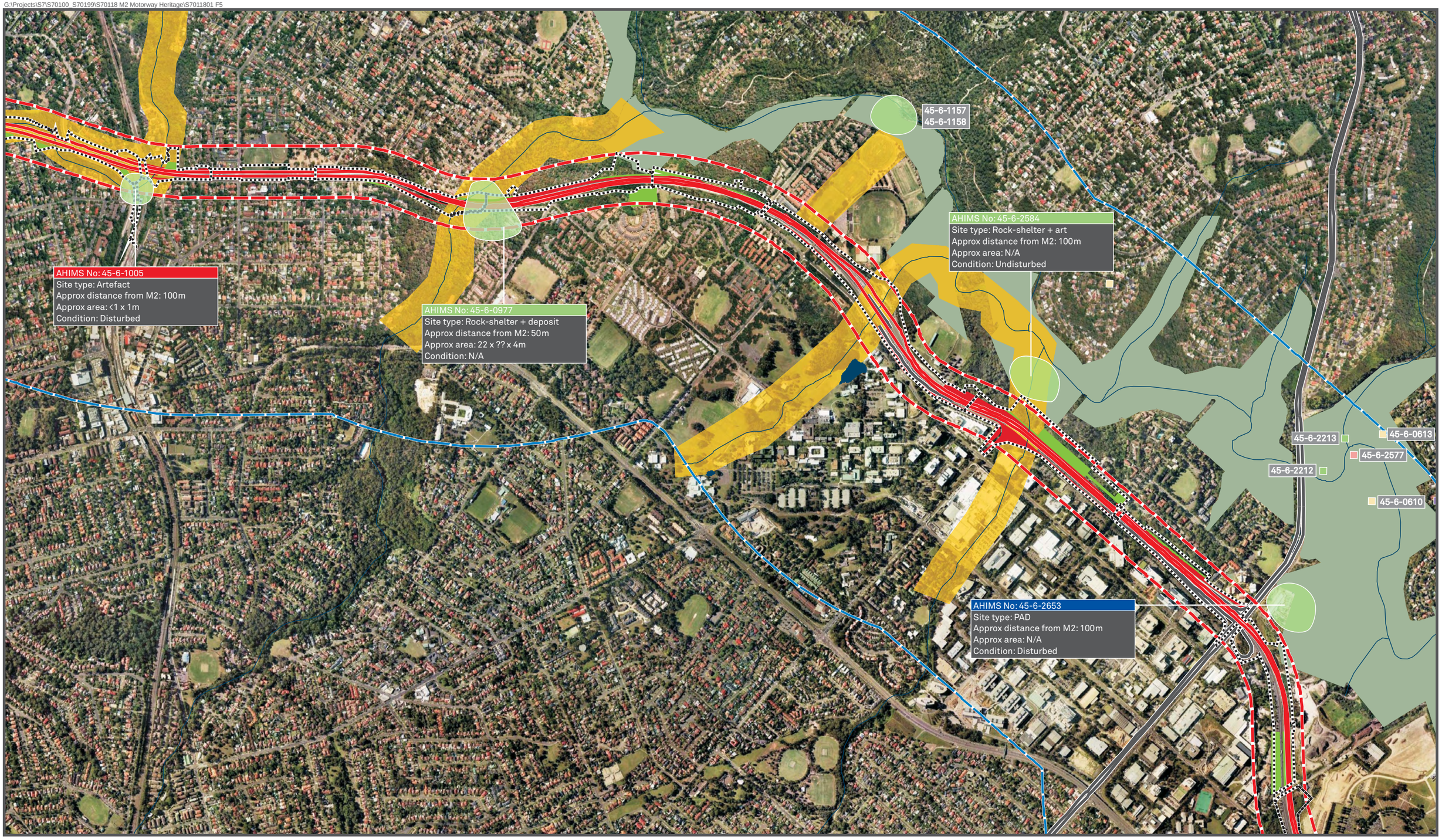

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0 750m

- M2 Motorway alignment
- 100m Buffer area
- AHIMS site search boundary (1km)
- NPWS Estate
- River/Creekline
- Main Road
- M2 Motorway lease boundary
- Cleared area
- Sediment basin works
- Temporary clearing
- Areas of potential (identified in previous reports)
- General AHIMS site location

M2 Motorway Aboriginal Heritage Constraints Mapping - Central Section

NSW Roads and Traffic Authority

Preliminary Heritage Assessment:
M2 Upgrade Project
Lane Cove Road to Windsor Road
Sydney, NSW

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0 750m

- M2 Motorway alignment
- 100m Buffer area
- AHIMS site search boundary (1km)
- NPWS Estate
- River/Creekline
- Main Road
- M2 Motorway lease boundary
- Cleared area
- Sediment basin works
- Temporary clearing
- General AHIMS site location
- Axe Grinding Grooves
- Isolated Find
- Open Camp Site
- PAD
- Rock Engravings
- Shelter with Art
- Shelter with Deposit
- Shelter with Midden
- Unknown

M2 Motorway Aboriginal Heritage Constraints Mapping - Eastern Section

NSW Roads and Traffic Authority
Preliminary Heritage Assessment:
M2 Upgrade Project
Lane Cove Road to Windsor Road
Sydney, NSW

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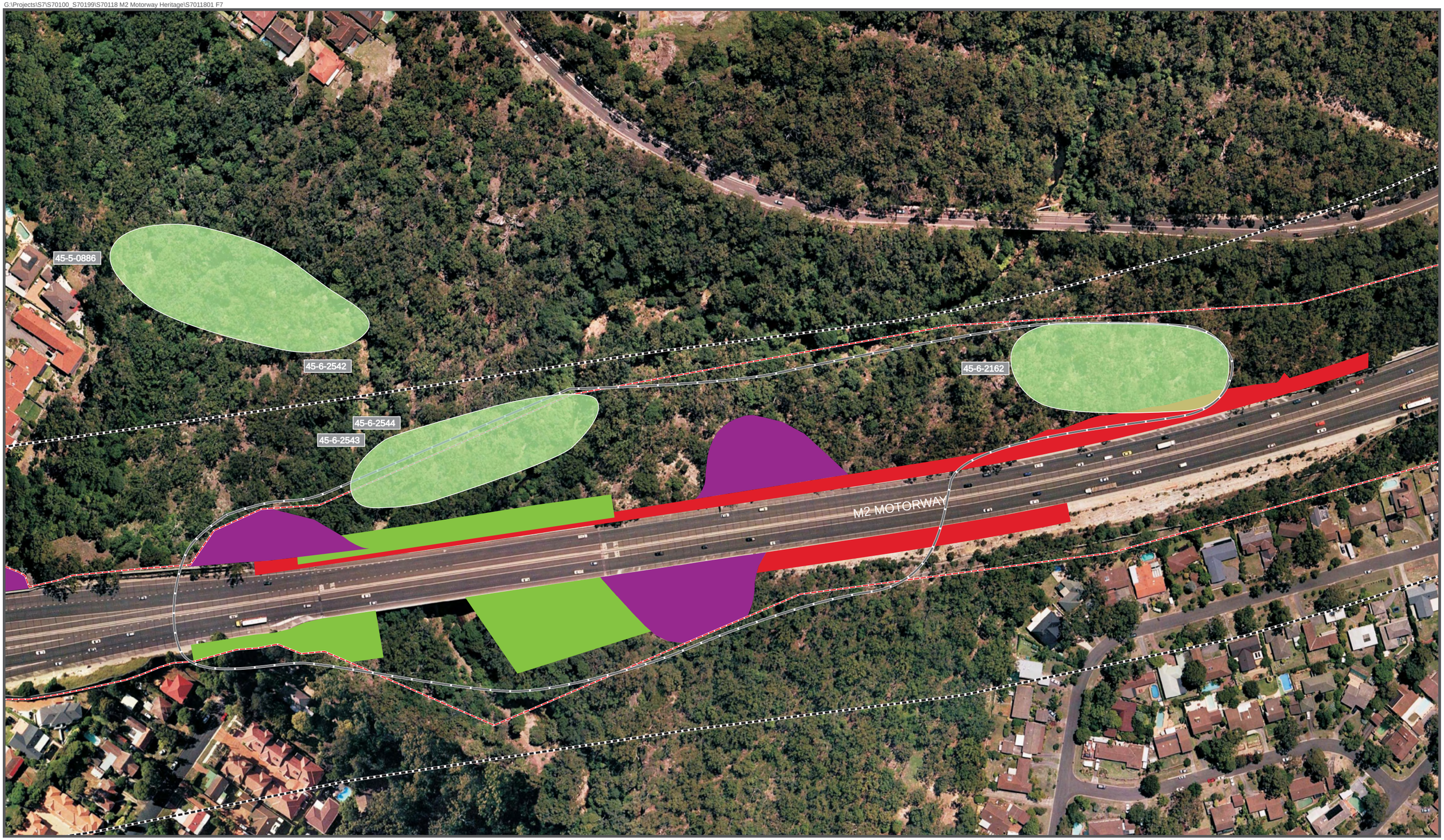

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0 100m
Approximate

- 100m Buffer area
- Area 1 Boundary
- M2 Motorway lease boundary
- Cleared area
- Sediment basin works
- Temporary clearing
- General AHIMS site location

Recorrected AHIMS Site Locations 45-6-2543, 45-6-2544 and 45-6-2162

NSW Roads and Traffic Authority
Preliminary Heritage Assessment:
M2 Upgrade Project
Lane Cove Road to Windsor Road
Sydney, NSW

Figure
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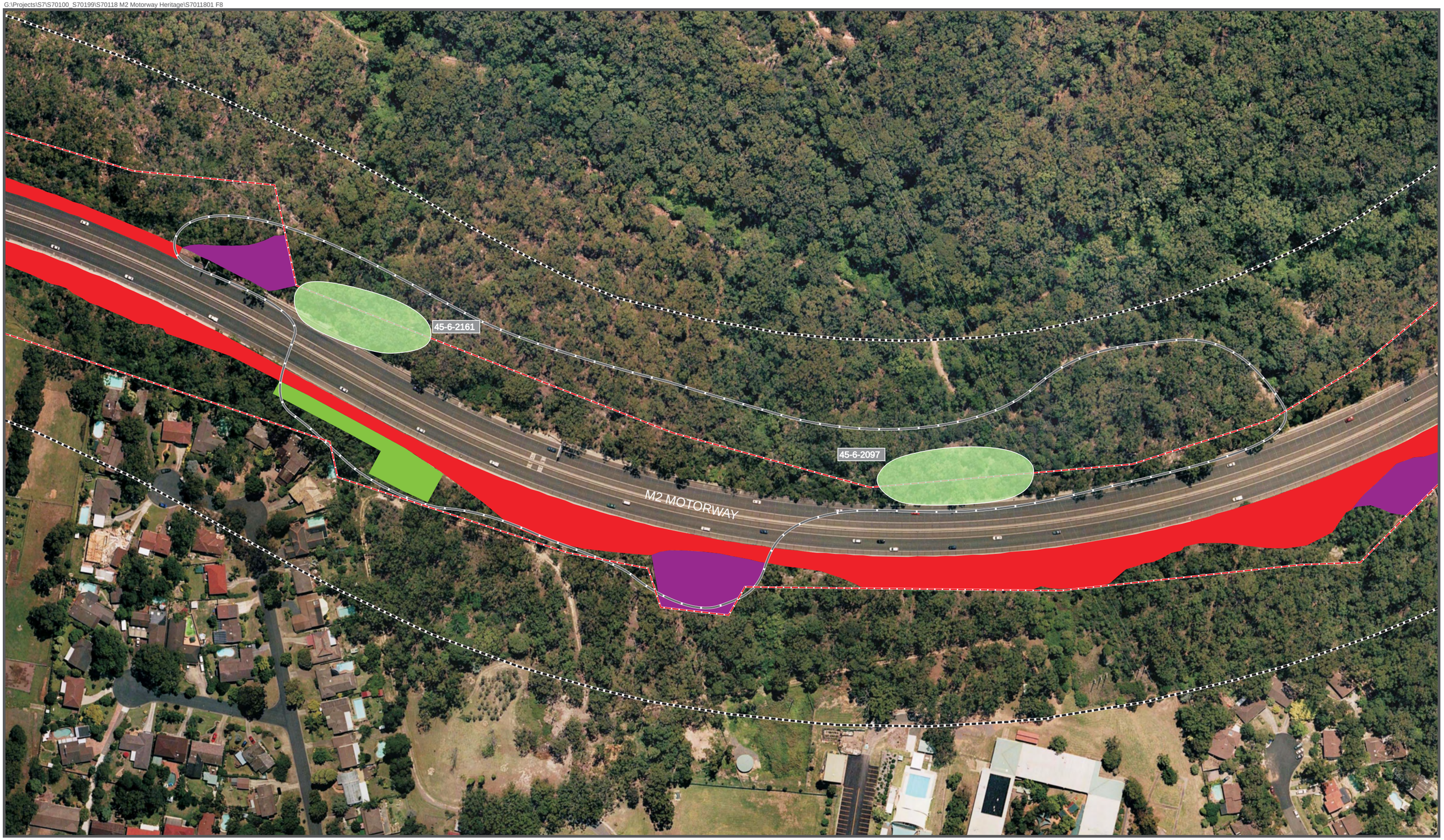

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LAST MODIFIED	TO 24 04 2010

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0 100m
Approximate

- 100m Buffer area
- Area 2 Boundary
- M2 Motorway lease boundary
- Cleared area
- Sediment basin works
- Temporary clearing
- General AHIMS site location

Recorrected AHIMS Site Locations 45-6-2161 and 45-6-2097

NSW Roads and Traffic Authority
Preliminary Heritage Assessment: M2 Upgrade Project
Lane Cove Road to Windsor Road
Sydney, NSW

Figure F8

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PROJECT ID 60143257
CREATED BY TO
LAST MODIFIED TO 23 04 2010

AECOM
www.aecom.com

0 100m
Approximate

- 100m Buffer area
- Area 3 Boundary
- M2 Motorway lease boundary
- Cleared area
- Sediment basin works
- Temporary clearing
- General AHIMS site location

Recorrected AHIMS Site Locations 45-6-2160 and 45-6-2163

NSW Roads and Traffic Authority
Preliminary Heritage Assessment: M2 Upgrade Project
Lane Cove Road to Windsor Road
Sydney, NSW

Figure F9

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PROJECT ID 60143257
CREATED BY TO
LAST MODIFIED TO 23 04 2010

AECOM
www.aecom.com

0 100m
Approximate

- 100m Buffer area
- Area 4 Boundary
- M2 Motorway lease boundary
- Cleared area
- Sediment basin works
- Temporary clearing
- General site location of DC1

Recorded Site Location DC1

NSW Roads and Traffic Authority
Preliminary Heritage Assessment:
M2 Upgrade Project
Lane Cove Road to Windsor Road
Sydney, NSW

Figure
F10

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PROJECT ID 60143257
CREATED BY TO
LAST MODIFIED TO 23 04 2010

AECOM
www.aecom.com

0 250m
Approximate

- 100m Buffer area
- Area Boundary
- M2 Motorway lease boundary
- Cleared area
- Sediment basin works
- Temporary clearing
- General AHIMS site location

Recorrected AHIMS Site Locations 45-5-1005, M2A1 and 45-6-0977

NSW Roads and Traffic Authority
Preliminary Heritage Assessment: M2 Upgrade Project
Lane Cove Road to Windsor Road
Sydney, NSW

Figure F11

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Plates

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Plate P1: General view of site M2A1 (AHIMS 45-6-2949)

Plate P2: Grinding grooves at site M2A1 (AHIMS 45-6-2949)

Plate P3: Hollowed dishes at site M2A1 (AHIMS 45-6-2949)

Plate P4: Location of Isolated Find (AHIMS 45-5-1005)

Plate P5: Location of 45-5-2892 indicated by AHIMS coordinates. Landform precludes occurrence of Aboriginal rockshelters

Plate P6: Rockshelter (AHIMS 45-6-0977)

Plate P7: Rockshelter and midden (AHIMS 45-6-1854)

Plate P8: Rockshelter (AHIMS 45-6-2097)

Plate P9: Rockshelter, Part A (AHIMS 45-6-2160)

Plate P10: Rockshelter, Part B (AHIMS 45-6-2160)

Plate P11: Rockshelter (AHIMS 45-6-2160). Note M2 noise barrier approximately 60 m south

Plate P12: Rockshelter (AHIMS 45-6-2161)

Plate P13: Reckshelter (AHIMS 45-6-2162)

Plate P14: Reckshelter (AHIMS 45-6-2162). Note hand stencils – one new stencil at left and fading original stencil to its right

Plate P15: Rockshelter (AHIMS 45-6-2163)

Plate P16: Rockshelter (AHIMS 45-6-2163). Shelter overlooks Blue Gum Creek towards the M2 noise barrier approximately 30 m to the south

Plate P17: Rockshelter (AHIMS 45-6-2542)

Plate P18: Rockshelter (AHIMS 45-6-2542). Note outline of former excavation test pit

Plate P19: Rockshelter (AHIMS 45-5-2543)

Plate P20: Rockshelter (AHIMS 45-6-2543) as seen from creek confluence beneath M2 bridge

Plate P21: Rockshelter (AHIMS 45-6-2544)

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Appendix A

An Excel database derived from GIS shapefiles was issued by DECCW. An official printed transcript was not provided. Due to security requirements the AHIMS search results have been removed from the Public Exhibition Copy of this report. The search results were provided in the Government agency version of the report.

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Appendix B

Log of Aboriginal Community Consultation and Communication

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Aboriginal Consultation Process

Project: M2 Upgrade Project

Stage 1 - Advisory Requests Sent

	Contact	Date Sent	Comment
Local Newsapaper Ad	*Daily Telegraph*		
Local Newsapaper Ad	*Northern District Times*		Advert ran Wednesday 4 November 2009.
Local Newsapaper Ad	*Hills News*		Advert ran Tuesday 3 November 2009.
Local Newsapaper Ad	*National Indigenous Times (NIT)*		Advert ran Thursday 29 October 2009
Local Newsapaper Ad	*The Koori Mail*		Advert ran Wednesday 4 November 2009.
DECCW		3-Nov-09	Received response dated 12/11/09 advising the following groups for consultation: DLALC, DCAC, DTAC, DACHA, DLO and MLALC.
Metropolitan LALC	Rebecca McHugh	3-Nov-09	
Deerubin LALC	Steve Randall	3-Nov-09	
Registrar Aboriginal Owners	N/A	3-Nov-09	Study area not within national park land
Native Title Services		3-Nov-09	
National Native Title Tribunal	N/A	3-Nov-09	Response received 4/11/09 with a list of land parcels under claim number NC97/8.
NSW ALC	Sylvie Ellsmore	11-Mar-09	Response rceived 18/11/09 (dated 16/11/09) advising direct contact with the relavant LALCs (MLALC/DLALC) and suggesting early discussion and provision of site maps of sites in close proximity to the project area.
Local Council - Ryde		3-Nov-09	
Local Council - Baulkam Hills		3-Nov-09	Received letter nominating an additional two Aboriginal groups for consultation - Darug Custodian Aboriginal Corporation (DCAC) and Norwest Aboriginal Development Association (NADA)

Aboriginal Group Notifications Sent (DATE) - see "addresses" sheet

Aboriginal Group Registrations & Communications

Organisation	Contact person	Date	Comments
DTAC	Sandra Lee	2-Nov-09	Received telephone call from Sandra who has seen the ad in the NIT. DTAC interested in consultation.
Yarrawalk	Scott Franks	4-Nov-09	Received letter by email registering interest. Ad in Koori Mail quoted.
DLALC	Steve Randall	4-Nov-09	Received letter registering formal interest in consultation.
MLALC	Paul Morris	11-Nov-09	Received letter registering formal interest in consultation.
DCAC	Leanne Watson	16-Nov-09	Following advice from BHSC, rang DCAC to invite registration of interest. Leanne registered verbally. Received formal letter of interest by fax on 18/11/09.
DACHA	Celestine Everingham	16-Nov-09	Following advice from DECCW rang DACHA to invite registration of interest. Celestine registered verbally.
DLO	Gordon Workman	16-Nov-09	Following advice from DECCW rang DLO to invite registration of interest. Gordon registered verbally.

Stage 2 - Briefing & Methodology Advice Sent

Organisation	Contact person	Date Sent	Comments
DTAC	Sandra Lee	20-Nov-09	No formal response prior to focus group meeting.
Yarrawalk	Scott Franks	20-Nov-09	No formal response prior to focus group meeting.
DLALC	Steve Randall	20-Nov-09	No formal response prior to focus group meeting.
MLALC	Paul Morris	20-Nov-09	No formal response prior to focus group meeting.
DCAC	Leanne Watson	20-Nov-09	No formal response prior to focus group meeting.
DACHA	Celestine Everingham	20-Nov-09	No formal response prior to focus group meeting.
DLO	Gordon Workman	20-Nov-09	No formal response prior to focus group meeting.

Stage 2 - Aboriginal Focus Group Meeting Attendance

Organisation	Contact person	Date	Comments
DTAC	Sandra Lee		Unable to attend
Yarrawalk	Scott Franks	11-Dec-09	
DLALC	Steve Randall		Unable to attend
MLALC	Paul Morris	11-Dec-09	Meeting was attended by Alan Madden
DCAC	Leanne Watson	11-Dec-09	
DACHA	Celestine Everingham	11-Dec-09	Meeting was attended by Gordon Morton
DLO	Gordon Workman	11-Dec-09	

Aboriginal Group Comments Received

Organisation	Contact person	Date Rec'd	Comments
DCAC	Leanne Watson	11-Dec-09	DCAC expressed concern at AFG Meeting that previous monitoring works had not been conducted in conjunction with Aboriginal community. She drew attention to the Bidjigal Reserve Deed of Agreement (see **Appendix C**).
Yarrawalk	Scott Franks	11-Dec-09	Yarrawalk and DLO expressed concern that the initial field inspections were not conducted with Aboriginal
DLO	Gordon Workman	11-Dec-09	community participation and therefore Aboriginal socio-cultural values could not be taken into account. It was
DACHA	Celestine Everingham		No formal response received
DTAC	Sandra Lee		No formal response received
DLALC	Steve Randell		No formal response received
MLALC	Paul Morris		No formal response received

Stage 3 - Fieldwork and Aboriginal Stakeholder Reports

Organisation	Contact person	Date Rec'd	Feedback Received & Date
DTAC	Sandra Lee	19-Jan-10	Fieldwork 15-17 December 2009, attended by John Reilly. Received fieldwork report 19/1/2010 - all sites identified in the study area must be monitored whist construction occurs in the vicinity
Yarrawalk	Scott Franks	21-Dec-09	Fieldwork 15-17 December 2009, attended by Scott Franks and Danny Franks. Received fieldwork report 21/12/09 - Terrys Creek not be disturbed and a 100 to 200 m exclusion zone be placed around M2A1 (subsequently revised to be on south side of bridge only); monitoring should occur if further development is considered in areas other than those in the current construction plan; the proponent should consider an offset in regard to any destruction; and the proponent should agree to a Heritage Management Plan and strategy.
DLALC	Steve Randall		Fieldwork 15 December 2009 in DLALC area only, attended by Steve Randell. Did not submit a field survey report at time of writing.
MLALC	Paul Morris		Did not attend fieldwork.
DCAC	Leanne Watson		Fieldwork 15-17 December 2009, attended by Leanne Watson and Jessica Wright. Did not submit field survey report at time of writing.
DACHA	Celestine Everingham		Fieldwork 15-17 December 2009, attended by Gordon Workman and Tim Wells. Did not submit field survey report at time of writing.
DLO	Gordon Workman	22-Dec-09	Fieldwork 15-17 December 2009, attended by John Reilly. Received fieldwork report 22/12/2009 - Works will not impact upon site M2A1, but DLO wants to be involved in any works in that area; Indirect impacts to CF3 (AHIMS 45-6-2161) may occur through vibration during construction. Periodic monitoring should occur.

Stage 4 - Draft Reports for Review - Sent

Organisation	Contact person	Date Sent	Feedback Received & Date
DTAC	Sandra Lee		TBA
Yarrawalk	Scott Franks		TBA
DLALC	Steve Randall		TBA
MLALC	Paul Morris		TBA
DCAC	Leanne Watson		TBA
DACHA	Celestine Everingham		TBA
DLO	Gordon Workman		TBA

Date	Stakeholder Group	Stakeholder Representative	Correspondence/Comments	AECOM Representative
02-Nov-09	DTAC	Sandra Lee	Sandra rang to register interest in consultation. Response to advert in NIT.	Rick Bullers
04-Nov-09	Yarrawalk	Scott Franks	Received letter by email registering interest in the project.	Rick Bullers
13-Nov-09	NADA	Greg Davison	Rang three different telephone numbers to invite registration. No answer an any. Left message on CSIRO voicemail. No response.	Rick Bullers
16-Nov-09	DCAC	Leanne Watson	Rang to invite registration of interest. Leanne gave verbal registration. Sent letter to DCAC to formally invite registration.	Rick Bullers
16-Nov-09	DACHA	Celestine Everingham	Rang to invite registration of interest. Celestine gave verbal registration. Sent letter to DACHA to formally invite registration.	Rick Bullers
16-Nov-09	DLO	Gordon Workman	Rang to invite registration of interest. Gordon gave verbal registration. Sent letter to DLO to formally invite registration.	Rick Bullers
16-Nov-09	NADA	Greg Davison	Rang three different telephone numbers to invite registration. No answer an any. Left message on CSIRO voicemail. No response.	Rick Bullers
16-Nov-09	NADA	Brian Freeman	Rang mobile to invite registration. No answer; no voicemail capability.	Rick Bullers
18-Nov-09	DCAC	Leanne Watson	Received faxed letter formally registering interest in the project.	Rick Bullers
18-Nov-09	NSW ALC	Sylvie Ellmore	Received letter advising direct contact with MLALC and DLALC.	Rick Bullers
04-Dec-09	YW, DTAC, DCAC, DLALC, MLALC, DACHA, DLO	Various	Rang groups to advise of Focus group meeting, nominally scheduled for 1.00pm 10 Dec 09. YW attending, DTAC not sure, DLALC no answer, MLALC not sure, DCAC not sure, DACHA (Gordon Morton) attending, DLO attending.	Rick Bullers
07-Dec-09	YW, DTAC, DCAC, DLALC, MLALC, DACHA, DLO	Various	Rang groups to advise RTA change to FGM (now Friday at 10 am). YW attending, DTAC not attending, DLALC no answer, MLALC not sure, DCAC attending, DACHA (Gordon Morton) attending, DLO attending.	Rick Bullers
09-Dec-09	DLALC	Steve Randell	Rang to follow up re meeting and field work - still no answer	Rick Bullers
09-Dec-09	YW, DTAC, DCAC, DLALC, MLALC, DACHA, DLO	Varioius	Emailed groups to confirm that the time of the FGM is at 10 am, not 10 pm. Also requested confirmation that groups woild have field representatives for fieldwork netween 15-17 december.	Rick Bullers

09-Dec-09	DLALC	Steve Randell	Emailed to advise that I had been trying to contact him by phone since early december with no answer. Advised that I had been trying to call the wrong number, and would call back later today when he is back in the office.	Rick Bullers
09-Dec-09	DCAC	Leanne Watson	Received email stating that field officers will be available on 15-17 December 2009.	Rick Bullers
09-Dec-09	DTAC	Sandra Lee	Sandra called to ask if inspections will be paid. I said they would (only FGM is unpaid). She will send Lex Dadd on fieldwork because he is the fittest given the terrain. I arrangd to email the FGM PowerPoint presentation to her.	Rick Bullers
09-Dec-09	Yarrawalk	Scotte Franks	Received Yarrawalk insurances by email. Covering letter states that Yarrawalk is a division of Tocumwall (insurances in that name).	Rick Bullers
09-Dec-09	DTAC	Sandra Lee	Received email from DTAC requesting information on Native Title issues, and advising that DTAC would take legal action if not addressed. The email was passed on to the client and RTA for action since it is nit considered a cultural heritage issue.	Rick Bullers
10-Dec-09	MLALC	Paul Morris	Received call from Paul to discuss FGM and fieldwork. He is getting lots of info from various places such as NSWALC so is confused. Explained that FGM is tomorrow at SES North Ryde and fieldwork is next week. He aske me to resend the email on fieldwork again to his own email address.	Rick Bullers
11-Dec-09	DCAC, DALCHA, YW, DLO, MLALC	Leanne Watson, Gordon Moreton, Scott Franks, Gordon Workman, Alan Madden	Conducted Aboriginal Focus Group Meeting at SES North Ryde. Issues raised include CH assessment of sites inspected in March 2009 and previous monitoring of sites. DLALC and DTAC did not attend	Rick Bullers
14-Dec-09	DTAC	Sandra Lee	Emailed the FGM presentation to Sandra and told her that we will be revisiting the sites previouslu=y assessed in March early in the New Year.	Rick Bullers
14-Dec-09	DCAC, DLALC, DLO, YW, MLALC	Various	Emailed to advise the meeting place for tomorrow's fieldwork. Also advise dthat there is a chance that we will postpone.	Rick Bullers
14-Dec-09	DACHA	Gordon Moreton	Rang to advise metting place tomorrow (not on email) - also advised that there is a chance that we will postpone.	Rick Bullers

15-17 Dec 09	DCAC, DTAC, YW, DLO, DLALC, DACHA	Leanne Watson, Jessica Wright, John Reilly, Scott Franks, Gordon Workman, Ron Workman, Steve Randall, Gordon Morton, Tim Wells	Fieldwork	Rick Bullers, Tessa Corkill
19-Dec-09	DCAC, DTAC, YW, DLO, DLALC	Leanne Watson, Sandra Lee, Scott Franks, Gordon Workman, Steve Randall	Emailed copies of the invitation to particpate letter, contract for services, schedule of fees and template for fieldwork report	Rick Bullers
21-Dec-09	DLO	Gordon Workman	Received a total of 20 emails with photographs taken during fieldwork (117 photos). Gordon said he had sent the photos of the messy "Little Bloodwood" shelter (AHIMS 45-6-0977) to DECCW for action.	Rick Bullers
21-Dec-09	YW	Scott Franks	Received two emails: 1) copy of YW's survey report, and 2) requested an email address for invoices.	Rick Bullers
21-Dec-09	YW	Scott Franks	Emailed back with a request for discussion on YW's recommendation for exclusion zone around the Terrys Creek GG site.	Rick Bullers
21-Dec-09	YW	Scott Franks	Emailed back stating that an email address for invoices has been requested from the client.	Rick Bullers
21-Dec-09	DCAC, DTAC, YW, DLO, DLALC	Leanne Watson, Sandra Lee, Scott Franks, Gordon Workman, Steve Randall	Sent email saying that they can email me the invoice as long as they are addressed to LeiCon, not AECOM. Also asked for signed contract (so invoices can be process) and also asked for methodology response forms.	Rick Bullers
21-Dec-09	YW	Scott Franks	Received fax with signed copy of the contract and an invoice. I pdf'd it and sent it through to LeiCon.	Rick Bullers

21-Dec-09	YW	Scott Franks	Received phone call from Scott asking if I hade received the report, the contract and the invoice. I confirmed we had. He said that he had received a call from John Fisher saying that he'd received the report. I asked Scott if he had received my email regarding the Terrys Creek site; we discussed it and he confirmed that he would send an email agreeing to exclusion on the southern side and not on the northern side of the bridge.	Rick Bullers
22-Dec-09	DLO	Gordon Workman	Received call from Gordon to discuss his report. He was concerned that he didn't have enough to say to warrant his $500 fee. His concerns related to a site where he could feel vibrations from traffic on the M2 and wondered if jackhammers would be used in the vicinity. I told him if that was his concern then it should be noted in his report.	Rick Bullers
22-Dec-09	DCAC, DTAC, YW, DLO, DLALC	Leanne Watson, Sandra Lee, Scott Franks, Gordon Workman, Steve Randall	Sent email with a copy of the RTA template application for site officers form and asked all stakeholders (that took part in the field inspections) to fill it out ASAP and send it back.	Rick Bullers
22-Dec-09	YW	Scott Franks	Received two emails: 1) stating that he had sent in a site officer form months ago, and 2) sent a filled-out copy of the site officer application. I replied saying that each individual project would require a new site officer application.	Rick Bullers
19-Jan-10	DTAC	Sandra Lee	Called to follow up on Stakeholder survey reports. Sandra advised that it was not yet done but would get onto it ASAP	Rick Bullers
19-Jan-10	DLALC	Steve Randall	Called to follow up on Stakeholder survey reports. Steve not yet in; will call back later.	Rick Bullers
19-Jan-10	DCAC	Leanne Watson	Called to follow up on Stakeholder survey reports. No answer on mobile; left voicemail message asking her to call me.	Rick Bullers
19-Jan-10	DACHA	Celestine Everingham	Called to follow up on Stakeholder survey reports. No answer on mobile; left voicemail message asking her to call me.	Rick Bullers
19-Jan-10	DLO	Gordon Workman	Called to follow up on Stakeholder survey reports. Gordon adivised he had sent the report before Xmas. I said that I had not seen it, but would check my emails	Rick Bullers
20-Jan-10	DLO	Gordon Workman	Called to advise Gordon that I did not have a copy of the report in my records. He immediately sent a copy.	Rick Bullers

20-Jan-10	DLALC	Steve Randall	Received call from Steve to confirm costs for fieldwork and report. I advised the normal RTA rates. He will have a report together by Wednesday next week which needs to go before their Council before finalising. We should have it by Friday next week (29/1/10).	Rick Bullers

Quit smoking and breastfeed to prevent asthma: study

By Julian Drape

NATIONAL

MOTHERS wanting to reduce the risk of their children developing asthma should not smoke during pregnancy and breastfeed their babies for as long as possible in the early months of life.

A new two-year study into asthma and wheezing in young children has uncovered the main risk factors associated with the condition.

Infants are twice as likely to develop asthma if their mothers smoke during pregnancy, a newly released Australian Institute of Health and Ageing report shows.

Babies who are breastfed for more than 12 months are half as likely to develop the condition.

The incidence of asthma is also higher among infants born prematurely or to young mums aged under 25. Aboriginal children are at greater risk, too.

Report author Guy Marks said his team examined the effect breastfeeding had on wheezing in the first few years of a baby's life.

"This study does show that children who are breastfed for longer in the first year of life were less likely to have the onset of wheezing during the first two years of life," Prof Marks said.

Breastfeeding is thought to provide better protection against infections, which can bring on asthma.

Infants with older siblings and those attending child care are also at greater risk of wheezing.

Prof Marks, from the Australian Centre for Asthma Monitoring, says that supports the infection hypothesis.

"The most likely explanation is those children are more likely to pick up colds and other respiratory viruses."

It's a fact of life that some kids won't be breastfed for long, if at all, and many will have brothers and sisters or attend child care.

Which is why Prof Marks believes quitting smoking during pregnancy is "the most important avoidable risk factor".

He also warns against passive smoking after birth.

Some 17 per cent of Australian infants experience asthma in the first three years of their life.

By the age of five just over 20 per cent have been diagnosed with the condition. Of those given the all-clear, another four per cent develop asthma each year in the next two years.

Boys are more likely than girls to develop asthma or wheezing in infancy, but from age five onwards new cases occur equally in both sexes. - AAP

Immigration says sorry over Malu Sara

Thursday Island

TORRES STRAIT

THE immigration department has formally apologised to the people of the Torres Strait over the deaths of five people when one of its vessels sank in 2005.

Investigations into the sinking of the 6.5-metre immigration vessel Malu Sara, which was lost in sea fog between the islands of Saibai and Badu in October 2005, found the tragedy was completely avoidable.

On board the vessel when it sank were immigration officers Wilfred Baira and Ted Harry, Mr Harry's girlfriend Valorie Saub, plus Flora Enosa and her five-year-old daughter Ethena.

Department secretary Andrew Metcalfe told a Senate hearing in Canberra this month that the department had offered a formal apology to the people of the Torres Strait.

"I would like to again acknowledge the department's deep sadness at the loss of life and to record the department's condolences to the families, friends and colleagues of those who are lost, and also to the wider Torres Strait communities," he said.

Earlier this year, the Queensland coroner condemned police and the immigration department for the "totally avoidable" loss of five lives when the Malu Sara sank.

"The department is deeply sorry that the tragic sequence of events as described by the coroner occurred and for the losses suffered by all those affected by this avoidable tragedy," Mr Metcalfe said.

The department had since made changes and improvements to its procedures to ensure that such a tragedy could never occur again.

"The welfare and wellbeing of staff would always be a paramount objective in the department's operations," Mr Metcalfe said.

Those on board the Malu Sara were attempting a 74km voyage from Saibai Island to Badu Island when the vessel became lost in fog on the afternoon of October 14, 2005. It later began taking on water.

Despite countless calls from the skipper, Mr Baira, no air search was launched until 10am the following day, eight hours after police were told the boat was sinking fast.

Ms Enosa's was the only body recovered. - AAP

A file photo of the Malu Sara immigration boat.

Centrelink gets more complaints than other agencies: estimates

NATIONAL: The Commonwealth Ombudsman received an average of 19 complaints a day against Centrelink over the past financial year.

It was the most complained about commonwealth agency with 7,266 complaints or queries made to the ombudsman between 2008-09, a Senate estimates hearing was told last Thursday.

The largest number came from people on the NewStart allowance, the disability support pension, family tax benefit and aged pension payments.

Department of Families, Housing, Community Services and Indigenous Affairs secretary Dr Jeff Harmer told the hearing it was a "relatively small proportion" given the number of interactions the agency has with clients.

But Senator Sue Boyce said it was the tip of the iceberg, because many more complaints against the agency had not reached the ombudsman. - AAP

Senate pays tribute to late Democrat Jack Evans

NATIONAL: The Senate has paid tribute to late Australian Democrats stalwart Jack Evans.

John (Jack) Gordon Evans, who died earlier this month aged 80, co-founded the party with Don Chipp and was briefly a senator in the early 1980s.

Opposition Senate Leader Nick Minchin on Monday said Jack Evans' service to the party went far beyond his time in WA parliament.

"I think it's true that his very short Senate career belies the extent of his considerable contribution to Australian democracy," he told parliament.

Government Senate Leader Chris Evans remembered the pivotal role he played in rebuilding the Democrats during the 1990s.

"He was very much a party man, very much working for the success of the party behind the scenes and was a really unifying force in the Democrats, despite having very strong views of his own," he said.

Australian Greens Leader Bob Brown said Jack Evans' tenacity characterised his political career.

"That and his character won him the admiration and respect shown to him in life and death," he said.

Evans is survived by his wife Margaret, children Suzanne and John and seven grandchildren. - AAP

PUBLIC NOTICE

MAIAWALI-KARUWALI PEOPLE #1 & 2 NATIVE TITLE AUTHORISATION MEETING

All persons who are members of the **Maiawali-Karuwali People** as described in the public notice of 21 October 2009 are advised that the authorisation meeting previously scheduled for 7 November 2009 has been cancelled due to logistical difficulties. The authorisation meeting has now been re-scheduled and will take place at the Waltzing Matilda Centre, Winton, on 28 November 2009 commencing at 9am and finishing at 4pm. An information session will also be held at the same venue on 27 November 2009 from 2pm – 5pm.

All Maiawali-Karuwali People are invited to contact Christine Royan, Communities Project Officer, of QSNTS on 1800 663 693 no later than close of business Wednesday, 24 November 2009, to register their intention to attend the authorisation meeting.

QSNTS regrets that it is not able to assist with travel and accommodation costs for attending the authorisation meeting. Morning tea, lunch and afternoon tea will be provided.

QSNTS

Aboriginal Heritage M2 UPGRADE PROJECT

RTA

The Roads and Traffic Authority of NSW (RTA) proposes to widen sections of the M2 motorway between Windsor Road, Baulkham Hills and Lane Cove Road, North Ryde. The project will include widening of carriageways, construction of additional ramps at Windsor Road, Herring Road and Christie Road, upgrade of the Intelligent Transport System and modifications to the toll plaza.

The RTA seeks the registration of Aboriginal groups and/or Aboriginal people who wish to be consulted on Aboriginal cultural heritage matters relating to the M2 Upgrade project.

The cultural heritage assessment may result in the RTA applying for an Aboriginal Heritage Impact Permit under section 87 and/or section 90 of the *National Parks and Wildlife Act 1974*, and may also be used in the assessment of the impact of the project under the *Environmental Planning and Assessment Act 1979*.

Registrations from Aboriginal groups and/or Aboriginal people wishing to be consulted must be received by phone or in writing by **18 November 2009**.

To register your interest, please contact:
Rick Bullers
AECOM Australia Pty Ltd
PO Box 726, PYMBLE NSW 2073
T: 02 8484 8999
F: 02 8484 8989
E: rick.bullers@aecom.com

At the AICA meeting in Adelaide were, standing from left, Seraphim Slade, George Villaflor, Patrick Malone and Gilmore Johnston and, seated, Nelson Conboy and Lloyd Wyles.

Adelaide hosts AICA meeting

DELEGATES from across the country attended the Australian Indigenous Communications Association (AICA) conference held recently in Adelaide, South Australia.

AICA Chief Executive Officer Patrick Malone hailed the conference a success, with delegates coming from rural, remote and metropolitan areas. He said the gathering had provided a forum for those working in Indigenous broadcasting and communications to network and share their stories.

Mr Malone said the two-day conference had produced some important recommendations and raised issues that would be followed up on in the coming year.

"The budget is a big issue, especially with the award modernisation from the beginning of the year. Broadcasters will be on proper wages," he said.

"We've had the same amount in our budget since 1996 and so this year we will be lobbying strongly to get more money into the sector."

Mr Malone said AICA would also lobby for a move back to funding under the Department of Communications, instead of the current Department of Water, Heritage and the Arts (DEWHA). He said the funding move would mean better services for those in the Indigenous communications industry.

Mr Malone said the conference had allowed delegates to interact with two guest speakers – NITV Chief Executive Officer Pat Turner and DEWHA representative Kate Gilbert.

A working party, made up of representatives from AICA, National Indigenous TV, Indigenous Community TV and remote groups, was also formed during the conference to further develop ideas and build relationships.

"One thing that came out of the conference is that we all need to start thinking a little more strategically than we have been doing," Mr Malone said.

A major concern among delegates from the more remote areas was the introduction of satellite television now being rolled out in country areas, he said.

"When remote Indigenous services were set up they had the ability to turn off programming that was culturally inappropriate and replace it, with a local ceremony for example," he said.

"Now there won't be that option and it's a big concern for people. We really need to be ready for the new technology."

A discussion paper on the new changes to the licensing classifications by the Australian Communications and Media Authority (ACMA) had raised many questions on the impact the proposed changes will have, particularly on funding.

AICA's new board members are: Annette Victor (ICTV Remote), Frances Kelly (PAW Media), Seraphim Slade (STICCA Cunning), Lloyd Wyles (TAIMA Townsville), Andrew Beckett (CAMRA Cherbourg), Jeanette Brown (CAMRA Cherbourg), Nelson Conboy (QRAM Cairns) and Selena Sullivan (ABC Radio National Darwin).

Lena Andrews (Wangki Radio), Candice Siedler (Qld Remote Aboriginal Media), Susan Locke (Pintupi Anmatjere Warlpiri – PAW Media) and Bernadette Angus (Pilbara and Kimberley Aboriginal Media – PAKAM).

Vince Coulthard and Jim Remedio.

Ngaanyatjarra Media senior cultural officer Noel Roberts with AICA membership officer Gilmore Johnston.

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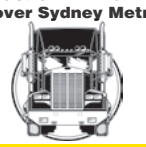

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Cumberland Classifieds

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Public notices

RTA

Aboriginal Heritage M2 UPGRADE PROJECT

The Roads and Traffic Authority of NSW (RTA) proposes to widen sections of the M2 motorway between Windsor Road, Baulkham Hills and Lane Cove Road, North Ryde. The project will include widening of carriageways, construction of additional ramps at Windsor Road, Herring Road and Christie Road, upgrade of the Intelligent Transport System and modifications to the toll plaza.

The RTA seeks the registration of Aboriginal groups and/or Aboriginal people who wish to be consulted on Aboriginal cultural heritage matters relating to the M2 Upgrade project.

The cultural heritage assessment may result in the RTA applying for an Aboriginal Heritage Impact Permit under section 87 and/or section 90 of the *National Parks and Wildlife Act 1974*, and may also be used in the assessment of the impact of the project under the *Environmental Planning and Assessment Act 1979*.

Registrations from Aboriginal groups and/or Aboriginal people wishing to be consulted must be received by phone or in writing by **18 November 2009.**

To register your interest, please contact:
Rick Bullers
AECOM Australia Pty Ltd
PO Box 726, PYMBLE NSW 2073
T: 02 8484 8999
F: 02 8484 8989
E: rick.bullers@aecom.com

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BED queens ens new sealy posture firm in plastic $390, matt only $290 8407-9743
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BED Single & King Single. Sealy ensemble, new in plastic. $280 & $350. 9144 1721
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2048698v1

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2290806v1

COFFEE table $50 and corner TV cabinet unit $80 Good condition. Matching timber. Phone: 0421 103 106
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STUDENT Desk 90cmx56cm, 2 draws, good condition. $40. 0425 270 698
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ENTERTAINMENT. unit, pol. Tas oak, l155 by h130 by w50, exc condition, $260, Ph 9888-7524, 0413-949-225
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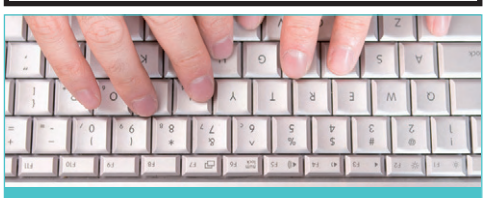

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2199870v2

Cumberland Classifieds

▶ 13 19 79

NOTICE BOARD

Public notices

WANTED! 30 people to try Weight loss sample. Lose 5-15kg in 90 days! 9431 3734
2139882v1

LOOKING for staff? Phone our friendly professional Sales Advisors to place your advertisement. Cumberland Classifieds 131 979.
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Psychic notices / astrology

ARCHANGEL Michael guides. 1902 221 596 $2.97pm mobx 1300 850 196 $2.45pm, absolutesoulsecrets.com.au
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A Super Special Offer gypsyrosepsychic.com.au Tarrot, spells, curses, etc. Private readings. c/c special $23 for 10min 9703-7797 1902-226-042 $3.85pm mobiles extra. 33 years experience.
2223082v1

GRACE'S Psychic Love, Career, Future. 1902 283 575 $3.95min mobex c/card 1800 283 575, SMS Love to 1976 70 70. $3.95 per msg pair SMS help line 1800-444-407
2191150v7

SARAH'S Psychics Reveal all. 1902 215 562 $3.96pm mob ex. C/c $3.50pm 1300 498 831
2068871v2

RTA

Aboriginal Heritage M2 UPGRADE PROJECT

The Roads and Traffic Authority of NSW (RTA) proposes to widen sections of the M2 motorway between Windsor Road, Baulkham Hills and Lane Cove Road, North Ryde. The project will include widening of carriageways, construction of additional ramps at Windsor Road, Herring Road and Christie Road, upgrade of the Intelligent Transport System and modifications to the toll plaza.

The RTA seeks the registration of Aboriginal groups and/or Aboriginal people who wish to be consulted on Aboriginal cultural heritage matters relating to the M2 Upgrade project.

The cultural heritage assessment may result in the RTA applying for an Aboriginal Heritage Impact Permit under section 87 and/or section 90 of the *National Parks and Wildlife Act 1974*, and may also be used in the assessment of the impact of the project under the *Environmental Planning and Assessment Act 1979*.

Registrations from Aboriginal groups and/or Aboriginal people wishing to be consulted must be received by phone or in writing by **18 November 2009.**

To register your interest, please contact:
Rick Bullers
AECOM Australia Pty Ltd
PO Box 726, PYMBLE NSW 2073
T: 02 8484 8999
F: 02 8484 8989
E: rick.bullers@aecom.com

PUB: HSG DATE: 3/11/09 PAGE: 105 COLOUR: C M Y K MB FD: MB

National Native Title Tribunal

New South Wales and Australian Capital Territory Registry
Level 25, 25 Bligh Street
Sydney NSW 2000
GPO Box 9973
Sydney NSW 2000
Telephone (02) 9235 6300
Facsimile (02) 9233 5613

4 November 2009

Rick Bullers
Professional Archaeologist
AECOM Australia Pty Ltd
PO Box 726
Pymble NSW 2073

Our Reference: 3128/09to

Dear Mr Bullers

Native Title Search Results of Council of the Shire of Hornsby and Council of the Shire of Baulkham Hills Local Government Areas

Thank you for your letter of 3 November 2009.

My search on 4 November 2009 found:

Register Type	NNTT Reference Numbers
National Native Title Register	Nil.
Register of Native Title Claims	NC97/8
Unregistered Claimant applications	Nil.
Register of Indigenous Land Use Agreements	Nil.

I have included the Register of Native Title Claims extract, attachments and a NNTT Registers fact sheet to help you understand the search result.

Please note that there may be a delay between a native title determination application being lodged in the Federal Court and its transfer to the Tribunal. As a result, some native title determination applications recently filed in the Federal Court may not appear on the Tribunal's databases.

If you need more information please call me on 1800 640 501.

Yours sincerely

Tom O'Reilly
Senior Case Officer

Telephone (02) 9235 6315
Facsimile (02) 9235 5613
Email tom.o'reilly@nntt.gov.au

Encl

NATIONAL NATIVE TITLE TRIBUNAL

Application Information and Extract from the Register of Native Title Claims

Application Information

Application numbers: Federal Court number: NSD6061/98
NNTT number: NC97/8

Application name: Darug Tribal Aboriginal Corporation

Registration history: Registered from 12/05/1997 to 29/09/1999.
Registered from 13/12/2000.

NNTT map attached.

Register Extract (pursuant to s.186 of the *Native Title Act 1993*)

Application lodged with: National Native Title Tribunal

Date application lodged: 12/05/1997

Date claim entered on Register: 13/12/2000

Applicants: Angela Martin, Colin Rex Gale, Gordon William Morton

Address for service:
Eddy Neumann
Eddy Neumann Lawyers
Level 1
255 Castlereagh Street
SYDNEY NSW 2000
Phone: (02) 9264 9933
Fax: (02) 9264 9966

Additional Information:

Not Applicable

Area covered by the claim:

Information identifying the boundaries of:
a) the area covered by the application; and
b) any areas within those boundaries that are not covered by the application.

(a) 18 x AO size colour maps (1 x locality & 17 x enlargements), 1 x A3 locality map and a 21 page tenure/parcel identifier produced by the Surveyor General's Department have been filed with the National Native Title Tribunal. The 21 page tenure/parcel identifier is "Attachment C".

(b) Subject to clauses (d) and (e) the area covered by the application excludes any land or waters covered by:
(i) a schedule interest;
(ii) a freehold estate;
(iii) a commercial lease that is neither an agricultural lease nor a pastoral lease;
(iv) an exclusive agricultural lease or an exclusive pastoral lease;
(v) a residential lease;
(vi) a community purpose lease;
(vii) a lease dissected from a mining lease as referred to in s23B(2)(vii);
(viii) any lease (other than a mining lease) that confers a right of exclusive use over particular land or waters;

which was validly vested or granted on or before 23 December 1996.

(c) subject to clauses (d) and (e) the area covered by the application excludes any area covered by the valid construction or establishment of any public work, where the construction or establishment of the public work commenced on or before 23 December 1996.

(d) Where the act specified in (b) and (c) falls within the provision of
(i) s23B(9) - Exclusion of acts benefiting Aboriginal peoples or Torres Straight Islanders;
(ii) s23B(9A) - Establishment of a national or state park;
(iii) s23B99B) - Acts where legislation provides for non-extinguishment;
(iv) s23B(9C) - Exclusion of Crown to Crown grants; and
(v)s23B(10) - Exclusion by regulation,
the area covered by the act is not excluded from this application.

(e) Where an act referred to in clauses 2 and 3 covers land or waters referred to in:
s47 - Pastoral leases held by native title claimants;
s47A - Reserves etc covered by claimant applications; and
s47B - Vacant crown land covered by claimant applications,
the area covered by the act is not excluded from the application.

(f) Where an area is covered by a previous non-exclusive possession act (s 23F) the native title claim group does not claim the native title rights and interests set out in clause 1 of Attachment E to the exclusion of all others.

(g) The area covered by the application excludes land where native title has been extinguished at common law.

Persons claiming to hold native title:

The native title claim group comprises all the members of the Darug Tribal Aboriginal Corporation and their descendants

Registered native title rights and interests:

The following Native Title Rights & Interests were entered on the Register on 13/12/2000:
1. Subject to paragraphs 2 - 5 below the applicants claim the full and free enjoyment of the following native title rights in relation to area subject to application.
(a) a right to possess, occupy, use and enjoy the claimed area
(b) a right to make decisions about the use and enjoyment of the claimed area
(c) a right of access to the claimed area
(d) a right to control the access of others to the claimed area
(e) a right to use and enjoy the resources of the claimed area
(f) a right to control the use and enjoyment of others or resources of the claimed area
(g) a right to trade in resources of the claimed area

(h) (right not registered)
(i) a right to maintain and protect places of importance under traditional laws, customs and practices in the claimed area
(j) (right not registered)

2. With respect to those parts of the area the subject of the application which are, or have been the subject of a previous non-exclusive possession act within the meaning of s23F of the NTA, the applicants claim the native title rights and interests set out in 1 above subject to the rights and interests created in the "non exclusive possession act" which are not inconsistent with the rights and interests claimed and, in the case of rights granted which are inconsistent with the rights and interests claimed, subject to any suspension of the native title rights and interests which those inconsistent rights and interests cause.

3. With respect to those parts of the area the subject of the application which are, or have been, the subject of
(a) a Category B intermediate period act within the meaning of s232C;
(b) a Category C intermediate period act within the meaning of s232D; or
(c) a Category D intermediate period act within the meaning of s232E;
the applicants claim the native title rights and interests set out in 1 above subject to the rights and interests created in the "non exclusive possession act" which are not inconsistent with the rights and interests claimed and, in the case of rights granted which are inconsistent with the rights and interests claimed, subject to any suspension of the native title rights and interests which those inconsistent rights and interests cause.

4. With respect to those parts of the area the subject of the application which are, or have been the subject of
(a) a Category B past act within the meaning of s230;
(b) a Category C past act within the meaning of s231; or
(c) a Category D past act within the meaning of s232;
the applicants claim the native title rights and interests set out in 1 above subject to the rights and interests created in the "non exclusive possession act" which are not inconsistent with the rights and interests claimed and, in the case of the rights granted which are inconsistent with the rights and interests claimed, subject to any suspension of native title rights and interests which those inconsistent rights and interests cause.

5. The native title rights and interests identified above do not extend to ownership of any minerals, petroleum or gas which are wholly owned by the Crown.

6. The native title rights and interests identified above do not include a claim for exclusive occupation and use of off shore areas as defined by s253.

Register attachments:

1. Tenure/Parcel Identifier (Available for inspection at the Sydney Registry of the Tribunal), Attachment C of the Application, 21 pages - A4, Attached 12/05/1997.

Note: The Register may, in accordance with s.188 of the Native Title Act 1993, contain confidential information that will not appear on the Extract.

Searching the NNTT Registers in New South Wales

Search service
On request the National Native Title Tribunal will search its public registers for you. A search may assist you in finding out whether any native title applications (claims), determinations or agreements exist over a particular area of land or water.

In New South Wales native title cannot exist on privately owned land including family homes or farms.

What information can a search provide?
A search can confirm whether any applications, agreements or determinations are registered in a local government area. Relevant information, including register extracts and application summaries, will be provided.

In NSW because we cannot search the registers in relation to individual parcels of land we search by local government area.

Most native title applications do not identify each parcel of land claimed. They have an external boundary and then identify the areas not claimed within the boundary by reference to types of land tenure e.g., freehold, agricultural leasehold, public works.

What if the search shows no current applications?
If there is no application covering the local government area this only indicates that at the time of the search either the Federal Court had not received any claims in relation to the local government area or the Tribunal had not yet been notified of any new native title claims.

It does not mean that native title does not exist in the area.

Native title may exist over an area of land or waters whether or not a claim for native title has been made.

Where the information is found
The information you are seeking is held in three registers and on an applications database.

National Native Title Register
The National Native Title Register contains determinations of native title by the High Court, Federal Court and other courts.

Register of Native Title Claims
The Register of Native Title Claims contains applications for native title that have passed a registration test.

Registered claims attract rights, including the right to negotiate about some types of proposed developments.

Register of Indigenous Land Use Agreements
The Register of Indigenous Land Use Agreements contains agreements made with people who hold or assert native title in an area.

The register identifies development activities that have been agreed by the parties.

Application summaries
An application summary contains a description of the location, content and status of a native title claim.

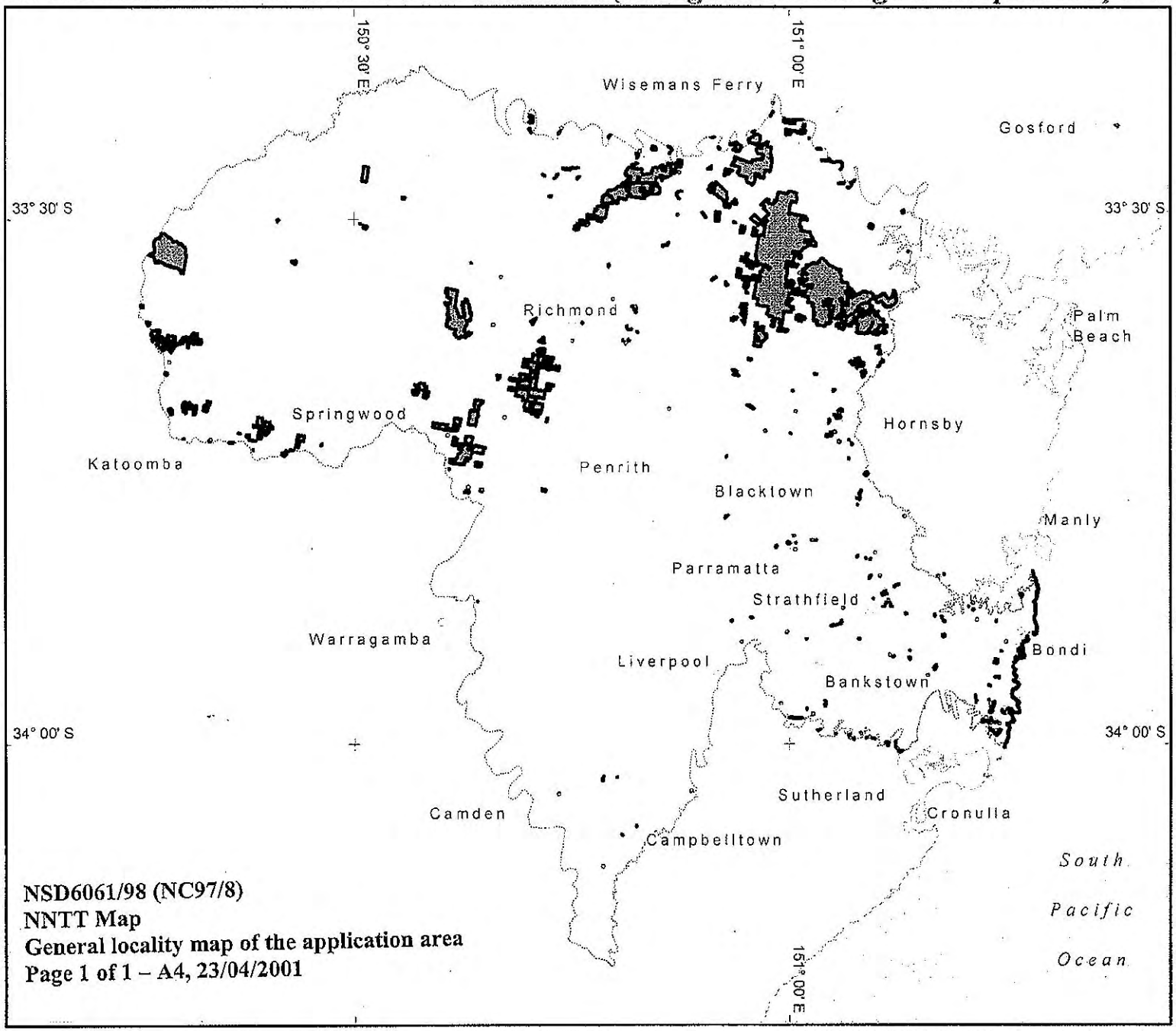
This information may be different to the information on the Register of Native Title Claims, e.g., because an amendment has not yet been tested.

How do you request a search?

A search request form is available on the Tribunal's web site at:
http://www.nntt.gov.au/registers/search.html
This form says how much searches cost.
Mail, fax or email your request to the Tribunal's Sydney registry, identifying the local government area/s you want searched.

Email: SydneySearch@nntt.gov.au
Fax: (02) 9233 5613
Address: GPO Box 9973, Sydney NSW 2001
Phone: (02) 9235 6300

NATIVE TITLE APPLICATION: NG6061/98 (Darug Tribal Aboriginal Corporation) NC97/008



NSD6061/98 (NC97/8)
NNTT Map
General locality map of the application area
Page 1 of 1 – A4, 23/04/2001

Area of application subject to claim

External boundary of application

NOTE: To determine areas subject to claim within the external boundary, reference to the application description is necessary.

Map created by: Geospatial Analysis & Mapping Branch, National Native Title Tribunal (23/04/2001)

Application boundary data sourced from Land and Property Information, Department of Information, Technology & Management (NSW).
Location and coastline data sourced from AUSLIG.

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NOTE. This map does not form part of the Register of Native Title Claims. It is provided as general information only and to assist in locating the area involved.

The Registrar, the National Native Title Tribunal and its staff and officers and the Commonwealth, accept no liability and or give no undertakings, guarantees or warranties concerning the accuracy, completeness or fitness for purpose of the map.

NORTH

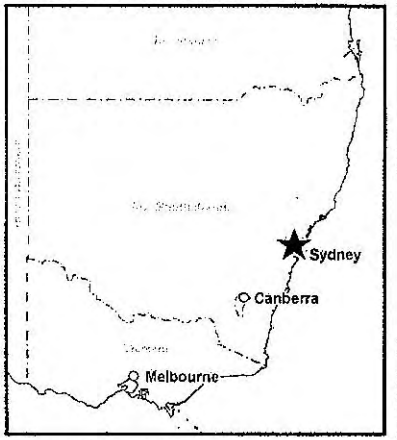
0 20

KILOMETRES

Latitude and Longitude based on Australian Geodetic Datum 1984
Non Projection

NATIONAL NATIVE TITLE TRIBUNAL

Location of NG6061/98 within New South Wales



NC97/8 ; Darug #3

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
1	120/10//751628////	BOWEN	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
2	120/48//751664////	WHEENY	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	ALEXANDRIA	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	ALEXANDRIA	LA PEROUSE	WAVERLEY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	ALEXANDRIA	LA PEROUSE	WOOLLAHRA	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	ALEXANDRIA	METROPOLITAN	SOUTH SYDNEY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	BANKSTOWN	METROPOLITAN	STRATHFIELD	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	BEROWRA	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	BILPIN	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	CASTLE HILL	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	COLO	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	CONCORD	METROPOLITAN	ASHFIELD	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	CONCORD	METROPOLITAN	CONCORD	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	COOMASSIE	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	CORNELIA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	FIELD OF MARS	DEERUBBIN	PARRAMATTA	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	FIELD OF MARS	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	FREDERICK	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	GIDLEY	DEERUBBIN	BLACKTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	HAM COMMON	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	HUNTERS HILL	METROPOLITAN	HUNTERS HILL	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	HUNTERS HILL	METROPOLITAN	RYDE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	IRVINE	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	IRVINE	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

ATTACHMENT C

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
4	120///////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	KURRAJONG	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	LINDEN	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	MARRAMARRA	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	MEEHAN	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	MERROO	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	MINTO	THARAWAL	CAMPBELLTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	NARELLAN	THARAWAL	CAMDEN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	NELSON	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	NEPEAN	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	NORTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	PETERSHAM	METROPOLITAN	MARRICKVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
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4	120///////	ST GEORGE	METROPOLITAN	CANTERBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
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4	120///////	ST JAMES	METROPOLITAN	SYDNEY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
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4	120///////	ST MATTHEW	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	STRATHDON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
4	120///////	WILBERFORCE	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
5	120///////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
5	120///////	WOODFORD	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
6	120///////	COLO	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
6	120///////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
6	120///////	CORNELIA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
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6	120///////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
6	120///////	MARRAMARRA	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
6	120///////	MEEHAN	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
6	120///////	NORTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
6	120///////	ST GEORGE	METROPOLITAN	CANTERBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
6	120///////	ST GEORGE	METROPOLITAN	HURSTVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
6	120///////	WILBERFORCE	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
7	120///////	BILPIN	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
7	120///////	BOTANY	LA PEROUSE	BOTANY BAY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
7	120///////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
7	120///////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
7	120///////	PETERSHAM	METROPOLITAN	MARRICKVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
7	120///////	ST MATTHEW	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
7	120///////	ST PETER	THARAWAL	CAMPBELLTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
8	120///////	NOT_DEFINED	NOT_DEFINED	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
8	120///////	NOT_DEFINED	NOT_DEFINED	WAVERLEY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
8	120///////	NOT_DEFINED	NOT_DEFINED	WOOLLAHRA	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
9	120///////	HUNTERS HILL	METROPOLITAN	RYDE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
10	120///////	FIELD OF MARS	DEERUBBIN	PARRAMATTA	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
11	120///////	FIELD OF MARS	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
11	120///////	FREDERICK	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
11	120///////	LIBERTY PLAINS	METROPOLITAN	AUBURN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
12	120////10024/3000//	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
13	120////1047/3000//	HUNTERS HILL	METROPOLITAN	HUNTERS HILL	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
14	120////10860/3000//	CONCORD	METROPOLITAN	CONCORD	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
15	120////1107/2030/R/	FIELD OF MARS	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
16	120////11292/3000//	NEPEAN	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
17	120////1159/3000/	NELSON	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
18	120////12386/3000//	HUNTERS HILL	METROPOLITAN	RYDE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
19	120////14732/1603//	KURRAJONG	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
20	120////15277/3000//	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
21	120////15480/3090//	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
22	120////1616/3000//	ALEXANDRIA	LA PEROUSE	WAVERLEY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
23	120////18846/3000//	PETERSHAM	METROPOLITAN	MARRICKVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
24	120////1915/3000//	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
25	120////2248/3000//	MENANGLE	THARAWAL	CAMPBELLTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
26	120////22865/3000//	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
27	120////2508/3000//	ALEXANDRIA	LA PEROUSE	WAVERLEY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
28	120////268/858/R/	ST JAMES	METROPOLITAN	SYDNEY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
29	120////2958/3000//	CONCORD	METROPOLITAN	ASHFIELD	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
30	120////3558/3000//	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
31	120////414/3000//	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
32	120////4294/3000//	PETERSHAM	METROPOLITAN	CANTERBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
33	120////5165/3000//	PETERSHAM	METROPOLITAN	MARRICKVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
34	120////5223/3000//	ST GEORGE	METROPOLITAN	HURSTVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
35	120////578/3000//	HAM COMMON	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
36	120////7506/3000//	ST GEORGE	METROPOLITAN	HURSTVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
37	120////80/3000/R/	FIELD OF MARS	DEERUBBIN	PARRAMATTA	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
39	120/1//182467////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
40	120/1//192764///	BANKSTOWN	GANDANGARA	BANKSTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
41	120/1//34388////	ALEXANDRIA	LA PEROUSE	WOOLLAHRA	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
42	120/1//39760////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
43	120/1//592412////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
44	120/1//709431////	FIELD OF MARS	METROPOLITAN	PARRAMATTA	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
45	120/1//724350////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
46	120/1//820326////	BANKSTOWN	GANDANGARA	BANKSTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
47	120/1//822201////	CASTLE HILL	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
48	120/1//822268///	LIBERTY PLAINS	GANDANGARA	BANKSTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
49	120/1//824022////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
50	120/1//848020////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
51	120/1//848071////	ST MATTHEW	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
52	120/1//850403////	ST JOHN	DEERUBBIN	HOLROYD	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
53	120/1//867085////	ST GEORGE	METROPOLITAN	ROCKDALE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
54	120/1//965996////	ST LUKE	GANDANGARA	FAIRFIELD	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
55	120/1/22/758605////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
56	120/1/26/758829////	ST JOHN	DEERUBBIN	PARRAMATTA	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
57	120/10//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
58	120/10//829656///	LIBERTY PLAINS	METROPOLITAN	BANKSTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
59	120/10/20/758605////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
60	120/10/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
61	120/101//786384////	SOUTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
62	120/103//752025////	CORNELIA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
63	120/104//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
64	120/1051//752053////	SOUTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
65	120/1052//752053////	SOUTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
66	120/106//752029////	FREDERICK	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
67	120/1064//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
68	120/109//752014////	BEROWRA	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
69	120/11//939734////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
70	120/1114//48270////	CASTLE HILL	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
71	120/113//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
72	120/113//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
73	120/117//751662////	STRATHDON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
74	120/118//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
75	120/118//752039/1919/2030//	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
76	120/12//774457////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
77	120/12//939734////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
78	120/120//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
79	120/121//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
80	120/122//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
81	120/123//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
82	120/125//752039/4104/2030//	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
83	120/126//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
84	120/127//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
85	120/127//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
86	120/129//752039/1919/2030//	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
87	120/13//58560////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
88	120/13//631041////	ST PETER	THARAWAL	CAMPBELLTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
89	120/13//774457////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
90	120/131//751635////	COOMASSIE	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
91	120/132//751635////	COOMASSIE	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
92	120/134//751658/2245/1507//	MERROO	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
93	120/134//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
94	120/134//752039/2308/2030//	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
95	120/135//751658////	MERROO	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
96	120/135//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
97	120/136//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
98	120/137//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
99	120/138//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
100	120/14//3790////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
101	120/14//842775////	HUNTERS HILL	METROPOLITAN	RYDE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
102	120/144//751635////	COOMASSIE	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
103	120/144//752014////	BEROWRA	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
104	120/144//752048////	NORTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
105	120/146//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
106	120/146//752048////	NORTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
107	120/147//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
108	120/148//47922////	COOMASSIE	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
109	120/1492//752011////	ALEXANDRIA	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
110	120/15//16074////	BEROWRA	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
111	120/15//57112////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
112	120/150//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
113	120/150//752025////	CORNELIA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
114	120/151//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
115	120/152//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
116	120/155//752048////	NORTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
117	120/156//10177////	BANKSTOWN	GANDANGARA	BANKSTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
118	120/1562//822233////	ALEXANDRIA	LA PEROUSE	WAVERLEY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
119	120/158//752048////	NORTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
120	120/16//3790////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
121	120/160//752014////	BEROWRA	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
122	120/160//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
123	120/161//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
124	120/1611//752011////	ALEXANDRIA	LA PEROUSE	WAVERLEY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
125	120/162//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
126	120/163//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
127	120/164//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
128	120/165//752014////	BEROWRA	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
129	120/165//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
130	120/166//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
131	120/167//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
132	120/167//752025/8553/2030/R/	CORNELIA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
133	120/17//7464////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
134	120/17//825649////	PETERSHAM	METROPOLITAN	MARRICKVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
135	120/171//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
136	120/173//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
137	120/173//752048////	NORTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
138	120/174//752048////	NORTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
139	120/175//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
140	120/176//47914////	BEROWRA	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
141	120/176//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	214
142	120/177//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
143	120/178//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
144	120/179//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	214
145	120/1799//822244////	ALEXANDRIA	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
146	120/18//825649////	PETERSHAM	METROPOLITAN	MARRICKVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
147	120/18/1/758558////	NELSON	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
148	120/18/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
149	120/180//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
150	120/181//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
151	120/181//752039/4107/2030//	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION					HOLDER/VESTEE/LESSEE/TRUSTEE				CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
152	120/182//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
153	120/182//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
154	120/183//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
155	120/183//752039/4106/2030//	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
156	120/184//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
157	120/185//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
158	120/186//39768////	HAM COMMON	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
159	120/186//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
160	120/1863//700001////	ST JAMES	METROPOLITAN	SYDNEY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
161	120/187//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
162	120/188//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
163	120/189//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
164	120/190//751656////	MEEHAN	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
165	120/190//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
166	120/191//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
167	120/194//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
168	120/194//752025////	CORNELIA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
169	120/197//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
170	120/198//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
171	120/198//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
172	120/199//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
173	120/199//752048////	NORTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
174	120/2//216322////	ST MATTHEW	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
175	120/2//249704////	BRINGELLY	GANDANGARA	LIVERPOOL	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
176	120/2//347829////	GIDLEY	DEERUBBIN	BLACKTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
177	120/2//39760////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
178	120/2//41627////	ALEXANDRIA	LA PEROUSE	WAVERLEY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
179	120/2//562557////	CONCORD	METROPOLITAN	CONCORD	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
180	120/2//592412////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
181	120/2//982390////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
182	120/20//237206////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
183	120/20//57637////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
184	120/20/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
185	120/200//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
186	120/200//752039/4702/2030//	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
187	120/201//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
188	120/201//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
189	120/201//752039/4958/2030//	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
190	120/202//47644////	MEEHAN	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
191	120/202//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
192	120/202//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
193	120/203//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
194	120/205//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
195	120/206//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
196	120/206//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
197	120/206//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
198	120/207//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
199	120/208//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
200	120/208//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
201	120/208//752047/1423/2030//	NELSON	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
202	120/209//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
203	120/21//57637////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
204	120/210//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
205	120/210//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
206	120/211//751627////	BLACKHEATH	DEERUBBIN	ILUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
207	120/212//751627////	BLACKHEATH	DEERUBBIN	ILUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
208	120/212//752025////	CORNELIA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
209	120/213//751627////	BLACKHEATH	DEERUBBIN	ILUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
210	120/214//751627////	BLACKHEATH	DEERUBBIN	ILUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
211	120/215//751627////	BLACKHEATH	DEERUBBIN	ILUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
212	120/216//751627////	BLACKHEATH	DEERUBBIN	ILUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
213	120/217//751627////	BLACKHEATH	DEERUBBIN	ILUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
214	120/218//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
215	120/219//751627////	BLACKHEATH	DEERUBBIN	LUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
216	120/219//752039/7371/2030//	MAROOTA	DEERUBBIN	AULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
217	120/22//939734////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
218	120/220//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
219	120/221//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
220	120/222//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
221	120/223//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
222	120/224//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
223	120/225//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
224	120/226//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
225	120/228//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
226	120/229//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
227	120/231//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
228	120/231//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
229	120/236//752048////	NORTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
230	120/237//751649/	KURRAJONG	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
231	120/240//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
232	120/240//752048////	NORTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

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DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
233	120/241//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
234	120/245//752025////	CORNELIA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
235	120/247//752039/10609/2030//	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
236	120/252//751662////	STRATHDON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
237	120/258//729633////	CORNELIA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
238	120/26//752040////	MARRAMARRA	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
239	120/260//859029////	NORTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
240	120/261//859029////	NORTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
241	120/2658//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
242	120/276//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
243	120/277//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
244	120/278//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
245	120/2816//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
246	120/295//752047////	NELSON	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
247	120/3//211148///	BANKSTOWN	GANDANGARA	BANKSTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
248	120/3//39760////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
249	120/3//41627////	ALEXANDRIA	LA PEROUSE	WAVERLEY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
250	120/3//706164////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
251	120/3//820355////	MEEHAN	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
252	120/3//820392////	MERROO	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
253	120/3/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
254	120/30//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
255	120/30//751670////	WOODFORD	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
256	120/302//729721////	BANKSTOWN	GANDANGARA	BANKSTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
257	120/306//752047////	NELSON	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
258	120/32//751670////	WOODFORD	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
259	120/323//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
260	120/324//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
261	120/324//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
262	120/325//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
263	120/326//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	214
264	120/326//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
265	120/327//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
266	120/327//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
267	120/328//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
268	120/329//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
269	120/33//751670////	WOODFORD	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
270	120/330//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
271	120/330//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
272	120/331//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
273	120/331//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
274	120/332//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
275	120/333//47653////	KURRAJONG	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
276	120/333//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
277	120/333//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
278	120/334//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
279	120/334//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
280	120/335//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
281	120/335//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
282	120/336//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
283	120/336//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
284	120/337//751644////	HARTLEY	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
285	120/337//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
286	120/338//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
287	120/339//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
288	120/339//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
289	120/340//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
290	120/340//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
291	120/341//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
292	120/341//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
293	120/342//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
294	120/343//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
295	120/344//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
296	120/346//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
297	120/347//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
298	120/348//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
299	120/354//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
300	120/354//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
301	120/355//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
302	120/356//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
303	120/357//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
304	120/357//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
305	120/358//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
306	120/359//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
307	120/359//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
308	120/360//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
309	120/361//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
310	120/362//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
311	120/371//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
312	120/382//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
313	120/383//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE'	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
314	120/387//752047////	NELSON	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
315	120/395//752047////	NELSON	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
316	120/4//41627////	ALEXANDRIA	LA PEROUSE	WAVERLEY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
317	120/4//57637////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
318	120/4//739331////	PROSPECT	DEERUBBIN	BLACKTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
319	120/4/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
320	120/401//752011////	ALEXANDRIA	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
321	120/41//752025////	CORNELIA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
322	120/410//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
323	120/411//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
324	120/412//721589////	ST PETER	THARAWAL	CAMPBELLTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
325	120/412//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
326	120/422//752056////	ST GEORGE	METROPOLITAN	HURSTVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
327	120/4310//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
328	120/434//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
329	120/456//752036////	LIBERTY PLAINS	GANDANGARA	BANKSTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
330	120/46//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
331	120/46//752016////	BRINGELLY	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
332	120/469//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
333	120/478//752056////	ST GEORGE	METROPOLITAN	ROCKDALE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
334	120/4789//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
335	120/4807//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
336	120/481//752056////	ST GEORGE	METROPOLITAN	HURSTVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
337	120/4858//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
338	120/494//704503////	CONCORD	METROPOLITAN	CONCORD	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
339	120/4A//57637////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
340	120/5//57637////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
341	120/5//739331////	PROSPECT	DEERUBBIN	BLACKTOWN	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
342	120/5//746934////	LIBERTY PLAINS	METROPOLITAN	STRATHFIELD	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
343	120/5/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
344	120/500//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
345	120/509//729627////	CONCORD	METROPOLITAN	CONCORD	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
346	120/518//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
347	120/518//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
348	120/519//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
349	120/520//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
350	120/521//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
351	120/522//751646////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
352	120/522//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
353	120/5229//809179////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
354	120/523//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
355	120/523//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
356	120/524//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
357	120/5244//820345////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
358	120/5245//820345////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
359	120/525//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
360	120/5255//824002////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
361	120/526//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
362	120/5263//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
363	120/5264//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
364	120/5265//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
365	120/5266//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
366	120/5267//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
367	120/5268//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

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DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
368	120/5269//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
369	120/5270//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
370	120/5271//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
371	120/5272//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
372	120/5273//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
373	120/5274//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
374	120/5275//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
375	120/5276//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
376	120/5277//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
377	120/5278//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
378	120/5279//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
380	120/5280//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
381	120/5281//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
382	120/5282//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
383	120/5283//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
384	120/5284//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
385	120/5285//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
386	120/5286//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
387	120/5287//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
388	120/5288//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
389	120/5289//824057////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
390	120/529//752056////	ST GEORGE	METROPOLITAN	ROCKDALE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
391	120/5295//824070////	BOTANY	LA PEROUSE	BOTANY BAY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
392	120/530//752056////	ST GEORGE	METROPOLITAN	KOGARAH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
393	120/533//752056////	ST GEORGE	METROPOLITAN	HURSTVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
394	120/534//752056////	ST GEORGE	METROPOLITAN	HURSTVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
395	120/535//752056////	ST GEORGE	METROPOLITAN	HURSTVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

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DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
396	120/541//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
399	120/545//822284////	JAMISON	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
400	120/553//47342////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
401	120/56//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
402	120/57//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
403	120/575//752053////	SOUTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
404	120/58//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
405	120/59//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
406	120/594//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
407	120/596//752049////	PETERSHAM	METROPOLITAN	MARRICKVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
408	120/597//752049////	PETERSHAM	METROPOLITAN	MARRICKVILLE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
409	120/598//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
410	120/6//2006////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
411	120/6//752039////	MAROOTA	DEERUBBIN	BAULKHAM HILLS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
412	120/6/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
413	120/60//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
414	120/601//39962////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
415	120/61//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
416	120/610//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
417	120/62//752015////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
418	120/64//751635////	COOMASSIE	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
419	120/642//728440////	PETERSHAM	METROPOLITAN	CANTERBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
420	120/65//751635////	COOMASSIE	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
421	120/66//752021////	CASTLEREAGH	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
422	120/7//2562////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
423	120/7//57637////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
424	120/7/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

NC97/8 ; Darug #3

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
425	120/711//47216////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
426	120/712//47216////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
427	120/713//47216////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
428	120/714//47216////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
429	120/715//47216////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
430	120/716//47216////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
431	120/717//47216////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
432	120/719//47216////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
433	120/720//47216////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
434	120/721//47216////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
435	120/722//47216////	PETERSHAM	METROPOLITAN	LEICHHARDT	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
436	120/723//752053////	SOUTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
437	120/756//752035////	HUNTERS HILL	METROPOLITAN	RYDE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
438	120/79//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
439	120/8//57637////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
440	120/8/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
441	120/80//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
442	120/80//751656////	MEEHAN	DEERUBBIN	HAWKESBURY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
443	120/81//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
444	120/817//752028////	FIELD OF MARS	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
445	120/818//752028////	FIELD OF MARS	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
446	120/82//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
447	120/84//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
448	120/85//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
449	120/85//751660////	NEPEAN	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
450	120/86//40224////	NEPEAN	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
451	120/86//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
452	120/87//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
453	120/88//40226////	NEPEAN	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
454	120/88//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
455	120/89//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
456	120/9//57112////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
457	120/9/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
458	120/90//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
459	120/91//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
460	120/94//751635////	COOMASSIE	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
461	120/962//752053////	SOUTH COLAH	METROPOLITAN	HORNSBY	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
462	120/97//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
463	120/98//751627////	BLACKHEATH	DEERUBBIN	BLUE MOUNTAINS	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
464	120/?//55267////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
465	120/A//368101////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
466	120/PT6//57637////	CONCORD	METROPOLITAN	DRUMMOYNE	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
467	130///////	BOTANY	LA PEROUSE	RANDWICK	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
467	130///////	CONCORD	METROPOLITAN	CONCORD	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
467	130///////	FIELD OF MARS	METROPOLITAN	PARRAMATTA	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
467	130///////	HAM COMMON	DEERUBBIN	HAWKESBURY	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
467	130///////	HUNTERS HILL	METROPOLITAN	RYDE	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
467	130///////	HUNTERS HILL	METROPOLITAN	UNINCORPORATED	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
467	130///////	ST GEORGE	METROPOLITAN	KOGARAH	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
467	130///////	ST JOHN	DEERUBBIN	PARRAMATTA	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
467	130///////	ST MATTHEW	DEERUBBIN	HAWKESBURY	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
467	130///////	WILBERFORCE	DEERUBBIN	HAWKESBURY	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
468	130///////	NOT_DEFINED	NOT_DEFINED	WAVERLEY	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
469	130/1//119108////	ALEXANDRIA	LA PEROUSE	RANDWICK	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

NC97/8 ; Darug #3

DESCRIPTION						HOLDER/VESTEE/LESSEE/TRUSTEE			CONTACT ADDRESS DETAILS			
REF	PARCEL IDENTIFIER	PARISH	LALC	LGA	TYPE	ORG/SURNAME	GIVEN NAME	TITLE	ADDRESS1	TOWN	STATE	PC
470	130/2//119108////	ALEXANDRIA	LA PEROUSE	RANDWICK	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
471	130/3//119108////	ALEXANDRIA	LA PEROUSE	RANDWICK	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
472	130/7A/10/11608///	BANKSTOWN	GANDANGARA	BANKSTOWN	STATUS UNKNOWN	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
474	120/12/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
475	120/13/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
476	120/14/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
477	120/15/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
478	120/16/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
479	120/17/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
480	120/18/9/758387////	STRATHDON	DEERUBBIN	PENRITH	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
481	120/013/35//251284////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148
482	120/8//251284////	BOTANY	LA PEROUSE	RANDWICK	OTHER CROWN LAND	STATE LANDS SERVICES			PO BOX 878	BLACKTOWN	NSW	2148

9 November 2009

10 NOV 2009

Rick Bullers
Professional Archaeologist
AECOM Pty Ltd
PO Box 786
PYMBLE NSW 2073

Dear Mr Bullers

Re: Aboriginal community consultation notification for proposed M2 Upgrade Project between Windsor Road, Baulkham Hills and Lane Cove Road, North Ryde

I refer to your letter dated 3 November 2009 regarding participation in the consultation process for the above project.

Council welcomes this opportunity and would like to register its interest. As requested, the following is a list of our local Indigenous contacts:

Greg Davison
Norwest Aboriginal Development Association
Ph: 9208 8808
Ph: 9490 8184 (CSIRO)
(Mob) 0418 969 022

Brian Freeman
Norwest Aboriginal
Development Association
(Mob) 0401 220 968

Aunty Edna Watson
Darug Custodian Aboriginal Corporation
Ph: (02) 4573 6964
(Mob) 0408 272 660
146 Boundary Rd
Oakville NSW 2765

Ian Bundeluk
Darug Custodian Aboriginal Corporation
PO Box 36
Kellyville NSW 2155

Colin Gale
Darug Tribal Aboriginal Council

PO Box 441
Blacktown NSW 2148

Deerubbin Local Aboriginal Land Council
PO Box V184
Mt Druitt Village NSW 2770

If you need further information, please contact Raquel Ricafort-Bleza, Special Projects, on 9843 0560.

Yours faithfully

Stewart Seale.

Stewart Seale
MANAGER - FORWARD PLANNING

DARUG - LAND - OBSERVATIONS

ABN: 87239202455
E-MAIL: gordow51@bigpond.net.au
PO BOX: 571 Plumpton. NSW 2761
Phone: 029831 8868 or 0415 663 763

15-2-2010

Mr Rick Bullers

Professional Archaeologist

AECOM Australia Pty Ltd.
Re: M2 Upgrade project, between North Ryde and Baulkham Hills, NSW

During the inspection of site CF3 (AHIMS 45-6-2161) it was noted that vibrations could be felt from traffic passing on the M2, which was 30-40 m south of the rock shelter. Works in the area of this site include alterations to the existing sediment basin (approximately 100 m west of the site) on the northern side of the M2, and temporary clearing of vegetation, installation of a works site compound and bridge widening on the southern side of the M2 bridge. Since the site is on the northern side of the M2, there will be no direct impacts to the site. However, there may be indirect impacts from construction vibration. DLO believes that periodic monitoring of the site during construction activities in the vicinity of site CF3 is warranted to ensure that no adverse vibration impacts occur during construction
D.L.O finds your Recommendations in this DRAFT Report very good and the Recommendations of Mr Scott Franks from Yarrawalk are good
D.L.O would like to be involved in all area of works to be carried out on this job site.

Yours faithfully

Uncle
Gordon Workman
Darug Elder

Sites Officer

Darug Aboriginal Cultural Heritage Assessments

ABN 51734106483

Gordon Morton & Associates

Mob: 0422 865 831
Fax: 45 677 421

Celestine Everingham
90 Hermitage Rd., Kurrajong Hills, 2758
Ph/Fax: 45677 421
Mob: 0432 528 896

19. 2. 10

Attention
Rich Bullers
AECOM

re M2 upgrade project – between North Ryde and Baulkham Hills, N.S.W.

DHCHH have read and considered your report on the above project we support your recommendations with the exception of 3. iii. – we wish to monitor at sites during construction. We are very concerned that protective fencing is erected to protect Darug rock shelters to within 50 m of any works to minimise the potential for damage (see site list 3.1) p 41. Special care should be taken with site M2 #1 as we feel it may be directly impacted through access during construction and/or sedimentation. Mitigation measures must be established to minimise all potential impacts on these important Darug sites

Yours Sincerely,

G W Morton

DARUG CUSTODIAN ABORIGINAL

CORPRORATION

PO BOX 81 WINDSOR 2756.

PH: 45775181 FAX: 45775098 MOB: 0415770163

ABN: 81935722930

mulgokiwi@aol.com

19 February 2010.

Attention: Rick Bullers.

SUBJECT: Preliminary Aboriginal Heritage Assessment – M2 Upgrade.

Dear Rick,

The Darug Custodian Aboriginal Corporation been involved in the conservation of Bidgigal reserve for the past thirty years, this area is an undisputed Darug area that has evidence of our occupation throughout. Previous to and during the construction of the M2 our group was active in the preservation of this area, the outcome of this was the co management agreement with the local council for the protection of our heritage within Bidgigal reserve.

In previous years the consultation, assessments and monitoring within the M2 corridor and buffer zones have not been satisfactory to our group. Sites thousands of years old need to be cared for by the traditional owners, this is how our culture and respect works towards sites being appropriately cared for. The monitoring of our rock shelters has been carried out for the past ten years without any consultation to the Darug people, our people need to visit these areas to monitor as it is with good faith that we agree to sites being looked after during and after development. Our group need to be involved in all future monitoring of our sites within the M2 Buffer area.

The Archaeological works connected to the M2 construction need to be revised as our sites are not separated , site 45-6-2543 is a recorded rock shelter that has had previous excavation works without consultation to the darug people, this rock shelter has been recorded as a single shelter, this is incorrect the rock shelter attached should also be recorded. The separation of sites in this way is inacurate and does not show any Aboriginal cultural aspect of our sites. Many rock shelters within the original assessment were not recorded due to the amount of people that could stay within the shelter this also is an incorrect assessment.

Site 45-6-0977 is in a disgraceful state, this needs to be cleaned up and cared for appropriately it is an offence to deface our sites in this way, local residents should be educated on this, there are also in place programs where local schools have been asked to care for sites that have a high profile like this shelter, if community is aware many will help to care for these areas.

On the 15th to the 17th of December 2009 this area was visited to identify whether any sites would be impacted with the upgrade works for the M2. The area that will be impacted by the works is all Darug land, an area of sandstone country such as this our sites are all connected, therefore there will be impacts to our sites. We recognise that there is minimal impact to Archaeologically recorded sites for the proposed works, there is still impacts with all of the works proposed to our sites. We recognise that these proposed works are necessary and it is our groups main aim to care appropriately for our cultural heritage therefore we support the works going ahead with these recommendations.

- All works and monitoring (Cultural Heritage) to be carried out be experienced Darug Site officers.
- AHIP put in place for Site 45-6-0977 for clean up and rehabilitation works to initially be carried out by experienced site officers.
- All Archaeological sites recorded where works will not impact be fenced as no go zones during construction, specifically grinding groove area .
- Should Aboriginal object be identified during construction DCAC should be notified immediately.
- Toolbox meetings on identifying materials of Cultural Heritage need to be introduced to these works prior to anyone entering site.
- Should Darug skeletal remains be found during construction DCAC should be notified immediately.
- We recommend that areas close to recorded archaeological sites be monitored as during construction works in the past it is necessary for our conservation aims.
- All aspects of cultural heritage within this project needs to have consultation with DCAC.
- Monitoring of rockshelters by DCAC as has been done previously by Archaeologists, DCAC wants full involvement.

These are the recommendations that are necessary for this project to move forward the past consultation for the M2 area has not been thorough and correct. Darug sites cannot be recognised and cared for without experienced Darug people, hopefully all future works can be done appropriately.

We are pleased with the consultation process with AECOM for the upgrade works to date, do not hesitate to contact us with further enquiries on the above numbers.

Regards,

Leanne Watson

Appendix C

Care Management Agreement

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BIDJIGAL RESERVE DEED OF AGREEMENT

BETWEEN

ANTHONY BERNARD KELLY, MINISTER ASSISTING THE MINISTER FOR NATURAL RESOURCES (LANDS) OF THE STATE OF NEW SOUTH WALES

AND

CRAIG KNOWLES, MINISTER FOR NATURAL RESOURCES OF THE STATE OF NEW SOUTH WALES

AND

IAN (BUNDELUK) JOHN WATSON ON BEHALF OF THE NATIVE TITLE CLAIM GROUP FOR NATIVE TITLE APPLICATION NC 94/6

AND

BAULKHAM HILLS SHIRE COUNCIL

AND

TELSTRA CORPORATION LIMITED

AND

INTEGRAL ENERGY AUSTRALIA

2003

Table of Contents

DEED OF AGREEMENT MADE 4th December **2003**

PARTIES

BETWEEN **ANTHONY BERNARD KELLY**, Minister assisting the Minister for Natural Resources (Lands) of the State of New South Wales in his capacities as State Minister for New South Wales under the *Native Title Act 1993* (Cth), Minister administering the *Crown Lands Act 1989* (NSW) and Minister administering the *Geographical Names Act 1966* (NSW)

AND **CRAIG KNOWLES**, Minister for Natural Resources of the State of New South Wales in his capacity as Minister administering the *Forestry Act 1916* (NSW).

AND **IAN (BUNDELUK) JOHN WATSON** on behalf of the native title group for native title application NC94/6.

AND **BAULKHAM HILLS SHIRE COUNCIL**, constituted under the *Local Government Act 1993* (NSW).

AND **TELSTRA CORPORATION LIMITED**
(ACN 051 755 556).

AND **INTEGRAL ENERGY AUSTRALIA**
constituted as a corporation under the *Energy Services Corporations Act 1995* (NSW).

RECITALS

A. A Native Title Application was lodged by Ian (Bundeluk) John Watson on behalf of the descendants of the Darug people on 28 September 1994 with the National Native Title Tribunal under the *Native Title Act 1993* (Cth). The application was given number NC94/6 by the Tribunal. The Tribunal accepted the application for a reduced area under the original provisions of the *Native Title Act 1993* (Cth) on 20 September 1995. On 30 September 1998 the application was taken to be made to the Federal Court of Australia for determination and given file number NG6008 of 1998 in the New South Wales District Registry of the Court.

B. Native Title Application NC94/6 (as accepted by the National Native Title Tribunal) covers an area of land and waters in the Baulkham Hills Shire local government area within the Sydney Metropolitan area. The area of the application includes part of the land known as Excelsior Park (or Excelsior Reserve) and the land comprising the remainder of Darling Mills State Forest (originally an extension to Cumberland State Forest) adjacent to the M2 Motorway. Excelsior Park is a reserve under Part 5 of the *Crown Lands Act 1989*. Darling Mills State Forest is dedicated as a State Forest and declared a National Forest under the *Forestry Act 1916*.

C. Excelsior Park and Darling Mills State Forest form a continuous area of significant urban bushland. Two areas within Excelsior Park, known as Ted Horwood Reserve and Eric Mobbs Reserve have been developed as sporting fields and for active public recreation.

D. The New South Wales Government, Baulkham Hills Shire Council and the descendants of the Darug Aboriginal people wish to resolve Native Title Application NC94/6 by agreement and to provide for a consistent future shared management and conservation of the overall bushland area of Excelsior Park and Darling Mills State Forest in perpetuity for the mutual benefit of the citizens of New South Wales, the local community and the descendants of the Darug people and to facilitate the preservation and promotion of Darug culture and heritage.

E. At a meeting on 15 September 2001, persons identifying as Darug descendants and members of the Aboriginal group unanimously resolved to support the Bidjigal Reserve Agreement and to authorise Ian (Bundeluk) John Watson and Colin Gale to represent all Darug descendants and members of the Aboriginal group.

F. On 16 August 2002, Colin Gale advised the NSW Native Title Services Ltd that he no longer wished to represent the Darug descendants or members of the Aboriginal group in the signing of the Agreement. Colin Gale's decision not to sign the Agreement does not affect the resolve of the Darug descendants or members of the Aboriginal group to support the Agreement.

OPERATIVE PROVISIONS

THE PARTIES AGREE AS FOLLOWS:

1. Interpretation

1.1 "**Aboriginal group**" means the group of persons who identify as descendants of the Aboriginal people who were in occupation of the areas of the M2 Bushland, the Eric Mobbs Reserve and the Ted Horwood Reserve under traditional laws acknowledged and traditional customs observed by them at the acquisition of sovereignty by the British Crown over the Colony of New South Wales in 1788.

"**Applicant for Native Title Application NC94/6**" means the applicant for Native Title Application NC94/6.

"**Crown Lands Act**" means the *Crown Lands Act 1989*.

"**Crown Lands Minister**" means the Minister administering the *Crown Lands Act 1989*.

"**Darling Mills State Forest**" means the land dedicated as State Forest and declared National Forest under the *Forestry Act 1916* that was named Darling Mills State Forest No.1038 under the *Geographical Names Act 1966* by notification in the Gazette of 26 October 1984 and that remained dedicated as a State Forest at the date of commencement of this Agreement.

"**Darug Custodian Aboriginal Corporation**" means the association incorporated by that name under *the Aboriginal Councils and Associations Act 1976* (Cth).

"**Darug Tribal Aboriginal Corporation**" means the association incorporated by that name under the *Aboriginal Councils and Associations Act 1976* (Cth).

"**Eric Mobbs Reserve**" means the land known by that name within the Excelsior Park developed as a sporting field and for active public recreation, the boundaries of which are defined pursuant to this Agreement.

"**Excelsior Park**" means the reserve under Part 5 of the *Crown Lands Act 1989* that at the date of commencement of this Agreement is covered by Reserve No. 80863 from sale (80864 from lease generally) for public recreation and preservation of flora and fauna notified in the Gazette of 18 July 1958 and Reserve No. 90693 for public recreation notified in the Gazette of 4 February 1977.

"**Forestry Minister**" means the Minister administering the *Forestry Act 1916*.

"**future act**" means a future act as defined in the *Native Title Act 1993* (Cth).

"**Gazette**" means the New South Wales Government Gazette.

"**Geographical Names Minister**" means the Minister administering the *Geographical Names Act 1966*.

"**Integral Energy**" means Integral Energy Australia constituted as a corporation under the *Energy Services Corporations Act 1995*.

"**Local Resident**" means a person :

(i) who is a resident of Baulkham Hills Shire; and

(ii) whose place of residence is not greater than 5 kilometres in any direction from the M2 Bushland; and

(iii) who is a ratepayer of Baulkham Hills Shire Council.

"**Local Council**" means Baulkham Hills Shire Council constituted under the *Local Government Act 1993*.

"**M2 Bushland**" means the land described in Schedule 1 to this Agreement. It comprises the area of the existing Darling Mills State Forest and Excelsior Park (excluding the Eric Mobbs Reserve and the Ted Horwood Reserve).

"**Native Title Application NC94/6**" means Native Title Determination Application NC94/6 by Ian (Bundeluk) John Watson lodged under the *Native Title Act 1993* (Cth) with the National Native Title Tribunal on 28 September 1994 and accepted by the Tribunal on 20 September 1995 and given file number NG6008 of 1998 in the Federal Court of Australia, New South Wales District Registry.

"Native title claim" means a native title determination application that is a claimant application under the *Native Title Act 1993* (Cth), a compensation application under the *Native Title Act 1993* (Cth), or any action seeking a determination of native title in any court, made by a person claiming to hold, or at one time to have held, native title in, or in relation to, any part of the land covered by the Agreement.

"Native title claim group" means the persons described in section "A5" of the native title application NC94/6.

"**Party**" **or** "**Parties**" means a party or the parties to this Agreement as the case may be, except where the context or subject matter otherwise indicates or requires.

"**Telstra**" means Telstra Corporation Limited, ACN 051 755 556.

"**Ted Horwood Reserve**" means the land known by that name within the Excelsior Park developed as a sporting field and for active public recreation, the boundaries of which are defined pursuant to this Agreement.

1.2 In this Agreement unless the context or subject matter otherwise indicates or requires:

a) the word person includes a body corporate or a statutory corporation;

b) words denoting the singular number shall include the plural and vice versa;

c) a reference to a person includes a reference to the person's executors, administrators, successors, substitutes (including but not limited to persons taking by novation) and assigns;

d) a reference to anything is a reference to the whole or any part of it and a reference to a group of persons is a reference to any one or more of them;

e) a reference to any legislation or legislative provision includes any statutory modification or re-enactment of, or legislative provision substituted for, and any subordinate legislation issued under, that legislation or legislative provision;

f) a reference to a recital, clause, schedule or annexure is to a recital, clause, schedule or annexure to this Agreement;

g) a recital, schedule, annexure or a description of the Parties forms part of this Agreement;

h) a reference to any agreement is a reference to this Agreement (and, where applicable, any of its provisions) as amended, novated, supplemented or replaced from time to time; and

i) a reference to a Minister, authority, body or person includes the Minister, authority, body or person for the time being performing the functions performed by that Minister, authority, body or person at the date of this Agreement.

1.3 The parties intend that this Agreement shall have effect as a Deed.

2. Objects

2.1 The objects of this agreement are:

a) to recognise that the M2 Bushland, the Eric Mobbs Reserve and the Ted Horwood Reserve are within the traditional country of the Darug people;

b) to name the place of the M2 Bushland "Bidjigal Reserve" in acknowledgment of the importance which the land is said to have for the descendants of the Darug people;

c) to revoke the existing reservation of Excelsior Park;

d) to dedicate the areas of Eric Mobbs and Ted Horwood Reserves for the public purposes of public recreation and community purposes and to retain the Reserves under the care and management of the Local Council;

e) to dedicate the remainder of Excelsior Park as Bidjigal Reserve for the purposes of the Preservation of Aboriginal Cultural Heritage, the preservation of flora and fauna, and public recreation;

f) to establish a reserve trust for the Bidjigal Reserve under the name "Bidjigal Reserve Trust" and to appoint the reserve trust as trustee of the Bidjigal Reserve;

g) to provide for the affairs of the Bidjigal Reserve Trust to be managed by a trust board whose members will comprise descendants of the Darug people, persons from the local community and representatives of the Local Council and the Upper Parramatta River Catchment Trust;

h) to procure an Act of the Parliament of New South Wales to revoke the dedication of Darling Mills State Forest;

i) to add the lands comprising the former Darling Mills State Forest to the Bidjigal Reserve;

j) to identify a suitable site within the Bidjigal Reserve or a nearby site within the Baulkham Hills Shire for the development of an Aboriginal cultural centre for the preservation and promotion of Darug culture and heritage;

k) to permit the lawful establishment of an educational facility within the Bidjigal, Ted Horwood or Eric Mobbs Reserve for disseminating information about Aboriginal Cultural Heritage and conducting educational tours within the Bidjigal Reserve; and

l) to provide for the withdrawal of Native Title Application NC94/6 and the discontinuance of the whole of the proceedings in the Federal Court of Australia in relation to the Application.

3. Commencement and Duration

Commencement

3.1 This Agreement commences on the date the Agreement is made, being the date first hereinbefore written.

Duration

3.2 The Agreement continues in force until the reservation of Excelsior Park is revoked or otherwise extinguished and thereafter the Agreement will remain in force for so long as the dedication of Bidjigal Reserve in accordance with clause 7.2(a)(iii) of this Agreement remains in force.

Rights that Survive Termination

3.3 The rights and obligations of the Parties under clauses 4.5, 4.6, 4.7 and 14.4 of this Agreement will continue beyond termination of this Agreement.

4. Traditional Ownership

Authority to enter into Agreement

4.1 Ian (Bundeluk) John Watson represents and warrants that all necessary authorisations have been obtained for him to enter into this Agreement on behalf of the native title claim group and that this Agreement is valid and binding and enforceable in accordance with its terms and against him, the native title claim group and all the persons in the Aboriginal group.

4.2 Notwithstanding the generality of the preceding clause, Ian (Bundeluk) John Watson represents and warrants that:

(a) he is a descendant of the Darug people and a member of the Aboriginal group;

(b) all persons who claim to be Darug descendants or members of the Aboriginal group were invited to attend a meeting held on 15 September 2001 at Parramatta in the State of New South Wales for the purpose of authorising Ian (Bundeluk) John Watson and Colin Gale or other member or members of the Aboriginal group to enter into this Agreement on behalf of all Darug descendants and members of the Aboriginal group as being entitled to speak on their behalf and to make decisions binding on them in relation to the areas of the M2 Bushland and the Eric Mobbs and Ted Horwood Reserves;

(c) at that meeting Ian (Bundeluk) John Watson and Colin Gale were authorised to enter into this Agreement on the basis described in the preceding clause and pursuant to that authority they were to enter into this Agreement;

(d) On 16 August 2002, Colin Gale advised NSW Native Title Services Ltd that he no longer wished to represent the Darug descendants or members of the Aboriginal group in the signing of the Agreement. Colin Gale's decision not to sign the Agreement does not affect the resolve of the Darug descendants or the Aboriginal group to support the Agreement;

(e) where in this agreement Ian (Bundeluk) John Watson purports to bind Darug descendants and members of the Aboriginal group in a particular manner or matter he does so;

(i) in his capacity as described in the preceding clauses; and

(ii) so as to bind such persons individually and collectively in that manner or matter.

Recognition of traditional ownership

4.3 The Local Council and the State of New South Wales recognise that at the time of acquisition of sovereignty by the British Crown in 1788 over the former Colony of New South Wales, the M2 Bushland, the Ted Horwood Reserve and the Eric Mobbs Reserve formed a part of the traditional country of Aborigines whose contemporary descendants identify as the Darug people.

No acknowledgment of native title

4.4 The Parties acknowledge that this Agreement does not constitute any acknowledgment by the Local Council, the State of New South Wales, any Minister of the State of New South Wales, Telstra or Integral Energy of the existence of native title in or in relation to the M2 Bushland, the Ted Horwood Reserve or the Eric Mobbs Reserve.

Future acts authorised

4.5 Ian (Bundeluk) John Watson and all persons in the Aboriginal group consent to:

a) all acts being done by the Parties to this Agreement in exercise of their respective rights and in performance of their respective obligations under this Agreement that would be future acts; and

b) any future act being done in land dedicated as the "Bidjigal Reserve" pursuant to this Agreement (including any land added to that Reserve) and land comprising the Ted Horwood and Eric Mobbs Reserves dedicated for public recreation pursuant to this Agreement but only if the act is empowered to be done and is validly done in relation to those reserve lands under the *Crown Lands Act* and regulations.

Effect upon any native title

4.6 The Parties acknowledge:

a) that this Agreement does not constitute any surrender by the Darug descendants or other persons in the Aboriginal group on whose behalf Native Title Application NC94/6 has been made of any native title

rights and interests held by them in or in relation to the M2 Bushland, the Ted Horwood Reserve and the Eric Mobbs Reserve; and

b) that the rights (if any) of the Applicant for Native Title Application NC94/6, the Darug descendants or other Aborigines in connection with any native title held in relation to the M2 Bushland, the Ted Horwood Reserve and the Eric Mobbs Reserve are not affected except as is provided for in this Agreement and to the extent necessary to give effect to this Agreement.

Compensation

4.7 The benefits (including financial benefits and other consideration) to be provided to the Applicant for Native Title Application NC94/6, the Darug descendants and other persons in the Aboriginal group by or under this Agreement constitute full compensation within the meaning of Division 5 of Part 2 of the *Native Title Act 1993* (Cth) or any other Act (whether of the Commonwealth or the State of New South Wales) for:

a) the dedication of any part of the M2 Bushland under the *Crown Lands Act* as the Bidjigal Reserve or as an addition to that Reserve; and

b) the dedication of Eric Mobbs Reserve and Ted Horwood Reserve for public recreation under the *Crown Lands Act*.

c) the doing of any future act in or in relation to the M2 Bushland, Ted Horwood Reserve and Eric Mobbs Reserve that is authorised to be done under this Agreement; and

d) the exercise of the respective rights and the discharge of the respective obligations of the parties under this Agreement; and

e) for any consequential impairment or effect on the continued existence, enjoyment or exercise of native title rights and interests in or in relation to the M2 Bushland, Eric Mobbs Reserve and Ted Horwood Reserve.

5. Change of Name of the M2 Bushland

5.1 The Local Council, the Crown Lands Minister and the Forestry Minister will take all necessary steps to advertise and promote a change of name of the area of the M2 Bushland now known as Darling Mills State Forest and part of Excelsior Park to "Bidjigal Reserve".

5.2 The Crown Lands Minister will, within 28 days after the date of commencement of this Agreement, request the Geographical Names Board of New South Wales constituted under the *Geographical Names Act 1966* to assign the geographic name of "Bidjigal Reserve" to the M2 Bushland in accordance with the *Geographical Names Act 1966*.

5.3 In the event that the Geographical Names Board decides that the name of "Bidjigal Reserve" should be adopted for that place and so recommends to the Geographical Names Minister, the Geographical Names Minister will, after such inquiry as the Minister thinks fit, decide whether to approve or disapprove the recommendation within 28 days of such recommendation being made. Without prejudice to the Minister's discretion under section 9(5) of the *Geographical Names Act 1966* and an inquiry which the Minister thinks fit to undertake, the Minister will approve a recommendation to assign the name "Bidjigal Reserve" to that place.

6. Survey of Eric Mobbs and Ted Horwood Reserves

6.1 The Parties acknowledge that the area of the M2 Bushland, being the area described in Schedule 1 to this Agreement, excludes the sporting and active recreation areas within Excelsior Park known as the Ted Horwood and Eric Mobbs Reserves.

6.2 The Local Council will fix by survey the boundaries of Eric Mobbs Reserve and Ted Horwood Reserve within Excelsior Park in consultation with the Applicant for Native Title Application NC94/6 and any representatives of the

Aboriginal group nominated to the Local Council for this purpose by the Darug Custodian Aboriginal Corporation and the Darug Tribal Aboriginal Corporation.

6.3 If the Local Council, the Applicant for Native Title Application NC94/6 and any nominees of the Darug Custodian Aboriginal Corporation and Darug Tribal Aboriginal Corporation are unable to agree on the position of any of the boundaries of the Eric Mobbs and Ted Horwood Reserves to be surveyed in accordance with this clause, the position of the boundary in dispute will be decided by the Surveyor-General of New South Wales.

7. Dedication of Ted Horwood, Eric Mobbs and Bidjigal Reserves

Revocation of Excelsior Park

7.1 The Crown Lands Minister will, pursuant to section 90 of the *Crown Lands Act* by notification in the Gazette, revoke the whole of the reservation of Excelsior Park.

Dedication of Eric Mobbs, Ted Horwood and Bidjigal Reserves

7.2 The Crown Lands Minister will not revoke the reservation of Excelsior Park unless:

(a) on the same day as the notification revoking such notification is published in the Gazette, the Crown Lands Minister also publishes in the Gazette, pursuant to section 80 of the *Crown Lands Act*, notifications dedicating the Crown lands listed below for the corresponding public purposes specified in respect of those Crown lands:

(i) The area of Eric Mobbs Reserve – for the public purposes of public recreation and community purposes;

(ii) The area of Ted Horwood Reserve – for the public purposes of public recreation and community purposes; and

(iii) The area of Excelsior Park excluding the areas of Eric Mobbs Reserve and Ted Horwood Reserve – for the public purposes of

Preservation of Aboriginal Cultural Heritage, preservation of flora and fauna, and public recreation (the Bidjigal Reserv));
and

(b) an abstract of the proposed dedications is laid before both Houses of the New South Wales Parliament at least 10 sitting days before the dedication is made, as hereafter provided for in this Agreement.

Declaration of Public Purpose and Tabling of Proposed Dedications

7.3 To enable the dedication of the Crown lands to be made, as provided for in the preceding clause of this Agreement, the Crown Lands Minister will, as soon as reasonably practicable after the date of commencement of this Agreement:

(a) cause an abstract of the proposed dedications to be laid before both Houses of the New South Wales Parliament, as hereafter provided for in this Agreement; and

(b) declare, by notification published in the Gazette pursuant to the *Crown Lands Act*, the purpose of Preservation of Aboriginal Cultural Heritage to be a public purpose for the purposes of section 80 of the *Crown Lands Act*.

8. Establishment of Bidjigal Reserve Trust

Establishment of Reserve Trust

8.1 The Crown Lands Minister, at the same time as the dedication of Crown land for public purposes in accordance with clause 7.2(a)(iii) of this Agreement is notified in the Gazette, will, pursuant to section 92(1) of the *Crown Lands Act* by notification in the Gazette, establish and name a reserve trust and appoint it as trustee of the dedicated land (the Bidjigal Reserve).

Name of Reserve Trust

8.2 The corporate name of the reserve trust shall be 'Bidjigal Reserve Trust'.

Appointment of Trust Board

8.3 The affairs of the Bidjigal Reserve Trust shall be managed by a trust board in accordance with section 92(6)(a) of the *Crown Lands Act*.

Membership of Trust Board

8.4 The Crown Lands Minister, within 28 days of the publication in the Gazette notifying the establishment of the Bidjigal Reserve Trust and from time to time thereafter as provided for in this Agreement and the *Crown Lands Act*, will appoint as members of the trust board:

(a) 4 individual persons (none of them being a corporation), who shall be appointed as hereafter provided in this Agreement; and

(b) such number of ex officio members as hereafter provided in this Agreement.

Constitution of first Trust Board

8.5 The trust board first appointed by the Crown Lands Minister to manage the affairs of the Bidjigal Reserve Trust shall be comprised of 9 members, as follows:

(a) 4 individual persons (none of them being a corporation), to be appointed in accordance with the following clause of this Agreement;

(b) The Secretary of the Darug Custodian Aboriginal Corporation or other office bearer of the Corporation nominated by the Corporation (ex officio appointment);

(c) The Secretary of the Darug Tribal Aboriginal Corporation or other office bearer of the Corporation nominated by the Corporation (ex officio appointment);

(d) The General Manager of Baulkham Hills Shire Council or a person holding another position with the Council nominated by the General Manager of the Council (ex officio appointment);

(e) The Secretary of the Bushland Conservation Committee or other office bearer of the Committee nominated by the Committee (ex officio appointment; and

(f) The Secretary of the Upper Parramatta River Catchment Trust or a person holding another position with the Trust nominated by the Trust (ex officio appointment).

Individual members of the first Trust Board

8.6 The Crown Lands Minister will appoint the 4 individual (not ex officio) members of the first trust board from the following classes of persons:

(a) The first and second appointments: to be a Darug descendant who has lodged an expression of interest with the Crown Lands Minister for appointment to the position and who has demonstrated to the satisfaction of the Crown Lands Minister a commitment to the Preservation of Aboriginal Cultural Heritage, the preservation of flora and fauna and public recreation. If no such person is available to be so appointed, the Crown Lands Minister may appoint any other individual person to the position.

(b) The third and fourth appointments: to be a Local Resident who has lodged an expression of interest with the Crown Lands Minister for appointment to the position and who has demonstrated to the satisfaction of the Crown Lands Minister a commitment to the preservation of Aboriginal Cultural Heritage, the preservation of flora and fauna and public recreation. If no such person is available to be so appointed, the Crown Lands Minister may appoint any other individual person to the position.

Preference in replacement of individual members of the Trust Board

8.7 The Crown Lands Minister, when appointing any person in replacement of an individual (not ex-officio) member of the trust board whose office becomes vacant by reason of any of the matters referred to in clause 6 of Schedule 3 to the *Crown Lands Act*, shall appoint that person from the class of persons from whom the previous member was appointed if there is a person of such class available at the time to be so appointed.

Change in the membership of the Trust Board

8.8 The Crown Lands Minister will consult from time to time as required with the organisations from which the ex officio members of the first trust board are appointed in relation to:

(a) any further appointment of a member to the trust board;

(b) any reappointment of a member of the trust board;

(c) any increase or decrease in the number of members of the trust board; and

(d) the filling of any vacancy in the membership of the trust board by reason of any of the matters referred to in clause 6 of Schedule 3 to the *Crown Lands Act*.

9. Addition of Darling Mills State Forest to Bidjigal Reserve

Revocation of Darling Mills State Forest

9.1 The Forestry Minister, as soon as reasonably practicable after the dedication of the Crown land referred to in clause 7.2(a)(iii) of this Agreement, will use his or her best endeavours to secure the introduction into, and passage through, the New South Wales Parliament of a Bill for an Act to revoke the dedication of Darling Mills State Forest, being a State forest declared as a national forest within the meaning of the *Forestry Act 1916*.

Addition of former Darling Mills State Forest to Bidjigal Reserve

9.2 Within 28 days after the revocation of the dedication of Darling Mills State Forest, as provided for in the preceding clause of this Agreement, the Crown Lands Minister will publish in the Gazette, pursuant to s.81 of the Crown Lands Act, a notice adding such lands (as Crown lands) to the Crown lands dedicated in accordance with clause 7.2(a)(iii) of this Agreement (the Bidjigal Reserve).

10. Statutory Conditions for Dedication of Crown Lands

Assessment under Crown Lands Act not required

10.1 For the purpose of dedicating Crown lands under the *Crown Lands Act* as provided for in clause 7.2 of this Agreement (the dedication of the Ted Horwood, Eric Mobbs and Bidjigal Reserves) and addition of the area of Darling Mills State Forest to the Bidjigal Reserve as provided for in clause 9.2 of this Agreement, the Crown Lands Minister warrants:

(a) that he is satisfied that it is in the public interest to dedicate the lands without assessing the lands under Part 3 of the *Crown Lands Act*; and

(b) that in relation to the dedication of the lands he has had due regard to the principles of Crown land management.

Tabling in Parliament of proposed dedication and addition

10.2 The Crown Lands Minister will, in accordance with section 82 of the *Crown Lands Act*, cause an abstract of the proposed dedication of Crown lands and an abstract of the proposed addition to dedicated Crown lands referred to in the preceding clause (as the case may be) to be laid before both Houses of the New South Wales Parliament at least 10 sitting days before the dedication or addition is made.

11. Cultural Centre for the Preservation of Darug Culture and Heritage

Location of Centre within M2 Bushland

11.1 The Local Council, the Applicant for Native Title Application NC94/6, the Darug Custodian Aboriginal Corporation and the Darug Tribal Aboriginal Corporation will use their reasonable endeavours to identify a suitable location within the M2 Bushland for the development of a cultural centre for the preservation and promotion of Darug culture and heritage.

L: :ation of Centre outside M2 Bushland

11.2 In the event that a suitable location cannot be identified within the M2 Bushland for the development of a cultural centre for the preservation and promotion of Darug culture and heritage, the Local Council, the Applicant for Native Title Application NC94/6 the Darug Custodian Aboriginal Corporation and the Darug Tribal Aboriginal Corporation will use their reasonable endeavours to identify a suitable location for the development of such a cultural centre within the Baulkham Hills Shire.

Identification process without prejudice to functions of the Local Council

11.3 The identification process referred to in the preceding clauses 11.1 and 11.2 will be undertaken without prejudice to the obligations of the Local Council to exercise its statutory powers and discretions in respect of any rezoning and development applications that may be made in relation to any suitable location.

Favourable consideration of rezoning or development applications

11.4 The Local Council will favourably consider any rezoning or development application that may be made in relation to any suitable site identified in accordance with the preceding clauses 11.1 and 11.2 to enable the construction and use of a cultural centre for the preservation and promotion of Darug culture and heritage on the land.

Local Council not to perform its statutory functions contrary to law

11.5 The parties understand and accept that the Local Council cannot by this Agreement bind itself to approve any rezoning or development application made to the Council pursuant to the preceding clause of this Agreement as these decisions must be taken by the Council in accordance with law and after such notification, consultation and objection procedures as may be required by law are satisfied.

12. Educational Facility

Local Council to Assist

12.1 The Local Council will assist the Darug Custodian Aboriginal Corporation or Darug Tribal Aboriginal Corporation to establish at a location approved by the Local Council within the M2 Bushland or the Ted Horwood or Eric Mobbs Reserve, a facility for disseminating information about Aboriginal culture and heritage and for conducting educational tours within the M2 Bushland. The Local Council will not provide this assistance, and the facility will not be established if its establishment and use would be contrary to any Act or law of the State of New South Wales and the Commonwealth of Australia.

13. Public Utilities and Services

Telstra

13.1 The Parties acknowledge that telecommunication works and facilities lawfully owned, controlled, maintained or operated by Telstra may exist within the areas of Excelsior Park and Darling Mills State Forest (hereafter referred to as 'Telstra's works and facilities'). The parties will consult with Telstra before carrying out any works or doing anything within those areas in exercise of their respective rights or in the discharge of their respective obligations under this Agreement that in any way may adversely affect, impair or interfere with Telstra's works and facilities.

Sydney Water

13.2 The Parties acknowledge that water sewerage and drainage works and facilities lawfully owned, controlled, maintained or operated by Sydney Water Corporation (a corporation constituted under the *Sydney Water Act 1994*) exist within the areas of Excelsior Park and Darling Mills State Forest (hereafter referred to as 'Sydney Water's works and facilities'). The Parties will consult with Sydney Water Corporation before carrying out any works or doing anything within those areas in exercise of their respective rights or in the

discharge of their respective obligations under this Agreement that in any way may adversely affect, impair or interfere with Sydney Water's works and facilities.

13.3 Without limiting the generality of the preceding clause, the Parties acknowledge that Sydney Water Corporation has or may be entitled to the benefit of the easement for water rising main described in Part 1 of Schedule 2 to this Agreement, which traverses the area of Excelsior Park.

Integral Energy

13.4 The Parties acknowledge that electricity distribution works and facilities lawfully owned, controlled, maintained or operated by Integral Energy exist within the areas of Excelsior Park and Darling Mills State Forest (hereafter referred to as 'Integral Energy's works and facilities'). The Parties will consult with Integral Energy before carrying out any works or doing anything within those areas in exercise of their respective rights or in the discharge of their respective obligations under this Agreement that in any way may adversely affect, impair or interfere with Integral Energy's works and facilities.

13.5 Without limiting the generality of the preceding clause, the Parties acknowledge that Integral Energy:

(a) has or may be entitled to the benefit of easements for transmission line, electricity supply and distribution described in Parts 2, 3 and 4 of Schedule 2 to this Agreement, which traverse the area of Excelsior Park; and

(b) holds or may be entitled to hold an occupation permit described in Part 5 of Schedule 2 to this Agreement over the site of an electricity transmission line traversing the area of Darling Mills State Forest.

13.6 The Parties (including Integral Energy) acknowledge that revocation of the dedication of Darling Mills State Forest, as provided for in clause 9 of this Agreement, will have the consequence of terminating the occupation permit of

Integral Energy referred to in the preceding clause of this Agreement. In the event that Integral Energy considers that it would be necessary or desirable for it to have the benefit of an easement for electricity purposes over the site of the former occupation permit following revocation of the dedication of the Darling Mills State Forest, the parties:

(a) give their consent for Integral Energy to acquire in its favour by compulsory process under the *Land Acquisition (Just Terms Compensation) Act 1991* an easement in gross for electricity purposes in the terms of such an easement specified in Part 8 of Schedule 4A of the *Conveyancing Act 1919* over the site of the former occupation permit; and

(b) agree that the benefits to be conferred or provided under this Agreement will constitute full compensation to which they may each be entitled under the *Land Acquisition (Just Terms Compensation) Act 1991* or any other Act or law of the State of New South Wales or the Commonwealth of Australia for any impairment, diminution or affect on any interest they have in the land concerned by the acquisition of the easement for electricity purposes in favour of Integral Energy.

14. Withdrawal of Native Title Application NC94/6

Withdrawal of Native Title Application

14.1 The Applicant for Native Title Application NC94/6 will withdraw Native Title Application NC94/6 and discontinue the whole of the proceedings in the Federal Court of Australia in relation to the Application within 14 days after the Bidjigal Reserve Trust is established for the Bidjigal Reserve in accordance with clause 8 of this Agreement.

Parties consent to withdrawal of Native Title Application

14.2 The Parties to this Agreement who are parties to Native Title Application NC94/6 consent to the Applicant for Native Title Application NC94/6 withdrawing the Application in accordance with the preceding clause. These Parties will not seek an order by the Federal Court for the payment by the

Applicant for Native Title Application NC94/6 or by any other party of their costs in the proceedings in that Court in relation to the Application.

Assistance by the Crown Lands Minister

14.3 The Crown Lands Minister will assist the Applicant for Native Title Application NC94/6 in preparing all necessary documents and making all necessary applications to the Federal Court for the purpose of the Applicant for Native Title Application NC94/6 fulfilling his obligation under clause 14.1 of this Agreement. The Crown Lands Minister will meet any costs and expenses necessarily incurred by the Applicant for Native Title Application NC94/6 for that purpose.

No Further Claim

14.4 Ian (Bundeluk) John Watson, the Applicant for Native Title Application NC94/6 warrants that, after the date of commencement of this Agreement, he or any person on his behalf:

(a) will not make any native title claim in relation to any part of the area of Native Title Application NC94/6 and the areas of the M2 Bushland, Ted Horwood Reserve and Eric Mobbs Reserve; and

(b) will not assist in any way any person to make any native title claim in relation to any part of the area of Native Title Application NC94/6 and the areas of the M2 Bushland, Ted Horwood Reserve and Eric Mobbs Reserve; and

(c) will assist the Crown Lands Minister in any way the Crown Lands Minister may reasonably require with respect to any native title claim made after the date of commencement of this Agreement in relation to any part of the area of Native Title Application NC94/6 and the areas of the M2 Bushland, Ted Horwood Reserve and Eric Mobbs Reserve.

15. General

Parties to act promptly in giving effect to the Agreement

15.1 Each Party will, at its own expense and without unreasonable delay, do everything necessary or required of it to exercise its rights and to perform its obligations under this Agreement. If a provision of this Agreement requires a Party to do something by a specified date or within a specified period the party concerned will not, without reasonable excuse, breach that obligation.

Assistance by Parties to each other

15.2 Except as otherwise expressly provided for in this Agreement, each Party may request the assistance (other than financial assistance) of any other Party if the assistance would be reasonably necessary to give effect to this Agreement and the matters contemplated by it. Any such assistance requested for this purpose must not be unreasonably withheld.

Government fees and charges

15.3 Except as otherwise expressly provided for in this Agreement, the Crown Lands Minister will be responsible for payment of any Government duties, fees or charges that may be payable by any Party to this Agreement in giving effect to the Agreement and the matters required or contemplated to be done under the Agreement.

Costs of acquisition of easement by Integral Energy

15.4 Integral Energy will be responsible for all costs, duties, fees and charges that may be incurred or suffered by it in acquiring the easement for electricity purposes as provided for in clause 13.5 of this Agreement.

No termination for breach

15.5 No breach of this Agreement by any Party (other than breach of a provision of the Agreement that is expressed to be a warranty) will give to any other party a right to elect to terminate this Agreement, but that Party may exercise any right or remedy otherwise available to it in respect of the breach.

Registration of Agreement in General Register of Deeds

15.6 The Crown Lands Minister is authorised by the other Parties to hold the Agreement once it is executed as a deed by the Parties and thereafter to lodge the Agreement with the Registrar-General for registration in the General Register of Deeds maintained under s.184C of the *Conveyancing Act 1919*. Following registration of the Agreement in that Register, the Crown Lands Minister will provide to each other Party a registration copy of the Agreement.

Filing of Agreement with Federal Court and National Native Title Tribunal

15.7 Following registration of the Agreement in the General Register of Deeds, the Crown Lands Minister is authorised by the Parties to provide a registration copy of the Agreement to the National Native Title Tribunal and to file a registration copy of the Agreement with the Federal Court of Australia, New South Wales District Registry in the proceedings in that Court relating to Native Title Application NC94/6.

Notices

15.8 (a) *Method of Giving Notices*

A notice, consent, approval or other communication (each a 'Notice') under this Agreement must be signed by or on behalf of the person giving it, addressed to the person to whom it is to be given and:

(i) delivered to that person's address;

(ii) sent by pre-paid mail to that person's address; or

(iii) transmitted by facsimile to that person's address.

(b) *Time of Receipt*

A Notice given to a person in accordance with this clause is treated as having been given and received:

(i) if delivered to a person's address, on the day of delivery if a Business Day, otherwise on the next Business Day;

(ii) if sent by pre-paid mail, on the third Business Day after posting; or

(iii) if transmitted by facsimile to a person's address and a correct and complete transmission report is received, on the day of transmission if a Business Day, otherwise on the next Business Day.

(c) *Addresses for Notices*

For the purposes of this clause the addresses of the Parties shall be as specified in Schedule 3 to this Agreement.

Governing law

15.9 This Agreement is governed by the law in force in the State of New South Wales and shall be deemed to be made in Sydney in New South Wales.

Waiver

15.10 The non-exercise of or delay in exercising any power or right of a Party does not operate as waiver of that power or right, nor does any single exercise of a power or right preclude any other or further exercise of it or the exercise of any other power or right. A power or right may only be waived in writing, signed by the Party to be bound by the waiver. Where this Agreement provides that any act of a Party has to be done in a particular manner or form, the other party will waive its rights to take action for a breach of this Agreement if the Party, when it does the act, substantially complies with the required manner or form.

Amendment

15.11 This Agreement may only be amended or supplemented in writing, signed by the Parties

Severability

15.12 Any provision in this Agreement which is invalid or unenforceable in any jurisdiction is to be read down for the purposes of the jurisdiction, if possible, so as to be valid and enforceable, and is otherwise capable of being severed to the extent of the invalidity or unenforceability, without affecting the remaining

provisions of this Agreement or affecting the validity or enforceability of that provision in any other jurisdiction.

Liabilities of Parties

15.13 If two or more Parties are included within the same defined term in this Agreement:

(a) a liability of those parties under this Agreement is a joint liability of all of them and a several liability of each of them;

(b) a right given to those parties under this Agreement is a right given severally to each of them; and

(c) a representation, warranty or undertaking made by those Parties is made by each of them.

Further Assurance

15.14 Each Party must do, sign, execute and deliver and must procure that each of its employees and agents does, signs, executes and delivers, all deeds, documents, instruments and acts reasonably required of it or them by notice from another Party to carry out and give effect to this Agreement and the rights and obligations of the Parties under it.

Entire Agreement

15.15 This Agreement is the entire agreement of the Parties on the subject matter. The only enforceable obligations and liabilities of the Parties in relation to the subject matter are those that arise out of the provisions contained in this Agreement. All representations, communications and prior agreements in relation to the subject matter are merged in and superseded by this Agreement.

Headings

15.16 In this Agreement the Table of Contents and headings are for convenience of reference only and do not affect interpretation.

16. Schedules

16.1 The following are the Schedules to this Agreement:

1. Description of the M2 Bushland
2. Description of Easements and Occupation Permit within Excelsior Park and Darling Mills State Forest:

   Part 1 – Description of Water Rising Main Easement

   Part 2 – Description of Electricity Transmission Line Easement

   Part 3 – Description of Occupation Permit for Electricity Transmission Line.

   Part 4 – Description of Electricity Distribution Line Easement
3. Addresses for Notices

IN WITNESS of their Agreement the parties have hereunder signed their names and affixed their seals:

Signed sealed and delivered for and on behalf of **ANTHONY BERNARD KELLY Minister assisting the Minister for Natural Resources (Lands)** of the State of New South Wales, by
Warwick Watkins Director General
Department of Lands
in the presence of:

Warwick Watkins
Director General

Signature of Witness
JANET HOSS

Signed sealed and delivered for and on behalf of **CRAIG KNOWLES, Minister for Natural Resources** of the State of New South, by
Peter Duncan
Managing Director
State Forests of New South Wales
in the presence of:

Peter Duncan
Managing Director

Signature of Witness
THERESE TRAN

Signed sealed and delivered by
IAN (BUNDELUK) JOHN WATSON
In the presence of:

Signature of Witness
JANET HOSS.

The Common Seal of
BAULKHAM HILLS SHIRE COUNCIL
was hereunto affixed in the presence of:

MAYOR

~~Signature of Witness~~ GENERAL MANAGER

I certify that **RICHARD JOHN WATERS**, Regional Property Vendor Manager, with whom I am personally acquainted or as to whose identity I am otherwise satisfied, signed this document in my presence as attorney for **TELSTRA CORPORATION LIMITED** under Power of Attorney registered Book **4338** No. **72**

Signature of witness

Terrance John Layton

Name of witness

Address of witness:

101 Ilya Rd

Ulladulla 2539

Certified correct for the purposes of the Real Property Act 1900 by the attorney named below

Signature of Attorney

Attorney's name: **RICHARD JOHN WATERS**

Signing on behalf of:

TELSTRA CORPORATION LIMITED

By executing this document the attorney states that the attorney has received no notice of revocation of the power of attorney

Signed, sealed and delivered by
John Wallace as attorney for
INTEGRAL ENERGY AUSTRALIA
pursuant to Power of Attorney 4370 Book No 330 who has no notice of revocation, in the presence of:

Signature of witness .
JANET MOSS

John Wallace, Attorney
Gen. Manager Engineering Performance

Terry Joyce, General Counsel
Countersignee

Schedule 1

Description of the Area of the M2 Bushland

The land which at the date of commencement of this Agreement comprises the area of the Darling Mills State Forest and the area of Excelsior Park excluding the areas of the Eric Mobbs and Ted Horwood Reserves as defined in clause 1 of this Agreement.

The M2 Bushland is shown on the Plan annexed to this Agreement.

Schedule 2

Description of Easements and Occupation Permit within Excelsior Park and Darling Mills State Forest

Part 1 – Description of Water Rising Main Easement

An Easement for Water Rising Main acquired by notice in the Gazette of 19 October 1962 at folio 2994 and shown on Plan 18594-3000. The easement is located within Excelsior Park to the north of Ted Horwood Reserve and traverses the area of Excelsior Park in a north-south direction.

The site of the easement is indicated on the Plan annexed to this Agreement.

Part 2 – Description of Easement for Transmission Line

An easement for transmission line 40.25 metres wide acquired by notice in the Gazette of 25 May 1956 at folio 1454. The easement is over that part of the Carlingford-Lithgow 132 Kv transmission line shown on Plans 15926-3000 and 16980-3000 within Excelsior Park. The easement traverses the area of Excelsior Park (including the area of Eric Mobbs Reserve) in an east-west direction.

The site of the easement is indicated on the Plan annexed to this Agreement.

Part 3 – Description of Easement for Electricity Supply

An easement for transmission line 18.29 metres wide acquired by notice in the Gazette of 19 July 1963 at folio 2101 and shown on Plan 18845-3000. The easement traverses that area of Excelsior Park south of Eric Mobbs Reserve, along the western boundary of Excelsior Park, in a north-south direction.

The site of the easement is indicated on the Plan annexed to this Agreement.

Part 4 – Description of Electricity Distribution Line Easement

An easement for transmission line, variable width, acquired by notice in the Gazette of 12 March 1965 at folio 840. The easement traverses the area of Excelsior Park (including the area of Eric Mobbs Reserve) in an east-west direction alongside the Carlingford – Lithgow 132 Kv transmission line described in Parts 2 and 5 of this Schedule and is shown on Plan 19442-3000.

The site of the easement is indicated on the Plan annexed to this Agreement.

Part 5 – Description of Occupation Permit for Transmission Line

An Occupation Permit about 30 metres wide granted under the *Forestry Act 1916* on 25 May 1956 over the part of the route of the Carlingford- Lithgow 132 Kv transmission line traversing the area of Darling Mills State Forest in an east-west direction and shown on Plans 15926-3000 and 16980-3000.

The site of the Occupation permit is indicated on the Plan annexed to this Agreement.

Schedule 3

Addresses for Notices

Name of Party	Address for Notices
Minister assisting the Minister for Natural Resources (Lands)	General Manager Native Title and Aboriginal Land Claims Department of Lands GPO Box 15 Sydney NSW 2001 (Ref: V. Field, NC94/6)
Minister for Natural Resources	As above
Ian (Bundeluk) John Watson	146 Boundary Road Oakville NSW 2765
Baulkham Hills Shire Council	The General Manager Baulkham Hills Shire Council P O Box 75 Castle Hill NSW 1765 (Ref: R. Webb, 442249)

Telstra Corporation Limited

Blake Dawson Waldron
Lawyers
Level 37
Grosvenor Place
225 George Street
Sydney NSW 2000

(Ref: L. Flynn,
MPB.CLL.1258 3286)

Integral Energy Australia

Integral Energy Networks
(A business unit of Integral Energy Australia)
General Manager Engineering Performance
51 Huntingwood Drive
HUNTINGWOOD NSW 2148
(PO Box 6366 BLACKTOWN NSW 2148)

(Ref: G Riethmuller, 97/00876)

Appendix D

Stakeholder Survey Reports

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[M2 HIGHWAY UPGRADE ABORIGINAL FIELD INVESTIGATION SURVEY]

Aboriginal stakeholder survey report

PROCEDURE FOR ABORIGINAL CULTURAL HERITAGE CONSULTATION AND INVESTIGATION – RESOURCE 03

December 2009

Purpose of this assessment

This assessment forms part of the Stage 2 preliminary assessment of the RTA *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*. Its purpose is to determine whether any features of Aboriginal cultural significance occur within the study area for this project, and whether their significance would be affected by the project. This assessment will be used to assist the RTA in determining whether further assessment and consultation is required for this project.

Project details: (provide the following information)

a) Project title: M2 Upgrade Aboriginal field investigation survey

b) Location of study area: M2 Highway up grade various locations

c) Name of Aboriginal site officer(s) completing this assessment: Scott Franks and Danny Franks

d) Name of Aboriginal organisation(s) represented by this survey: Yarrawalk

e) Name of site officer(s) who undertook site survey: Scott Franks and Danny Franks

f) Date of survey: 15th 16th and 17th December 2009

2 Methodology:

a) Approximately how much of the total project study area was surveyed (e.g. 10%-100%) and why? (E.g. Certain areas were heavily disturbed, properties were inaccessible, ground visibility was poor, difficult weather conditions, etc.)

The area contained within the study area was surveyed on foot by transecting the area covering 100% of the impact area, including a 90 to 200 meter buffer outside the impact area.

b) How was the survey undertaken? (E.g. by foot, by car, individually, in groups, other? If other people were involved in the survey, please provide their names and name of their organisation, if relevant)

The area was surveyed on foot by Scott Franks Yarrawalk, Gordon Walkman Rodney Walkman DLO, **Rick Bullers** Professional Archaeologist AECOM, Leanne Watson, and other Aboriginal stake holders.

3 Results:

a) Please provide a description of the area surveyed. Include a description of the total area covered, landforms, built areas, etc. Where appropriate, survey areas should be identified on a map/plan

The study area is in several different locations along the M2 motor way on the first day we surveyed (15/12/2009) AREA 1 Darling mill Creek sites 2543,2544,2162(hand stencil of a (small child) 2161 and 2097.

These areas are considered important. The area in question has an Aboriginal Management agreement but it seems that this has not been managed to the standars of agreement that is in place. It seems that the organisation that has managed the area has not bothered to keep the Aboriginal community fully involved in the work and surveys. It also seems that monitoring and inspections have not occurred.
The areas are extremely over grown with noxious weeds and in some cases have been vandalised.
Site 2097 is a typical over hang where our people would have lived and considered home. The area in question was close to a constant water source with readily available native food. It should also be accepted that the area was used for local ceremonies and activities consistent with ceremonies with both men's and women's sites within close proximity.

This site was within 100 meters of the proposed development.

Day 2 16th December 2009 sites visited 2160, 2163, 2472, DEC 1 it should be noted that site 2472 was recovered under a section 90 permit some time ago.

2160. This is shelter with art work. The art work in question was Charcoal but could not be clearly interpreted as it was extremely old but would have held significant importance.

2163. 3 Quarts artefacts were located at the site. Once again this is typical over hang where our people would have lived and considered home. The area in question was close to a constant water source, with readily available native food. It should also be accepted that the area was also used for local ceremonies and activities consistent with ceremonies with both men's and women's sites within close proximity.

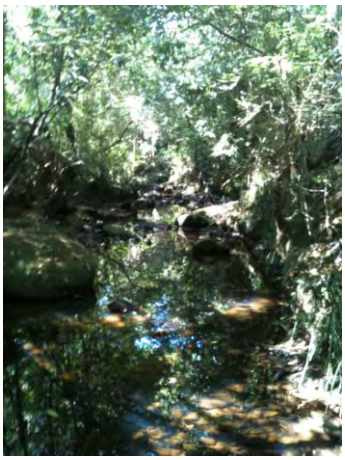
2472. Records indicate that this site has been recovered via a section 90 permit. As to the location of the artefacts, that would need to be confirmed. Notwithstanding the removal of the artefacts, the area is important to our people and should not be disturbed.

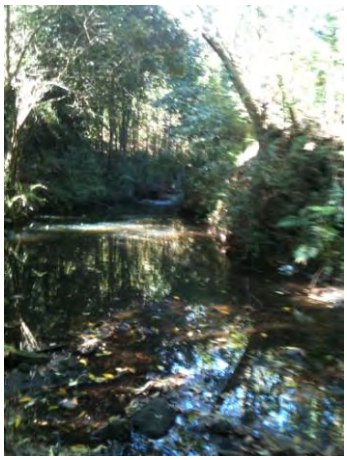
Dec 1 is a shelter located along side a creek line. The shelter has had test pitting (2 x 50x50cm) and records indicate that artefacts have been removed but the location of the said artefacts is not known.

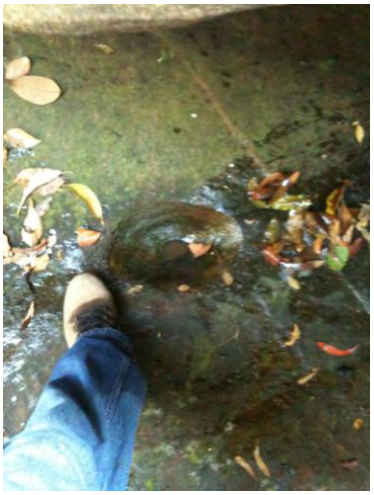
Day 3 17th December 2009 sites visited Area 6. 45-5-1005
Modified area within the off ramp area 1(one) isolated find believed to be a manu port. The sediment pond in this area will need to be expanded. No objections to this occurring.

Area 7 Terry Creek
Top side where new site was found. i.e. Grinding Groves.

On this day we located a site. The site consisted of several grinding groves and axe sharpening areas.







This area was not recorded in previous surveys. It is an extremely important find and clearly demonstrates an area that would have had continuous use over many generations. This area needs to be protected and should have an exclusion zone in place of approximately100 to 200 metres. A sites card was taken on the day to ensure this site was recorded. It should also be noted that there is a site within a 250 meter radius of this site that is a shelter. This would further support that the area needs to be protected.

b) Were any of the following features identified during the survey? (Please tick as required)

■ stone tools or flakes	☐ hearths	☐ shell middens
☐ scarred trees	■ shelters	■ art sites
☐ bora circles	■ significant spiritual or social areas	
☐ totems	■ significant cultural landscape features	

■ other – please state: several stone artefacts were located at several of the sites in all the areas we surveyed. Typical silcrete flakes and quartz tools.

If any of the above items were ticked, please provide a description including the location, quantity, size, condition and significance of the feature, if known. Where appropriate, this information should be identified on a map/plan (please attach).

At know stage during the survey was any of the above located.

c) Is it considered likely that any of the above features may be present in the study area, despite not being positively identified during the survey?

d) If known, please provide a description of the natural resources used by Aboriginal people that are, or would have been, available within the study area. Please describe the significance of these resources to past and present Aboriginal communities.

In all of the areas in question, there was ample native vegetation located. These areas today would still support easy access to food and water.

The areas in question have cultural integrity to support the values needed to consider them as a PAD in particular, some of the shelters.

03 ABORIGINAL STAKEHODER SURVEY REPORT

5 Conclusion:

Is the project likely to affect any significant known or potential Aboriginal cultural heritage features as identified by the survey?

■ Yes. This project will not only in some areas impact directly on the Aboriginal cultural heritage features from a construction prospective, but it will also impact from the level of noise and white light contamination.

Recommendation

- That Terry's Creek not be disturbed and have a 100 to 200 meter exclusion zone place around it.
- That if any of the other areas need to be developed and the area needs the surface removed that monitoring take place.
- The proponent should consider an offset with regard to any destruction.
- The proponent should agree to a Heritage Management plan and strategy.

This assessment has been completed by:

Name: Scott Franks

Provide signature

Position title: **Aboriginal heritage manager**

Provide title

Organisation name: **Yarrawalk**

Provide name of Aboriginal organisation

On the following date: **21st December 2009**

Insert date

03 ABORIGINAL STAKEHODER SURVEY REPORT

DARUG - LAND - OBSERVATIONS

ABN: 87239202455
E-MAIL: gordow51@bigpond.net.au
PO BOX: 571 Plumpton. NSW 2761
Phone: 029831 8868 or 0415 663 763

22-12-2009

Mr Rick Bullers
Professional Archaeologist

During the inspection of site CF3 (AHIMS 45-6-2161) it was noted that vibrations could be felt from traffic passing on the M2, which was 30-40 m south of the rock shelter. Works in the area of this site include alterations to the existing sediment basin (approximately 100 m west of the site) on the northern side of the M2, and temporary clearing of vegetation, installation of a works site compound and bridge widening on the southern side of the M2 bridge. Since the site is on the northern side of the M2, there will be no direct impacts to the site. However, there may be indirect impacts from construction vibration. DLO believes that periodic monitoring of the site during construction activities in the vicinity of site CF3 is warranted to ensure that no adverse vibration impacts occur during construction

In relation to the grinding groove site on Terry's Creek, the site is on the southern side of the Terry's Creek M2 bridge and extends further south along the creek line. The upgrade works for the M2 will include temporary vegetation clearance, bridge widening and improvements to the sediment ponds (all of which are on the northern side of the bridge. Ground impacts in the vicinity of the grinding grooves will be limited to clearance of a pad for bridge construction works and installation of additional bridge support piers. These works will not impact on the grinding groove site. And D.L.O wants to be involved in all work and works that will happen

Yours faithfully

Uncle
Gordon Workman
Darug Elder

Sites Officer

DARUG TRIBAL ABORIGINAL CORPORATION

PO Box 441
Blacktown, NSW, 2148
PH/Fax: (02) 9622 4081
Mobile 041 543 9326
Email: darug_tribal@live.com.au
ABN: 77 184 151 969 ICN: 2734

19/1/2010

Dear Rick Bullers
Archaeologist AECOM

Re: M2 Upgrade North Ryde to Pennant Hills 15th 16th 17th December 2009

DTAC Representative John Reilly

This field inspection covered a previously conducted survey on the M2 motorway prior to construction in the 1990's.

We revisited known rock shelters sites and places of significance from that survey.

Most sites had some disturbance by various visitors to these National Park and bush locations.

In the overhang rock shelters some hand paintings and charcoal impressions were recorded. A major concern is relating to construction, causing possible damage to some rock shelters through heavy machine vibration.

A new Indigenous site was found on a creek bed .This was identified as a stone grinding area, located on a rock base where the creek water flowed through it.

These sites must be monitored at all times whilst work takes place as we are losing to many sites of this significance of our past ancestors.

Hugs & Smiles

Sandra Lee

Secretary

Darug Tribal Aboriginal Corporation

Appendix E

AHIMS Site Card – Site M2A1 (AHIMS 45-6-2949)

A site card was prepared and submitted to DECCW for this site. Due to security requirements the AHIMS Site Card has been removed from the Public Exhibition Copy of this report. The Site Card was provided in the Government agency version of the report.

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Worldwide Locations

Australia	+61-2-8484-8999
Azerbaijan	+994 12 4975881
Belgium	+32-3-540-95-86
Bolivia	+591-3-354-8564
Brazil	+55-21-3526-8160
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France	+33(0)1 48 42 59 53
Germany	+49-631-341-13-62
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Singleton
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Environmental Assessment

Surface Water Assessment

Environmental Assessment

Surface Water Assessment

Prepared for

Hills M2

Prepared by

AECOM Australia Pty Ltd
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T +61 2 8023 9333 F +61 7 8023 9399 www.aecom.com
ABN 20 093 846 925

23 April 2010

60143257

Quality Information

Document M2 Upgrade Environmental Assessment – Surface Water Assessment

Ref 60143257

Date 23 April 2010

Prepared by Bruce Withnall

Reviewed by Courtney Henderson

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
	29 January 2010	Courtney Henderson		
	05 February 2010	Courtney Henderson		
	23 February 2010	Courtney Henderson		
	16 March 2010	Bruce Withnall	Michael Daly	
	23 April 2010	Bruce Withnall	Michael Daly	

Table of Contents

Terminology List

Terminology	Description
Annual Exceedance Probability (AEP)	The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood discharge of 500m3/s has an AEP of five per cent, it means that there is a five per cent chance (that is one in 20 chance) of a 500m3/s or larger flood event occurring in any one year (see also average recurrence interval).
Australian Height Datum (AHD)	A common national surface level datum approximately corresponding to mean sea level
Average Recurrence Interval (ARI)	The long term average number of years between the occurrence of a flood as big as or larger then the selected event for example, floods with a discharge as great as or greater than the 20 year ARI flood will occur, on average, once in every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event.
Catchment	The land area draining through the main stream, as well as tributary streams, to a particular site location. It always relates to an area above a specific location.
Discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m3/s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving, for example metres per second (m/s).
Emergency management	A range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding.
Flash flooding	Flooding which is sudden and unexpected. It is often caused by sudden local or nearby heavy rainfall. Often defined as flooding which peaks within six hours of the causative rain.
Flood	Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.
Flood fringe areas	The remaining area of flood prone land after floodway and flood storage areas have been defined.
Flood mitigation standard	The average recurrence interval of the flood, selected as part of the floodplain risk management process that forms the basis for physical works to modify the impacts of flooding.
Floodplain	Area of land that is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land.
Floodplain risk management options	The measures that might be feasible for the management of a particular area of the floodplain. Preparation of a floodplain risk management plan requires a detailed evaluation of floodplain risk management options.
Floodplain risk management plan	A management plan developed in accordance with the principles and guidelines in the NSW Floodplain Development Manual (2005). Usually includes both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.
Flood plan (local)	A sub-plan of a disaster plan that deals specifically with flooding. They can exist at state, division and local levels. Local flood plans are prepared under the leadership of the SES.
Flood planning area	The area of land below the FPL and thus subject to flood related development controls.
Flood planning levels (FPLs)	Are the combinations of flood levels (derived from significant historical flood events or floods of specific AEPs) and freeboards selected for floodplain risk management purposes, as determined in management studies and

Terminology	Description
	incorporated in management plans.
Flood proofing	A combination of measures incorporated in the design, construction and alteration of individual buildings or structures subject to flooding, to reduce or eliminate flood damages.
Flood prone land	Land susceptible to flooding by the PMF event. Flood prone land is synonymous with flood liable land.
Flood risk	Potential danger to personal safety and potential damage to property resulting from flooding. The degree of risk varies with circumstances across the full range of floods. Flood risk is divided into 3 types, existing, future and continuing risks. They are described below: • Existing flood risk: the risk a community is exposed to as a result of its location on the floodplain. • Future flood risk: the risk a community may be exposed to as a result of new development on the floodplain. • Continuing flood risk: the risk a community is exposed to after floodplain risk management measures have been implemented. For a town protected by levees, the continuing flood risk is the consequences of the levees being overtopped. For an area without any floodplain risk management measures, the continuing flood risk is simply the existence of its flood exposure.
Flood storage areas	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation. Hence, it is necessary to investigate a range of flood sizes before defining flood storage areas.
Floodway areas	Those areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels.
Freeboard	Provides reasonable certainty that the risk exposure selected in deciding on a particular flood chosen as the basis for the FPL is actually provided. It is a factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. Freeboard is included in the flood planning level.
Habitable room	In a residential situation: a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom. In an industrial or commercial situation: an area used for offices or to store valuable possessions susceptible to flood damage in the event of a flood.
Hazard	A source of potential harm or a situation with a potential to cause loss. In relation to the NSW Floodplain Development Manual (2005) the hazard is flooding which has the potential to cause damage to the community.
Hydraulics	The term given to the study of water flow in waterways, in particular the evaluation of flow parameters such as water level and velocity
Hydrograph	A graph which shows how the discharge or stage/flood level at any particular location varies with time during a flood.
Hydrology	Term given to the study of the rainfall and runoff process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods.
Local overland flooding	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
Local drainage	Smaller scale problems in urban areas.
Mainstream flooding	Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam.
Major drainage	Councils have discretion in determining whether urban drainage problems are associated with major or local drainage. For the purposes of the NSW

Terminology	Description
	Floodplain Development Manual (2005) major drainage involves: • The floodplains of original watercourses (which may now be piped, channelised or diverted), or sloping areas where overland flows develop along alternative paths once system capacity is exceeded; and/or • Water depths generally in excess of 0.3m (in the major system design storm as defined in the current version of Australian Rainfall and Runoff). These conditions may result in danger to personal safety and property damage to both premises and vehicles; and/or • Major overland flowpaths through developed areas outside of defined drainage reserves; and/or • The potential to affect a number of buildings along the major flow path.
Mathematical/computer models	The mathematical representation of the physical processes involved in runoff generation and stream flow. These models are often run on computers due to the complexity of the mathematical relationships between runoff, stream flow and the distribution of flows across the floodplain.
Merit approach	The merit approach weighs social, economic, ecological and cultural impacts of land use options for different flood prone areas together with flood damage, hazard and behaviour implications, and environmental protection and well being of the State's rivers and floodplains. The merit approach operates at two levels. At the strategic level it allows for the consideration of social, economic, ecological, cultural and flooding issues to determine strategies for the management of future flood risk which are formulated into council plans, policy, and EPIs. At a site specific level, it involves consideration of the best way of conditioning development allowable under the floodplain risk management plan, local flood risk management policy and EPIs.
Minor, moderate and major flooding	Both the SES and the BoM use the following definitions in flood warnings to give a general indication of the types of problems expected with a flood: • Minor flooding: causes inconvenience such as closing of minor roads and the submergence of low level bridges. The lower limit of this class of flooding on the reference gauge is the initial flood level at which landholders and townspeople begin to be flooded. • Moderate flooding: low-lying areas are inundated requiring removal of stock and/or evacuation of some houses. Main traffic routes may be covered. • Major flooding: appreciable urban areas are flooded and/or extensive rural areas are flooded. Properties, villages and towns can be isolated.
Modification measures	Measures that modify either the flood, the property or the response to flooding.
Peak discharge	The maximum discharge occurring during a flood event.
Probable maximum flood	The PMF is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, and where applicable, snow melt, coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain. The extent, nature and potential consequences of flooding associated with a range of events rarer than the flood used for designing mitigation works and controlling development, up to and including the PMF event should be addressed in a floodplain risk management study.
Probable maximum precipitation	The PMP is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organisation, 1986). It is the primary input to PMF estimation.
Probability	A statistical measure of the expected chance of flooding (see AEP).

Terminology	Description
Risk	Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. In the context of the NSW Floodplain Development Manual (2005) it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
Runoff	The amount of rainfall which actually ends up as streamflow, also known as rainfall excess.
Stage	Equivalent to water level (both measured with reference to a specified datum).
Stage hydrograph	A graph that shows how the water level at a particular location changes with time during a flood. It must be referenced to a particular datum.
Survey plan	A plan prepared by a registered surveyor.
Water surface profile	A graph showing the flood stage at any given location along a watercourse at a particular time.
Note: project description terminology is contained in the project description.	

Executive Summary

Existing Environment

Transverse Drainage:- The M2 Motorway traverses through three main catchment areas of Darling Mills Creek, Devlins Creek and Terrys Creek whilst a number of smaller tributaries located towards the eastern end of the M2 (including Mars, University, Shrimptons and Porters Creeks) also form part of the Lane Cove River catchment. Within the limits of proposed widening works the motorway is crossed by some 26 local drainage lines which are served by transverse drainage structures comprising a combination of large concrete arches and box or pipe culverts. Large multi span bridge structures situated several metres above the normal water level are used to cross the three main creek waterways.

For the purposes of this study, existing flood conditions in the 100 year ARI design event have been estimated for the seven (7) transverse culvert structures which are to be extended due to the widening works, and a long reach of Devlins Creek that runs parallel to the motorway in an easterly direction and incorporates or influences the hydraulic behaviour of a number of culvert structures. Along the entire length of the reach modelled, the flood extent is typically contained within the riparian bush zone.

At University Creek, the existing flood behaviour in the vicinity of the M2 motorway appears to be influenced by a number of man made features. Flows from the upper catchment are initially controlled by a large diameter pipe and inlet structure immediately upstream of Talavera Road. The pipe flows are conveyed under the road and a building on the property located upstream of the M2, to discharge into an open channel near the inlet of the existing motorway culvert (Culvert 35). The hydraulic analyses indicate that the 100y ARI flood levels in this area may be higher than the adjoining motorway, which would therefore be overtopped in the existing situation.

At Shrimptons Creek, hydraulic modelling results indicate that the existing property access bridge, located just upstream of the motorway boundary, is constricting the waterway and controlling flood levels in this area.

Water Quality:- Between July and December 1994 (prior to the original motorway construction), samples were taken from sites downstream of the motorway to establish background Total Suspended Solids (TSS) averages for wet (128 mg/l) and dry (8 mg/l) conditions. Subsequent long term sampling results (post M2 construction) for wet events have calculated the median and average values to range between 5mg/l to 13mg/l (median) and 11mg/l to 32mg/l (average). Comparison of these results for the two alternative periods suggests that construction of the existing motorway has not had any significant impact on the water quality of downstream receiving waters.

Within the limits of the proposed project widening, there are thirty one (31) water quality basins originally provided to treat the low flow runoff draining from the existing motorway pavement surface via the stormwater pipe drainage networks. Low flow runoff (first flush) or contaminated spills washed from the road surface are directed through bifurcation pits that divert the water into the basins for containment and treatment. The first flush of runoff typically contains the higher concentration of sediments and larger particulate matter (waste materials from vehicles such as brake pad wear and metals). These settle out of the water when temporarily stored in the basin. Fluid type materials washed from the surface (such as fuels and oils) are less dense and float on the water surface allowing them to also be contained in the basin by use of special outlet arrangements.

The water sampling of the existing basins suggest that pollutants are being retained and the basins are therefore performing their intended function in helping to protect the quality of the receiving waters.

Receiving Environment - Native aquatic submerged and emergent vegetation is not abundant within the creeks of the study area. This is likely to be as a result of the chiefly rocky substrate found here, high water velocity during heavy rainfall and competition from introduced species. No assemblages of native aquatic plants were found that could be described as native vegetation communities. No aquatic plant species of conservation significance were recorded or considered likely to occur within the M2 corridor or surrounds. A variety of aquatic weeds (e.g. Water Milfoil (*Myriophyllum aquaticum*) and Watercress (*Rorippa nasturtiumaquaticum*)) are found along the waterways of the study area. Of these, three species are listed as noxious weeds: Long-leaf Willow Primrose (*Ludwigia longifolia*), Ludwigia (*Ludwigia peruviana*), and Sagittaria (*Sagittaria platyphylla*).

Prior to residential development in surrounding areas, the creeks of the locality are likely to have supported a diverse community of insects, fish, frogs, birds and mammals. The creeks are degraded to varying degrees as a result of a number of factors including increased erosion due to the concentration of stormwater flows, weed invasion, polluted catchment runoff and the presence of exotic fish species. As a result of this condition, frogs, fish

and aquatic invertebrates that are sensitive to these forms of disturbance are unlikely to persist in these waterways. Nonetheless, a variety of disturbance tolerant fauna species remain.

The present condition of the creeks of the M2 corridor varies from highly modified to near-natural. The section of Darling Mills Creek crossed by the M2 corridor appears to be in relatively moderate condition, with low turbidity, little evidence of sedimentation and a low level of weed invasion. This area is likely to be inhabited by many species of native fish, the Eastern snake-necked Tortoise (*Chelodina longicollis*) the following frog species: the Green Stream Frog (*Litoria phyllochroa*), Peron's Tree Frog (*Litoria peronii*), Striped Marsh Frog (*Limnodynates peronii*) and Common Eastern Froglet (*Crinia signifera*).

The other creeks of the study area are more disturbed and are likely to contain a lower diversity and abundance of fish and frog species with the Plague Minnow becoming increasingly dominant in more disturbed areas.

Obstructions to fish movement within the M2 Corridor exist where waterways pass beneath the Motorway via culverts. Other barriers to fish passage include the retarding basin wall near Loyalty Road, North Rocks and weirs on the Lane Cove River). No threatened or protected aquatic invertebrate or fish species have been recorded in the waterways of the M2 Corridor. Introduced fish species recorded in the locality include Goldfish (*Carassius auratus*), Common Carp (*Cyprinus carpio*) and Plague Minnow (*Gambusia holbrooki*). Goldfish and Common Carp are not likely to be abundant in the small rocky streams of the study area however the Plague Minnow is found in all of the creeks, especially in disturbed areas. This species is listed as a Key Threatening Process due to its detrimental impacts upon tadpoles and frog eggs.

Impact assessment – Transverse Drainage

Operation:- The varying nature and extent of the proposed widening along the route means that only seven (7) of the twenty-six (26) existing transverse culvert drainage structures are affected by the widening to such an extent that they require physical extension. The lengths of these extensions vary from a minimum of 2.4m to a maximum of 17.1m (both for the same Culvert 35) with the remainder generally falling in the range of 4.9m to 8.5m.

Each of the affected structures has been modelled to establish 100 year ARI flood levels as well as outlet velocities for both the existing and proposed conditions. Modelling results show that there are no significant increases in flood levels which would potentially impact on upstream or adjoining properties. Culvert 26 is the only location where a potential impact has been identified and this is limited to a maximum increase of only 0.02m which should not adversely affect any of the surrounding properties. At University Creek (Culvert 35), the proposed channel works would reduce flood levels in this reach (between 1.0 to 1.5m) thereby improving the existing situation and reducing the risk of the motorway being overtopped by floodwaters.

It is not proposed to alter the waterway area (cross-sectional dimensions) of the existing culvert structures and as such the changes in outlet velocity are typically less than 0.1m/s. Such small changes are considered to be negligible relative to the velocities already prevailing at the existing outlets and in the adjoining downstream creek sections. The only exception is for University Creek where increasing the length of the relatively steep existing culvert grade with improvements to the channel upstream has increased the outlet velocity.

In addition to the individual transverse culvert crossings, the motorway is to be widened along the reach running parallel to Devlins Creek. For the reach between Chainage 10580 to 11100 downstream of Murray Farm Road, the proposed design concept is to construct the carriageway supported on piers and as a structurally cantilevered section to overhang the creek. This concept has been hydraulically modelled and found to have minimal impact (<0.01m) on flood levels.

Construction: - The proposed widening works would involve site establishment and preparation works as well as earthworks and drainage works. The disturbance of the areas surrounding the works would increase the susceptibility of the site to erosion problems occurring. Management techniques employed to control and deal with runoff from the site works during construction also have the potential to concentrate flows and increase erosion leading to water quality issues for the receiving waters downstream.

As the existing culvert structures are the only means to convey upstream catchment flows across the motorway, facilitation of the construction works is likely to result in some temporary obstruction of the waterway flow path. This obstruction may be caused by temporary bunding or diversions of the waterway, the placement of construction equipment or materials within the flow area, stockpiles or access roads and work platforms. There is the potential for such obstructions to result in the redistribution or concentration of flows (increased velocities) and depending on the circumstances this may increase flood levels upstream and temporarily impact on adjoining properties.

Mitigation Measures – Transverse Drainage

Operation: - The options for managing potential increases in upstream flood levels are largely constrained by the existing size and location of the previously constructed transverse culvert structures. The typical presence of retaining walls and a narrow corridor width is also a limiting factor. The concept design therefore generally proposes to construct new, or modify existing, retaining walls over any inlets/outlets affected by the widening works to minimise the need for extending the culvert structure. This approach should ensure there would be minimal additional upstream impacts (increase in flood levels) created and the need for disturbance of the surrounding environment is also reduced.

For the few culvert structures that are to be extended and may cause flood level impacts, the proposed mitigation measures include keeping the length of required extensions to an absolute minimum and modifying the inlet details to ensure hydraulic efficiencies are optimised and upstream impacts are minimised.

Energy dissipaters and scour protection measures downstream of extended culvert outlets would be modified and/or reconstructed as required to suit the new outlet conditions. Depending on the extent or nature of modification to the existing outlet structures, these scour protection works would largely reproduce the existing measures, which generally comprise either concrete dissipaters, rock mattress and/or dumped rock rip rap.

At University Creek (Culvert 35) the proposed works include replacing the existing overgrown gabion and rock mattress lined channel, which runs eastwards along the upstream (westbound) side of the motorway, with a concrete lined channel. The new channel would provide greater flow capacity than is currently available which should be sufficient to mitigate the impacts of the proposed widening as well as improve the existing flood situation by reducing the potential for overtopping of the motorway. An open traffic barrier, such as wire rope or guard rail, would be utilised along this reach to allow for potential overtopping of the motorway in the larger flood events. Special attention would be afforded to transitioning the channel into the culvert inlet in order to ensure any hydraulic losses (increases in water level) are minimised and the potential culvert performance is optimised. Increased velocities within the channel and at the culvert outlet would require additional consideration, such as energy dissipation, during detail design to reduce the hazard and prevent scouring of the downstream reaches.

Where piers are required for widening of any of the main bridges (Darling Mills, Devlins or Terrys Creeks), these are to be generally located out of the main creek waterway and are unlikely to create additional hydraulic impacts. Appropriate scour protection in the form of dumped rock rip rap would be provided where required.

Construction: - A Soil and Water Management sub-plan would be developed as part of an overall Construction and Environment Management Plan (CEMP) to document the relevant issues and proposed mitigation measures for dealing with potential impacts during the construction phase. These measures would include minimising the area disturbed, the erection of silt fencing, placement of hay bales, temporary and permanent sediment basins, temporary diversion berms and other similar erosion control measures implemented on large earthworks projects. It is also proposed that disturbed areas be re-vegetated as the works progress and that any scour protection measures required for the operational phase would be installed as soon as practical.

Impact assessment – Water Quality

Operation:- During the operational phase, the main potential water quality impacts attributable to the widening works would be an increase in pollutants associated with changes in the contributing catchment characteristics (i.e. increase in percentage of imperviousness or the overall total surface area resulting in larger volumes of runoff to be treated). The nature of pollutants associated with the motorway function and contained in this runoff include: gross pollutants, sediments and suspended solids, nutrients, heavy metals, organics, oils and surfactants, contaminant/accident spills. Minimising the transfer and discharge of these pollutants from the motorway to the waterways is the key objective for the operational phase.

In order to assess the potential impacts associated with the motorway widening, preliminary computer modelling using the MUSIC software (Version 3, 2005) has been undertaken for a selection of the existing basins affected by the works. Nine (9) basins were selected to provide a representative sample of the range of changes in contributing catchment areas including all of those with the largest percentage increases. For the twenty two (22) other basins they are either not affected by the widening works or the increase in area is less than 10% (typically <5%). Changes of less than 5 or 10% are generally within the order of accuracy for the modelling approach and assumptions with the resulting relative impacts mostly smaller. The changes are therefore not considered significant and can be readily addressed and dealt with during the detailed design phase.

Models defining the existing catchment characteristics were initially set up for each of the selected basins to establish a baseline performance representative of current motorway conditions. The models were then modified

to reflect any change in percentage imperviousness or increase in catchment area and thus quantify what potential impacts might be created by the widening works alone. Further model changes were then introduced to demonstrate the resultant treatment effectiveness (reduction in potential pollutant load impacts) following implementation of proposed basin modification works. The proposed works primarily involve changes to the inlet and outlet details in order to better utilise the existing storage volume available. All of the basins currently have a 1m freeboard above the top water level (TWL - the normal operating level for capturing and treating the low flow events) and at least 0.5m freeboard above the maximum water level (MWL – the highest water level reached in the basin before excess overflows are discharged directly from the basin itself). Initial modelling results suggest that increasing the ponded (extended) depth by approximately 0.2m to 0.3m would cater for the treatment of the extra runoff volumes generated by the upgrade.

The modelling results demonstrated that the existing basins are providing treatment for Total Suspended Solids (TSS) and Total Phosphorus (TP) that is in accordance with the stormwater treatment objectives for NSW outlined in Australian Runoff Quality (ARQ Table 1.2), these being: TSS reduction of 80%, TP reduction of 45%, TN reduction of 45%, Gross Pollutants 100%. The existing basins do not meet the pollutant reduction targets for Total Nitrogen (TN) (range of pollutant removal is 14 to 24 %). It will not be practicable to achieve the TN target due to the size of basin that would be required being larger than the space available.

Following the proposed widening of the motorway, the modelling results suggest that except for Total Nitrogen (TN), the existing basins would still have sufficient capacity/performance to be able to satisfy the treatment objectives of Australian Runoff Quality (ARQ) without any significant modification. After the motorway upgrade, TN pollutant loads are reduced in the order of 15 – 25 and this is also consistent with the existing level of treatment efficiencies (i.e. the current TN pollutant removal rates are not worsened).

With regards to spill incidents, the owners of the motorway Hills M2 Motorway indicated that there have not been any major spill incidents to threaten the surrounding environment since operations began. There have been some minor instances of contaminants falling from trucks (such as chemicals or paints) and the small oil & fuel leaks resulting from motor vehicle accidents. All such spills/incidents are quickly dealt with by the M2 response team which has a special action plan and spill containment kit to deploy so that the potential for any contaminants to reach the drainage system and downstream environment is minimised. As a further safeguard, the motorway drainage systems have been designed to direct any low flows, including fluid spills or wash down volumes, into the water quality basins where the contaminated runoff can be retained and appropriately dealt with. The potential for spill incidents to impact on the downstream ecosystem is therefore considered to be relatively low.

Construction: - The main potential impacts on water quality are more likely to occur during the construction phase when the underlying soils are exposed due to clearing of the works areas. This is primarily associated with increased erosion and sedimentation issues which are influenced by the severity of a storm event, the slope and footprint of disturbed area in conjunction with the management measures being implemented. Erosion and sediment loads would gradually diminish after construction as the disturbed areas are remediated and the revegetation of batters (or other stabilisation measures) start to establish and hold the soils in place. The key objective is to minimise erosion of disturbed earthworks areas and to contain any sediments on-site.

Other potential construction impacts include: building waste and litter; acids and chemicals from washing processes; accidental spills of construction fuels or chemical materials; and disturbance of contaminated soils.

Mitigation Measures – Water Quality

As a general guiding principle for design and construction, water quality mitigation and management measures would be implemented in accordance with the RTA's *Water Policy and Code of Practice for Water Management (1999)* and *Managing Urban Stormwater - Soils and Construction (Landcom 2004 – often referred to as The Blue Book)*. A summary of measures likely to be implemented for both the construction and operational phases is provided below

Operation: - appropriate energy dissipation and scour protection measures would be provided at bridge waterways and culvert inlets/outlets as necessary. Permanent scour protection requirements particularly at culvert outlets would be implemented as soon as practical and where feasible. Surface areas disturbed by the construction works would be re-established with landscaping.

The existing water quality basins would be modified as required to account for any significant changes in contributing catchment area or to meet the target pollutant reduction criteria. Basin 30b which is located just to the east of the Norfolk Tunnel would additionally be modified to incorporate measures for dealing with tunnel wash down water from maintenance activities.

Operational procedures would be reviewed to ensure the incident response plan is updated to address any changes or issues attributable to the upgrade works and also, adequately incorporates the latest environmental procedures and technologies for dealing with accidental contaminant spills. Maintenance plans and schedules would also be reviewed and updated as appropriate.

Construction: - the control and mitigation of potential surface water quality impacts during construction would be defined in a Soil and Water Management Plan (SWMP) prepared as part of the overall Construction Environmental Management Plan (CEMP). The SWMP would be developed to incorporate “best practice” controls and measures in accordance with “The Blue Book” and the Plan would be continually updated to suit the changing needs as the project works progress.

1.0 Introduction

1.1 Overview

This report provides an assessment of the surface water management issues associated with construction and operation of the proposed M2 Motorway Upgrade. The assessment includes identifying potential impacts and mitigation measures pertaining to flooding, stormwater and water quality. Detailed descriptions of the proposed upgrade works and M2 environs are provided within the main body of the Environmental Assessment (refer Sections 1, 4 and 7).

The objectives of this assessment include:

- Define the existing environment with respect to surface water aspects such as:
  - The interaction of the motorway and its transverse culvert drainage structures on flooding for surrounding areas.
  - The quality of surface water runoff from the motorway and the receiving water environment.
- Quantify the nature and extent of potential impacts due to both the construction and operational phases of the project.
- Identify appropriate mitigation measures to address and ameliorate any impacts.

1.2 Assessment Scope

General construction impacts associated with the M2 Motorway Upgrade are a key issue that must be addressed in the Environmental Assessment, as outlined in the Director-General's Requirements for the proposal. In particular the Environmental Assessment must include consideration of and a management framework for erosion, sedimentation, water quality and riparian management issues in and around watercourse crossings. This technical study has been prepared to satisfy that assessment requirement.

This technical study includes:

- A description of the hydrologic and hydraulic context of the existing motorway, including existing water quality and aquatic ecology in the receiving waters;
- A description of the existing motorway stormwater collection and treatment systems, including proposed modifications and the likely impacts to treatment effectiveness and water quality;
- A description of transverse drainage devices installed along the motorway and the proposed modification to these structures, including an assessment of the potential impacts associated with the proposed modifications;
- An identification and assessment of sources of polluted water at project sites during construction and on surface roads and in tunnels during operation and appropriate mitigation strategies to prevent potential water quality impacts; and,
- An assessment of the likely ground stability impacts during construction with specific focus on riparian zones and identification of appropriate mitigation strategies to minimise the potential for erosion and sedimentation issues in the downstream receiving waters.

1.3 Policy Framework

The relevant legislative requirements and government policies applicable to the surface aspects of the proposed upgrade works include:

- Water Act 1912.
- Water Management Act 2000.
- Fisheries Management Act 1994.
- NSW State Rivers and Estuaries Policy.
- NSW Floodplain Development Manual 2005.

2.0 Background

2.1 Geology

Within the length of the motorway corridor there are two major geological formations being Hawkesbury Sandstone and the overlying Ashfield Shale member of the Wianamatta Group. The interface between the two formations may be marked by the presence of the Mittagong Formation.

Hawkesbury Sandstone is a medium to coarse grained quartz sandstone with minor lenses of shale and laminate.

The Wianamatta Group Shales comprise Ashfield and Bringelly Shale Formations. The Ashfield Shale consists of black to dark grey shale and laminate. Bringelly Shale is comprised of shale, calcareous claystone, laminate and fine to medium-grained lithic-quartz sandstone.

The Mittagong Formation is comprised of alternating bands (and lenses) of sandstone and black siltstone of variable thickness. The quartz sandstone is of a finer grain than the Hawkesbury Formation.

The Hawkesbury Sandstone relief tends to be fairly rugged with rolling to very steep hills with steep or benched side slopes. Relief in the Ashfield Shale is generally undulating with rounded ridges and hill crests.

2.2 Soils

There are five major soil landscapes occurring throughout the corridor. The Glenorie Landscape (*gn*) is the main soils developed on the Wianamatta Group Shales. Typically these soils have a depth of up to 2m approximately with the topsoil consisting of a friable dark brown loam. Also on Wianamatta Group Shales there are some small areas of soils in the West Pennant Hills Landscape (*wp)* which are generally less than 2m in depth.

The Lucas Heights Landscape (*lh*) is typically found on the Mittagong Formation with the depth commonly less than 1m and a high soil erosion hazard.

In the southern section of the Lane Cove River valley and in the upper valley of Terrys Creek, the soils are shallow (less than 1m) and fall within the Gymea Landscape (*gy*). The erosion hazard is high to extreme.

In the northern section as well as the rugged valleys of Devlins Creek, the soils are mostly within the Hawkesbury Landscape (*ha*) and less than 0.5m depth. These shallow soils in conjunction with the steep terrain have an extreme erosion hazard.

2.3 Aquatic Environment

The M2 Motorway traverses through three main catchment areas of Darling Mills Creek, Devlins Creek and Terrys Creek whilst a number of smaller tributaries located towards the eastern end of the M2 (including Mars, University, Shrimptons and Porters Creeks) also form part of the Lane Cove River catchment. Within the limits of proposed widening works the motorway is crossed by some 26 local drainage lines which are served by transverse drainage structures comprising a combination of large concrete arches and box or pipe culverts. Large multi span bridge structures situated several metres above the normal water level, are used to cross the three main creek waterways.

Native aquatic submerged and emergent vegetation is not abundant within the creeks of the study area. This is likely to be as a result of the chiefly rocky substrate found here, high water velocity during heavy rainfall and competition from introduced species. The only commonly encountered native aquatic plants were Bull Rush (*Typha orientalis*) and knotweeds (*Persicaria spp*.), which were found in small patches along the creeks, chiefly in disturbed areas.

The detention basins within the M2 corridor contain an artificial assemblage of emergent native aquatic plants including Tall Spike-Rush *Eleocharis sphacelata*, Marsh Club-rush (*Bolboschoenus fluviatilis*) and Jointed Twig-rush (*Baumea articulata*) which were planted when the basins where constructed.

No assemblages of native aquatic plants were found that could be described as native vegetation communities. No aquatic plant species of conservation significance were recorded or considered likely to occur within the M2 corridor or surrounds. A variety of aquatic weeds (e.g. Water Milfoil (*Myriophyllum aquaticum*) and Watercress (*Rorippa nasturtiumaquaticum*)) are found along the waterways of the study area. Of these, three species are listed as noxious weeds. Noxious aquatic species recorded include:

- Long-leaf willow primrose (*Ludwigia longifolia*)
- Ludwigia (*Ludwigia peruviana*), and
- Sagittaria (*Sagittaria platyphylla*).

Prior to residential development in surrounding areas, the creeks of the locality are likely to have supported a diverse community of insects, fish, frogs, birds and mammals. The creeks are degraded to varying degrees as a result of a number of factors including increased erosion due to the concentration of stormwater flows, weed invasion, polluted catchment runoff and the presence of exotic fish species. As a result of this condition, frogs, fish and aquatic invertebrates that are sensitive to these forms of disturbance are unlikely to persist in these waterways. Nonetheless, a variety of disturbance tolerant fauna species remain.

The present condition of the creeks of the M2 corridor varies from highly modified to near-natural. The section of Darling Mills Creek crossed by the M2 corridor appears to be in relatively moderate condition, with low turbidity, little evidence of sedimentation and a low level of weed invasion. This area is likely to be inhabited by many species of native fish. It is also likely to be inhabited by the introduced fish, the Plague Minnow (*Gambusia holbrooki*) though the population density of this species is likely to be relatively low due to the higher water quality and intact riparian vegetation which favour native fish species. The Eastern snake-necked Tortoise (*Chelodina longicollis*) is also likely to be found here. Recent frog surveys conducted along this section of Darling Mills Creek detected the Green Stream Frog (*Litoria phyllochroa*), Peron's Tree Frog (*Litoria peronii*), Striped Marsh Frog (*Limnodynates peronii*) and Common Eastern Froglet (*Crinia signifera*).

The other creeks of the study area are more disturbed and are likely to contain a lower diversity and abundance of fish and frog species with the Plague Minnow becoming increasingly dominant in more disturbed areas.

Obstructions to fish movement within the M2 Corridor exist where waterways pass beneath the Motorway via culverts. During low flow conditions, the streams of water flowing through the culverts are broad but very shallow and may limit the passage of some fish species. Higher water velocity and turbulence during rainfall events and a lack of pooled areas for fish to rest between bouts of swimming may also limit fish movement through the culverts. The extremely low light level within culverts may also create a non-physical barrier for some fish species that may avoid dark areas during daylight hours (Fairfull and Witheridge 2003). Larger in stream structures (e.g. the retarding basin wall near Loyalty Road, North Rocks and weirs on the Lane Cove River) lower in the catchments of these creeks are also potential barriers to fish passage.

No threatened or protected aquatic invertebrate or fish species have been recorded in the waterways of the M2 Corridor. Introduced fish species recorded in the locality include Goldfish (*Carassius auratus*), Common Carp (*Cyprinus carpio*) and Plague Minnow (*Gambusia holbrooki*). Goldfish and Common Carp are not likely to be abundant in the small rocky streams of the study area however the Plague Minnow is found in all of the creeks, especially in disturbed areas. This species is listed as a Key Threatening Process due to its detrimental impacts upon tadpoles and frog eggs.

2.4 Existing M2 Motorway Design

The original design of the existing M2 Motorway was undertaken in 1995-96 with construction completed and the motorway opened to traffic in May 1997.

Detailed information pertaining to the assumptions and basis for the original Motorway design of drainage elements are limited. Copies of the design drawings and some work as executed information have been obtained but the supporting design calculations, reports or technical models were not available for review. The investigations undertaken for this current assessment have therefore relied upon the limited details that were already available along with some new information specifically gathered while developing the widening concept.

2.5 Survey Information

The following survey information was initially available for the purposes developing the design concept and associated investigations:

- 2m topographical mapping contours for the surrounding region.
- Photogrammetric survey within the corridor, excluding the pavement area, obtained from Ausimage (SKM).

- Detail survey of the Motorway surface between the existing barriers, not including eastbound pavement between Pennant Hills Road and Murray Farm Road obtained by surveyors for the M2 Upgrade Project team in November 2008, and from previous studies.
- Additional survey obtained by surveyors for the M2 Upgrade Project team in January 2009 to specifically assist with the hydraulic investigations and the detail design process in general.

A review of the above survey information has indicated that there are still some areas of insufficient detail (such as confirming existing basin and culvert inlet/outlet details) and further survey is to be obtained to address this issue prior to detail design commencing.

2.6 Water Quality Data

As part of the original approval conditions for the M2 Motorway, a water quality monitoring program was initiated in 1997-98 following the commencement of operation in May 1997. The objectives of the monitoring program were to examine water quality to check for conformance with recommended quality limits and to quantify any changes in water quality so as to identify long term impacts which might be associated with construction. Since that time, water quality data has been collected and analysed by HLA-Envirosciences at sixteen (16) locations on tributary waterways upstream and downstream of the M2 corridor (refer Figures 1 to 5). The samples are collected following noteworthy storm events (where rainfall is greater than 10mm in the 24 hour period prior to sampling) and analysed for Total Suspended Solids (TSS). Suspended solids loadings are used as an important indicator in relation to nutrient transport and aesthetic appearance. Appendix A tabulates and charts the sampling data obtained for numerous events dating back as far as January 1998. The calculated long term average and median values for each of the sites are also included.

It should be noted that sites M2-1 through to M2-8 downstream of the motorway (refer figures 1 to 5) are the same sampling locations used by a Bill Rooney between July and December 1994 (prior to construction) to establish background averages for wet (128 mg/l) and dry (8 mg/l) conditions.

In addition to the ongoing event monitoring, water from a selection of water quality basins located along the corridor has also been sampled in May-June 2007 and July 2008 for a broader range of constituent pollutants. The objectives of this monitoring program were to examine the water quality in selected basins along the motorway and to conduct compliance sampling for licensing requirements. A comparison of results is included in Appendix A and discussed further in Section 4.1.

N

Westlink

Westlink

Toongabbie Creek

Abbott Rd

M2-10

M2-1

M2-2

500

1000

1500

2000

2500

3000

3500

4000

Seven Hills Rd

Cropley Dr

Windsor Rd

Old Northern Rd

Cook St

8b

8

Junction Rd

Hillcrest Ave

Caroline Chisholm Dr

Caroline Chisholm Dr

Churchill Dr

Churchill Dr

Northmead Gul

Windsor Rd

Old Windsor Rd Old Windsor Rd

0 105 210 420 m

Figure 1: Surface Water Features

December 2009

Lease Boundary
Existing Basin
Proposed Basin
Proposed Culvert

Sampling Sites
Drainage Design
Existing Drainage
13 Culvert Name

Catchment Areas
Darling Mills Creek
Devlins Creek
Mars Creek
Northmead Gully
Shrimptons Creek
Terrys Creek

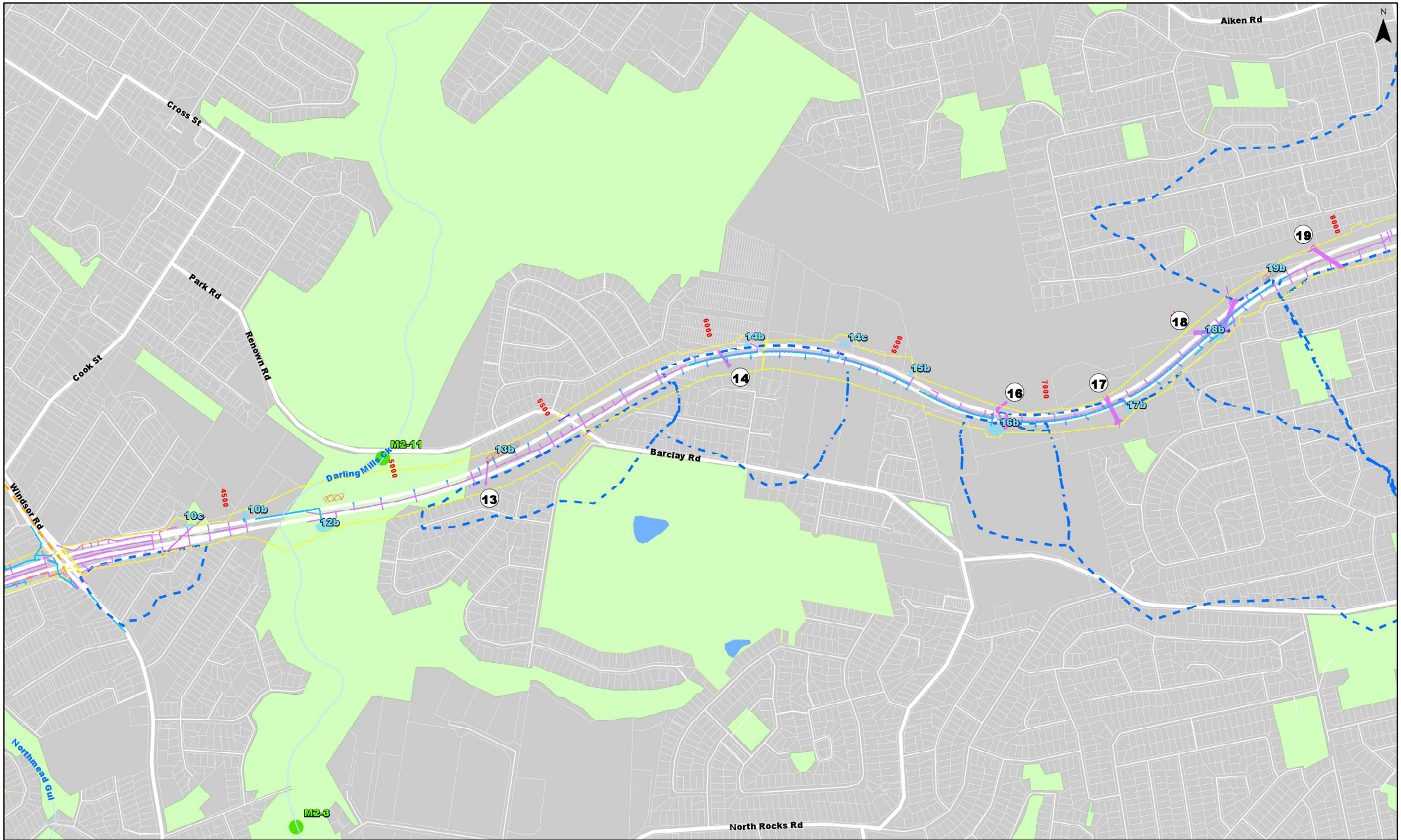


Figure 2: Surface Water Features

December 2009

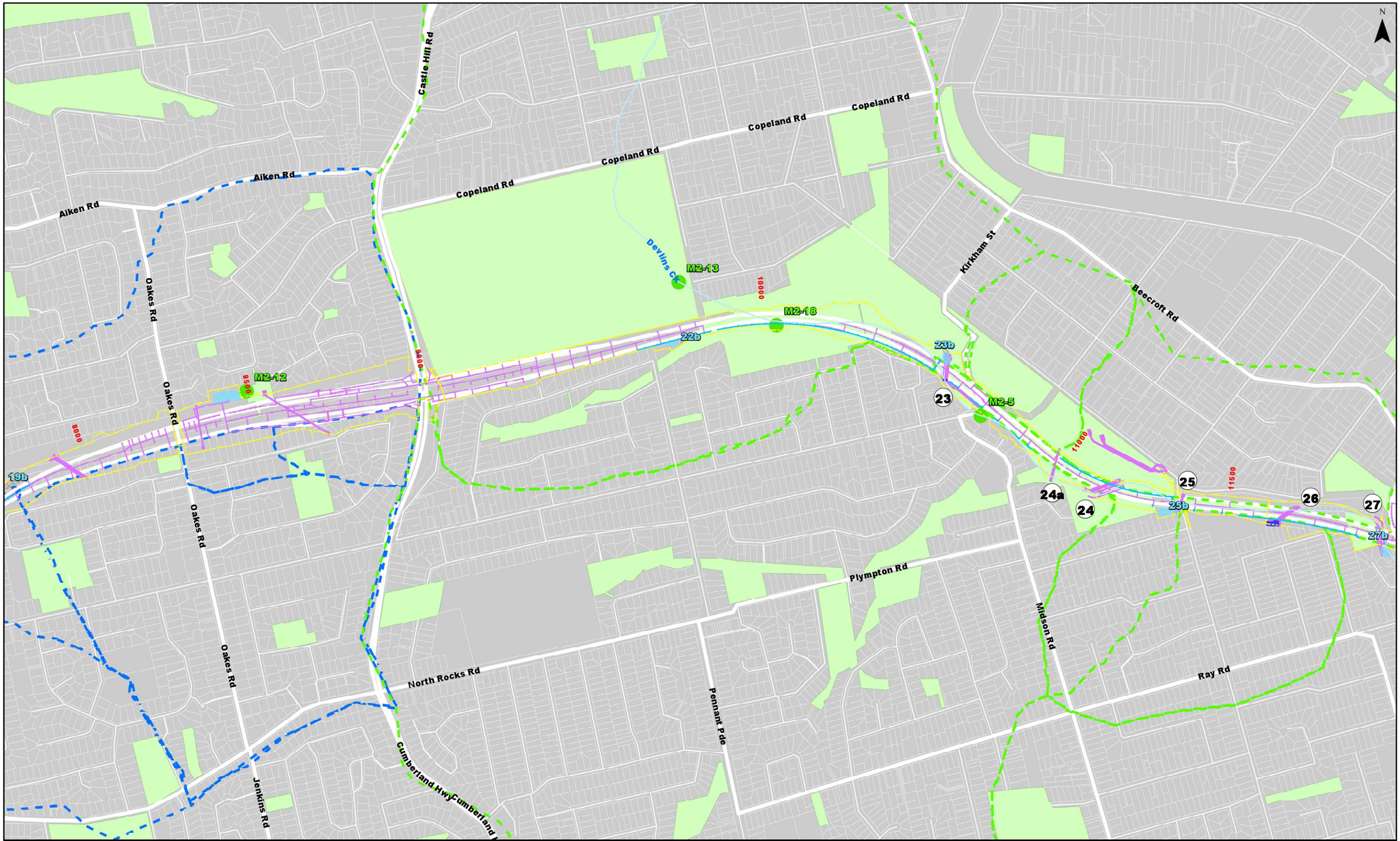


Figure 3: Surface Water Features

December 2009

Lease Boundary
Existing Basin
Proposed Basin
Proposed Culvert
Sampling Sites
Drainage Design
Existing Drainage
13 Culvert Name

Catchment Areas
Darling Mills Creek
Devlins Creek
Mars Creek
Northmead Gully
Shrimptons Creek
Terrys Creek

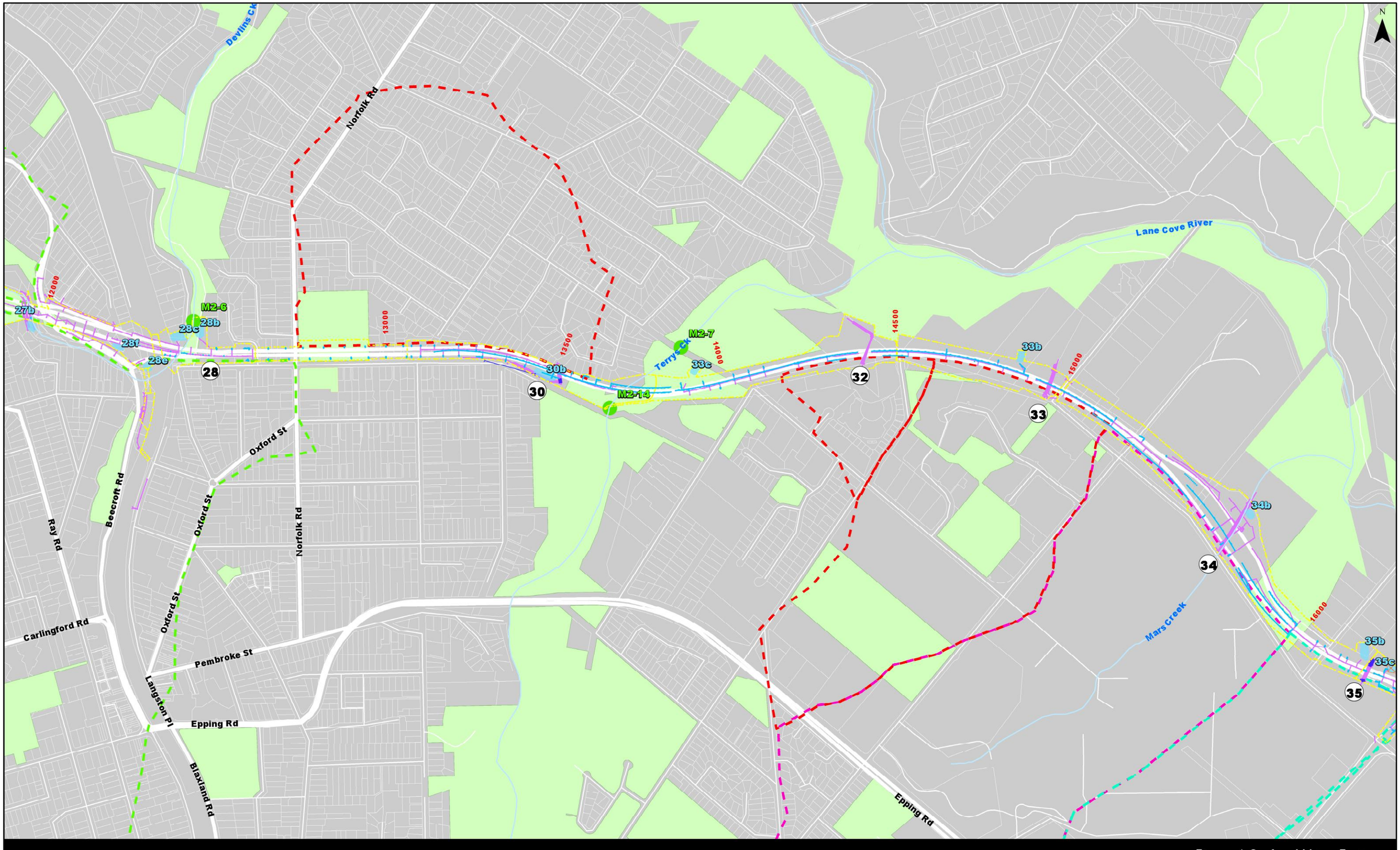


Figure 4: Surface Water Features

December 2009

Lease Boundary
Existing Basin
Proposed Basin
Proposed Culvert
Sampling Sites
Drainage Design
Existing Drainage
13 Culvert Name

Catchment Areas

Darling Mills Creek
Devlins Creek
Mars Creek
Northmead Gully
Shrimptons Creek
Terrys Creek

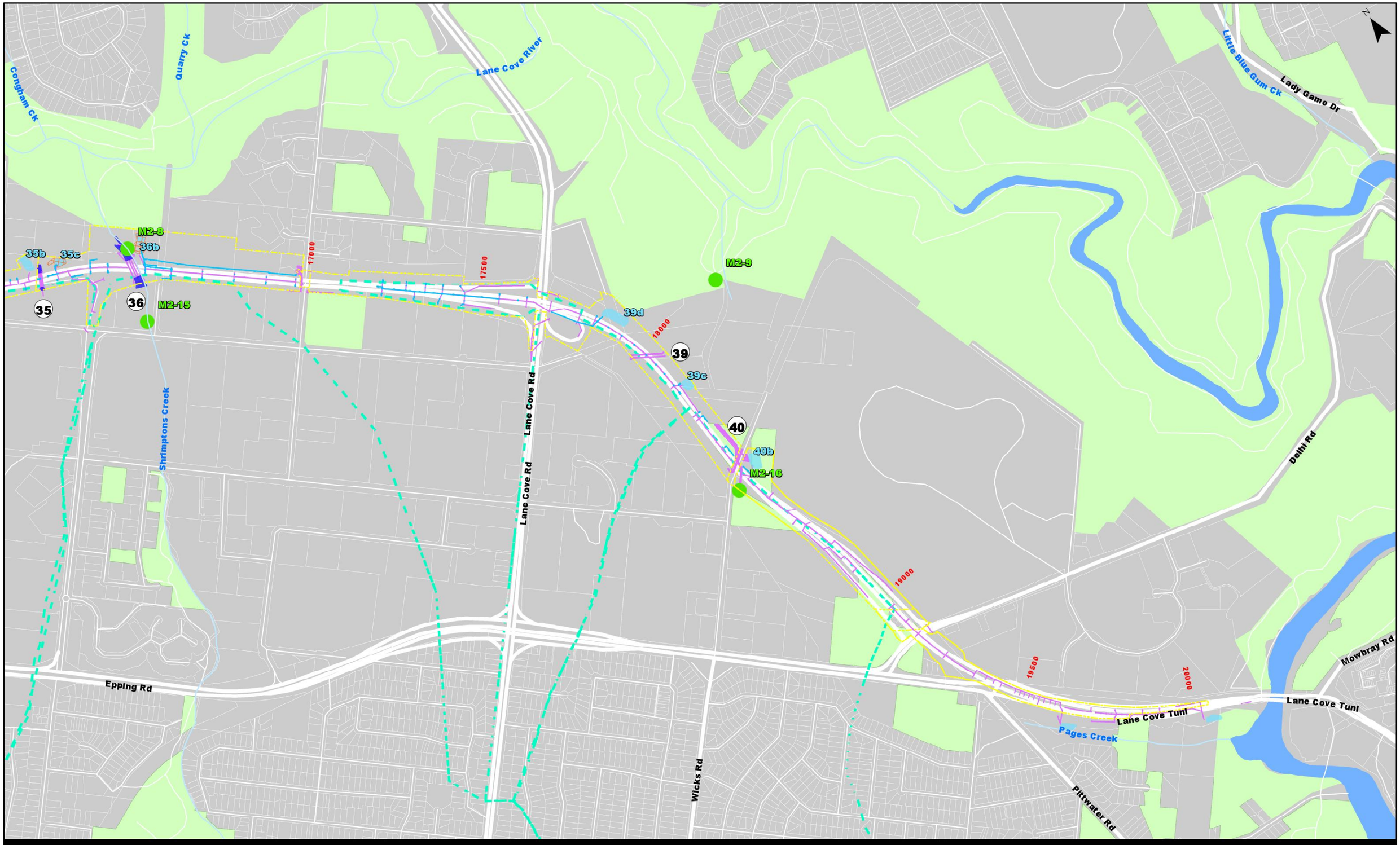


Figure 5: Surface Water Features

December 2009

Lease Boundary
Existing Basin
Proposed Basin
Proposed Culvert
Sampling Sites
Drainage Design
Existing Drainage
13 Culvert Name

Catchment Areas

Darling Mills Creek
Devlins Creek
Mars Creek
Northmead Gully
Shrimptons Creek
Terrys Creek

2.7 Proposed Upgrade Drainage Works

A brief description of the proposed upgrade works pertaining to surface water drainage elements within each of the Precincts is outlined below. A description of the M2 Precinct environs is available in Section 4 of the Environmental Assessment report. It should be emphasised that some of the ultimate drainage design details (particularly the basins) have not been finalised due to insufficient detail survey making it difficult to confirm the size and functionality of the existing basins. Additional survey information is being obtained to allow further investigations and enable the consideration of alternative design solutions for the various site specific conditions. The ultimate details would then be finalised as part of the detailed design process which would be completed prior to construction commencing. Some of the basin works described below may therefore be subject to change. However, it is not envisaged that such changes are likely to be significant relative to the scale of works currently proposed but rather they would be limited to additional earthworks in lieu of simply adjusting the inlet and outlet arrangement.

Prior to construction commencing, it is also proposed that the existing basins would be drained to allow for cleaning and de-silting to ensure the full capacity and effectiveness was available. A similar maintenance exercise would then be undertaken at the completion of construction so that the basins would be properly prepared for their ongoing operational conditions.

Precinct 1 – Abbott Road to Windsor Road

Drainage works for Precinct 1 predominantly involve the adjustment of existing, and provision of additional, inlet pits with associated pipes to drain the pavement area of the new west facing ramps. This longitudinal drainage system would drain to the existing water quality basin 8b located around Chainage 3580 on the eastbound side of the motorway (refer Figure 1). It is proposed to modify the existing basin inlet and outlet to provide for changes to the drainage system. Alternatively, some earthworks may be required to increase the storage volume. There are no transverse culvert works proposed or required within Precinct 1

Precinct 2 – Windsor Road to Pennant Hills Road

An existing 1200mm diameter pipe culvert at Chainage 5250 (Culvert 13 – refer Figures 2 & 6) is to be extended approximately 6m on the downstream outlet (eastbound) side to accommodate the proposed road widening. The works would incorporate a new headwall into the proposed retaining wall for the widening works with new energy dissipation and scour protection.

At Chainage 7560 it is proposed to extend the inlet of an existing 1500x1200 box culvert (Culvert 18 – refer Figures 2 & 7) by up to 5m on the westbound side, along with replacement of the inlet scour protection.

Figure 6 Culvert 13 – Chainage 5250

Figure 7 Culvert 18 – Chainage 7560

A new culvert parallel to the motorway is proposed at the Barclay Road overbridge (chainage 5520 to 5550 – refer Figure 2) which would provide connectivity of catch drains being relocated at the top of the cutting on the east bound (northern) side due to the road widening.

Within Precinct 2, there are eleven (11) existing water quality basins which would require modification works to provide additional volume for treatment purposes. The additional volumes potentially required vary considerably from nothing up to approximately 600m^3. The existing motorway corridor is typically constrained in terms of width or available land space, which severely limits the opportunity for increasing basin footprints. Wherever possible or practical, it is therefore generally proposed to modify the basin inlet/outlet arrangements (by changing the inlet/outlet levels, dimensions or similar) to better utilise any spare volume capacity that currently exists as freeboard (up to 1m of airspace above the top water level). This approach would be dependent on the existing levels of key basin features compared to the elevation of the motorway and drainage system upstream. It is envisaged that earthworks would be required in some locations to obtain additional storage volume. As a general design principle such earthworks would be minimised to avoid impacts on the surrounding vegetation.

It is possible that a new basin may be required on the eastbound side around Chainage 4800 (refer Figure 2) to remove the need for upgrading the drainage system across the motorway and then having to also enlarge the existing basin 12b on the westbound side.

Precinct 3 – Pennant Hills Road to Beecroft Road

Within Precinct 3, Devlins Creek runs parallel to the motorway for significant portions and crosses the M2 back and forth through large precast concrete arch structures on 3 occasions. Only the existing 12.4mx4m structure at Chainage 10550 (Culvert 23 – refer Figures 3 & 8) would be affected by the widening works and would require extension by approximately 4.9m. A gabion wall and open channel immediately downstream of the outlet would require re-construction or modification to suit. At Chainage 11640 there is a tributary creek served by a 4x1350mm diameter RCP (Culvert 26 – refer Figures 3 & 9) which would require extending up to 6m at the inlet and reconstruction of the existing scour protection.

Figure 8 Culverts 23, 24a & 24 - Chainage 10500-1120

Figure 9 Culverts 24, 25 & 26 - Chainage 11100-11700

Two (2) of the four (4) existing water quality basins are likely to require earthworks to create additional storage volume (23b & 27b). The existing basin 22b at Chainage 9730 could be significantly impacted (reduced) due to the widening works. If it is not possible to achieve the appropriate storage volume through earthworks modifications, it may be necessary to extend a retaining wall to remove the need for a batter slope and thereby minimise the footprint and impact of the widening. Basin 25b at Chainage 11310 (refer Figure 3) appears to already have sufficient storage volume but may require modification of the inlet and outlet.

Precinct 4 – Norfolk Tunnel (including approaches to Terrys Creek)

Within the vicinity of the bend in Somerset Street (at the projected intersection with Gloucester Road), the motorway widening is likely to impact on the existing local street drainage system. The works would involve relocation or reconfiguration of parts of the local street pit and pipe elements away from the motorway footprint.

The 3 cell 2400x1800 box culvert outlet located around Chainage 13500 is to be extended approximately 8m on the westbound side (Culvert 30 – refer Figures 4 & 10). Works would involve reconstructing the outlet scour protection measures as well as 30m of the existing concrete/rock mattress open channel which receives flows from the local road drainage system.

There are only two (2) water quality basins in Precinct 4. The existing volume for basin 28f at Chainage 12230 (Figure 4) appears to be sufficient, however if minor augmentation is required then this could be achieved through modification of the inlet and outlet. Otherwise there appears to be space available to enlarge the footprint by earthworks. Basin 30b at Chainage 13470 (Figure 4) is located at the end of the Norfolk Tunnel drainage system. The road widening is proposed to pass over the basin on a cantilevered roadway so that there is no impact (reduction) on the existing basin volume. The basin inlet/outlet is proposed to be modified to better utilise the spare volume available. Additional modifications to the basin would also be required to capture and treat the tunnel wash down water prior to discharge. Depending on the quality of the water this would be discharged manually either to the nearby sewer system or local drainage path down to Terrys Creek.

Figure 10 Culvert 30 – Chainage 13500

Precinct 5 – Terrys Creek to Lane Cove Tunnel

The upstream inlet of the existing 3 cell 2400x1800 box culvert for University Creek at Chainage 16220 (Culvert 35 – refer Figures 5 & 11) is to be extended approximately 2.4m on the westbound side and the downstream outlet is to be extended 17.1m under the new Christie Road onload ramp on the eastbound side. The associated widening of the embankment would require construction of a vertical retaining wall to limit the potential imposition (infilling) of an existing channel which runs along the upstream (westbound) side of the motorway. The channel of varying width is currently lined with gabions and rock mattresses which have become overgrown with weeds and other vegetation. It is proposed to reconstruct a new concrete channel with a more consistent and sightly increased waterway area to improve the hydraulic capacity and reduce flood levels through this area.

Figure 11 Culvert 35 – Chainage 16220

Figure 12 Culvert 36 – Chainage 16450

The Shrimptons Creek catchment drains to a large 20mx6m precast concrete arch under the motorway around Chainage 16450 (Culvert 36 – refer Figures 5 & 12). The widening works at this location include the provision of a westbound off ramp to Herring Road which would require extending the arch by 12m on the upstream side.

There are six (6) existing water quality basins in Precinct 5 with at least five (5) requiring some form of augmentation to achieve additional storage volume. It is proposed that this would be achieved through modification of the inlet and outlet arrangement for three (3) of the basins (33c, 34b & 35b) while earthworks would more likely be involved for the remaining two (35, & 36b). All of the basins are located on the eastbound side of the motorway in the Lane Cove River catchment.

3.0 Surface Water Catchment Assessment (Transverse Drainage)

3.1 Methodology

The assessment of local surface water catchments draining to and across/through the motorway has involved hydrologic modelling to determine peak flow estimates applicable for design and hydraulic modelling to quantify if the proposed upgrade works would impact on flood levels and velocities.

The hydrologic modelling of the urbanised catchments has been based on the XP-Rafts runoff-routing software. Models were established for the Devlins Creek, University and Shrimptons Creek catchments.

Hydraulic modelling has involved a combination of headwater calculations for the smaller culvert structures which primarily operate under inlet control, while detailed HEC-RAS modelling has been undertaken for the larger waterways where structures are more influenced by hydraulic gradients or potential downstream tailwater conditions. The waterways modelled include Devlins Creek, University Creek and Shrimptons Creek. The results output from the various hydraulic analyses are included in Appendix B.

It should be noted that the primary aim of the hydrologic/hydraulic analyses undertaken for this study was to establish the relative impacts of the proposed upgrade works. As such, the analyses and associated results are not purported to represent the type of rigorous investigations normally associated with a design flood study which defines design flood behaviour (such as absolute flood levels for planning purposes or design peak flows). The analyses and results are considered suitable for the intended purposes of quantifying the existing situation and the potential impacts attributable to the widening works.

Current scientific evidence suggests that the climate is changing and the effects of these changes need to be considered. Climate change is predicted to have an impact on variations in rainfall intensities as well as rises in sea levels. In this instance, the motorway corridor is situated at relatively high elevations and therefore is above the influence of any potential rise in sea level. With respect to variations in rainfalls, it is possible that these may increase or decrease and for the purposes of the current exercise the performance of the affected structures have also been conservatively assessed for up to a 20% increase in flows to identify any significant issues or risks should the future situation be different to existing or the assumed designed conditions.

3.2 Existing Environment

The M2 Motorway traverses through three main catchment areas of Darling Mills Creek, Devlins Creek and Terrys Creek whilst a number of smaller tributaries located towards the eastern end of the M2 (including Mars, University, Shrimptons and Porters Creeks) also form part of the Lane Cove River catchment. Within the limits of proposed widening works the motorway is crossed by some 26 local drainage lines which are served by transverse drainage structures comprising a combination of large concrete arches and box or pipe culverts. Large multi span bridge structures situated several metres above the normal water level are used to cross the three main creek waterways. These main creeks are all contained within well defined and incised valleys of predominantly bush vegetation. At Darling Mills Creek (approx. chainage 4570) the main watercourse and a tributary join together under one of the 33.75m bridge spans with piers located on the outside of the Y junction. Similarly at the Devlins Creek bridge (approx. chainage 9770), the main creek is joined by a small tributary watercourse before winding along the bridge alignment between and around the existing piers. An existing sewer line also closely follows the same channel alignments. The waterway channels are both relatively small and mostly lined with sandstone rocks with the general condition described as average to disturbed. The Terrys Creek bridge (approx. chainage 13670) comprises 33.75m spans with the piers located away from the creek banks. A summary of key details pertaining to the various existing structures is presented in Table 3-1.

The region surrounding the motorway is known to have experienced a number of historical floods with some of the more notable events occurring in November 1984, December 1989, twice in February 1990 and more recently February 2007. It appears there is limited data available from these events which would provide any quantitative value in assessing the performance of the existing structures or the relative impacts of the proposed upgrade works.

It is understood however, that the City of Ryde Council are currently in the process of preparing a detailed flood study which covers the tributaries within its jurisdiction. This includes Mars, University, Shrimptons and Porters Creeks. Details of this study were not available at the time of preparing this assessment.

For the purposes of this study, existing flood conditions in the 100 year ARI design event have been estimated for the seven (7) transverse culvert structures which are to be extended due to the widening works. A long reach of Devlins Creek extending from Beecroft Road to just upstream of Murray Farm Road and the upper M2 motorway crossing (culvert 23), effectively runs parallel to the motorway and incorporates or influences a number of culvert structures. Additionally, sections of the motorway adjacent to the creek are to be widened. Consequently this entire reach was modelled using HEC-RAS. The structures and adjoining reaches immediately upstream and downstream of the motorway at University (culvert 35) and Shrimptons Creeks (culvert 36) were modelled separately also using HEC-RAS. Culverts 13, 18, 26 and 30 were analysed using HY-8 culvert analysis software and the results are included in Appendix B.

The estimated 100 year ARI flood extent for the upper and lower reaches of Devlins Creek under existing conditions is presented in Figures 13 and 14. Along the entire length of the reach modelled, the flood extent is typically contained within the riparian bush zone which is bounded by the motorway embankment on one side and residential development on the other. Large precast concrete arch culvert structures are used for all of the main motorway crossings of Devlins Creek (Culverts 23, 24, 27 and 28) with only culvert 23 to be extended due to the widening works.

The existing flood behaviour for University Creek in the vicinity of the M2 motorway (refer Figure 15) appears to be influenced by a number of man made features. Flows from the upper catchment are initially controlled by a large diameter pipe and inlet structure immediately upstream of Talavera Road. The pipe flows are conveyed under the road and the building on the property located upstream of the M2 to discharge into an open channel near the inlet of the existing motorway culvert (Culvert 35). Excess flows that surcharge across Talavera Road, drop over a concrete weir (wall) where they are then directed overland through the property car park into another drop inlet structure and large box culvert which discharges into an overgrown gabion and rock mattress lined channel running eastwards alongside the westbound (southern) side of the motorway. The channel drops 1m into the motorway culvert inlet. Preliminary results of the hydraulic analyses have indicated that the 100y ARI flood levels in this area may be higher than the adjoining motorway which would therefore be overtopped in the existing situation. Further modelling is required to confirm the hydraulic conditions in this area.

At Shrimptons Creek, the buildings which are evident on the property immediately upstream of the motorway (refer Figure 15) have recently been demolished and the site is in the process of redevelopment. The hydraulic profile and results summarised in Appendix B indicate that the existing property access bridge, located just upstream of the motorway boundary, is constricting the waterway and appears to be controlling flood levels in this area. Downstream of the bridge as the channel drops quickly through the large arch culvert structure (nearly 3m in elevation difference from the bridge to the arch outlet), the steep nature causes flow in the reach to the inlet of the arch to become super-critical (i.e. below the normal water level based on the geometric properties of the waterway area). The 20mx6m arch itself has sufficient capacity to convey the 100y ARI design flow.

Table 3-1 Summary of Existing Transverse Drainage Structures

Culvert Ref ID GHD Design	Approx Chainage (m)	Catchment		No. Conduit Cells	Width (mm)	Height (mm)	Structure Type	Extension Length (m)		Comments
		Tributary Name	Area (ha)					Inlet	Outlet	
8	3620	Northmead Gully	71.40	2	2400	1800	BOX	-	-	No culvert extension works required
				1	1650		PIPE	-	-	
9	4300	Darling Mills Ck	4.73	1	750		PIPE	-	-	No culvert extension works required
	4570	Darling Mills Ck					Bridge			Additional piers are to be installed in-line with existing on the upstream side of the bridge. This may require the construction of one (1) and possibly two (2) pier(s) within the creek or its tributary. If this is necessary, it is proposed that the pier(s) would be streamlined and aligned with the flood flow. The Piers would not adversely increase hydraulic impacts (flood levels or velocities).
13	5250	Darling Mills Ck	10.55	1	1200		PIPE	6	-	New retaining wall to be constructed over outlet with rock mattress channel and gabion bank downstream to be reconstructed and extended
14	6020	Darling Mills Ck	16.11	2	1800		PIPE	-	-	No culvert extension works required
16	6850	Darling Mills Ck	9.17	1	2100		PIPE	-	-	No culvert extension works required
17	7180	Darling Mills Ck	55.69	1	9000	4000	Precast Concrete Arch	-	-	No culvert extension works required
18e	7565	Darling Mills Ck	159.02	3	3000	2400	BOX with a precast link slab	-	-	No culvert extension works required
18w	7560	Darling Mills Ck	12.51	1	1500	1200	BOX	4.9	-	Inlet rock mattress scour protection to be reconstructed.
19	7920	Darling Mills Ck	67.17	3	2400	1800	BOX with a precast link slab	-	-	No culvert extension works required
20	8340	Darling Mills Ck	4.33	1	1350		PIPE	-	-	No culvert extension works required
21	8500	Darling Mills Ck	6.9	1	1800		PIPE	-	-	No culvert extension works required

Culvert Ref ID GHD Design	Approx Chainage (m)	Catchment		No. Conduit Cells	Width (mm)	Height (mm)	Structure Type	Extension Length (m)		Comments
		Tributary Name	Area (ha)					Inlet	Outlet	
	9770	Devlins Ck					Bridge			Additional piers are to be installed in-line with existing in the middle and southern (westbound) side of the bridge structure. It is probable that this may require construction of one (1) and possibly two (2) pier(s) in or adjacent to a tributary channel or flow path joining with Devlins Ck The Piers would not adversely increase hydraulic impacts (flood levels or velocities).
23	10550	Devlins Ck	284	1	12400	4000	Precast Concrete Arch	-	4.9	Gabion wall and open channel downstream to be reconstructed. Low flow channel to be transitioned to existing creek with appropriate scour protection.
24a	10960	Devlins Ck	17.9	1	1800		PIPE	-	-	No culvert extension works required
24	11110	Devlins Ck	649	2	12400	4000	Precast Concrete Arch	-	-	No culvert extension works required
25	11350	Devlins Ck	16.3	2	1350		PIPE	-	-	No culvert extension works required
26	11640	Devlins Ck	30.91	4	1350		PIPE	6	-	Large area of rock mattress scour protection upstream of inlet to be reconstructed.
27	11930	Devlins Ck	752	1	18000	4500	Precast Concrete Arch	-	-	No culvert extension works required
28	12390	Devlins Ck	1007	1	21000	7300	Precast Concrete Arch	-	-	No culvert extension works required
30	13500	Terrys Ck	56.79	3	2400	1800	BOX with link slab	-	8.5	Existing concrete/rock lined open channel from local road drainage system to be reconstructed. Culvert outlet to be transitioned to downstream channel with scour protection measures
	13670	Terrys Ck					Bridge			Additional piers are to be installed in-line with existing on the downstream side of the bridge. The Piers would not adversely increase hydraulic impacts (flood levels or velocities).
32	14415	Terrys Ck	9.36	1	1500		PIPE	-	-	No culvert extension works required
33	14960	Terrys Ck	54.04	2	2400	1800	BOX	-	-	No culvert extension works required
34	15600	Mars Creek	96.87	3	2400	1800	BOX	-	-	No culvert extension works required

Culvert Ref ID GHD Design	Approx Chainage (m)	Catchment		No. Conduit Cells	Width (mm)	Height (mm)	Structure Type	Extension Length (m)		Comments
		Tributary Name	Area (ha)					Inlet	Outlet	
35	16220	University Ck	89.9	3	2400	1800	BOX with link slab	2.4	17.1	Culvert outlet to be extended under Christie Rd EB on-ramp and reconstruct energy dissipater. Minor inlet extension also required on WB side.
36	16450	Shrimptons Ck	560	1	approx. 20000	approx. 6000	Precast concrete arch units	12	-	Large arch structure – inlet to be extended under Herring Rd WB off-ramp
37	16980		49.45	1	1800		PIPE	-	-	No culvert extension works required
39	18000	Porters Ck	38.49	1	2400	1800	BOX	-	-	No culvert extension works required
40	18425		1.23	1	3600	2400	BOX	-	-	No culvert extension works required

SCALES AT A3 SIZE DRAWING
Horizontal 1:2500
Vertical 1:2500

Figure 13: Devlins Creek: 1 in 100y Flood Extent - Existing Conditions
December 2009

Legend

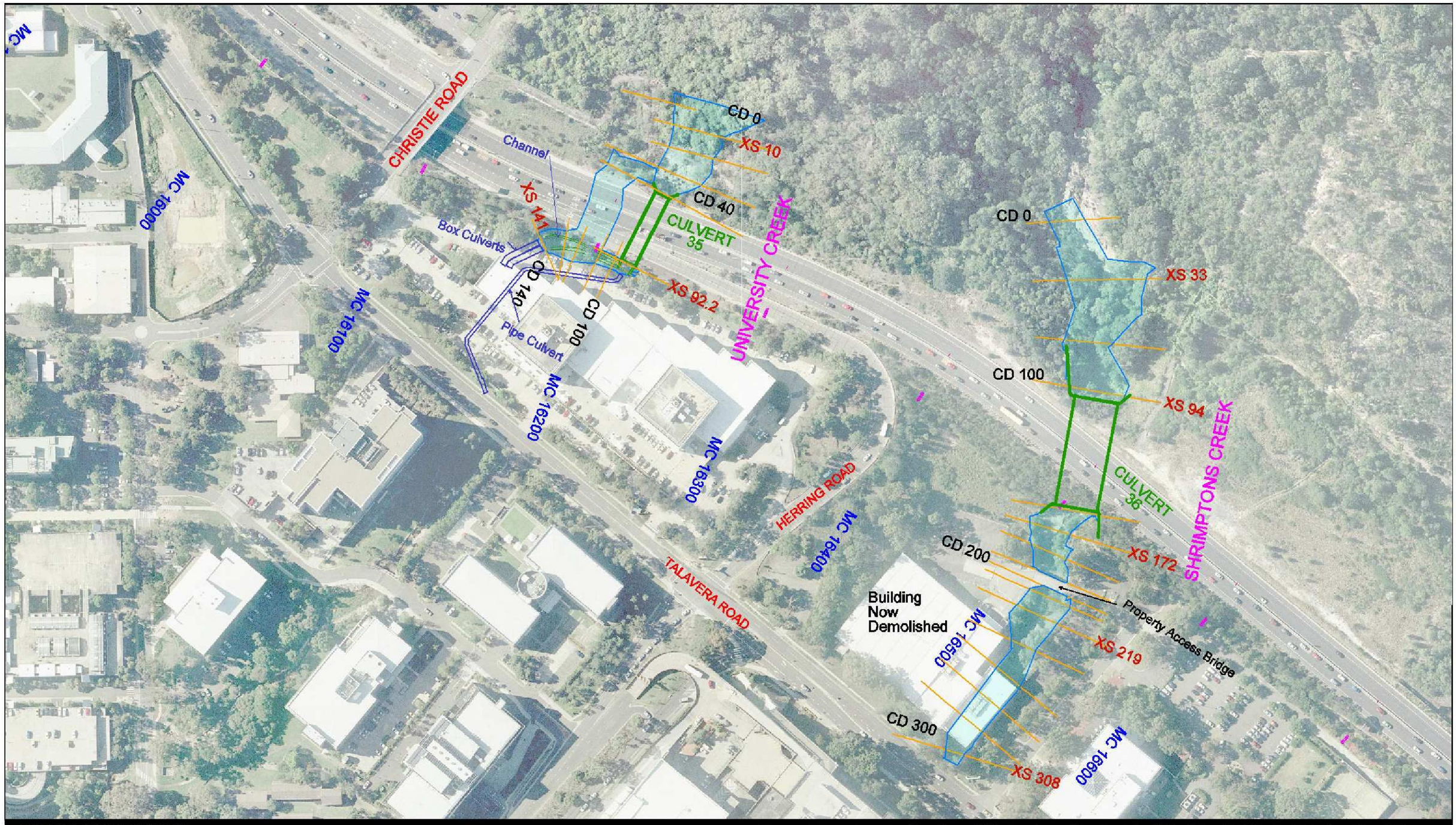
CD 12000	Channel Distance
XS 12040	Motorway Chainage
MC 12000	Channel Cross Section

SCALES AT A3 SIZE DRAWING
Horizontal 1:2500
Vertical 1:2500

Figure 14: Devlins Creek: 1 in 100y Flood Extent - Existing Conditions
December 2009

Legend

CD 12000	Channel Distance
XS 12040	Channel Cross Section
MC 12000	Motorway Chainage



SCALES AT A3 SIZE DRAWING
Horizontal 1:2000
Vertical 1:2000

Figure 15: University Creek and Shrimptons Creek: 1 in 100y Flood Extent - Existing Conditions

December 2009

Legend

CD 12000	Channel Distance
XS 12040	Channel Cross Section
MC 12000	Motorway Chainage

3.3 Impact Assessment

Construction: The proposed widening works would involve site establishment and preparation works as well as earthworks and drainage works. The disturbance of the areas surrounding the works would increase the susceptibility of the site to erosion problems occurring. Management techniques employed to control and deal with runoff from the site works during construction also have the potential to concentrate flows and increase erosion leading to water quality issues for the receiving waters downstream. Erosion and water quality issues are discussed in more detail in Section 4.

As the existing culvert structures are the only means to convey upstream catchment flows across the motorway, facilitation of the construction works is likely to result in some temporary obstruction of the waterway flow path. This obstruction may be caused by temporary bunding or diversions of the waterway, the placement of construction equipment or materials within the flow area, stockpiles or access roads and work platforms. There is the potential for such obstructions to result in the redistribution or concentration of flows (increased velocities) and depending on the circumstances this may increase flood levels upstream and temporarily impact on adjoining properties. Problems of a similar nature may be experienced at the Darling Mills and Devlins Creek bridge sites due to the construction of any piers which might be located within or immediately adjacent to the creek waterways. The hydraulic impacts for these sites should not be as significant as the culvert situation because of the larger waterway area available meaning the flows would not be as concentrated. Additionally, there are no adjoining properties at risk of damage from flooding.

Operation: The varying nature and extent of the proposed widening along the route means that only seven (7) of the twenty-six (26) existing transverse culvert drainage structures are affected by the widening to such an extent that they actually require physical extension. The lengths of these extensions vary from a minimum of 2.4m to a maximum of 17.1m (both for the same culvert 35) with the remainder generally falling in the range of 4.9m to 8.5m.

Each of the affected structures has been modelled to establish 100 year ARI flood levels for both the existing and proposed conditions. A summary of the flood level and velocity results is presented in Table 3-2.

Table 3-2 Hydraulic Impacts – 100 year ARI event

Culvert		Analysis	Design Flow	Upstream Flood Level (mAHD)		Relative Impact (m)	Outlet Velocity (m/s)		Relative Impact (m/s)
ID	Chainage		(m^3/s)	Existing	Proposed		Existing	Proposed	
13	5250	HY8	4.5	78.84	78.84	0.00	6.36	6.44	0.08
18	7560	HY8	5.3	73.05	73.05	0.00	6.66	6.66	0.00
23	10550	Hecras	110	85.56	85.56	0.00	1.34	1.34	0.00
		HY8		86.11	86.12	0.01	2.93	2.93	0.00
26	11640	HY8	14.8	78.81	78.83	0.02	2.58	2.58	0.00
30	13500	HY8	19.3	48.02	48.02	0.00	3.91	3.96	0.05
35	16220	Hecras	41	41.51	41.41	-0.10	2.96	4.49	1.53
36	16450	Hecras	190	32.91	32.91	0.00	3.68	3.68	0.00

As is evident from the results in Table 3-2, there are no significant increases in flood levels that would potentially impact on upstream or adjoining properties. At Culvert 26 a maximum increase in peak flood level of 0.02m is identified, which should not adversely affect any surrounding properties. Culvert 23 has been modelled using two techniques. A maximum increase of 0.01m is shown with one method (HY8) and no increase is shown with the other method (HECRAS). As with Culvert 26, this change is not likely to adversely affect any surrounding properties. At University Creek (Culvert 35), the proposed channel works (refer Section 2.6) would reduce flood levels in this reach (between 1.0 to 1.5m) thereby improving the existing situation and reducing the risk of the motorway being overtopped.

It is not proposed to alter the waterway area (cross sectional dimensions) of the existing culvert structures and as such the changes in outlet velocity are typically less than 0.1m/s. Such small changes are considered to be negligible relative to the velocities already prevailing at the existing outlets and in the adjoining downstream creek

sections. The only exception is for University Creek where increasing the length of the relatively steep existing culvert grade with improvements to the channel upstream has increased the outlet velocity. An energy dissipater at the relocated outlet together with other possible detail design measures (channel and inlet configurations, grade changes, increased culvert roughness or downstream dimensions) would be provided to address this increase.

In addition to the individual transverse culvert crossings, the motorway is to be widened along the reach running parallel to Devlins Creek. For the reach between Chainage 10580 to 11100 the proposed design concept is to construct the carriageway supported on piers and as a structurally cantilevered section to overhang the creek. This concept has been modelled in HECRAS and found to have minimal impact (<0.01m) on flood levels.

For the main bridge crossings of Darling Mills and Devlins Creeks, there is a possibility that one or two piers will need to be placed within or immediately adjacent to the creek channel. The need and/or location for these piers is subject to structural and constructability considerations and alternative options are being considered as part of the detailed design development. It is unlikely that the piers would have significant hydraulic impacts (increases in water levels, or velocities) in the context of the overall creek waterway area available relative to the area or size of the one or two additional piers. Any impacts would be localised and contained to the area immediately surrounding the pier itself. As noted in Section 2 and elsewhere, the creek channels and banks are generally defined or formed through the underlying sandstone rock substrate. While some local geomorphological changes may be experienced with time, substantial scouring is less likely to occur.

3.4 Management of Impacts

Construction: Managing potential hydraulic impacts during construction needs to minimise the risks to the surrounding environment as well as the works themselves. Appropriate mitigation measures to be implemented will vary depending on the nature of the risks and sensitivity of the particular situation but would include consideration of the following:

- Temporary diversion or pumping of low flows around the works area.
- Minimising the need or extent of any obstructions required to be placed within the waterway area.
- Programming or staging any construction associated with creek/channel works or the transverse culverts to minimise the total time that works are undertaken in the vicinity of watercourses and thereby minimise the risk exposure.
- To better facilitate construction methods and reduce potential erosion/scour problems, permanent diversion of small channels in localised areas might be considered for situations where the permanent works (such as bridge piers) may be required to remain adjacent to or partially obstructing the waterway.
- Ensuring construction equipment (or excess material) is removed from the waterway or floodplain areas if wet weather is approaching and at the completion of each day's work activity.
- Strategically placing temporary levees or bunds to contain potential impacts and minimise the risk to surrounding properties which might otherwise be affected.

Operation: The options for managing potential increases in upstream flood levels are largely constrained by the existing size and location of the previously constructed transverse culvert structures. The typical presence of retaining walls and a narrow corridor width is also a limiting factor. The concept design therefore generally proposes to construct new, or modify existing, retaining walls over any inlets/outlets affected by the widening works to minimise the need for extending the culvert structure. This approach should ensure there would be minimal additional upstream impacts (increase in flood levels) created and the need for disturbance of the surrounding environment is also reduced.

For the few culvert structures that are to be extended and may cause flood level impacts, the proposed mitigation measures include modifying the inlet details to ensure hydraulic efficiencies are optimised and therefore losses and upstream impacts are minimised; keeping the length of required extensions to an absolute minimum.

Energy dissipaters and scour protection measures downstream of the culvert outlets would be modified and/or reconstructed to suit. Depending on the extent or nature of modification to the existing outlet structures, these scour protection works would largely reproduce the existing measures which generally comprise either concrete dissipaters, rock mattress and/or dumped rock rip rap.

Just downstream of Murray Farm Road, between Chainage 10580 to 11100 (refer Figure 13), the motorway is to be widened on the westbound (southern) side where it would potentially impose on Devlins Creek and its floodplain which runs in parallel along the motorway corridor. In order to minimise impacts on the waterway area of the creek and floodplain, the concept design proposes to construct a concrete deck carriageway structure supported on piers (10880-11100) and as a cantilevered section (10580-10880) overhanging the floodplain area. Consequently there would be little to no change in flood behaviour along this reach.

At University Creek (Culvert 35), the property immediately upstream of the M2 motorway is currently affected by overland flooding from upstream and in a 100 year ARI event the M2 itself is at risk of being overtopped under existing conditions. The proposed works include replacing the existing overgrown gabion and rock mattress lined channel, which runs along the upstream (westbound) side of the motorway, with a concrete lined channel. The new channel would provide greater flow capacity than is currently available which would be sufficient to mitigate the impacts of the proposed widening as well as improve the existing flood situation. An open traffic barrier, such as wire rope or guard rail, would be utilised along this reach to allow for potential overtopping of the motorway in the larger flood events. Special attention would be afforded to transitioning the channel into the culvert inlet in order to ensure any hydraulic losses are minimised and the potential culvert performance is optimised. Increased velocities within the channel and at the culvert outlet would require additional consideration, such as energy dissipation, during detail design to reduce the hazard and prevent scouring of the downstream reaches.

Where piers are required for widening of any of the main bridges (Darling Mills, Devlins or Terrys Creeks) these are generally to be located out of the main creek waterway and are unlikely to create additional hydraulic impacts. Wherever possible the new piers would be aligned with the existing piers or creek channel and streamlined in shape to minimise the potential to interfere with stream flows. Appropriate scour protection in the form of dumped rock rip rap would be provided where required.

4.0 Water Quality

4.1 Existing Environment

The following observations in respect of the existing water quality conditions are made based on the available data summarised in Appendix A. As a general note, the data is quite variable but this is often typical of most water quality sampling data reflecting the stochastic nature of the rainfall-runoff processes.

Between July and December 1994 (prior to the original motorway construction), Bill Rooney sampled sites M2-1 through to M2-8 downstream of the motorway and established background TSS averages for wet (128 mg/l) and dry (8 mg/l) conditions. Subsequent long term sampling results (post M2 construction) by HLA Envirosciences (which follow wet events of rainfall greater than 10mm in preceding 24h) have calculated the median and average values to range between 5mg/l to 13mg/l (median) and 11mg/l to 32mg/l (average). Comparison of these results for the two alternative periods suggests that construction of the existing motorway has not had any significant impact on the water quality of downstream receiving waters.

Of the forty-seven (47) events which have been sampled at the 16 locations (some 752 samples in total), there are only thirteen instances (<2%) where the TSS has exceeded the background average of 128mg/l established prior to construction of the motorway. Excluding the results for Toongabbie Creek, which is outside the current limits or influence of proposed widening works, the number of exceedances is reduced to only ten (10) which resulted from five separate events. Only four of these results (0.5%) actually represent sampling sites nominated as being downstream of the motorway influence.

While TSS is only an indicator of potential contaminants and water quality, the long term monitoring results tend to suggest there appears to be minimal discharge or transfer of suspended solids from the motorway which could exacerbate sedimentation of the downstream receiving waters. The motorway activities are therefore having minimal impact on the general water quality of the various tributary watercourses through which it traverses.

Within the limits of the proposed project widening, some thirty one (31) water quality basins were originally provided to treat the low flow runoff draining from the existing motorway pavement surface via the stormwater pipe drainage networks. Low flow runoff (first flush) or contaminated spills washed from the road surface are directed through bifurcation pits which divert the water into the basins for containment and treatment. The first flush of runoff typically contains the higher concentration of sediments and larger particulate matter (waste materials from vehicles such as brake pad wear and metals) which tend to settle out of the water more readily when temporarily stored in the basin. Fluid type materials washed from the surface (such as fuels and oils) are less dense and tend to float on the water surface allowing them to also be contained in the basin by use of special outlet arrangements. The locations of the basins are shown on Figures 1 to 5 with estimated basin details summarised in Table 4-1. A copy of the original design details is included in Appendix C for reference.

The sampling of the existing water quality basins, which are meant to treat the “first flush” of runoff from the pavement surfaces, also suggest that the basins are performing their intended function in helping to protect the quality of the receiving waters. Water quality sampling results obtained in 2007 and 2008 for various basins are included in Appendix A.

The July 2007 HLA Envirosciences report found marginal exceedances of the ANZECC Freshwater criteria for zinc and copper at eight (8) of the ten (10) locations sampled. However, the report considered it was likely (but subject to further confirmation) that these exceedances were actually representative of regional water concentrations.

The July 2008 report by Sydney Environmental and Soil Laboratory Pty Ltd states that *“the waters sampled generally complied with the adopted guidelines”.* Possible explanations or reasons for any of the exceptions or exceedances noted were summarised as follows:

- Copper can be released into the environment by both natural sources (such as wind-blown dust, decaying vegetation, forest fires and sea spray) and human activities (including mining, metal production and phosphate fertilizer production).
- Cobalt which is most likely sourced from freely available particles not bound to soil or sediment particles.
- Tin which can enter waterways via a number of sources such as tin cans and organotin compounds which are often added to fungicides and insecticides.

- Beryllium which only marginally exceeded the guideline criteria is mostly found in soils within the environment.
- Zinc which is an abundant material that occurs naturally and is used in galvanising processes (including roof materials and gutters) as well as an activator in the rubber industry.
- Iron which is used in various alloys and applications including cars and is often naturally elevated in groundwater within sandstone layers.
- Polycyclic aromatic hydrocarbons (PAHs) which naturally occur in bush fires as well as oils with the most likely source being emitted from motor vehicle exhaust.

The elevated readings within the basins for some elements such as copper & zinc as well as the PAHs suggest that these pollutants are being captured and retained in the basins in accordance with the design functional intent.

The Hills M2 Motorway have indicated that the existing basins are generally working satisfactorily and aside from the ongoing build up of litter requiring regular cleaning, the basins have been drained and de-silted once in 2005 since the motorway became operational in 1997. The excavated sediment material was retained in a suitable storage area of the works depot within the motorway corridor.

With regards to spill incidents, the Hills M2 Motorway indicated that there has not been any major spill incidents to threaten the surrounding environment since operations began. There have been some minor instances of contaminants falling from trucks (such as chemicals or paints etc) and obviously some small oil & fuel leaks resulting from motor vehicle accidents. All such spills/incidents are quickly dealt with by the M2 response team which has a special action plan and spill containment kit to deploy so that the potential for any contaminants to reach the drainage system and downstream environment is minimised. As a further safeguard, the existing motorway drainage systems have been designed to direct any low flows, including fluid spills or wash down volumes, into the water quality basins where the contaminated runoff can be retained and appropriately dealt with.

Table 4-1 Water Quality Basin Details

Basin Ref ID GHD Design	Tributary Catchment	Basin Location Approx. Chainage		Contributing Catchment Area			Basin Volumes (m^3)		
				Existing (ha)	Proposed (ha)	% diff	GHD Design	Est. Available	Required
8B	Northmead Gully	3580	EB	2.06	3.12	51	1370	925	624
10C	*Darling Mills Ck*	*4390*	*EB*	*1.94*	*1.94*	*0*	*420*	*428*	*388*
10B	*Darling Mills Ck*	*4550*	*EB*	*1.50*	*1.50*	*0*	*290*	*445*	*300*
12B	Darling Mills Ck	4770	WB	2.88	3.18	10.4	480	746	636
E204	Darling Mills Ck	4780	EB		0.69				138
13B	Darling Mills Ck	5360	EB	3.50	3.95	13	775	207	790
14B	Darling Mills Ck	6100	EB	0.61	0.66	8	120	124	132
14C	Darling Mills Ck	6370	EB	0.95	0.99	4	240	349	198
15B	Darling Mills Ck	6570	EB	0.91	0.93	2	160	280	186
16B	Darling Mills Ck	6860	WB	0.93	0.98	5	180	457	196
17B	Darling Mills Ck	7230	WB	1.34	1.36	1	360	356	272
18B	Darling Mills Ck	7560	WB	2.89	2.97	3	590	643	594
19B	Darling Mills Ck	7850	EB	2.60	2.62	1	590	670	524
21B	*Darling Mills Ck*	*8440*	*EB*	*7.75*	*7.75*	*0*	*1700*		*0*
22B	Devlins Ck	9730	WB	3.94	4.07	3	500	642	814
23B	Devlins Ck	10510		2.76	2.92	12.9	490	547	576
25B	Devlins Ck	11310	EB	2.60	2.78	7	580	916	556

Basin Ref ID GHD Design	Tributary Catchment	Basin Location Approx. Chainage		Contributing Catchment Area			Basin Volumes (m^3)		
				Existing (ha)	Proposed (ha)	% diff	GHD Design	Est. Available	Required
27B	Devlins Ck	11900	WB	2.07	2.13	3	420	459	426
28F	Devlins Ck	12230	WB	1.71	1.68	-2	480	853	336
28E	*Devlins Ck*	*12320*	*WB*	*0.17*	*0.17*	*0*	*60*	*108*	*0*
28C	*Devlins Ck*	*12390*	*EB*	*1.48*	*1.51*	*2*	*410*	*286*	*0*
28B	Devlins Ck	12460	EB	0.83	0.83	0	180	410	0
30B	Terrys Ck	13470	WB	2.09	2.89	38	520	905	578
33C	Terrys Ck	13920	EB	2.03	2.31	14	320	852	462
33B	Terrys Ck	14860	EB	1.42	1.67	18	260	595	334
34B	Mars Ck	15620	EB	5.03	5.17	3	930	1260	1034
35B	University Ck	16190	EB	3.44	3.51	2	680	1250	702
35C	University Ck	16285	EB	1.01	0.97	43	230	237	318
36B	Shrimptons Ck	16500	EB	1.60	2.54	59	330	676	1092
39D	Porters Ck	17880	EB	5.44	5.56	2	920	3099	1112
39C	*Porters Ck*	*18155*	*EB*	*1.65*	*1.65*	*0*	*300*	*2135*	*0*
40B	*Porters Ck*	*18460*	*EB*	*2.62*	*2.62*	*0*	*660*	*1248*	*0*

- *Basins highlighted in italics are not directly affected by the widening works.*

4.2 Impact Assessment

Construction: Potential impacts on water quality are more likely to occur during the construction phase of the proposal than the operational phase. The proposed works would involve excavation in many locations, resulting in exposure of the underlying soils, which has the potential to lead to sediment transport, erosion and ultimately sedimentation in downstream water bodies. The potential for sediment transport and sedimentation issues would be influenced by factors such as severity of storm events, the slope and footprint of disturbed area and the management controls that are implemented.

Works involving excavations would have the greatest potential to result in sediment transport and sedimentation issues. Such works would include physical widening works, construction of new piers for bridges, retaining walls, installation of stormwater drainage infrastructure and the augmentation of culverts and water treatment basins. These construction activities pose the greatest risk where they occur near waterways, on steep slopes or on land subject to flow or flooding. A management framework and site specific controls would need to be developed and implemented during the construction phase of the project to reduce the risks of sedimentation in down gradient water bodies due to the proposed constructions works.

Environmental releases of potentially harmful chemicals and other substances may occur as a result of proposed construction, which would have the potential to impact upon water quality in receiving waters down gradient from motorway. Such potentially contaminating substances would include acids and chemicals from washing processes, construction fuels, oils, lubricants, hydraulic fluids and other chemicals. Release of these substances might occur due to spills, as a result of equipment refuelling, failure and maintenance, via treatment and curing processes for concrete, as a result of inappropriate storage, handling and use of the substances or from the disturbance and inappropriate handling of potentially contaminated soils. These substances have the potential to be picked up in surface water (run-off) and be transported down gradient from the proposed works locations. Water quality and associated ecological impacts could result if these contaminants end up in water bodies down gradient from the works areas. A management framework would be required to reduce the potential for

environmental releases of potentially harmful chemicals and to reduce the risk of any such releases entering local waterways.

A description of specific locations and scenarios where there is the potential for disturbance of the soil and sediment liberation, release of potentially contaminating substances, off-site transport of sediment and pollutants and ultimately impacts to water quality in the down gradient environment as a result of proposed construction activities is outlined below. Details of appropriate management strategies to address the issues and reduce the risk of water quality impacts are provided for each scenario.

To assist the discussion, a preliminary assessment of areas more likely to be prone to erosion due to the construction works has been undertaken. Maps showing the results of the assessment are included in Appendix D with the potential risk categorised as either high or medium to low depending on the nature of the site conditions and the type of construction works being undertaken. The factors which have been considered include: ground conditions (rock or soil), erodibility, slope, extent of clearing required, location of works relative to sensitive receiving environments, piers/piling works, fill earthworks or retaining wall. In this instance, a significant proportion of the project involves widening of existing cut batters/faces. These cut batters are typically comprised of rock and the disturbed face will drain down to the motorway. The dirty water runoff can then be readily managed with a treatment train of appropriate measures to reduce the risk of sediments being transported to the downstream receiving environment.

During construction, soils will be disturbed and sediment will be liberated inside the motorway areas. There is also the potential for spills of potentially contaminating substances. Procedural and physical management measures would be implemented during construction to retain sediment and spills at the work locations. However, there is still a possibility that sediment and potentially contaminating substances could enter the motorway stormwater drainage system. In such situations, the stormwater would be collected and transferred to the existing water quality basins, which are designed to collect, retain and treat these types of pollutants. Under normal operating conditions, any pollutants from inside the motorway areas would therefore be collected and retained in the water quality basins, reducing the risk of water quality impacts in the receiving waters downstream of the motorway.

During significant rainfall events, the water quality basins have the potential to become completely filled to capacity. In such situations the basins are designed to surcharge into the downstream environment. During these occurrences pollutants from the motorway may bypass the basins themselves and be discharged into downstream drainage systems and ultimately into permanent water bodies, potentially affecting local water quality. However, any chemical contamination would be highly diluted due to the significant volumes of run off. In addition, it is likely that due to the urbanised nature of the surrounding catchments, the water quality of the runoff from the M2 Motorway would not be different from the quality of runoff from the existing urban catchments. Therefore it is anticipated that the contribution of the Motorway to pollutant loads in these receiving waters would be limited.

Potential water quality impacts may result from the proposed modifications of the existing water quality basins. The works proposed at these locations have the potential to cause disturbance to the ground surface in areas that do not drain to the basins themselves. Soil contamination could also occur in these areas from the excavators and other equipment required in the basin modification works. Sediment and any other pollutants from these areas would have the potential to enter watercourses and ultimately permanent water bodies down gradient from the works locations. The areas of disturbance at these locations would be anticipated to be quite small. In addition, these areas would have limited up-slope catchment areas, limiting the potential for surface water run-off. As such, the potential for large loads of sediments to be released from the areas of disturbance is considered to be quite low. Appropriate management strategies and plans would be required to limit the amount of soil disturbance, collect and retain sediment on-site and stabilise disturbed surfaces as soon as practicable following basin modification works. With suitable strategies in place it is anticipated that the potential for significant water quality impacts in the downstream aquatic environments during construction would be minimal.

As part of construction, works and storage areas are proposed in areas that do not drain to the motorway. Any sediment releases or potentially contaminating substances spilled in these locations would not be captured by the motorway stormwater collection system and water quality basins. These substances could potentially enter the local stormwater system, which drain to local watercourses, which could lead to water quality impacts in the downstream receiving waters. For these works and storage locations, appropriate management strategies would be required to limit area of disturbance, provide for secure and bunded storage of potentially contaminating substances, divert surface water from up-slope areas around the areas of disturbance, retain sediment on site and stabilise disturbed areas as soon as practicable following completion of construction at that location. Suitable

protective measures and devices would also be required at any entry points to the stormwater system to prevent the ingress of sediment and other pollutants. With suitable strategies and protective measures in place, it is considered that the potential for water quality impacts in downstream, receiving waters associated with the construction works would be minimal.

The proposed construction and modification works at the transverse drainage structures that cross the motorway have the potential to impact upon downstream water quality. At these locations, surface water flows are concentrated, velocities can be high and water can therefore have a large erosive potential. The proposed modifications often are located directly in the flow areas of these watercourses. Disturbance to these areas has the potential to decrease ground stability. Combined with the high erosive potential of run-off passing through these culverts, there is the potential for scour and the release of large sediment loads into the downstream receiving environment at these locations, particularly during significant rainfall events.

Outlets to these structures would be designed with suitable scour protection, to create stable discharge points, reducing the risk of scour at the culvert and sedimentation of the down stream receiving waters. The protective measures would also reduce the velocities and the erosive potential of the water being discharged from the culverts. However, during and immediately following construction, there would be a period in between initial ground disturbance and the installation of effective scour protection when these locations would be vulnerable to scour. This could potentially lead to sedimentation in down gradient water bodies, particularly during significant rainfall events, and downstream water quality impacts.

Appropriate management strategies would be required to manage surface water and prevent scour and sedimentation associated with proposed works at the transverse culvert crossings. Each location would need to be assessed individually and a work plan developed to minimise potential scour issues. The management strategies to be considered would include staging of works to maintain flows in stable areas, monitoring of weather forecast and commencement of in channel works when dry weather is forecasted (if practicable). Whilst there is limited opportunity to undertake the proposed culvert modifications on a seasonal basis, there may be some scope to prioritising the proposed works at these locations at times when dry weather is predicted. This would help to reduce potential scour and sedimentation issues. Installation of suitable permanent scour protection measures as soon as possible following each culvert modification would also assist in reducing the risk of scour and sedimentation of downstream receiving waters. However, due to the locations of these works and the unpredictability of the weather some potential for water quality impacts due to these works will remain.

Proposed works in riparian areas associated with the widening and modification of the bridges over the major watercourse crossings also have the potential to impact upon water quality. Riparian vegetation would need to be cleared to create works areas at these locations. Tracks would need to be created through vegetated areas to access the proposed works locations. The removal of vegetation and the disturbance created when constructing the tracks and works areas would cause ground instability. The potential for sediment release would increase from these areas, particularly on sloped land. Due to the proximity of these areas to watercourses, the potential for sedimentation of these watercourses and other water quality impacts would be increased due to the proposed works.

Site specific plans would be required at each location to manage and reduce the risk of water quality impacts associated with these works. The site-specific plans would include strategies such as the creation of exclusion zones to limit disturbance, works staging, specific activity procedures for vegetation clearing and access track creation, diversion of run-on from upslope areas around works areas, surface controls to promote ground stability, limit run-off lengths and reduce run-off velocities within the work sites, installation of devices to capture and retain sediment on-site and measures to re-establish ground stability as soon as practicable following the completion of construction. With appropriate strategies in place, the risk of sedimentation of the local waters in the vicinity of these works locations could be substantially reduced.

Operation: During the operational phase, the potential water quality impacts attributable to the widening works would be an increase in pollutants associated with changes in the contributing catchment characteristics (i.e. Increase in percentage of imperviousness or the overall total surface area resulting in larger volumes of runoff to be treated). The nature of pollutants associated with the motorway function and contained in this runoff include:

- Gross pollutants.
- Sediments and suspended solids.
- Nutrients.
- Heavy metals.

- Organics, oils and surfactants.
- Contaminant/accident spills.

Minimising the transportation and discharge of sediments, suspended solids, heavy metals and PAHs from the motorway is the key objective for the operational phase.

In order to assess the potential impacts associated with the motorway widening, preliminary computer modelling using the MUSIC software (Version 3, 2005) has been undertaken for a selection of the existing basins affected by the works. Nine (9) basins were selected to provide a representative sample of the range of changes in contributing catchment areas (refer Table 4-1 & 4-2) including all of those with the largest percentage increases. For the twenty two (22) other they are either not affected by the widening works or the increase in area is less than 10%.

Models defining the existing catchment characteristics were initially set up for each of the selected basins to establish a baseline performance representative of current motorway conditions. The models were then modified to reflect any change in percentage imperviousness or increase in catchment area and thus quantify what potential impacts might be created by the widening works alone.

The pollutant loads estimated from the MUSIC model for the current and proposed widened motorway conditions are summarised in Table 4-2. The base parameters adopted for purposes of the MUSIC modelling are presented in Appendix C along with more detailed results.

Table 4-2 Estimated Catchment Pollutant Loads (kg/year) – Pre and Post Widening

Basin	Chainage	Change in total Area %	Existing Catchments			Proposed Widened Catchments		
			TSS	TP	TN	TSS	TP	TN
8b	3580	51.5	5610	9.67	34.7	9600	16.2	56.1
12b	4770	10.4	8840	14.9	52	9760	16.6	57.5
13b	5360	12.9	10100	17.2	60.8	11000	18.5	66.7
23b	10510	5.8	9490	16	54.7	10100	16.9	57.6
25b	11310	5.9	8990	15.2	51.5	9690	16.3	55.3
30b	13470	38.3	7190	12.1	41.8	9930	16.7	57.2
33b	14860	17.6	4720	7.92	27.4	5630	9.48	32.6
35c	16285	43.3	3120	5.28	18.1	4660	7.84	26.9
36b	16500	58.8	5150	8.69	30.1	8040	13.6	47.4

Note: TSS = Total Suspended Solids, TP = Total Phosphorus, TN = Total Nitrogen

Further model changes were then introduced to demonstrate the resultant treatment effectiveness (reduction in potential pollutant load impacts) following implementation of proposed basin modification works. The proposed works primarily involve changes to the inlet and outlet details in order to better utilise the existing storage volume available. All of the basins currently have a 1m freeboard above the top water level (TWL - the normal operating level for capturing and treating the low flow events) and at least 0.5m freeboard above the maximum water level (MWL – the highest water level reached in the basin before excess overflows are discharged directly from the basin itself). Initial modelling results suggest that increasing the ponded (extended) depth by approximately 0.2m to 0.3m would generally cater for treating the increase in runoff volumes generated by the changes in catchment area. Given that a majority of basins are situated below the motorway level in downstream bushland areas, it should be feasible to accommodate such relatively small increases in depth without adversely affecting the hydraulic performance of the upstream drainage systems whilst still maintaining some freeboard of 0.2m to 0.3m.

A comparison of the treatment effectiveness results (% reduction of pollutant loads discharged) is included in Table 4.3 with more details available in Appendix C. Results for gross pollutants have not been included as the current and proposed basin arrangements provide 100% capture.

Table 4-3 Water Quality Treatment Train Effectiveness

Basin	% Reduction						Relative Difference %		
	Existing Basin			Proposed Basin					
	TSS	TP	TN	TSS	TP	TN	TSS	TP	TN
8b	85.4	68.8	20	85.4	68.9	18.7	0	0.1	-0.3
12b	80.3	64.5	16.1	80.9	64.6	16.4	0.6	0.1	0.3
13b	71.3	56.1	14.2	72.3	57	14.9	1.0	0.9	0.7
23b	77.2	61.8	15.9	77.6	62.1	16.2	0.4	0.3	0.3
25b	81.5	65.8	17.1	81.3	65.9	17	-0.2	0.1	-0.1
30b	84.8	68.6	17.6	84.8	68.8	17.4	0	0.2	-0.2
33b	85	69.1	21.1	84.9	69.1	20.6	-0.1	0	-0.5
35c	81.8	65.9	17.1	81.5	65.6	16.8	-0.3	-0.3	-0.3
36b	87.9	72.1	23.8	87.7	71.7	23.3	-0.2	-0.4	-0.5

Note: TSS = Total Suspended Solids, TP = Total Phosphorus, TN = Total Nitrogen

It is evident from the modelling results in Table 4-3 (and Appendix C) that the existing basins are performing well and except for TN appear to be achieving treatment efficiency levels (or percentage pollutant reductions) which are generally greater than or in accordance with the stormwater treatment objectives for NSW outlined in Australian Runoff Quality (ARQ Table 1.2) being:

- TSS reduction of 80%.
- TP reduction of 45%.
- TN reduction of 45% where practical to achieve.
- Gross Pollutants 100%.

The City of Ryde has also set out pollutant reduction objectives in the March 2009 Development Control Plan (DCP) for Water Sensitive Urban Design (WSUD) which targets 85% for TSS, 60% for TP, 45% for TN and 90% for gross pollutants. These objectives are greater than those required by ARQ but the modelling results suggest that with the exception of TN these values are also mostly being achieved under existing conditions. Following the proposed widening of the motorway, the modelling results suggest that the existing basins would still have sufficient capacity/performance to be able to satisfy the treatment objectives of ARQ without any significant modification.

There are some situations where a significant reduction in Total Nitrogen is not practical to achieve due to the size of basin which would be required. Nitrogen loads are often due to atmospheric fall-out rather than being sourced from motorway activities and typically large water surface areas (such as wetlands) are required for treatment purposes. In this instance, the potential size or footprint of basins are more often constrained by the prevailing topography and limited corridor area available whilst trying to minimise disturbance of the surrounding environment and established vegetation. A reduction in TN in the order of 15 – 25% has been found to be generally achievable given the prevailing constraints and this is also consistent with the existing level of treatment efficiencies (i.e. the current situation is not adversely affected).

Overall, the various analyses undertaken using MUSIC modelling indicate that the pollutant loads are proportionally related to the changes in catchment area. The results also show that these impacts are manageable through modifications to the existing basins and it is possible to achieve the treatment efficiency objectives required by ARQ. Additionally, the treatment performance levels achieved would be similar to the existing situation including TN.

4.3 Management of Impacts

As a general guiding principle for both design and construction, water quality mitigation and management measures would be implemented in accordance with the requirements of:

- *Water Policy and Code of Practice for Water Management (RTA 1999).*

- *Erosion and Sedimentation Management Procedures (RTA)*.

- *Managing Urban Stormwater - Soils and Construction Volumes 1 and 2 (often referred to as The Blue Book - Landcom 2004 and 2006)*.

A summary of measures likely to be implemented for both the construction and operational phases is provided below.

Construction: the control and mitigation of potential surface water quality impacts during the construction phase would be defined in a Soil and Water Management Plan (SWMP) prepared as part of the overall Construction Environmental Management Plan (CEMP). The SWMP would be developed to incorporate the most appropriate or "best practice" controls and measures in accordance with "The Blue Book" requirements and the Plan would be continually updated to suit the ever changing needs as the project works progress. Due consideration would also be given to the extent of works and situation relative to the sensitivity of the surrounding environment. Typical mitigation measures to be considered or implemented include:

- Minimising disturbed areas and re-vegetating or stabilising such areas as soon as practical as the works progress.
- Utilising cleared vegetation for mulching wherever possible to minimise erosion and filter runoff to trap coarse sediments.
- Installation of appropriate erosion control measures such as silt fencing, straw bales, check dams, temporary ground stabilisation, diversion berms or site regrading.
- Divert clean water runoff away from the works or disturbed areas wherever possible.
- Utilisation of existing water quality basins or installation of new temporary sediment basins as appropriate.
- Installation of any permanent scour protection measures required for the operational phase as soon as practical.
- Providing bunded areas for storage of hazardous materials such as oils, chemicals and refuelling areas.
- Any work platforms or access tracks required through waterway areas would be constructed of large clean rock material wrapped or underlain with geofabric.
- Employ a qualified soil conservation officer to advise on appropriate controls and to monitor the implementation and maintenance of such measures.
- Engage all site staff through tool box talks or similar with appropriate training on soil and water management practices.
- Work Method Statements would be prepared for all waterway works with particular emphasis on the early implementation of erosion and scour protection requirements.

Operation: appropriate energy dissipation and scour protection measures would be provided at bridge waterways and culvert inlets/outlets as necessary. Permanent scour protection requirements particularly at culvert outlets would be implemented as soon as practical. Surface areas disturbed by the construction works would be re-established with landscaping.

The existing water quality basins would be modified as required to account for any significant changes in contributing catchment area or to meet the target pollutant reduction criteria. Due to the constrained project corridor, and in an effort to minimise further disturbance of the established vegetation, wherever practical it is proposed to modify the inlet/outlet details of the existing basins to better utilise the storage volume already available by increasing the ponded (extended) depth. As discussed in Section 4.2, the majority of existing basins appear to have been designed with up to 1m of freeboard above the top water level (TWL) and 0.5m above the maximum water level (MWL). The required increases in depth are typically directly proportional to the percentage increase in catchment area. As indicated in Table 4-1, the change in contributing area is less than 15% for more than half of the existing basins and storage depths are in the order of 1m to 2m, so the required increase in depth would mostly be in the range of 0.15m to 0.3m which should not present any major problems or issues to achieve. In a number of instances however, it would be necessary to physically enlarge the basin to cater for the additional volume of runoff requiring treatment. A sensitivity analysis (refer Appendix C) has indicated that the increase in basin area required would also be directly proportional with the change in catchment area. In some instances the

solution would involve a combination of increasing area and depth so as to minimise the actual disturbance footprint for the basin.

The preferred approach for modifying the various basins in each Precinct is indicated in Section 2.6. The actual solution would ultimately be determined during the detailed design phase once the additional survey information has been obtained and further modelling/investigations are undertaken.

The basins would be used to treat the low flow runoff “first flush” from the motorway pavement surfaces. Basin 30b which is located just to the east of the Norfolk Tunnel would additionally be modified to incorporate measures for dealing with tunnel wash down water from maintenance activities.

The spill containment capability afforded within the existing basins would be retained and upgraded or enhanced as appropriate to minimise the risk of accidental spills or contaminants discharging freely to the downstream environment. Operational procedures would be reviewed to ensure the relevant incident response plans are updated to address any changes or issues attributable to the upgrade works and also, adequately incorporates the latest environmental procedures and technologies for dealing with accidental contaminant spills. Maintenance plans and schedules would also be reviewed and updated as appropriate.

5.0 Conclusion

A detailed assessment of surface water issues incorporating transverse culvert structures and water quality has been undertaken to establish existing baseline conditions and to quantify the nature and extent of any potential impacts associated with the proposed widening works. Both the construction and operational phases of the project have been considered. Where impacts have been identified, a range of appropriate mitigation measures have been proposed to ensure such impacts are minimised.

From a drainage perspective the proposed upgrade works are not considered significant in the context of the existing motorway environment. Only seven (7) of the existing transverse culvert structures are to be extended with the majority in the range of 5m to 8m. Detailed hydraulic analyses (refer Table 3-2 for results summary) indicate that there are no significant increases in flood levels which would potentially impact on upstream or adjoining properties. Culvert 26 is the only location where a potential impact has been identified and this is limited to a maximum increase of only 0.02m which should not adversely affect any surrounding properties. At University Creek, the proposed channel works would reduce flood levels in this reach (between 1.0 to 1.5m) thereby improving the existing situation and reducing the risk of the motorway being overtopped.

Where culvert structures are to be extended, the proposed mitigation measures will include keeping the length of required extensions to an absolute minimum and modifying the inlet details to ensure hydraulic efficiencies are optimised and therefore losses and upstream impacts are minimised.

The existing water quality basins are currently performing well and have greater capacity available to ensure that there would be no worsening of the existing situation. The long term TSS monitoring results tend to support this assessment with minimal discharge or transfer of suspended solids from the existing motorway which could exacerbate sedimentation of the downstream receiving waters. Water sampling of the actual basins, which are meant to treat the “first flush” of runoff from the pavement surfaces, also suggest that pollutants are being retained and the basins are performing their intended function in helping to protect the quality of the receiving waters. The motorway activities are therefore having minimal impact on the general water quality of the various tributary watercourses through which it traverses. As a further safeguard against contaminated spills, the motorway drainage systems are designed to direct any low flows, including fluid spills or wash down volumes, into the water quality basins where the contaminated runoff or accident spills can be retained and appropriately dealt with.

Various analyses have been undertaken using MUSIC modelling which indicate that the pollutant loads from the motorway upgrade are proportionally related to the changes in catchment area. MUSIC modelling results have indicated that in the most part, these existing basins would be able to treat the additional runoff volumes though the implementation of modifications to either the inlet/outlet arrangements, the basin area & volume or a combination of both. The standard treatment efficiency objectives required by ARQ (except for TN) would be achieved and performance levels similar to the existing situation would be targeted.

All of the measures proposed to mitigate any surface water impacts associated with the upgrade works are generally in accordance with the existing drainage elements and measures which were constructed as part of the original M2 Motorway.

In the context of the existing motorway presence and its surface water functionality, it is considered that the impacts associated with the upgrade works are generally minimal.

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XP Software, (2008 Version 7) XP-Rafts User Manual

Appendix A

Water Quality Data

Appendix A Water Quality Data

Table A5-1 - Long Term TSS Monitoring Results

Site Sampling ID	Tributary	Location	Avge	Median	06/01/98	16/02/98	16/04/98	05/05/98	03/06/98	20/07/98	06/08/98	20/10/98	18/11/98	15/12/98	20/01/99	02/02/99	08/03/99	23/04/99	25/05/99	10/06/99	12/07/99	20/08/99	23/09/99	05/10/99	09/11/99	10/12/99
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
M2-2	Toongabbie Ck	U/s	16	8	31	20	80	31	39	29	37	11	14	29	5	18	5	44	10	4	30	2	4	16	7	5
M2-10	Toongabbie Ck	U/s	19	9	24	17	14	66	27	55	58	6	52	38	9	16	3	2	8	13	48	4	1	9	5	13
M2-1	Toongabbie Ck	D/s	25	11	26	18	14	56	26	29	57	14	9	97	9	18	4	7	1	12	209	7	2	19	7	10
M2-11	Darling Mills Ck	U/s	17	7	19	42	14	49	40	16	90	7	16	41	6	37	9	5	19	25	29	6	2	4	8	24
M2-12	Darling Mills Ck	U/s	19	8	3	8	15	29	62	54	26	29	26	13	14	7	4	5	5	4	11	1	17	143	6	2
M2-3	Darling Mills Ck	D/s	20	9	19	46	19	56	39	39	101	7	4	81	10	40	8	2	16	24	14	17	1	9	15	22
M2-13	Devlins Ck	U/s	14	5	3	9	5	34	50	13	24	2	7	17	12	11	1	11	5	5	17	1	1	69	5	6
M2-18	Devlins Ck	U/s	11	6	9	9	6	18	31	13	17	12	3	15	9	5	2	5	5	4	10	1	4	15	4	8
M2-5	Devlins Ck	D/s	16	7	9	15	8	38	15	11	18	7	7	21	9	8	3	3	5	7	9	3	3	70	4	5
M2-6	Devlins Ck	D/s	15	10	9	12	19	41	23	30	30	8	14	22	10	11	5	17	6	11	12	6	5	25	8	29
M2-14	Terrys Ck	U/s	17	10	13	27	55	42	21	9	33	6	7	33	6	14	1	3	5	11	16	5	11	33	5	83
M2-7	Terrys Ck	D/s	18	9	17	20	43	38	29	14	30	9	7	42	7	14	4	4	7	13	8	4	18	41	4	9
M2-15	Shrimptons Ck	U/s	32	13	12	24	13	59	22	8	76	10	38	61	22	63	8	7	16	21	17	8	25	35	4	29
M2-8	Shrimptons Ck	D/s	21	11	39	23	13	54	21	7	70	9	38	55	15	34	7	6	17	23	18	5	23	35	3	22
M2-16	Porters Ck	U/s	18	6	2	11	3	45	66	6	62	86	26	13	8	9	1	5	4	5	21	3	6	21	4	7
M2-9	Porters Ck	D/s	23	9	7	16	19	88	19	3	111	33	24	94	45	16	11	3	9	8	35	3	4	56	26	20

143 value exceeds background reading of 128 mg/l for wet conditions

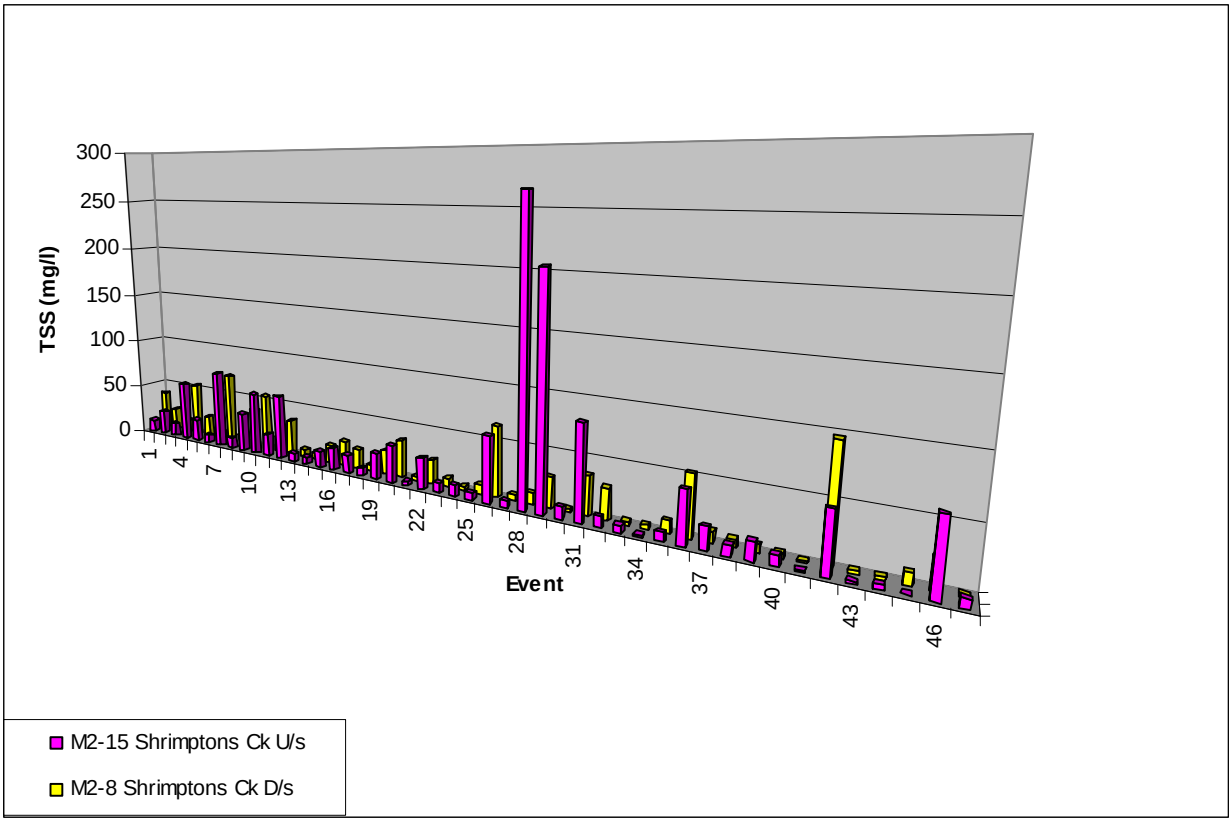
209 exceedance value is downstream of motorway

Table A5-1 Cont'd - Long Term TSS Monitoring Results

Site Sampling ID	Tributary	Location	Avge	Median	03/10/03	17/11/03	16/01/04	22/06/06	04/07/06	18/07/06	25/07/06	07/08/06	07/09/06	12/09/06	06/11/06	03/12/06	24/01/07	11/02/07	13/02/07	25/02/07	06/03/07	09/03/07	10/04/07	22/08/07	06/11/07	07/12/07	14/01/08	07/02/08	14/04/08
					23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
M2-2	Toongabbie Ck	U/s	16	8	6	6	5	1	17	8	10	8	63	4	7	29	11	28	2	7	4	2	4	4	22	5	7	10	5
M2-10	Toongabbie Ck	U/s	19	9	5	7	16	6	8	13	8	10	17	13	2	4	25	182	4	14	13	2	2	5	1	2	22	8	2
M2-1	Toongabbie Ck	D/s	25	11	7	6	11	22	10	4	15	9	82	19	9	11	29	168	12	20	40	10	10	7	7	2	6	5	16
M2-11	Darling Mills Ck	U/s	17	7	4	13	3	7	3	5	7	3	36	1	6	4	14	145	4	9	14	3	5	6	1	4	3	6	2
M2-12	Darling Mills Ck	U/s	19	8	46	4	10	6	14	18	9	5	24	8	5	2	100	31	4	6	2	8	2	6	7	4	1	74	2
M2-3	Darling Mills Ck	D/s	20	9	4	4	12	1	3	158	6	4	39	2	2	3	25	5	2	14	15	6	2	2	1	3	1	27	2
M2-13	Devlins Ck	U/s	14	5	5	7	6	2	1	7	3	2	10	2	1	1	7	40	2	12	8	4	2	4	1	3	17	210	2
M2-18	Devlins Ck	U/s	11	6	6	8	2	4	8	14	14	4	5	4	4	116	10	18	5	18	2	4	9	2	8	4	1	54	2
M2-5	Devlins Ck	D/s	16	7	8	6	4	3	4	17	10	3	21	2	1	4	11	44	4	9	12	2	9	10	4	2	1	270	2
M2-6	Devlins Ck	D/s	15	10	12	10	16	11	5	10	14	3	8	2	1	3	12	54	3	23	12	2	2	3	4	2	1	150	2
M2-14	Terrys Ck	U/s	17	10	8	12	10	3	8	76	49	4	9	14	2	13	19	50	6	24	2	28	16	3	1	3	1	9	2
M2-7	Terrys Ck	D/s	18	9	7	8	12	13	7	9	26	23	12	22	2	2	7	50	4	19	4	15	2	4	3	42	1	160	5
M2-15	Shrimptons Ck	U/s	32	13	9	11	7	60	6	265	206	11	85	10	6	2	8	46	20	9	16	10	2	51	2	4	1	61	7
M2-8	Shrimptons Ck	D/s	21	11	8	4	9	65	6	11	28	3	35	28	3	4	11	53	10	7	7	4	2	96	3	2	10	23	2
M2-16	Porters Ck	U/s	18	6	3	3	4	6	2	10	12	2	16	2	1	1	31	138	11	78	2	3	2	1	18	6	6	50	2
M2-9	Porters Ck	D/s	23	9	8	6	24	4	2	6	110	12	95	6	2	6	11	16	15	7	4	2	4	1	6	4	2	60	2

143 value exceeds background reading of 128 mg/l for wet conditions

209 exceedance value is downstream of motorway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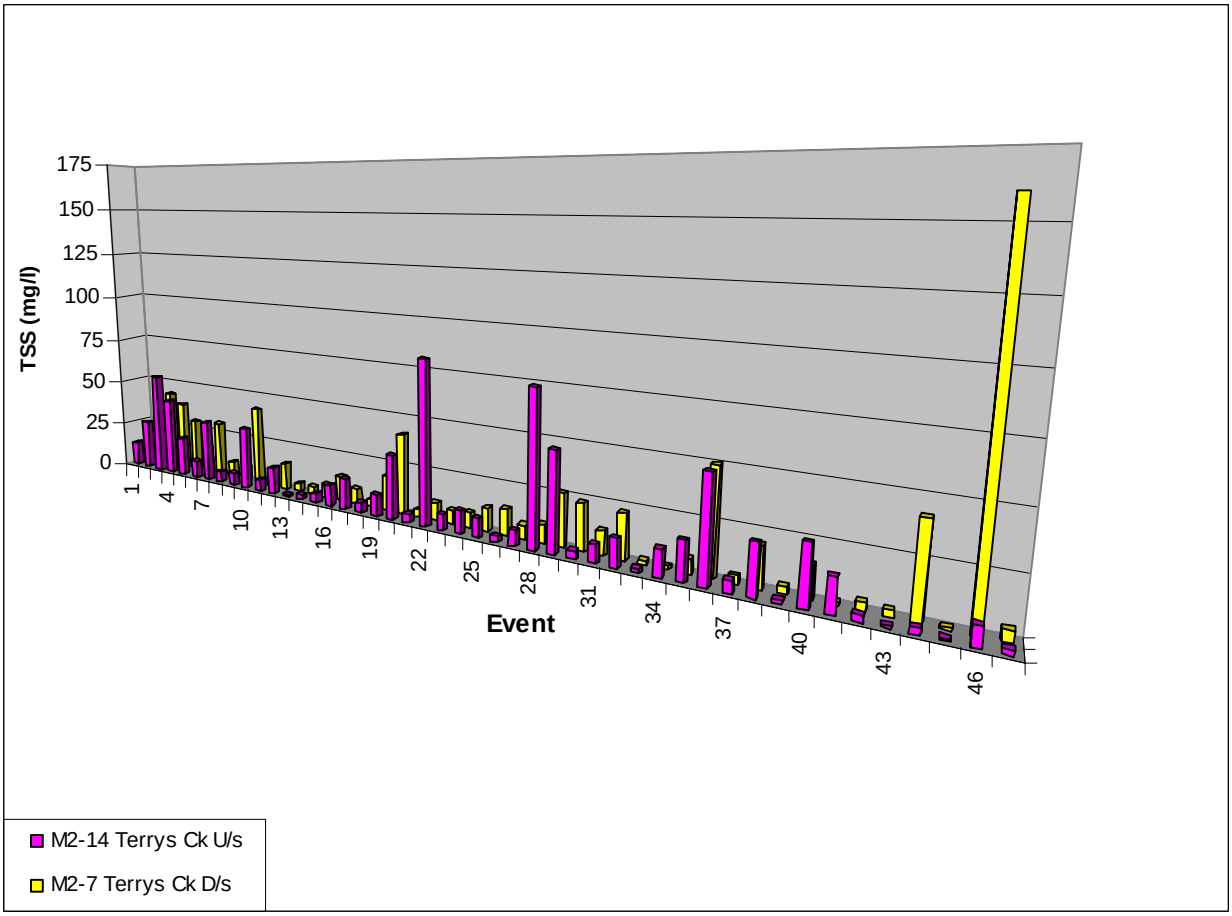
200
150
100
50
0
1
4
7
10
13
16
19
22
25
28
31
34
37
40
43
46
Event
M2-15 Shrimptons Ck U/s
M2-8 Shrimptons Ck D/s


TSS (mg/l)
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150
125
100
75
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25
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Event
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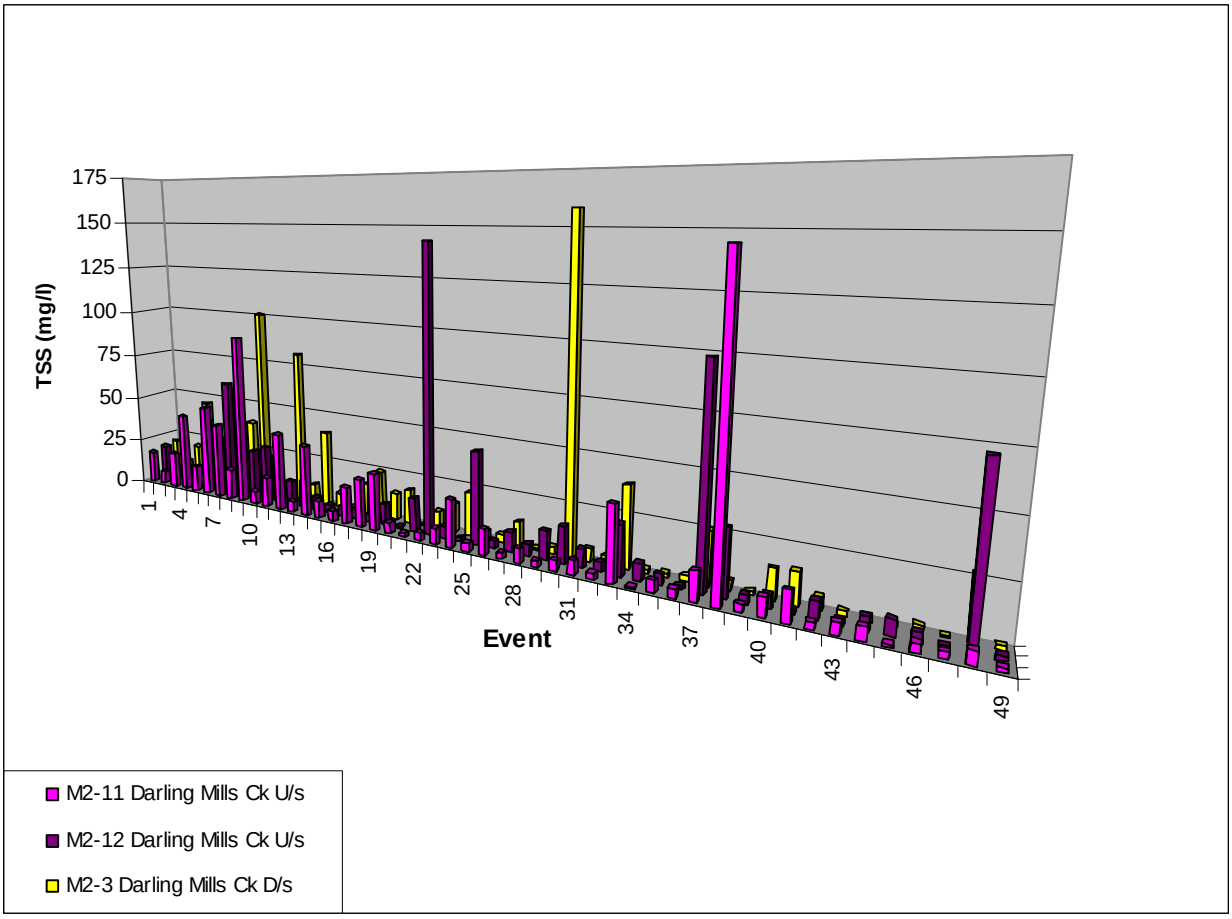
M2-7 Terrys Ck D/s


TSS (mg/l)
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150
125
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75
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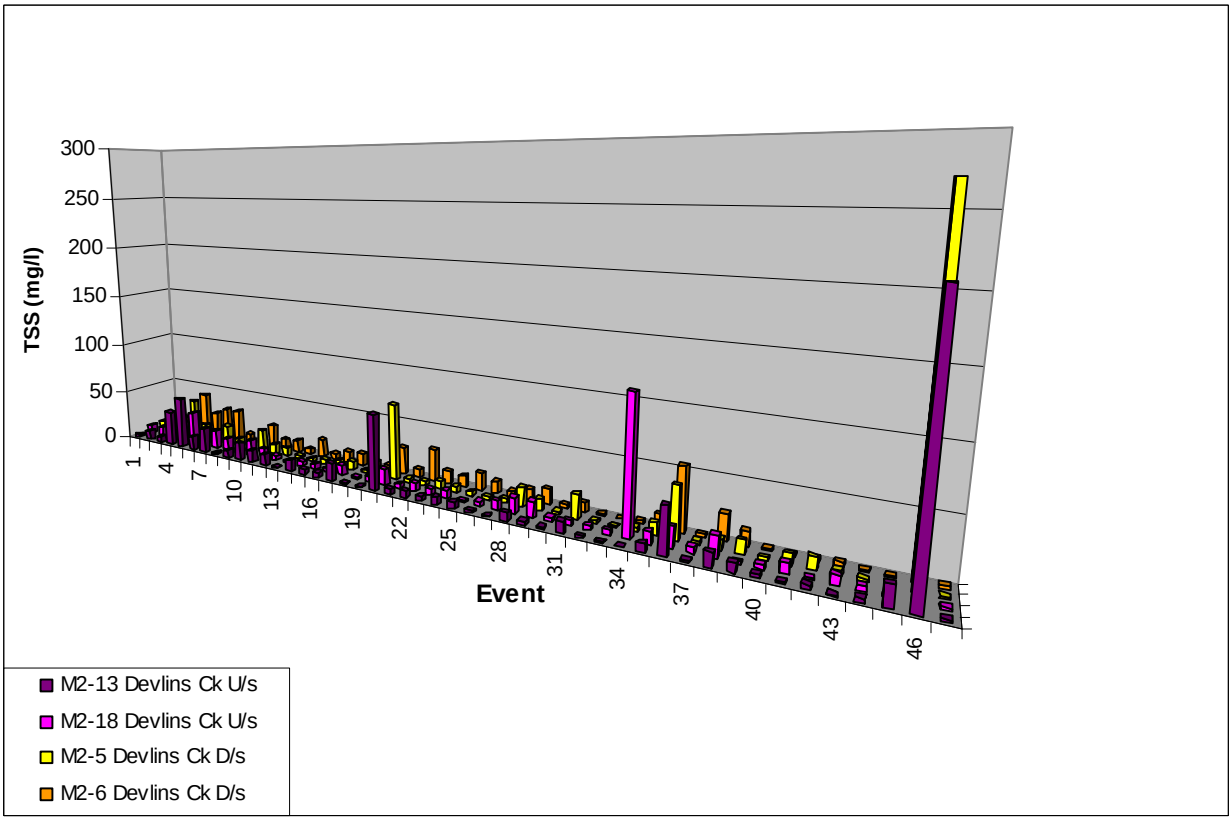
46
49
Event
M2-11 Darling Mills Ck U/s
M2-12 Darling Mills Ck U/s
M2-3 Darling Mills Ck D/s


TSS (mg/l)
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250
200
150
100
50
0
1
4
7
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25
28
31
34
37
40
43
46
Event
M2-13 Devlins Ck U/s
M2-18 Devlins Ck U/s
M2-5 Devlins Ck D/s
M2-6 Devlins Ck D/s

Table A5-2 - Water Quality Basin Sampling Results - 2007 and 2008

BASIN ID		Tributary Catchment Area	EXISTING BASIN Location		2007						2008					
as per original M2 design dwgs	HLA Report Basin Number		Chainage	East or West bound	pH	Alkalinity ($CaCO_3$)	e-coli	TDS	Copper mg/l	Zinc mg/l	pH	Alkalinity ($CaCO_3$)	e-coli	TDS	Copper mg/l	Zinc mg/l
ANZECC guideline/Trigger Value					**6.5-8.0**				**0.0014**	**0.008**	**6.5-8.0**				**0.0014**	**0.008**
8B	8	Northmead Gully	4340	EB											0.000	0.0048
10C	9	Darling Mills Ck	4530	EB	7.6	95	<10	190	0.000	0.006					0.0031	0.13
10B	10	Darling Mills Ck	4700	EB												
12B	11	Darling Mills Ck	5300	WB											0.0025	0.048
13B	12	Darling Mills Ck	6080	EB											0.000	0.014
14B	13	Darling Mills Ck	6360	EB	7.4	53	420	420	0.001	0.013					0.000	0.0071
14C	14	Darling Mills Ck	6550	EB												
15B	15	Darling Mills Ck	6820	EB											0.000	0.17
16B	16	Darling Mills Ck	7220	WB											0.000	0.003
17B	17	Darling Mills Ck	7540	WB											0.000	0.0044
18B	18	Darling Mills Ck	7750	WB											0.000	0.0083
19B	19	Darling Mills Ck		EB												
Lisle Ct		Darling Mills Ck	9690	EB												
22B	20	Devlins Ck	10460	WB	7.2	180	100	450	0.002	0.011					0.000	0.085
23B	21	Devlins Ck	11300	EB	7.2	46	50	290	0.003	0.011					0.0041	0.0095
25B	22	Devlins Ck	11860	WB	7.3	46	230	330	0.007	0.029						
27B	23	Devlins Ck	12200	WB											0.003	
28F	26	Devlins Ck	12380	WB											0.0011	0.01
28C	24	Devlins Ck	12440	EB											0.000	0.02

BASIN ID		Tributary Catchment Area	EXISTING BASIN Location		2007						2008					
as per original M2 design dwgs	HLA Report Basin Number		Chainage	East or West bound	pH	Alkalinity ($CaCO_3$)	e-coli	TDS	Copper mg/l	Zinc mg/l	pH	Alkalinity ($CaCO_3$)	e-coli	TDS	Copper mg/l	Zinc mg/l
28B	25	Devlins Ck	12300	EB												
28E	27	Devlins Ck	13420	WB											0.003	0.0093
30B	28	Terrys Ck	13860	WB											0.000	0.19
33C	29	Terrys Ck		EB											0.0012	0.014
Vimiera Rd		Terrys Ck	14820	WB												
33B	30	Terrys Ck	15620	EB											0.0019	0.0096
34B	31	Mars Ck	16150	EB											0.0025	0.16
35B	32	University Ck	16260	WB											0.000	0.095
35C	33	University Ck	16500	WB											0.000	0.0018
36B	34	Shrimptons Ck	17700	WB											0.000	0.012
39D	35	Porters Ck		WB	7.4	56	<10	110	0.002	0.01					0.000	0.0016
Lane Cove Rd		Porters Ck	18100	EB												
39C	36	Porters Ck	18400	EB											0.000	0.051
40B	37	Porters Ck		EB	7.1	96	<10	350	0.001	0.01					0.000	0.0031

Table A5-3 - Water Quality Site Sampling Results - 21 May & 1 June 2007

Site Sample ID	Tributary	Location	Flow (l/s)	Turbid (visual)	DO (mg/l)	EC(uS)	pH	Alkalinity ($CaCO_3$)	e-coli	TDS	Copper (mg/l)	Zinc (mg/l)
M2-2	Toongabbie Ck	U/s	15	grey	5.04	586	5.86	100	240	360	0.003	0.076
M2-10	Toongabbie Ck	U/s	15	clear	8.02	345	5.67	47	400	195	0.004	0.013
M2-1	Toongabbie Ck	D/s	5	clear	3.86	419	5.7	59	240	190	0.004	0.037
M2-11	Darling Mills Ck	U/s	15	brown	6.73	294	6.86	41	1100	170	0.003	0.005
M2-12	Darling Mills Ck	U/s	10	clear	5.75	1028	7.32	210	10000	650	0.011	0.019
M2-3	Darling Mills Ck	D/s	10	clear	7.46	300	6.46	43	400	175	0.003	0.005
M2-13	Devlins Ck	U/s	10	clear	4.96	365	7.33	46	66	250	0.002	0.006
M2-18	Devlins Ck	U/s	>5	clear	6.24	264	7.83	38	8800	160	0.007	0.014
M2-5	Devlins Ck	D/s	>5	clear	4.10	370	7.52	76	120	235	0.002	0.006
M2-6	Devlins Ck	D/s	25	Clear, sheen	6.10	402	7.39	59	1100	240	0.004	0.011
M2-14	Terrys Ck	U/s	>5	yellow	3.90	367	6.97	97	1100	240	<0.001	0.007
M2-7	Terrys Ck	D/s	30	clear	6.45	254	7.21	39	300	170	0.003	0.007
M2-15	Shrimptons Ck	U/s	15	clear	9.24	292	7.18	80	200	195	0.003	0.017
M2-8	Shrimptons Ck	D/s	25	clear	4.6	168	7.31	54	300	155	0.003	0.024
M2-16	Porters Ck	U/s	40	clear	6.29	3.17mS	7.5	92	<100	2710	0.002	0.014
M2-9	Porters Ck	D/s	15	clear	6.7	4.05mS	7.55	100	<100	2060	0.001	0.011

Appendix B

Hydraulic Modelling Results

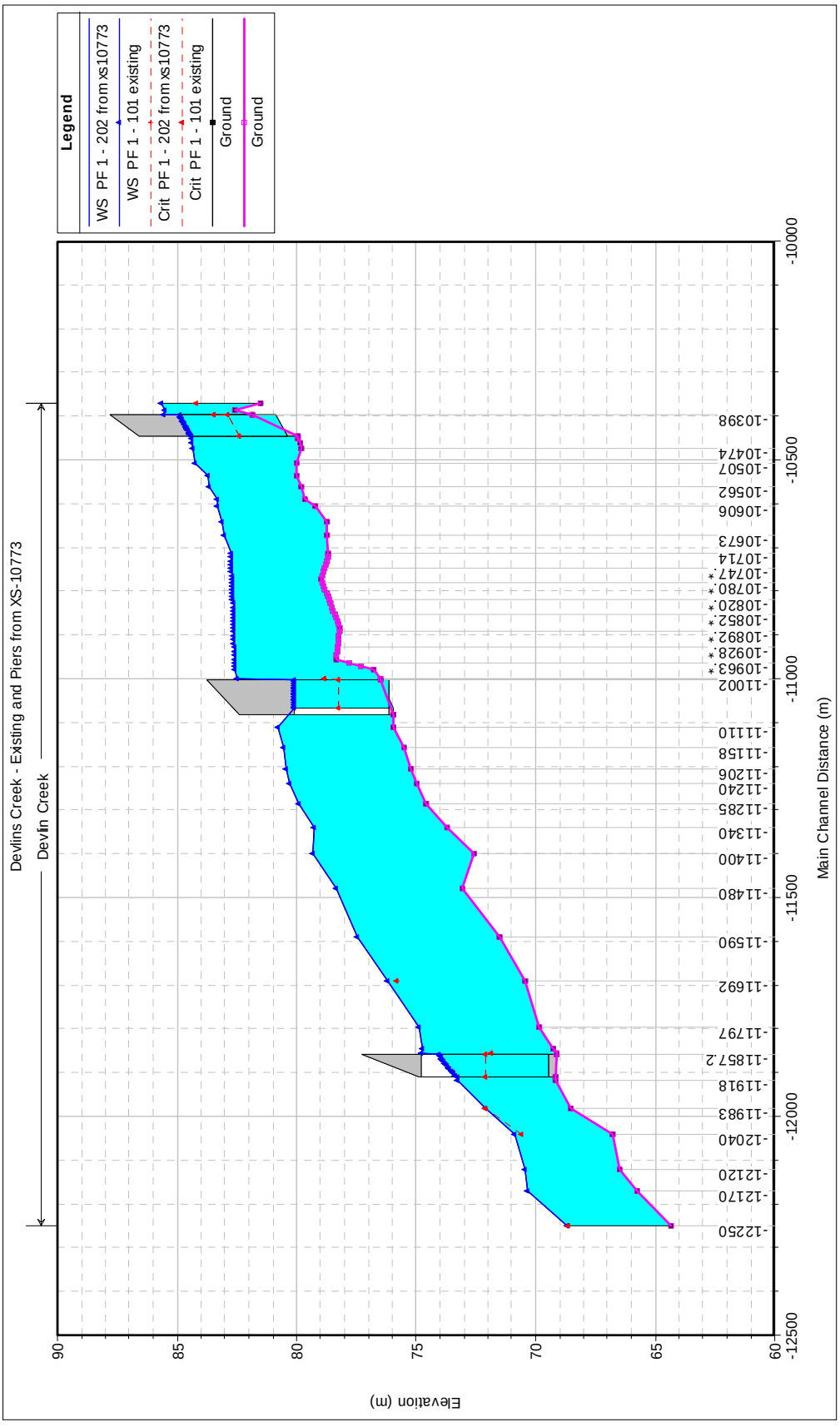
Appendix B Hydraulic Modelling Results

Devlins Creek - 100y ARI - Existing Conditions & Proposed with Piers											
River Sta	Q Total		Min Ch El	W.S. Elev	E.G. Elev	Vel Chnl	Vel Left	Vel Right	Vel Total	Top Width	Froude
	(m3/s)		(m)	(m)	(m)	(m/s)	(m/s)	(m/s)	(m/s)	(m)	
10372	109.6	Piers	81.52	85.67	85.75	1.2			1.2	46.76	0.27
10372	109.6	Exist	81.52	85.67	85.75	1.2			1.2	46.76	0.27
10387	109.6	Piers	82.56	85.53	85.7	1.82			1.82	36.41	0.45
-0387	109.6	Exist	82.56	85.53	85.7	1.82			1.82	36.41	0.45
10396	109.6	Piers	81.88	85.56	85.65	1.34			1.34	28.38	0.25
10396	109.6	Exist	81.88	85.56	85.65	1.34			1.34	28.38	0.25
10398	Culvert 23										
10452	109.6	Piers	79.97	84.41	84.49	1.28		0.36	1.25	26.68	0.2
10452	109.6	Exist	79.97	84.41	84.49	1.28		0.36	1.25	26.68	0.2
10462	109.6	Piers	79.86	84.37	84.47	1.44			1.44	26.36	0.27
10462	109.6	Exist	79.86	84.37	84.47	1.44			1.44	26.36	0.27
10474	109.6	Piers	79.79	84.34	84.45	1.48			1.48	27.53	0.29
10474	109.6	Exist	79.79	84.34	84.45	1.48			1.48	27.53	0.29
10507	109.6	Piers	80.01	84.25	84.38	1.58			1.58	27.84	0.32
10507	109.6	Exist	80.01	84.25	84.38	1.58			1.58	27.83	0.32
10535	109.6	Piers	80	83.69	84.22	3.22			3.22	10.34	0.57
10535	109.6	Exist	80	83.69	84.22	3.22			3.22	10.34	0.57
10562	109.6	Piers	79.78	83.66	83.97	2.49			2.49	14.73	0.46
10562	109.6	Exist	79.78	83.66	83.97	2.5			2.5	14.73	0.46
10589	109.6	Piers	79.64	83.3	83.77	3.02			3.02	16.4	0.65
10589	109.6	Exist	79.64	83.3	83.76	3.02			3.02	16.4	0.65
10606	109.6	Piers	79.23	83.33	83.58	2.25			2.25	17.45	0.43
10606	109.6	Exist	79.23	83.32	83.58	2.25			2.25	17.44	0.43
10641	109.6	Piers	78.73	83.11	83.4	2.38			2.38	15.14	0.44
10641	109.6	Exist	78.73	83.11	83.4	2.38			2.38	15.14	0.44
10673	109.6	Piers	78.73	83	83.25	2.18			2.18	15.43	0.39
10673	109.6	Exist	78.73	83	83.24	2.19			2.19	15.43	0.39
10714	109.6	Piers	78.66	82.73	83.05	2.51			2.51	14.87	0.47
10714	109.6	Exist	78.66	82.72	83.05	2.51			2.51	14.86	0.47

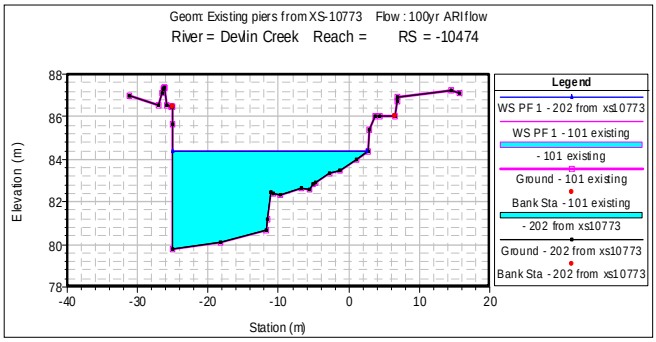
Devlins Creek - 100y ARI - Existing Conditions & Proposed with Piers											
River Sta	Q Total		Min Ch El	W.S. Elev	E.G. Elev	Vel Chnl	Vel Left	Vel Right	Vel Total	Top Width	Froude
	(m3/s)		(m)	(m)	(m)	(m/s)	(m/s)	(m/s)	(m/s)	(m)	
10773	109.6	Piers	78.97	82.69	82.82	1.6		0.14	1.59	32.73	0.32
10773	109.6	Exist	78.97	82.69	82.81	1.59		0.14	1.58	33.22	0.32
10884	109.6	Piers	78.19	82.63	82.67	0.84			0.84	49.44	0.17
10884	109.6	Exist	78.19	82.64	82.67	0.84			0.84	49.44	0.17
10955	109.6	Piers	78.34	82.58	82.63	0.96			0.96	39.36	0.18
10955	109.6	Exist	78.34	82.58	82.63	0.96			0.96	39.43	0.18
10980	109.6	Piers	76.79	82.58	82.62	0.84			0.84	33.33	0.13
10980	109.6	Exist	76.79	82.58	82.62	0.83			0.83	33.85	0.14
10999	235.3	Piers	76.49	82.49	82.6	1.46			1.46	30.35	0.2
10999	235.3	Exist	76.49	82.49	82.6	1.46			1.46	30.35	0.2
11002	Culvert 24										
11110	235.3	Piers	75.95	80.8	80.94	1.63			1.63	54.49	0.32
11110	235.3	Exist	75.95	80.8	80.94	1.63			1.63	54.49	0.32
11158	235.3	Piers	75.53	80.55	80.79	2.17	0.13		2.17	53.25	0.48
11158	235.3	Exist	75.53	80.55	80.79	2.17	0.13		2.17	53.25	0.48
11206	235.3	Piers	75.24	80.43	80.6	1.82			1.82	50.29	0.36
11206	235.3	Exist	75.24	80.43	80.6	1.82			1.82	50.29	0.36
11240	235.3	Piers	74.98	80.27	80.5	2.1			2.1	40.17	0.4
11240	235.3	Exist	74.98	80.27	80.5	2.1			2.1	40.17	0.4
11285	235.3	Piers	74.59	79.89	80.28	2.77			2.77	27.36	0.5
11285	235.3	Exist	74.59	79.89	80.28	2.77			2.77	27.36	0.5
11340	235.3	Piers	73.69	79.29	79.89	3.44			3.44	18.56	0.57
11340	235.3	Exist	73.69	79.29	79.89	3.44			3.44	18.56	0.57
11400	235.3	Piers	72.6	79.29	79.53	2.14			2.14	28.22	0.35
11400	235.3	Exist	72.6	79.29	79.53	2.14			2.14	28.22	0.35
11480	235.3	Piers	73.09	78.36	79.11	3.82			3.82	15.86	0.62
11480	235.3	Exist	73.09	78.36	79.11	3.82			3.82	15.86	0.62
11590	235.3	Piers	71.54	77.48	78.1	3.48			3.48	13.59	0.5
11590	235.3	Exist	71.54	77.48	78.1	3.48			3.48	13.59	0.5
11692	235.3	Piers	70.46	76.18	76.98	3.95			3.95	25.93	0.83
11692	235.3	Exist	70.46	76.18	76.98	3.95			3.95	25.93	0.83

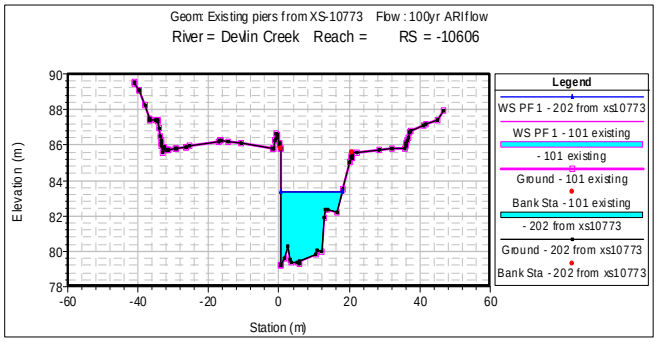
Devlins Creek - 100y ARI - Existing Conditions & Proposed with Piers											
River Sta	Q Total		Min Ch El	W.S. Elev	E.G. Elev	Vel Chnl	Vel Left	Vel Right	Vel Total	Top Width	Froude
	(m3/s)		(m)	(m)	(m)	(m/s)	(m/s)	(m/s)	(m/s)	(m)	
11797	235.3	Piers	69.84	74.9	75.39	3.13			3.13	37.35	0.7
11797	235.3	Exist	69.84	74.9	75.39	3.13			3.13	37.35	0.7
11845	246.1	Piers	69.29	74.72	75.03	2.47			2.47	32.42	0.45
11845	246.1	Exist	69.29	74.72	75.03	2.47			2.47	32.42	0.45
11856	246.1	Piers	69.12	74.76	74.98	2.06			2.06	24.76	0.3
11856	246.1	Exist	69.12	74.76	74.98	2.06			2.06	24.76	0.3
11857	Culvert 27										
11918	246.1	Piers	69.16	73.29	73.66	2.71			2.71	37.81	0.56
11918	246.1	Exist	69.16	73.29	73.66	2.71			2.71	37.81	0.56
11983	246.1	Piers	68.56	72.08	72.9	4.01			4.01	38.25	1.01
11983	246.1	Exist	68.56	72.08	72.9	4.01			4.01	38.25	1.01
12040	246.1	Piers	66.79	70.9	71.66	3.85			3.85	29.36	0.83
12040	246.1	Exist	66.79	70.9	71.66	3.85			3.85	29.36	0.83
12120	246.1	Piers	66.49	70.44	70.83	2.75			2.75	34.67	0.55
12120	246.1	Exist	66.49	70.44	70.83	2.75			2.75	34.67	0.55
12170	246.1	Piers	65.77	70.34	70.55	2.04			2.04	48.07	0.41
12170	246.1	Exist	65.77	70.34	70.55	2.04			2.04	48.07	0.41
12250	246.1	Piers	64.34	68.7	69.91	4.88			4.88	19.2	0.96
12250	246.1	Exist	64.34	68.7	69.91	4.88			4.88	19.2	0.96

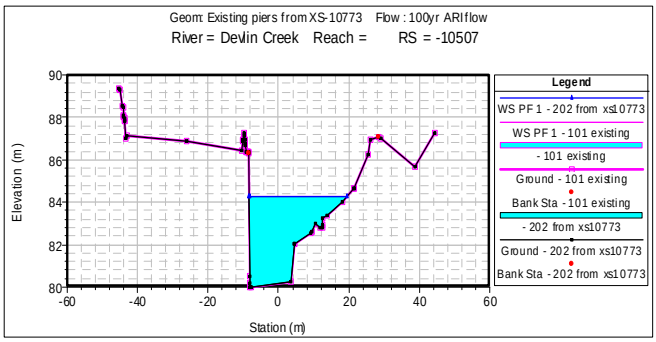
Devlins Creek hydraulic profile

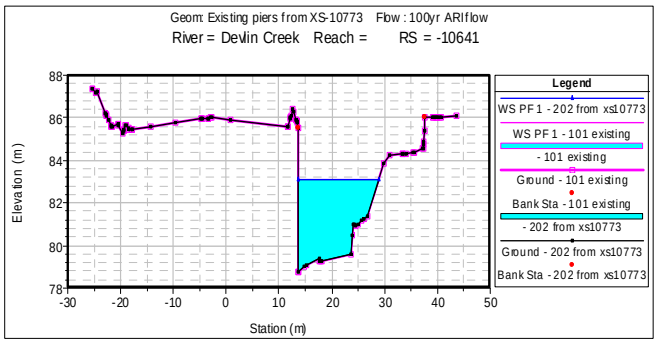


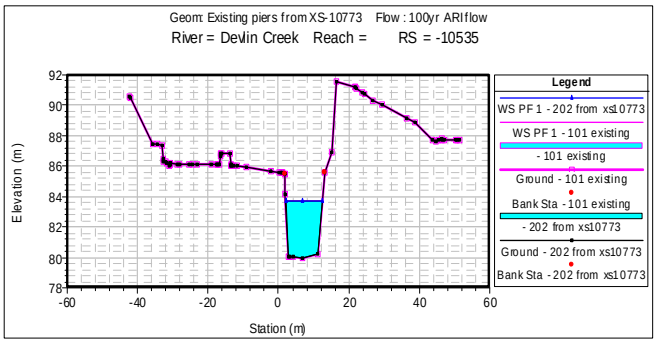
Devlins Creek cross sections

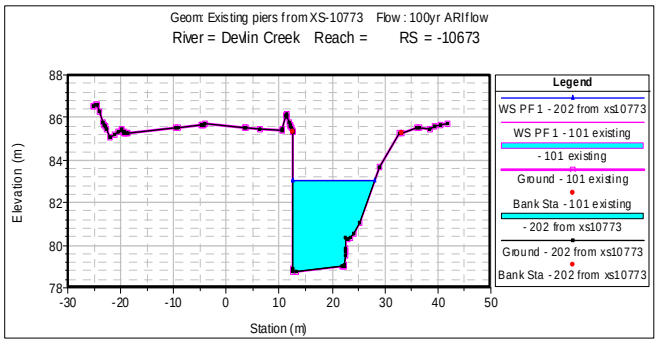


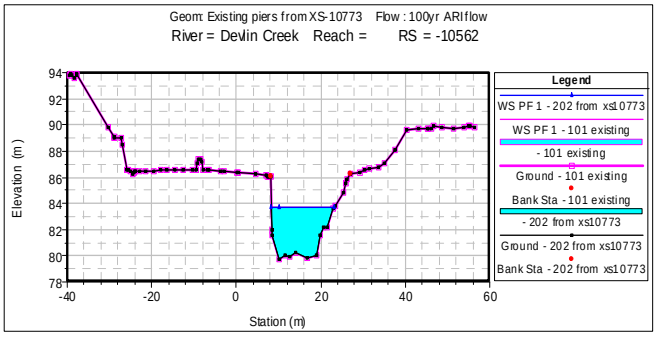


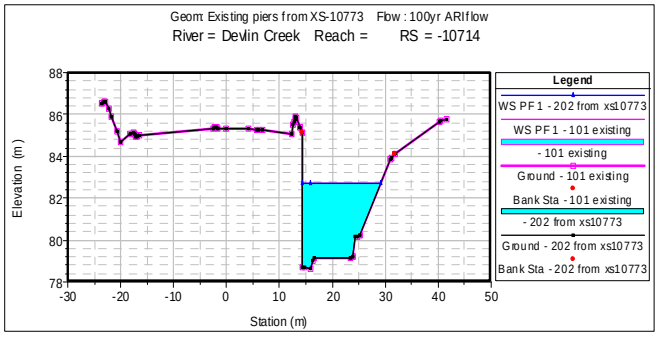


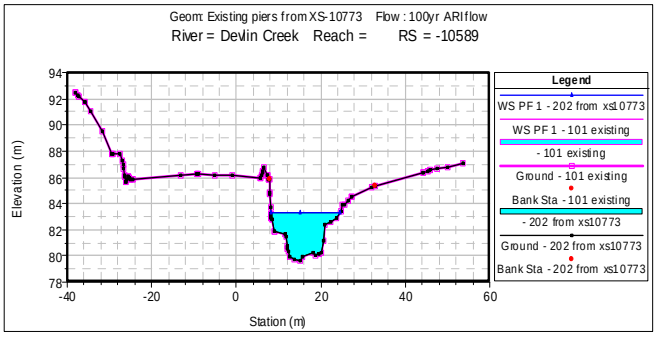


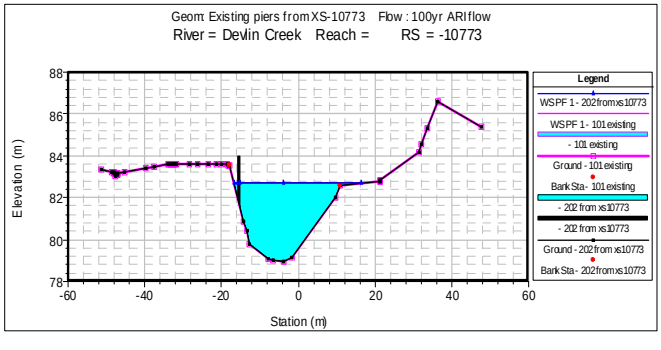




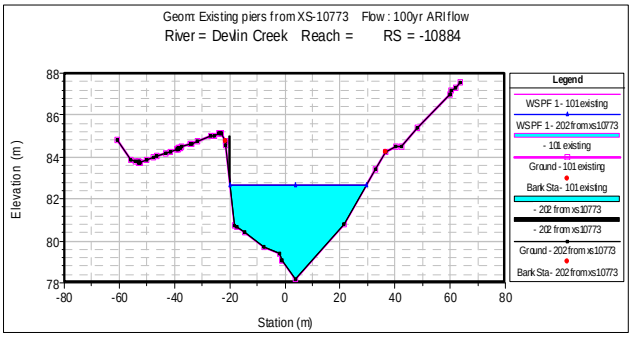


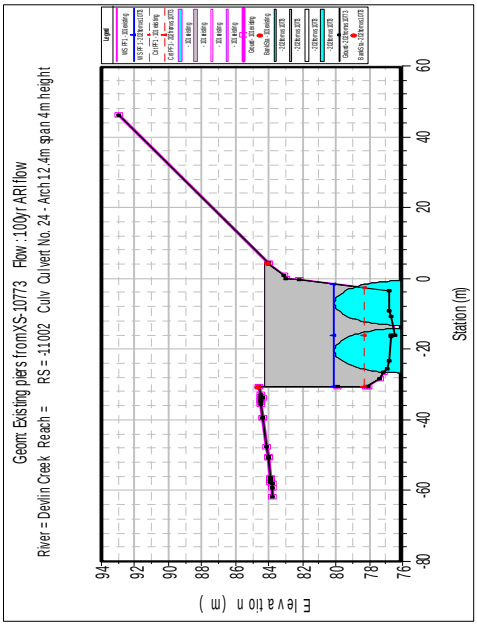


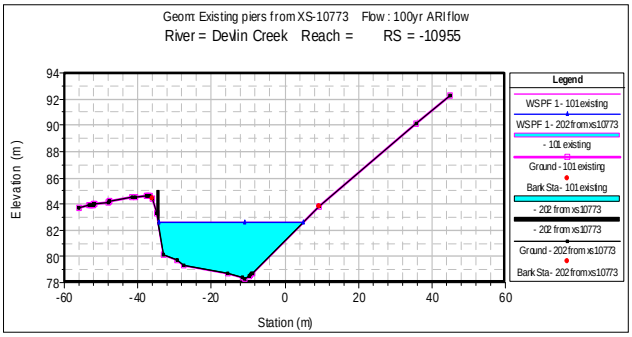


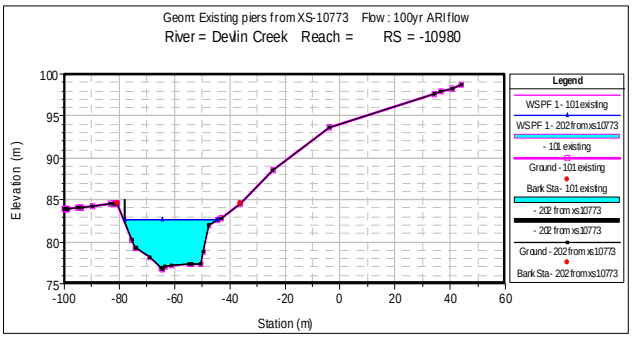


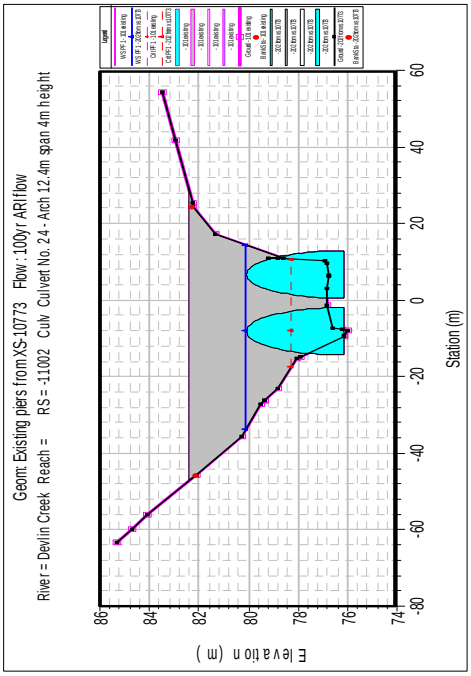
Devlins Creek cross sections . continued

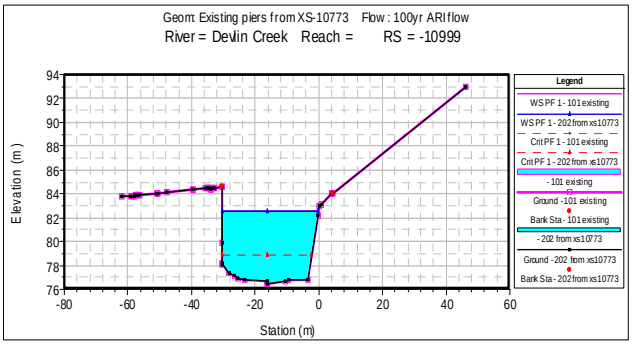


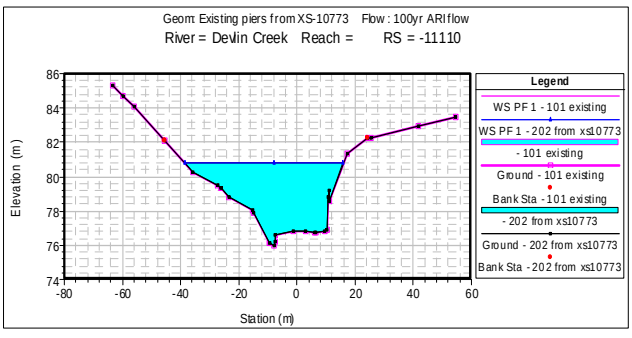






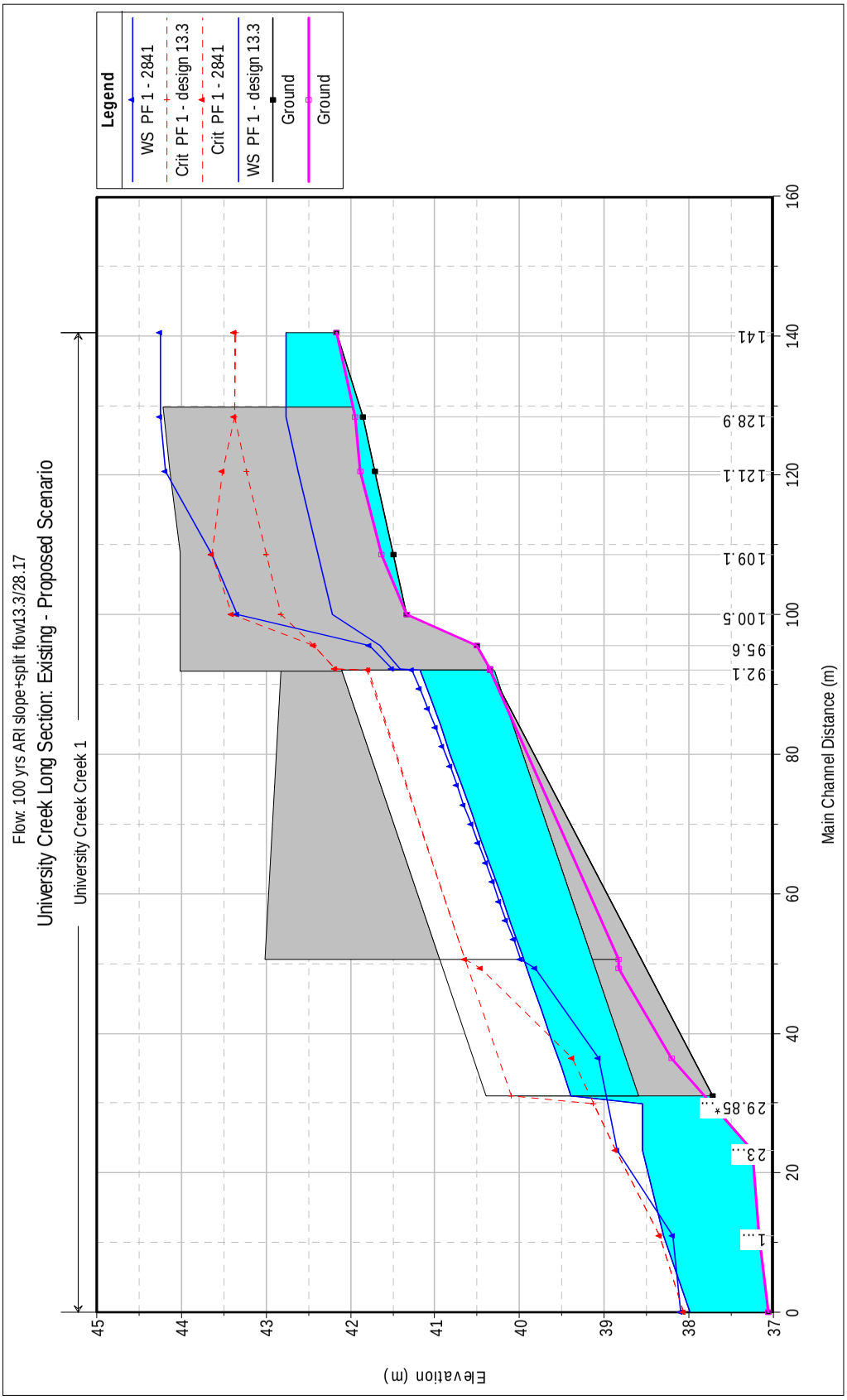




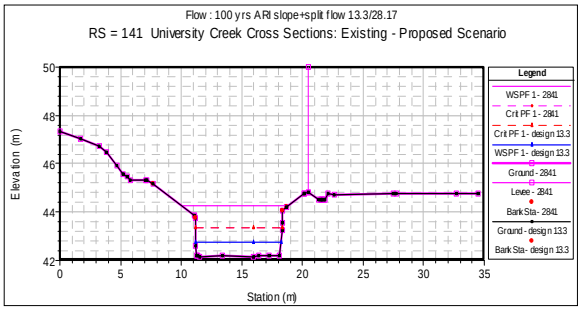


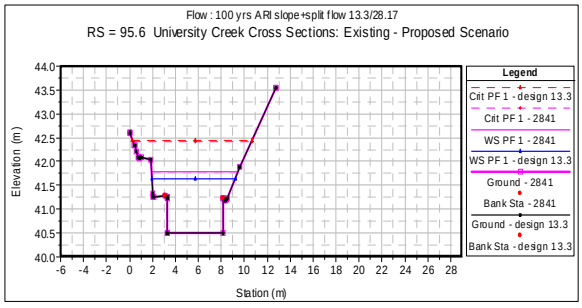
University Creek - 100y ARI – Existing and Proposed conditions											
River Sta	Q Total (m3/s)	Condition	Min Ch El (m)	W.S. Elev (m)	E.G. Elev (m)	Vel Chnl (m/s)	Vel Left (m/s)	Vel Right (m/s)	Vel Total (m/s)	Top Width (m)	Froude
141	28.17	extended	42.16	42.76	45.27	7.02			7.02	7.04	2.97
141	28.17	existing	42.16	44.25	44.43	1.88		0.13	1.88	8.81	0.46
128.9	28.17	extended	41.86	42.77	44.9	6.47			6.47	4.91	2.2
128.9	28.15	existing	41.95	44.25	44.37	1.67	0.5	0.74	1.34	19.58	0.37
121.1	28.17	extended	41.72	42.62	44.76	6.48			6.48	4.9	2.2
121.1	28.03	existing	41.88	44.19	44.34	1.87	0.44	0.85	1.48	21.08	0.43
109.1	28.17	extended	41.49	42.38	44.56	6.54			6.54	4.9	2.23
109.1	28.02	existing	41.63	43.64	44.22	3.52	1.28	1.4	3.12	8.57	0.89
100.5	28.17	extended	41.33	42.21	44.41	6.57			6.57	4.9	2.24
100.5	28.02	existing	41.34	43.34	44.03	3.74	0.99	1.46	3.47	7.4	0.99
95.6	41.47	extended	40.5	41.65	44.28	7.25	0.94	0.88	6.52	7.28	2.19
95.6	41.32	existing	40.5	41.78	43.83	6.42	0.9	0.83	5.63	7.53	1.83
92.2	41.47	extended	40.35	41.41	44.22	7.43			7.43	6.16	2.49
92.2	41.32	existing	40.35	41.51	43.78	6.67			6.67	6.26	2.14
92.1	Culvert 35										
49.3	41.32		38.83	39.82	42.26	6.93			6.93	8.12	2.58
36.5	41.32		38.2	39.07	39.93	4.11			4.11	18.37	1.77
29.85*	41.47		37.73	38.54	41.64	7.8			7.8	13.62	3.98
23.2	41.47	extended	37.25	38.54	39.57	4.49			4.49	13.77	1.75
23.2	41.32	existing	37.25	38.85	39.3	2.97		0.49	2.96	17.07	1.02
11	41.47	extended	37.17	38.29	38.66	2.69			2.69	26.5	1.13
11	41.32	existing	37.17	38.19	38.73	3.26			3.26	24.57	1.45
0	41.47	extended	37.06	37.99	38.35	2.69			2.69	34.53	1.28
0	41.32	existing	37.06	38.09	38.33	2.14			2.14	37.5	0.96

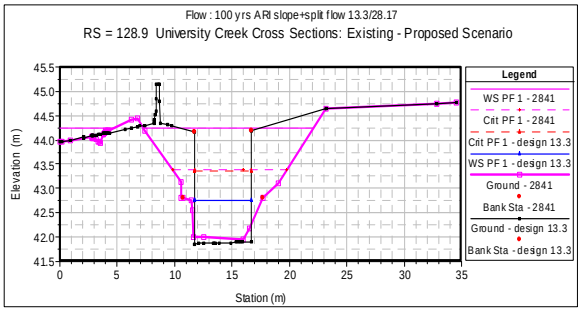
University Creek hydraulic profile

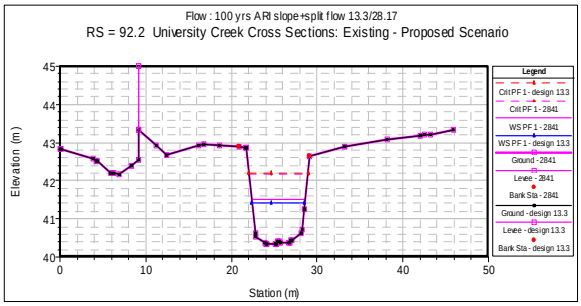


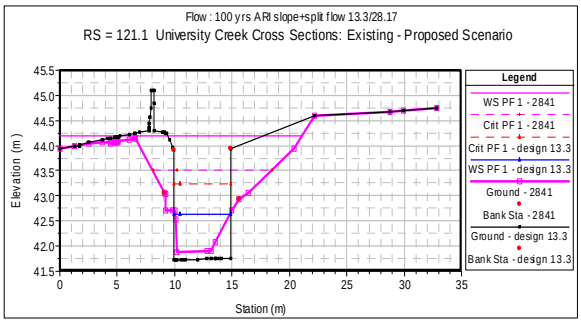
University Creek cross sections

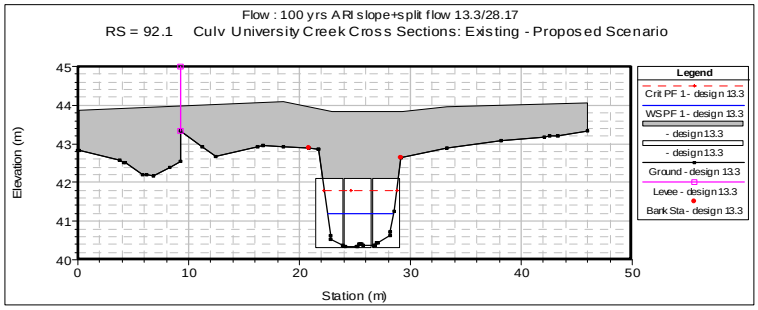


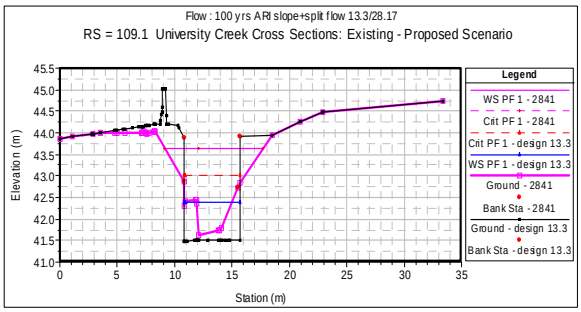


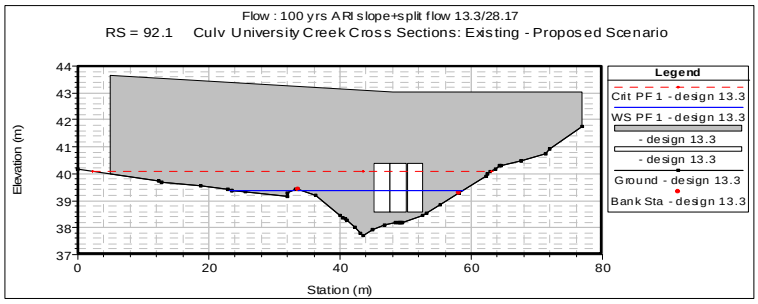


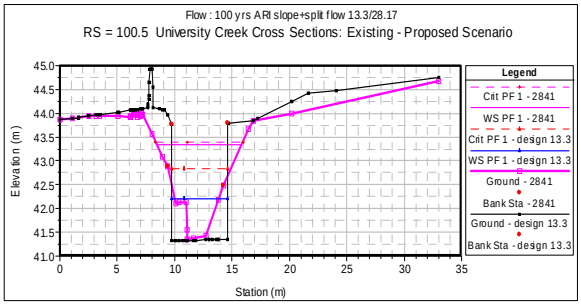


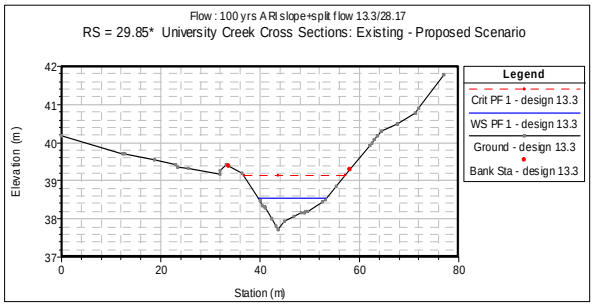




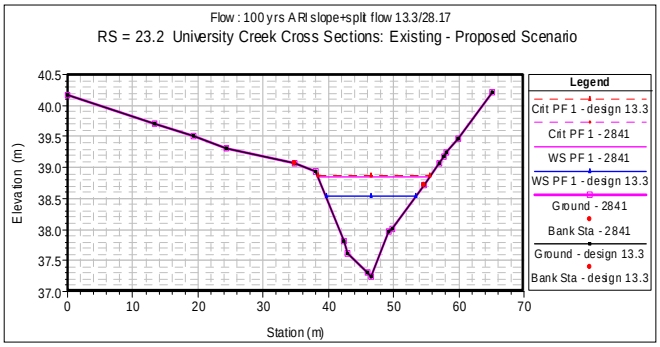


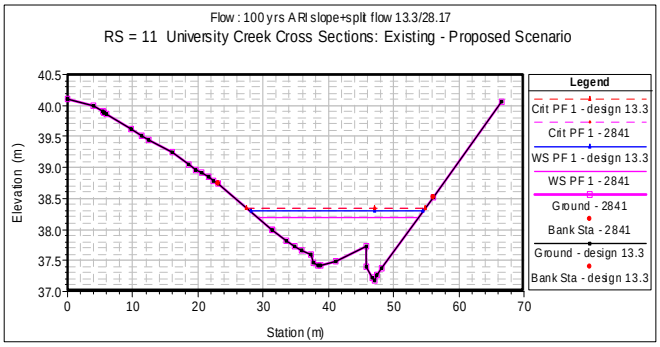


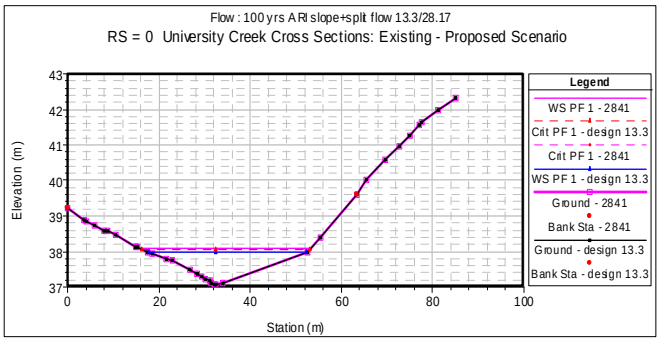




University Creek cross sections … continued

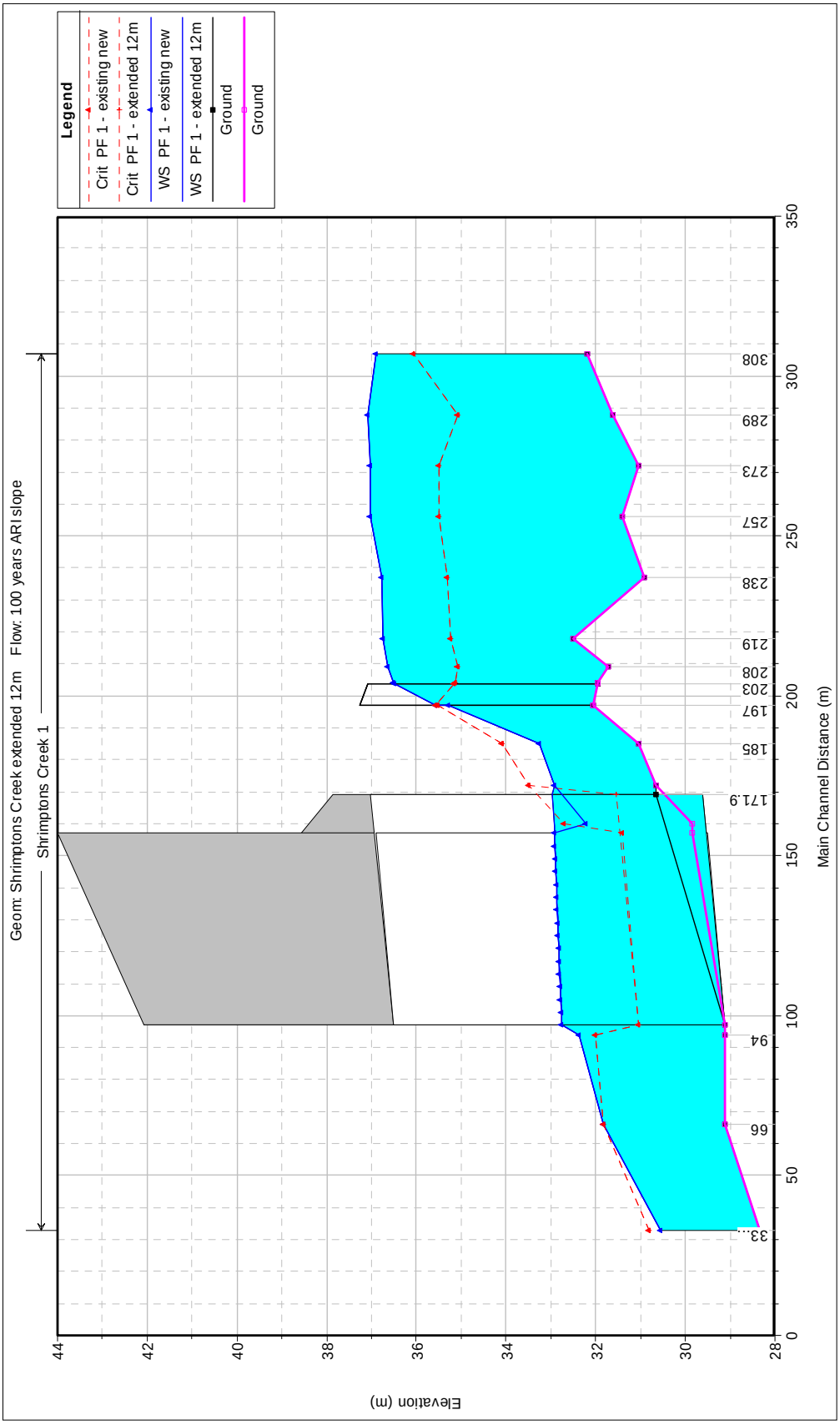




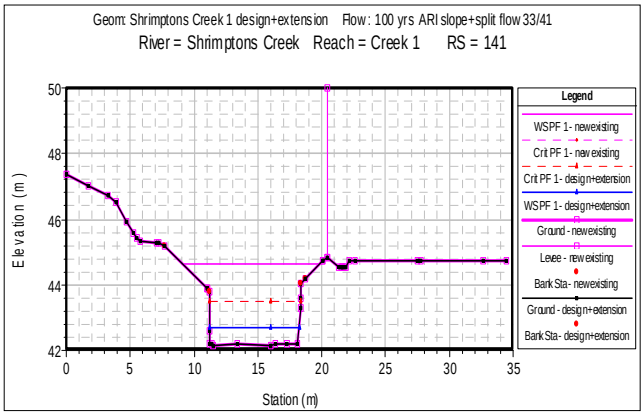


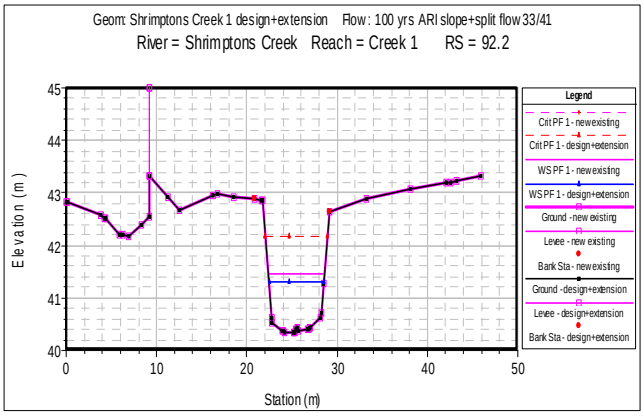
Shrimptons Creek - 100y ARI - Existing & Proposed 12m Extension											
River Sta	Q Total	Condition	Min Ch El	W.S. Elev	E.G. Elev	Vel Chnl	Vel Left	Vel Right	Vel Total	Top Width	Froude
	(m3/s)		(m)	(m)	(m)	(m/s)	(m/s)	(m/s)	(m/s)	(m)	
308	190.11	extend	32.19	36.9	37.6	3.87	0.97	1.78	3.42	28.54	0.6
308	190.11	exist	32.19	36.9	37.6	3.87	0.97	1.78	3.42	28.54	0.6
289	190.11	extend	31.61	37.08	37.38	2.53	0.81	1.05	2.19	40.65	0.38
289	190.11	exist	31.61	37.08	37.38	2.53	0.81	1.05	2.19	40.65	0.38
273	190.11	extend	31.05	37.03	37.31	2.51	0.72	1.29	2.08	49.18	0.4
273	190.11	exist	31.05	37.03	37.31	2.51	0.72	1.29	2.08	49.18	0.4
257	190.11	extend	31.4	37.03	37.23	2.16	0.3	1.33	1.82	47.97	0.34
257	190.11	exist	31.4	37.03	37.23	2.16	0.3	1.33	1.82	47.97	0.34
238	190.11	extend	30.91	36.76	37.14	2.89	0.73	1.08	2.43	44.26	0.45
238	190.11	exist	30.91	36.76	37.14	2.89	0.73	1.08	2.43	44.26	0.45
219	190.11	extend	32.49	36.75	37.03	2.38	0.13	0.61	2.14	54.21	0.42
219	190.11	exist	32.49	36.75	37.03	2.38	0.13	0.61	2.14	54.21	0.42
208	190.11	extend	31.73	36.64	36.99	2.62		0.48	2.58	38.12	0.45
208	190.11	exist	31.73	36.64	36.99	2.62		0.48	2.58	38.12	0.45
204	190.11	extend	31.95	36.52	36.95	2.91		0.34	2.91	19.82	0.49
204	190.11	exist	31.95	36.52	36.95	2.91		0.34	2.91	19.82	0.49
203	Property Access Bridge										
197	190.11	extend	32.06	35.29	36.74	5.33			5.33	16.41	1.15
197	190.11	exist	32.06	35.29	36.74	5.33			5.33	16.41	1.15
185	190.11	extend	31.04	33.25	35.94	7.26			7.26	20.9	2.07
185	190.11	exist	31.04	33.25	35.94	7.26			7.26	20.9	2.07
172	190.11	extend	30.65	32.91	34.69	5.91			5.91	22.7	1.58
172	190.11	exist	30.65	32.91	34.69	5.91			5.91	22.7	1.58
171.9	Culvert 36 Extended										
160	190.11	Existing culvert	29.85	32.2	33.98	5.91			5.91	24.82	1.59
94	190.11	extend	29.12	32.36	33.05	3.68			3.68	34.61	0.78
94	190.11	exist	29.12	32.36	33.05	3.68			3.68	34.61	0.78
66	190.11	extend	29.12	31.81	32.6	3.92			3.92	31.15	1
66	190.11	exist	29.12	31.81	32.6	3.92			3.92	31.14	1
33	190.11	extend	28.33	30.54	31.57	4.5			4.5	37.05	1.35
33	190.11	exist	28.33	30.54	31.57	4.5			4.5	37.05	1.34

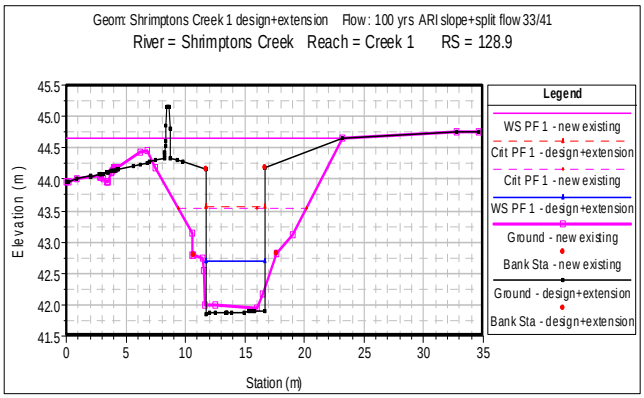
Shrimptons Creek hydraulic profile

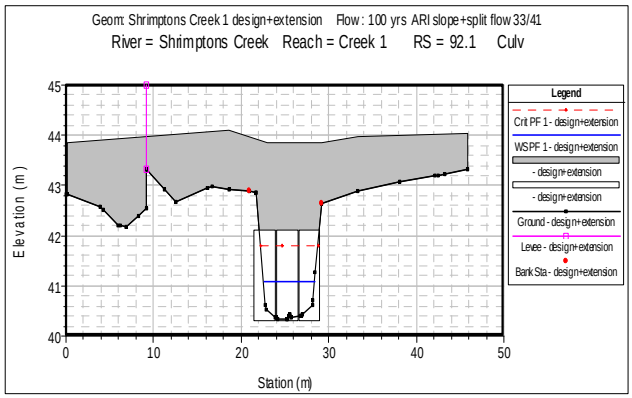


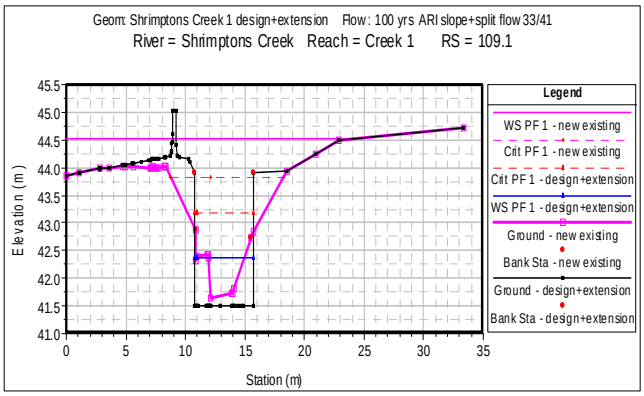
Shrimptons Creek cross sections

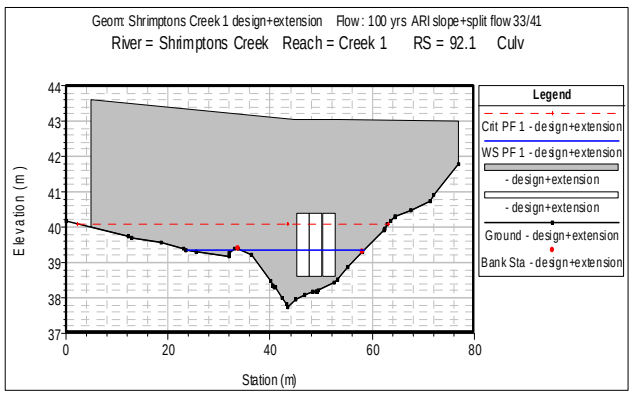


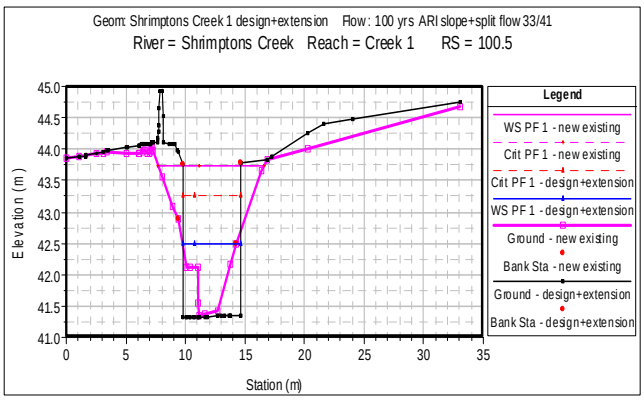


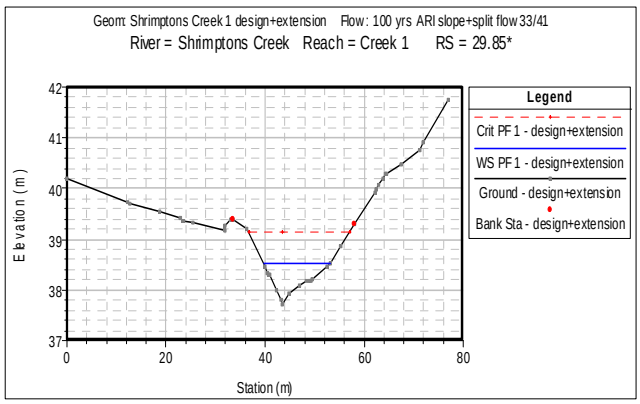




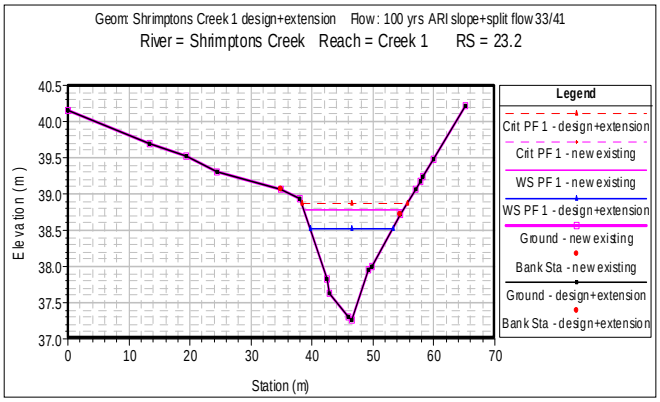


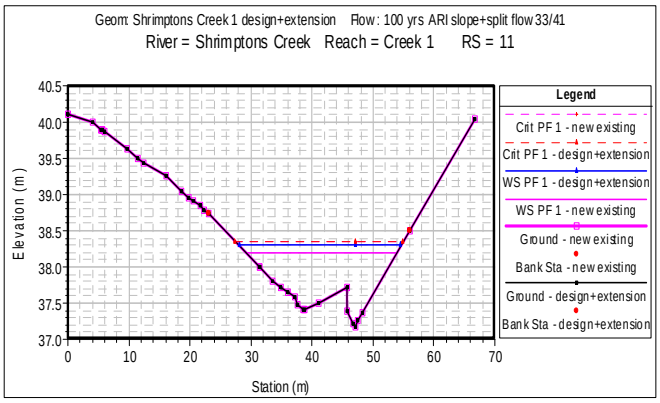


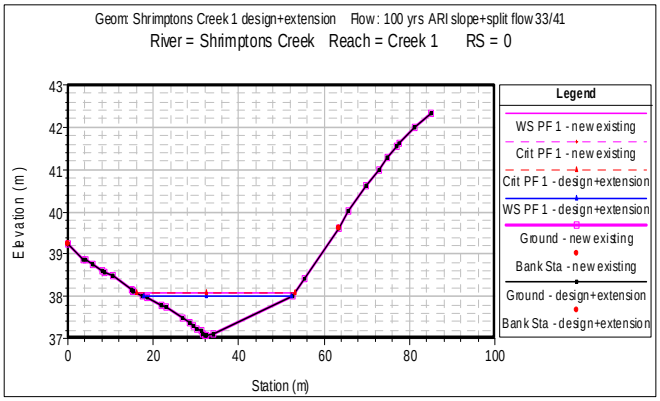




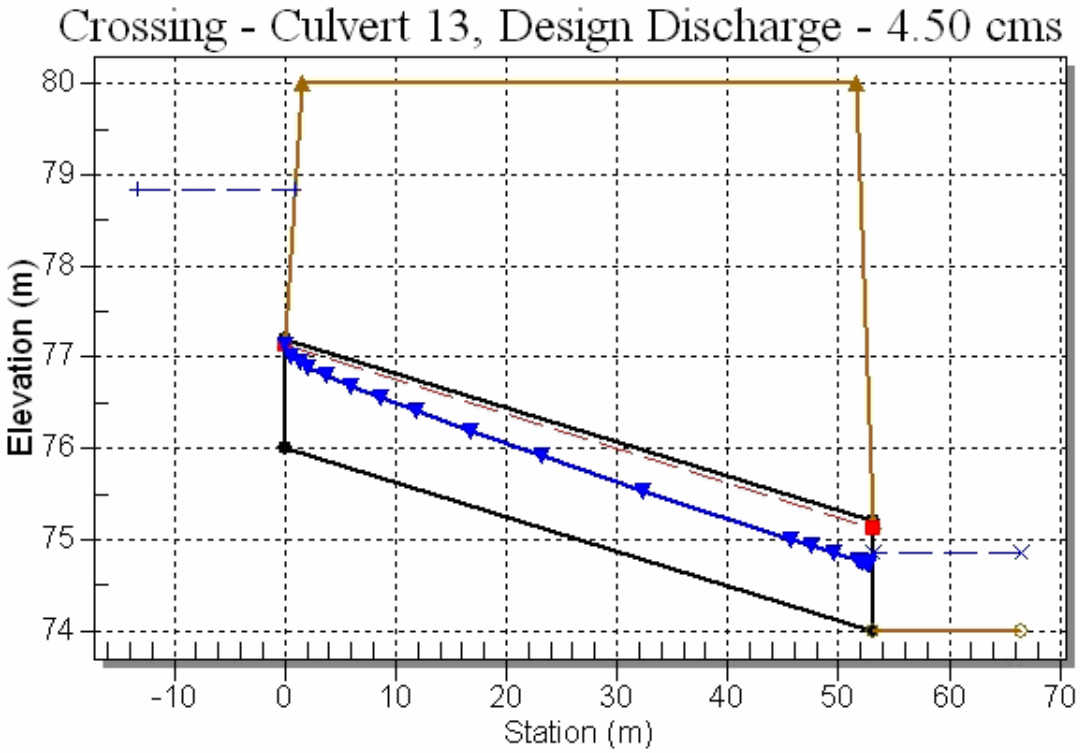
Shrimptons Creek cross sections … continued







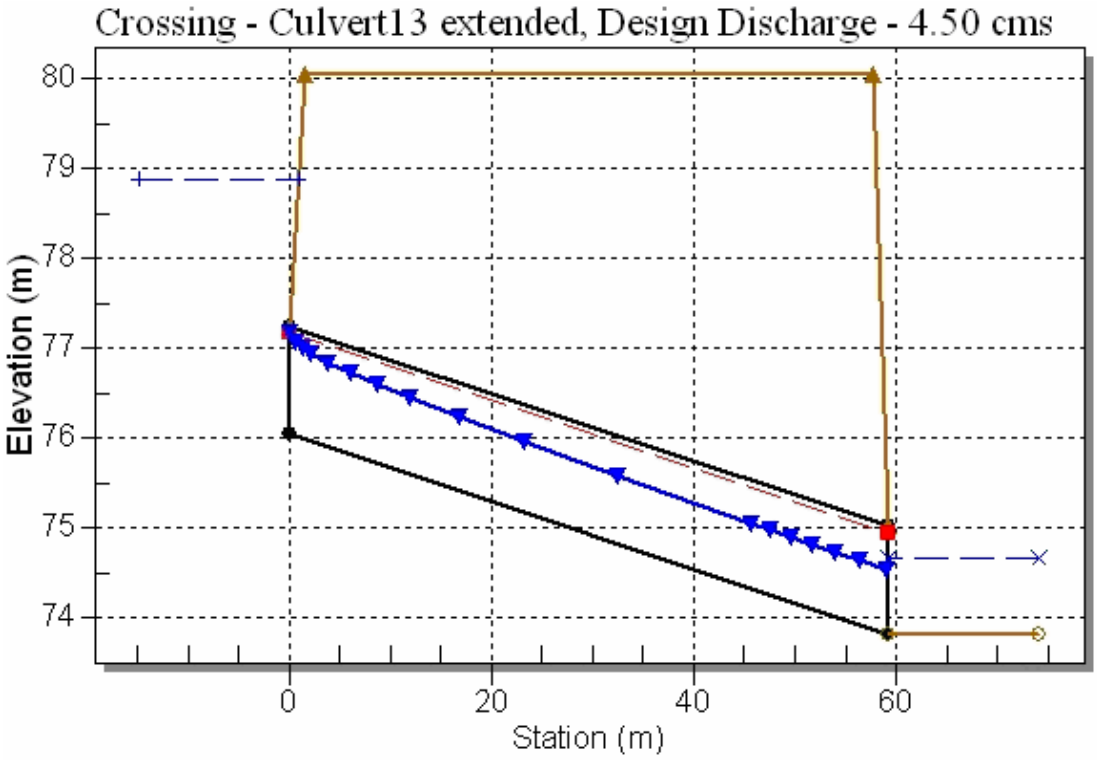
HY-8 Culvert 13 Analysis Report			
Culvert Data Summary - Culvert 13		Tailwater Channel Data - Culvert 13	
Barrel Shape:	Circular	Tailwater Channel Option:	Trapezoidal Channel
Barrel Diameter:	1200.00 mm	Bottom Width:	1.00 m
Barrel Material:	Concrete	Side Slope (H:V):	2.00 (_:1)
Barrel Manning's n:	0.0130	Channel Slope:	0.0040
Inlet Type:	Conventional	Channel Manning's n:	0.0200
Inlet Edge Condition:	Square Edge with Headwall	Channel Invert Elevation:	74.00 m
Inlet Depression:	None		



Inlet Elevation (invert): 76.00 m	*Outlet Elevation (invert): 74.00m*	*Culvert Length: 53.23 m*	*Culvert Slope: 0.0376*

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
4.00	4.00	78.40	2.401	0.0*	5-S2n	0.620	1.069	0.668	0.811	6.192	1.883
4.14	4.14	78.52	2.518	0.0*	5-S2n	0.632	1.085	0.682	0.823	6.237	1.900
4.28	4.28	78.64	2.639	0.0*	5-S2n	0.645	1.101	0.697	0.836	6.287	1.916
4.42	4.42	78.76	2.765	0.0*	5-S2n	0.658	1.117	0.711	0.849	6.332	1.931
4.50	4.50	78.84	2.838	0.0*	5-S2n	0.666	1.126	0.719	0.855	6.360	1.941
4.70	4.70	79.03	3.028	0.0*	5-S2n	0.684	1.149	0.740	0.872	6.422	1.963
4.84	4.84	79.17	3.166	0.0*	5-S2n	0.697	1.165	0.755	0.885	6.464	1.976
4.98	4.98	79.31	3.307	0.0*	5-S2n	0.710	1.181	0.770	0.896	6.509	1.990
5.12	5.12	79.45	3.453	0.0*	5-S2n	0.723	1.197	0.784	0.907	6.553	2.005
5.26	5.26	79.60	3.601	1.816	6-FFc	0.736	1.200	1.200	0.918	4.651	2.020
5.40	5.40	79.76	3.762	1.957	6-FFc	0.750	1.200	1.200	0.929	4.775	2.033

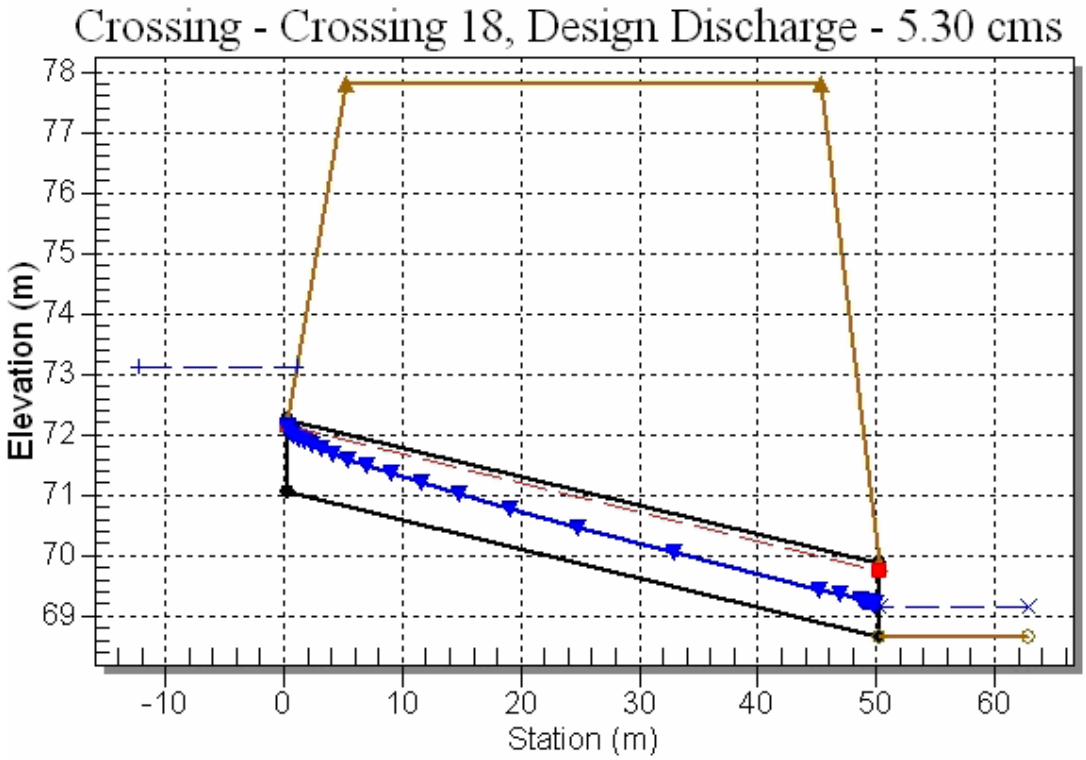
HY-8 Culvert 13 Extended Analysis Report			
Culvert Data Summary - Culvert 13		**Tailwater Channel Data - Culvert 13**	
Barrel Shape:	Circular	Tailwater Channel Option:	Trapezoidal Channel
Barrel Diameter:	1200.00 mm	Bottom Width:	1.00 m
Barrel Material:	Concrete	Side Slope (H:V):	2.00 (_:1)
Barrel Manning's n:	0.0130	Channel Slope:	0.0040
Inlet Type:	Conventional	Channel Manning's n:	0.0200
Inlet Edge Condition:	Square Edge with Headwall	Channel Invert Elevation:	73.77 m
Inlet Depression:	None		



Inlet Elevation (invert): 76.00 m	*Outlet Elevation (invert): 73.77m*	*Culvert Length: 59.33 m*	*Culvert Slope: 0.0376*

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
4.00	4.00	78.40	2.401	0.0*	5-S2n	0.620	1.069	0.660	0.811	6.277	1.883
4.14	4.14	78.52	2.518	0.0*	5-S2n	0.632	1.085	0.675	0.823	6.317	1.900
4.28	4.28	78.64	2.639	0.0*	5-S2n	0.645	1.101	0.689	0.836	6.369	1.916
4.42	4.42	78.76	2.765	0.0*	5-S2n	0.658	1.117	0.704	0.849	6.415	1.931
4.50	4.50	78.84	2.838	0.0*	5-S2n	0.666	1.126	0.712	0.855	6.442	1.941
4.70	4.70	79.03	3.028	0.0*	5-S2n	0.684	1.149	0.732	0.872	6.507	1.963
4.84	4.84	79.17	3.166	0.0*	5-S2n	0.697	1.165	0.747	0.885	6.546	1.976
4.98	4.98	79.31	3.307	0.0*	5-S2n	0.710	1.181	0.762	0.896	6.587	1.990
5.12	5.12	79.45	3.453	0.0*	5-S2n	0.723	1.197	0.776	0.907	6.629	2.005
5.26	5.26	79.60	3.601	1.697	6-FFc	0.736	1.200	1.200	0.918	4.651	2.020
5.40	5.40	79.76	3.762	1.844	6-FFc	0.750	1.200	1.200	0.929	4.775	2.033

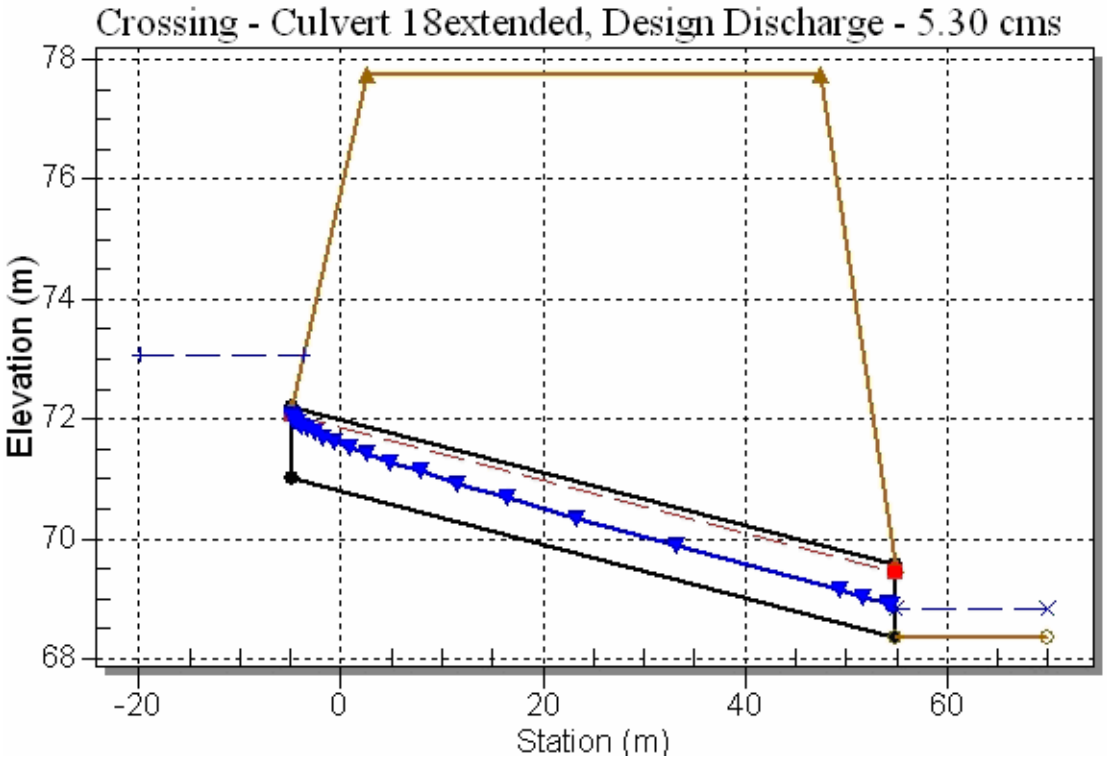
HY-8 Culvert 18 Analysis Report			
Culvert Data Summary - Culvert 18		Tailwater Channel Data - Culvert 18	
Barrel Shape:	Concrete Box	Tailwater Channel Option:	Rectangular Channel
Barrel Span:	1200.00 mm	Bottom Width:	3.00 m
Barrel Rise:	1500.00 mm	Channel Slope:	0.0200
Barrel Material:	Concrete	Channel Manning's n:	0.0200
Barrel Manning's n:	0.0130	Channel Invert Elevation:	68.60 m
Inlet Type:	Conventional		
Inlet Edge Condition:	Square Edge 90°Headwall		
Inlet Depression:	None		



Inlet Elevation (invert): 71.00 m	*Outlet Elevation (invert): 68.60m*	*Culvert Length: 50.06 m*	*Culvert Slope: 0.0479*

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
4.00	4.00	72.56	1.556	0.0*	5-S2n	0.401	0.900	0.426	0.404	6.258	3.297
4.24	4.24	72.64	1.638	0.0*	5-S2n	0.417	0.935	0.421	0.420	6.715	3.363
4.47	4.47	72.72	1.723	0.0*	5-S2n	0.434	0.970	0.465	0.435	6.418	3.426
4.71	4.71	72.81	1.812	0.0*	5-S2n	0.450	1.003	0.483	0.450	6.497	3.486
4.94	4.94	72.91	1.906	0.0*	5-S2n	0.466	1.037	0.503	0.465	6.557	3.546
5.18	5.18	73.00	2.003	0.0*	5-S2n	0.483	1.069	0.521	0.479	6.632	3.601
5.30	5.30	73.05	2.054	0.0*	5-S2n	0.490	1.086	0.531	0.487	6.657	3.629
5.65	5.65	73.21	2.212	0.0*	5-S2n	0.513	1.133	0.559	0.508	6.743	3.708
5.89	5.89	73.32	2.323	0.0*	5-S2n	0.528	1.165	0.577	0.522	6.802	3.757
6.12	6.12	73.44	2.439	0.0*	5-S2n	0.543	1.196	0.595	0.536	6.859	3.806
6.36	6.36	73.56	2.560	0.058	6-FFc	0.558	1.200	0.614	0.550	6.907	3.855

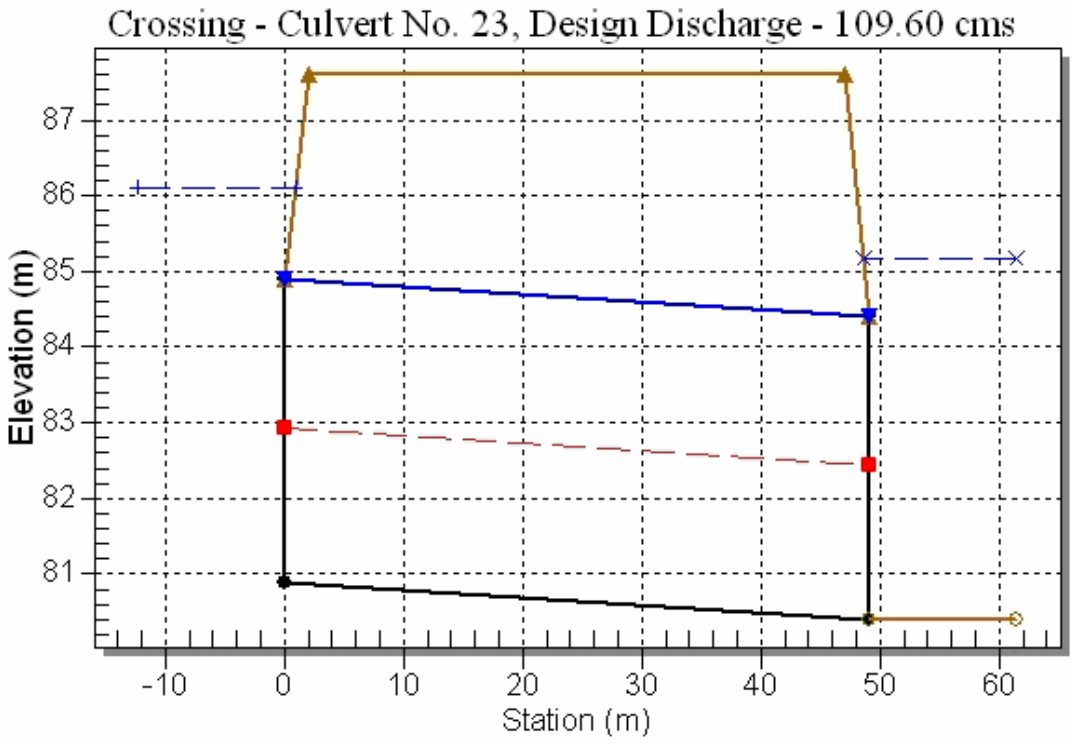
HY-8 Culvert 18 Extended Analysis Report			
Culvert Data Summary - Culvert 18		Tailwater Channel Data - Culvert 18	
Barrel Shape:	Concrete Box	Tailwater Channel Option:	Rectangular Channel
Barrel Span:	1200.00 mm	Bottom Width:	3.00 m
Barrel Rise:	1500.00 mm	Channel Slope:	0.0200
Barrel Material:	Concrete	Channel Manning's n:	0.0200
Barrel Manning's n:	0.0130	Channel Invert Elevation:	68.36 m
Inlet Type:	Conventional		
Inlet Edge Condition:	Square Edge 90°Headwall		
Inlet Depression:	None		



Inlet Elevation (invert): 71.00 m	*Outlet Elevation (invert): 68.36m*	*Culvert Length: 54.94 m*	*Culvert Slope: 0.0479*

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
4.00	4.00	72.56	1.556	0.0*	5-S2n	0.401	0.900	0.426	0.404	6.258	3.297
4.24	4.24	72.64	1.638	0.0*	5-S2n	0.417	0.935	0.421	0.420	6.715	3.363
4.47	4.47	72.72	1.723	0.0*	5-S2n	0.434	0.970	0.465	0.435	6.418	3.426
4.71	4.71	72.81	1.812	0.0*	5-S2n	0.450	1.003	0.483	0.450	6.497	3.486
4.94	4.94	72.91	1.906	0.0*	5-S2n	0.466	1.037	0.503	0.465	6.557	3.546
5.18	5.18	73.00	2.003	0.0*	5-S2n	0.483	1.069	0.521	0.479	6.632	3.601
5.30	5.30	73.05	2.054	0.0*	5-S2n	0.490	1.086	0.531	0.487	6.657	3.629
5.65	5.65	73.21	2.212	0.0*	5-S2n	0.513	1.133	0.559	0.508	6.743	3.708
5.89	5.89	73.32	2.323	0.0*	5-S2n	0.528	1.165	0.577	0.522	6.802	3.757
6.12	6.12	73.44	2.439	0.0*	5-S2n	0.543	1.196	0.595	0.536	6.859	3.806
6.36	6.36	73.56	2.560	0.058	6-FFc	0.558	1.200	0.614	0.550	6.907	3.855

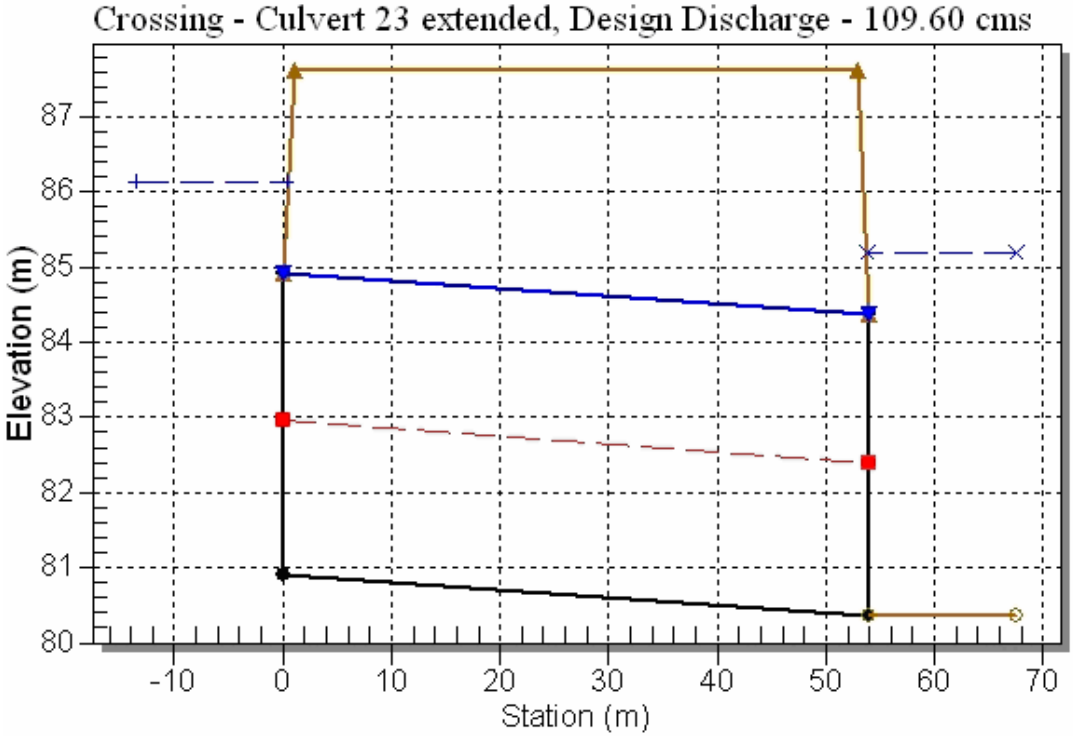
HY-8 Culvert 23 Analysis Report			
Culvert Data Summary - Culvert 23		Tailwater Channel Data - Culvert 23	
Barrel Shape:	User Defined Arch	Tailwater Channel Option:	
Barrel Span:	12000.00 mm	Constant Tailwater Elevation:	85.18 m
Barrel Rise:	4000.00 mm		
Barrel Material:	Concrete		
Barrel Manning's n:	0.0130 (top and sides)		
Manning's n:	0.0250 (bottom)		
Inlet Type:	Conventional		
Inlet Edge Condition:	Thin Edge Projecting		
Inlet Depression:	None		



Inlet Elevation (invert): 80.90 m	*Outlet Elevation (invert):80.40m*	*Culvert Length: 49.14 m*	*Culvert Slope: 0.0102*

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
91.00	91.00	85.82	3.445	4.921	4-FFf	1.565	1.801	4.000	4.780	2.434	0.000
95.05	95.05	85.88	3.563	4.980	4-FFf	1.612	1.853	4.000	4.780	2.542	0.000
99.10	99.10	85.94	3.681	5.041	4-FFf	1.657	1.906	4.000	4.780	2.651	0.000
103.15	103.15	86.00	3.799	5.104	4-FFf	1.702	1.959	4.000	4.780	2.759	0.000
107.20	107.20	86.07	3.916	5.170	4-FFf	1.747	2.010	4.000	4.780	2.867	0.000
109.60	109.60	86.11	3.986	5.210	4-FFf	1.773	2.038	4.000	4.780	2.932	0.000
115.30	115.30	86.21	4.152	5.310	4-FFf	1.836	2.103	4.000	4.780	3.084	0.000
119.35	119.35	86.28	4.270	5.383	4-FFf	1.881	2.149	4.000	4.780	3.192	0.000
123.40	123.40	86.36	4.387	5.460	4-FFf	1.926	2.196	4.000	4.780	3.301	0.000
127.45	127.45	86.44	4.508	5.538	4-FFf	1.971	2.242	4.000	4.780	3.409	0.000
131.50	131.50	86.52	4.630	5.619	4-FFf	2.015	2.289	4.000	4.780	3.517	0.000

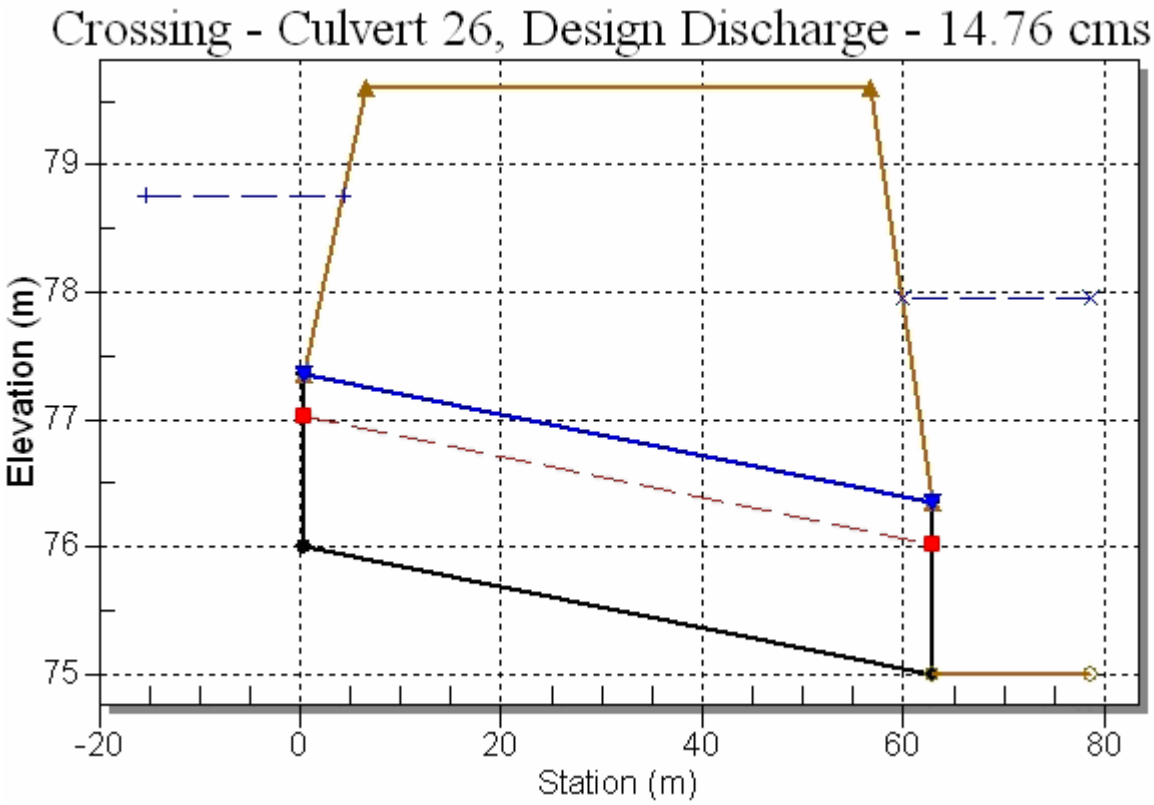
HY-8 Culvert 23 Extended Analysis Report			
Culvert Data Summary - Culvert 23		Tailwater Channel Data - Culvert 23	
Barrel Shape:	User Defined Arch	Tailwater Channel Option:	
Barrel Span:	12000.00 mm	Constant Tailwater Elevation:	85.18 m
Barrel Rise:	4000.00 mm		
Barrel Material:	Concrete		
Barrel Manning's n:	0.0130 (top and sides)		
Manning's n:	0.0250 (bottom)		
Inlet Type:	Conventional		
Inlet Edge Condition:	Thin Edge Projecting		
Inlet Depression:	None		



Inlet Elevation (invert): 80.90 m	*Outlet Elevation (invert):80.35m*	*Culvert Length: 54.02 m*	*Culvert Slope: 0.0102*

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
91.00	91.00	85.83	3.445	4.928	4-FFf	1.565	1.801	4.000	4.830	2.434	0.000
95.05	95.05	85.89	3.563	4.987	4-FFf	1.612	1.853	4.000	4.830	2.542	0.000
99.10	99.10	85.95	3.681	5.049	4-FFf	1.657	1.906	4.000	4.830	2.651	0.000
103.15	103.15	86.01	3.799	5.113	4-FFf	1.701	1.959	4.000	4.830	2.759	0.000
107.20	107.20	86.08	3.916	5.180	4-FFf	1.746	2.010	4.000	4.830	2.867	0.000
109.60	109.60	86.12	3.986	5.220	4-FFf	1.773	2.038	4.000	4.830	2.932	0.000
115.30	115.30	86.22	4.152	5.321	4-FFf	1.836	2.103	4.000	4.830	3.084	0.000
119.35	119.35	86.29	4.270	5.395	4-FFf	1.881	2.149	4.000	4.830	3.192	0.000
123.40	123.40	86.37	4.387	5.472	4-FFf	1.925	2.196	4.000	4.830	3.301	0.000
127.45	127.45	86.45	4.508	5.551	4-FFf	1.970	2.242	4.000	4.830	3.409	0.000
131.50	131.50	86.53	4.630	5.634	4-FFf	2.015	2.289	4.000	4.830	3.517	0.000

HY-8 Culvert 26 Analysis Report			
Culvert Data Summary - Culvert 26		Tailwater Channel Data - Culvert 26	
Barrel Shape:	Circular	Tailwater Channel Option:	
Barrel Diameter:	1350.00 mm	Constant Tailwater Elevation	77.95 m
Barrel Material:	Concrete		
Barrel Manning's n:	0.0130		
Inlet Type:	Conventional		
Inlet Edge Condition:	Square Edge with Headwall		
Inlet Depression:	None		



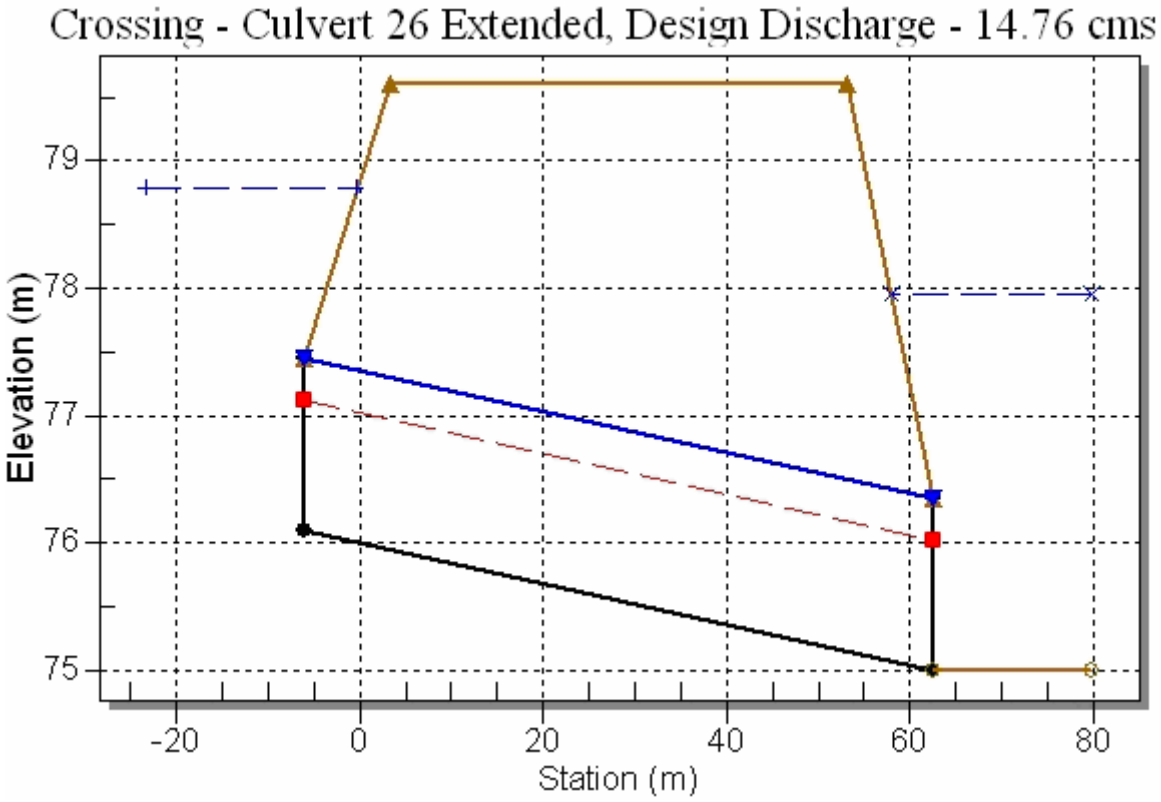
Inlet Elevation (invert): 76.00 m	*Outlet Elevation (invert):75.00m*	*Culvert Length: 62.62 m*	*Culvert Slope: 0.0160*

HY-8 Culvert 26 Extended Analysis Report

Culvert Data Summary - Culvert 26		Tailwater Channel Data - Culvert 26	
Barrel Shape:	Circular	Tailwater Channel Option:	
Barrel Diameter:	4 x 1350.00 mm	Constant Tailwater Elevation	77.95 m
Barrel Material:	Concrete		
Barrel Manning's n:	0.0130		
Inlet Type:	Conventional		
Inlet Edge Condition:	Square Edge with Headwall		

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
12.30	12.30	78.51	1.504	2.509	4-FFf	0.638	0.938	1.350	2.950	2.148	0.000
12.84	12.84	78.56	1.558	2.559	4-FFf	0.654	0.958	1.350	2.950	2.243	0.000
13.38	13.38	78.61	1.613	2.612	4-FFf	0.671	0.976	1.350	2.950	2.337	0.000
13.92	13.92	78.67	1.670	2.667	4-FFf	0.687	0.995	1.350	2.950	2.432	0.000
14.46	14.46	78.72	1.729	2.723	4-FFf	0.702	1.013	1.350	2.950	2.526	0.000
14.76	14.76	78.76	1.762	2.755	4-FFf	0.711	1.024	1.350	2.950	2.578	0.000
15.55	15.55	78.84	1.854	2.843	4-FFf	0.734	1.051	1.350	2.950	2.715	0.000
16.09	16.09	78.91	1.920	2.907	4-FFf	0.750	1.069	1.350	2.950	2.810	0.000
16.63	16.63	78.97	1.988	2.972	4-FFf	0.765	1.085	1.350	2.950	2.904	0.000
17.17	17.17	79.04	2.059	3.040	4-FFf	0.781	1.098	1.350	2.950	2.999	0.000
17.71	17.71	79.11	2.133	3.109	4-FFf	0.797	1.112	1.350	2.950	3.093	0.000

Inlet Depression:	None		



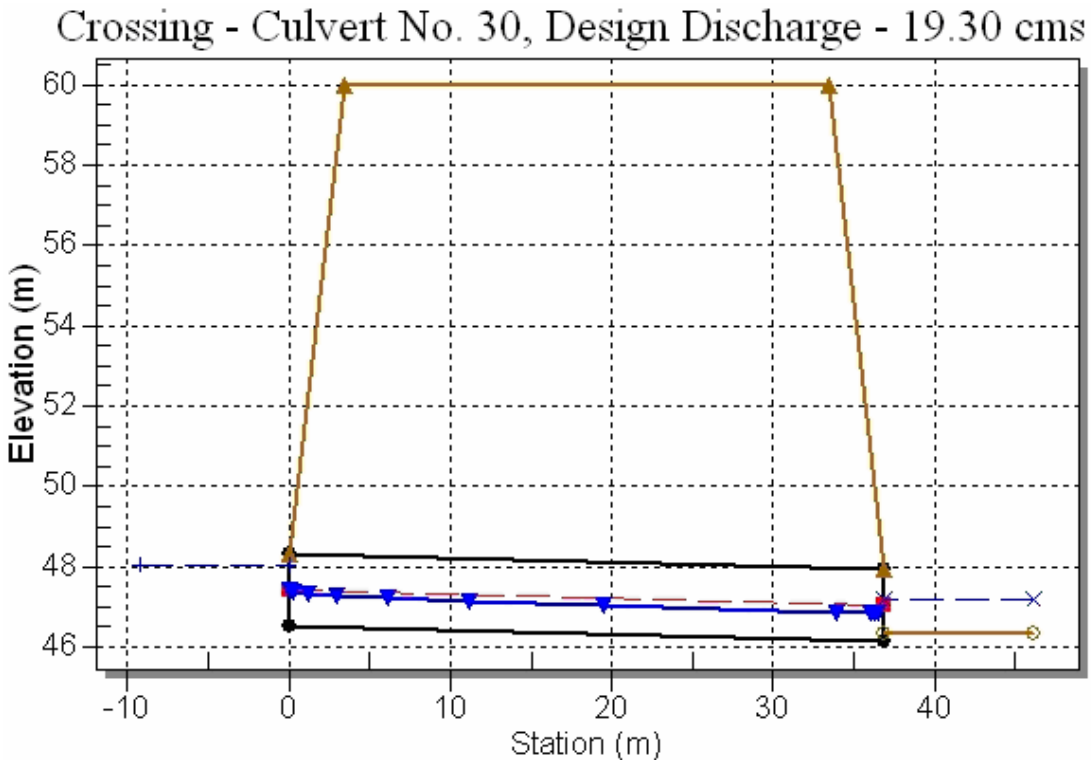
Inlet Elevation (invert): 76.10 m	*Outlet Elevation (invert):75.00m*	*Culvert Length: 68.72 m*	*Culvert Slope: 0.0160*

HY-8 Culvert 30 Analysis Report

Culvert Data Summary - Culvert 30		Tailwater Channel Data - Culvert 30	
Barrel Shape:	Concrete Box	Tailwater Channel Option:	Trapezoidal Channel
Barrel Span:	3 x 2400.00 mm	Bottom Width:	10.00 m
Barrel Rise:	1800.00 mm	Side Slope (H:V):	3.00 (_:1)
Barrel Material:	Concrete	Channel Slope:	0.0100
Embedment	0.00 mm	Channel Manning's n:	0.0400
Barrel Manning's n:	0.0130	Channel Invert Elevation:	46.35 m
Inlet Type:	Conventional		

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
12.30	12.30	78.53	1.504	2.429	4-FFf	0.637	0.938	1.350	2.950	2.148	0.000
12.84	12.84	78.58	1.558	2.481	4-FFf	0.654	0.958	1.350	2.950	2.243	0.000
13.38	13.38	78.64	1.613	2.536	4-FFf	0.670	0.976	1.350	2.950	2.337	0.000
13.92	13.92	78.69	1.670	2.592	4-FFf	0.686	0.995	1.350	2.950	2.432	0.000
14.46	14.46	78.75	1.729	2.651	4-FFf	0.702	1.013	1.350	2.950	2.526	0.000
14.76	14.76	78.78	1.762	2.684	4-FFf	0.711	1.024	1.350	2.950	2.578	0.000
15.55	15.55	78.88	1.854	2.776	4-FFf	0.733	1.051	1.350	2.950	2.715	0.000
16.09	16.09	78.94	1.920	2.841	4-FFf	0.749	1.069	1.350	2.950	2.810	0.000
16.63	16.63	79.01	1.988	2.909	4-FFf	0.765	1.085	1.350	2.950	2.904	0.000
17.17	17.17	79.08	2.059	2.979	4-FFf	0.780	1.098	1.350	2.950	2.999	0.000
17.71	17.71	79.15	2.133	3.051	4-FFf	0.796	1.112	1.350	2.950	3.093	0.000

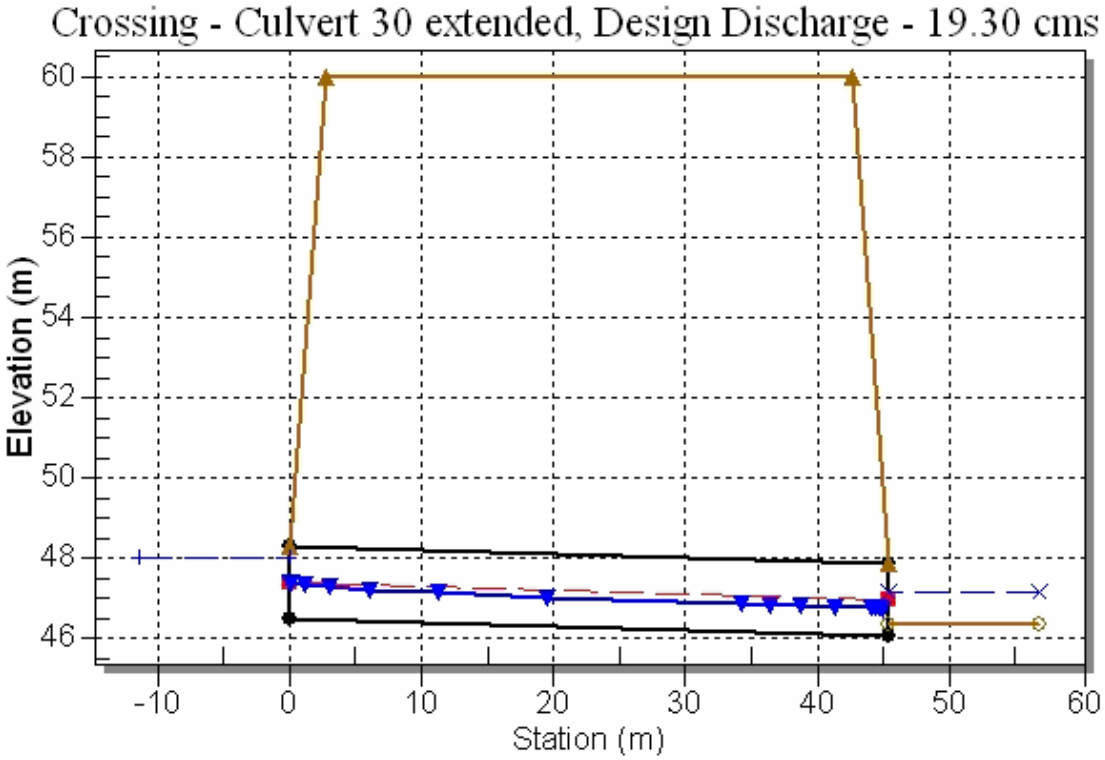
Inlet Edge Condition:	Square Edge 90°Headwall		
Inlet Depression:	None		



Inlet Elevation (invert): 46.50 m	*Outlet Elevation (invert):46.15m*	*Culvert Length: 36.90 m*	*Culvert Slope: 0.0095*

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
16.00	16.00	47.84	1.340	0.0*	1-S2n	0.561	0.797	0.598	0.731	3.716	1.796
16.72	16.72	47.88	1.379	0.0*	1-S2n	0.577	0.821	0.618	0.749	3.759	1.822
17.43	17.43	47.92	1.417	0.0*	1-S2n	0.594	0.844	0.637	0.767	3.801	1.847
18.15	18.15	47.96	1.456	0.0*	1-S2n	0.611	0.867	0.656	0.785	3.841	1.872
18.86	18.86	47.99	1.493	0.0*	1-S2n	0.627	0.890	0.674	0.802	3.885	1.895
19.30	19.30	48.02	1.516	0.0*	1-S2n	0.637	0.903	0.686	0.812	3.906	1.910
20.30	20.30	48.07	1.568	0.0*	1-S2n	0.661	0.934	0.712	0.836	3.958	1.941
21.01	21.01	48.11	1.605	0.0*	1-S2n	0.677	0.956	0.731	0.853	3.994	1.962
21.73	21.73	48.14	1.642	0.0*	1-S2n	0.694	0.977	0.749	0.869	4.030	1.984
22.44	22.44	48.18	1.679	0.0*	1-S2n	0.710	0.999	0.767	0.885	4.063	2.005
23.16	23.16	48.22	1.716	0.0*	1-S2n	0.727	1.020	0.785	0.901	4.096	2.024

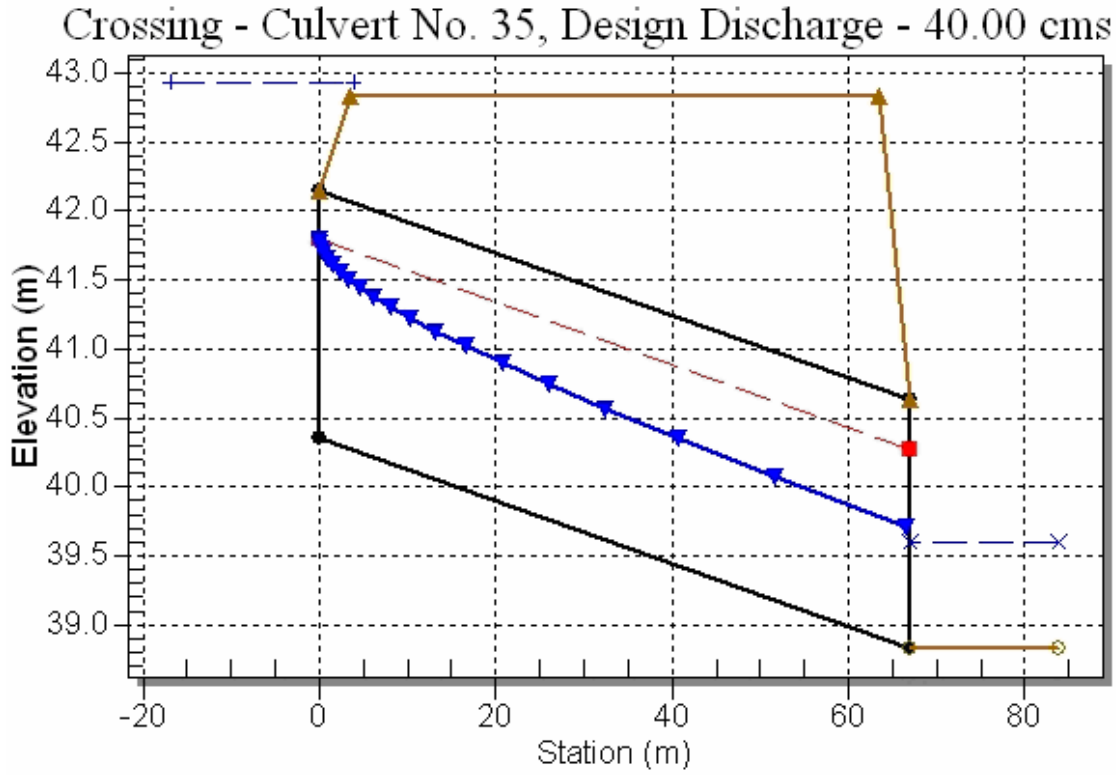
HY-8 Culvert 30 Extended Analysis Report			
Culvert Data Summary - Culvert 30		Tailwater Channel Data - Culvert 30	
Barrel Shape:	Concrete Box	Tailwater Channel Option:	Trapezoidal Channel
Barrel Span:	3 x 2400.00 mm	Bottom Width:	10.00 m
Barrel Rise:	1800.00 mm	Side Slope (H:V):	3.00 (_:1)
Barrel Material:	Concrete	Channel Slope:	0.0100
Barrel Manning's n:	0.0130	Channel Manning's n:	0.0400
Inlet Type:	Conventional	Channel Invert Elevation:	46.35 m
Inlet Edge Condition:	Square Edge 90°Headwall		
Inlet Depression:	None		



Inlet Elevation (invert): 46.50 m	*Outlet Elevation (invert):46.07m*	*Culvert Length: 45.44 m*	*Culvert Slope: 0.0095*

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
16.00	16.00	47.84	1.340	0.0*	1-S2n	0.561	0.797	0.590	0.731	3.766	1.796
16.72	16.72	47.88	1.379	0.0*	1-S2n	0.578	0.821	0.609	0.749	3.811	1.822
17.43	17.43	47.92	1.417	0.0*	1-S2n	0.594	0.844	0.628	0.767	3.858	1.847
18.15	18.15	47.96	1.456	0.0*	1-S2n	0.611	0.867	0.647	0.785	3.899	1.872
18.86	18.86	47.99	1.493	0.0*	1-S2n	0.628	0.890	0.665	0.802	3.939	1.895
19.30	19.30	48.02	1.516	0.0*	1-S2n	0.638	0.903	0.677	0.812	3.961	1.910
20.30	20.30	48.07	1.568	0.0*	1-S2n	0.661	0.934	0.702	0.836	4.013	1.941
21.01	21.01	48.11	1.605	0.0*	1-S2n	0.678	0.956	0.721	0.853	4.050	1.962
21.73	21.73	48.14	1.642	0.0*	1-S2n	0.694	0.977	0.738	0.869	4.086	1.984
22.44	22.44	48.18	1.679	0.0*	1-S2n	0.711	0.999	0.756	0.885	4.121	2.005
23.16	23.16	48.22	1.716	0.0*	1-S2n	0.727	1.020	0.774	0.901	4.158	2.024

HY-8 Culvert 35 Analysis Report			
Culvert Data Summary - Culvert 35		Tailwater Channel Data - Culvert 35	
Barrel Shape:	Concrete Box	Tailwater Channel Option:	Trapezoidal Channel
Barrel Span:	3 x 2400.00 mm	Bottom Width:	5.00 m
Barrel Rise:	1800.00 mm	Channel Slope:	0.0500
Barrel Material:	Concrete	Channel Manning's n:	0.0150
Barrel Manning's n:	0.0130	Channel Invert Elevation:	38.83 m
Inlet Type:	Conventional		
Inlet Edge Condition:	Square Edge 90°Headwall		
Inlet Depression:	None		



Inlet Elevation (invert): 40.35 m	*Outlet Elevation (invert):38.83m*	*Culvert Length: 67.02 m*	*Culvert Slope: 0.0227*

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
30.00	30.00	42.41	2.060	0.0*	5-S2n	0.640	1.212	0.705	0.634	5.909	9.464
32.00	32.00	42.52	2.168	0.0*	5-S2n	0.670	1.265	0.741	0.661	5.998	9.678

34.00	34.00	42.63	2.280	0.0*	5-S2n	0.700	1.317	0.777	0.688	6.077	9.883
36.00	36.00	42.75	2.395	0.0*	5-S2n	0.729	1.369	0.812	0.715	6.155	10.073
38.00	37.86	42.86	2.506	0.0*	5-S2n	0.755	1.415	0.845	0.740	6.222	10.265
40.00	39.00	42.93	2.577	0.0*	5-S2n	0.771	1.444	0.865	0.766	6.265	10.445
42.00	39.94	42.99	2.636	0.0*	5-S2n	0.784	1.467	0.881	0.791	6.295	10.621
44.00	40.78	43.04	2.690	0.0*	5-S2n	0.796	1.487	0.896	0.816	6.322	10.785
46.00	41.55	43.09	2.740	0.0*	5-S2n	0.806	1.506	0.909	0.840	6.352	10.948
48.00	42.27	43.14	2.788	0.0*	5-S2n	0.816	1.523	0.922	0.865	6.370	11.102
50.00	42.95	43.18	2.834	0.0*	5-S2n	0.826	1.540	0.933	0.889	6.394	11.254

Appendix C

MUSIC Modelling

Appendix C MUSIC Modelling

Approach Over

The Model for Urban Stormwater Improvement Conceptualisation (MUSIC – Version 3) has been utilised to simulate pollutant generation from stormwater runoff as well as the removal efficiencies of proposed stormwater treatment devices such as water quality basins. MUSIC allows the estimation of pollutant generation from different land uses and routes the stormwater pollutants through a user defined network of stormwater treatment measures or 'treatment train' to estimate the statistical distribution of pollutant loads and concentrations at any location within a drainage network. MUSIC determines if the proposed runoff treatment system can meet specified water quality objectives/criteria.

Note that MUSIC is not a detailed design tool as it does not contain the algorithms necessary for detailed sizing of structural stormwater quantity and/or quality facilities.

For the current exercise, the project area was assumed to comprise different types of runoff/pollutant catchment characteristics. The main type represents the motorway which is largely dominated by impervious road surfaces and the secondary type represents the adjoining pervious grassed or vegetated areas.

Flows from the motorway corridor have been analysed to estimate pollutant loads under the current motorway conditions as well as the proposed widened situation. The treatment performance of the existing water quality basins has also been analysed relative to the proposed basin modifications to establish the suitability of meeting the treatment objectives.

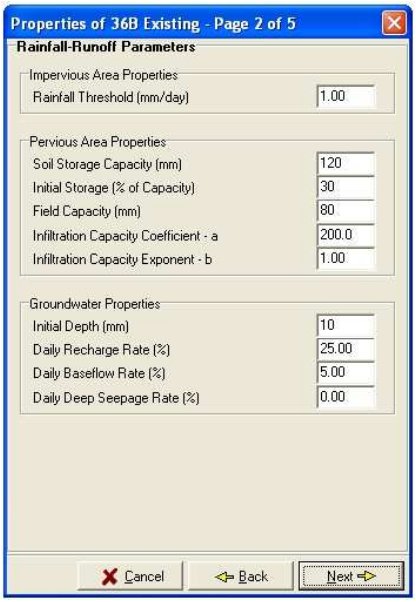
The following meteorological data have been utilised in the MUSIC modelling:

1. Rainfall Data: Sydney Observatory Pluviograph Chainage – 6 minute time step;
2. Period of Rainfall: 20 years from 1980 – 2001, and
3. Potential Evapo-Transpiration - PET: Sydney Monthly Arial PET has been selected from MUSIC template folder.

Adopted Base Parameters

Rainfall Runoff Properties - The MUSIC model for the M2 Motorway Upgrade was established using default hydrologic parameters for the rainfall -runoff due to a lack of existing data. The rainfall-runoff parameters extracted from MUSIC and shown in Figure C-1 have been applied.

Figure C-11 Rainfall Runoff Parameters



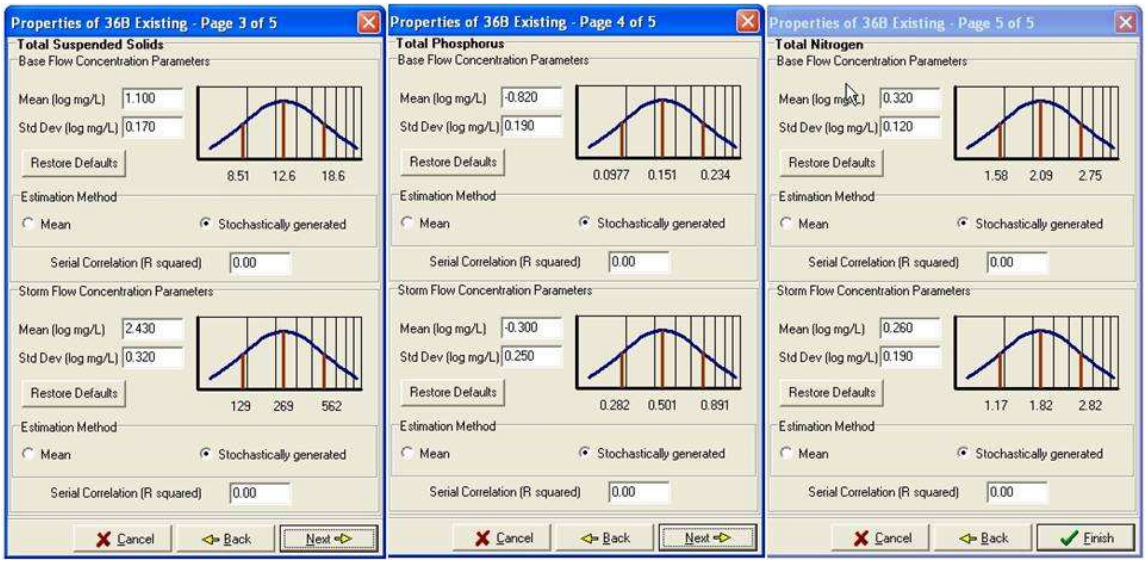
Pollutant Generation Characteristics for Selected Source Nodes - The base flow and storm flow concentration parameters applied in the MUSIC model established for the M2 Motorway are summarised in Figure C-2.

Note that for all simulations the pollutant export estimation method has been set to “stochastically generated” as per the guidelines.

Source Nodes - The Source Nodes are used to define the characteristics of the contributing catchments. (i.e. area, landuse, pollutant load generation). MUSIC Version 3 has five land uses to choose from, these being Forested, Agricultural, Rural Residential, Urban Residential, Commercial and Industrial. However, none of these relate specifically to the nature of conditions associated with roads/highways/motorways.

Therefore, landuse characteristics corresponding to the “Roads” classification in Tables 6 & 7 of Gold Coast City Council’s (GCCC) ‘MUSIC Modelling Guidelines’ (2006) were translated into the MUSIC model data sets for the purposes of establishing the Motorway Upgrade models. The adjoining pervious or vegetated catchments within the motorway corridor have been classified as a mixture of Agricultural and Forested

Figure C-12 Pollutant Concentration Parameters



Summary of MUSIC RESULTS																
		Source					Residual Load					% Reduction				
		Flow (ML/y)	TSS (kg/y)	TP (kg/y)	TN (kg/y)	GP (kg/y)	Flow (ML/y)	TSS (kg/y)	TP (kg/y)	TN (kg/y)	GP (kg/y)	Flow (ML/y)	TSS (kg/y)	TP (kg/y)	TN (kg/y)	GP (kg/y)
8B	**existing**	17.2	5610	9.67	34.7	439	16.8	816	3.01	27.8	0	2.3	85.4	68.8	20	100
	proposed	28	9600	16.2	56.1	709	27.6	1820	5.65	46.9	0	1.4	81.1	65.1	16.3	100
	designed	28	9390	16	56.4	709	27.5	1370	4.98	45.8	0	1.7	85.4	68.9	18.7	100
12B	**existing**	25.9	8840	14.9	52	656	25.6	1740	5.27	43.6	0	1.3	80.3	64.5	16.1	100
	proposed	28.7	9760	16.6	57.5	727	28.4	2030	6.08	48.6	0	1.1	79.2	63.3	15.4	100
	designed	28.7	9710	16.5	58.3	727	28.4	1860	5.82	48.7	0	1.2	80.9	64.6	16.4	100
13B	**existing**	30.3	10100	17.2	60.8	771	30.1	2910	7.56	52.2	0	0.7	71.3	56.1	14.2	100
	proposed	33.2	11000	18.5	66.7	847	33	3320	8.37	57.6	0	0.6	69.7	54.8	13.7	100
	designed	33.2	10800	18.4	67	847	33	2980	7.92	56.9	0	0.6	72.3	57	14.9	100
23B	**existing**	27.2	9490	16	54.7	677	26.9	2160	6.1	46	0	1.2	77.2	61.8	15.9	100
	proposed	28.8	10100	16.9	57.6	716	28.5	2370	6.55	48.7	0	1.1	76.5	61.2	15.4	100
	designed	28.8	9960	16.8	58	716	28.5	2230	6.37	48.6	0	1.2	77.6	62.1	16.2	100
25B	**existing**	25.8	8990	15.2	51.5	641	25.5	1660	5.18	42.7	0	1.1	81.5	65.8	17.1	100
	proposed	27.6	9690	16.3	55.3	685	27.3	1890	5.73	46	0	1.1	80.5	64.8	16.8	100
	designed	27.6	9620	16.2	55.2	685	27.3	1800	5.52	45.8	0	1.1	81.3	65.9	17	100
30B	**existing**	20.7	7190	12.1	41.8	515	20.4	1090	3.8	34.5	0	1.8	84.8	68.6	17.6	100
	proposed	28.7	9930	16.70	57.2		28.3	1870	5.80	48.4	0	1.3	81.1	65.3	15.3	100
	designed	28.7	10000	16.8	57.3	712	28.2	1520	5.25	47.3	0	1.6	84.8	68.8	17.4	100
33B	**existing**	13.6	4720	7.92	27.4	341	13.4	708	2.45	21.6	0	2.1	85	69.1	21.1	100
	proposed	16.3	5630	9.48	32.6	406	16	942	3.08	26.2	0	1.8	83.3	67.5	19.7	100
	designed	16.3	5580	9.44	32.4	406	15.9	842	2.92	25.8	0	1.9	84.9	69.1	20.6	100
35B	**existing**	9.07	3120	5.28	18.1	228	8.92	568	1.8	15	0	1.6	81.8	65.9	17.1	100
	proposed	13.4	4660	7.84	26.9		13.3	1100	3.05	22.9	0	1.1	76.5	61.1	14.7	100
	designed	13.4	4680	7.85	26.9	336	13.3	868	2.7	22.4	0	1.3	81.5	65.6	16.8	100
36B	**existing**	15	5150	8.69	30.1	377	14.5	620	2.43	22.9	0	3.3	87.9	72.1	23.8	100
	proposed	23.6	8040	13.6	47.4	594	23.1	1320	4.4	37.7	0	2	83.6	67.7	20.4	100
	designed	23.6	8040	13.6	47.4	594	23.0	985	3.85	36.4	0	2.5	87.7	71.7	23.3	100

Sensitivity Analysis Basin 8b

	Extended Depth	Avg Surface Area	Total Volume	Source					Residual Load					% Reduction				
Assumed Sensitivity Conditions	**(m)**	**(m2)**	**(m3)**	**Flow ML/y**	**TSS kg/y**	**TP kg/y**	**TN kg/y**	**GP kg/y**	**Flow ML/y**	**TSS kg/y**	**TP kg/y**	**TN kg/y**	**GP kg/y**	**Flow ML/y**	**TSS kg/y**	**TP kg/y**	**TN kg/y**	**GP kg/y**
Existing Conditions	1.8	435	978	17.2	5610	9.67	34.7	439	16.8	816	3.01	27.8	0	2.3	85.4	68.8	20	100
Proposed Catchment	1.8	435	978	28	9390	15.9	56	709	27.6	1750	5.56	47	0	1.4	81.3	65	16.1	100
Extended depth increased 0.5m	2.3	490	1338	28	9390	15.9	56	709	27.5	1520	5.2	46.3	0	1.6	83.8	67.3	17.3	100
Extended depth increased 1.0m	2.8	544	1754	28	9390	15.9	56	709	27.5	1370	4.95	45.7	0	1.7	85.5	68.9	18.4	100
Basin Area increased +25%	1.8	649	1223	28	9390	15.9	56	709	27.5	1510	5.16	45.9	0	1.7	84	67.6	18	100
Basin Area increased +50%	1.8	778	1472	28	9390	15.9	56	709	27.4	1340	4.88	45	0	2.1	85.8	69.3	19.6	100
Extended depth +0.3mm with permanent depth +0.2mm (permanent vol +35%)	2.1	499	1338	28	9390	15.9	56	709	27.5	1540	5.22	46.2	0	1.6	83.6	67.2	17.5	100

Treatment Efficiencies for Basin Modifications

Modifications required to satisfy Existing treatment effectiveness

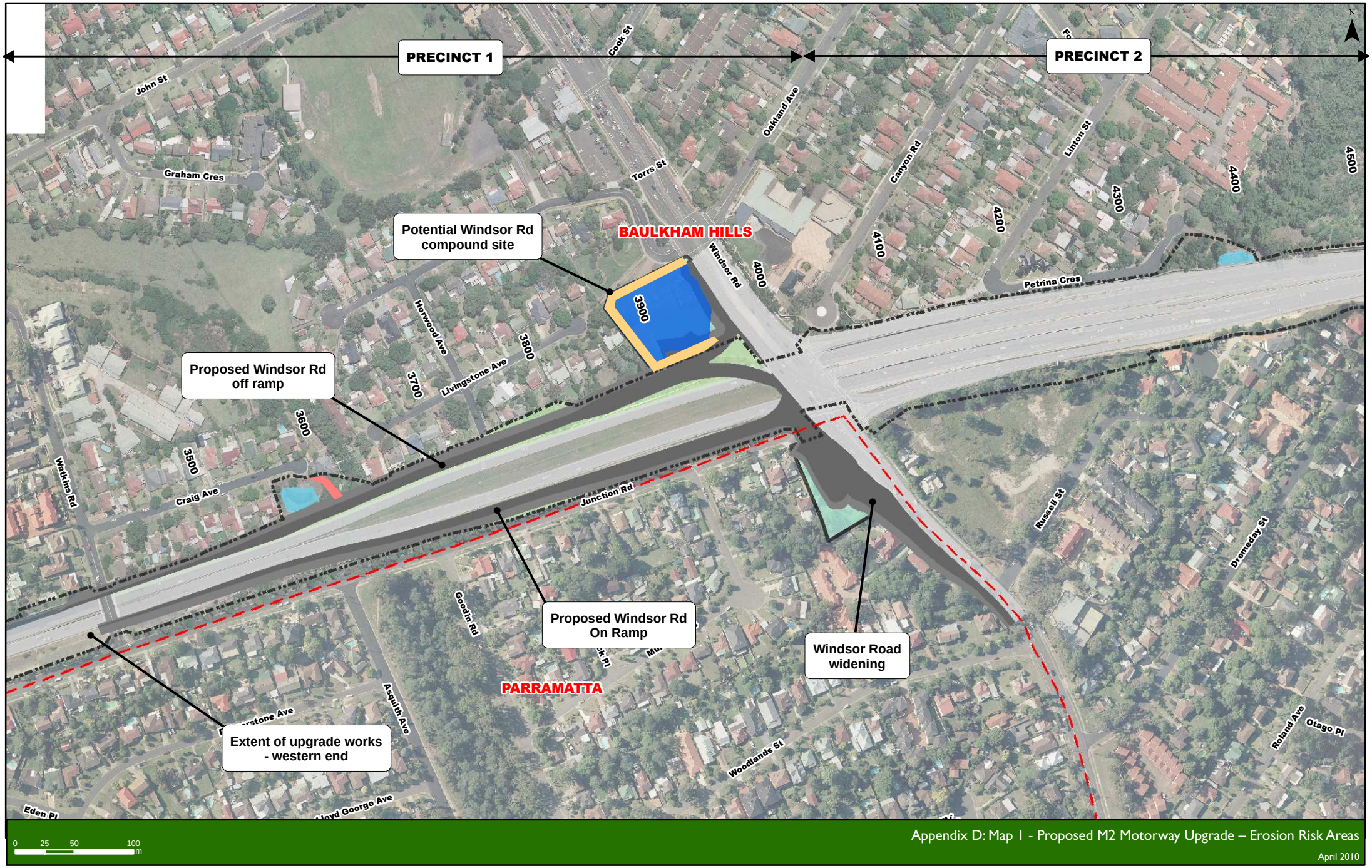
BASIN	CATCHMENT CHARACTERISTICS										BASIN CHARACTERISTICS used in MUSIC modelling									Treatment Effectiveness - Pollutant Reduction						Proposed basin modifications to satisfy required pollutant reduction					
	Existing Conditions				Proposed Widening						Levels			Storage Depths				Volumes		Existing Catchment			Proposed Design			Depth			Volume		
	Total	Imperv.	Perv.	% Imperv.	Total	Imperv.	Perv.	% Imperv.	Increase in total area	Est. Vol recd as 2% of area	Invert	Perm. (TWL)	Max. (MWL)	Perm.	Extend.	Total	average surface area	orifice diameter	Perm.	max basin	TSS	TP	TN	TSS	TP	TN	Additional extended	new total	Increase	New Proposed max	Increase	% of catch area
	[ha]	[ha]	[ha]	[%]	[ha]	[ha]	[ha]	[%]	[%]	[m3]	mAHD	mAHD	mAHD	[m]	[m]	[m]		[mm]	[m3]	[m3]	[%]	[%]	[%]	[%]	[%]	[%]	[m]	[m]	[%]	[m3]	[%]	[%]
8B	2.06	1.44	0.62	70	3.12	2.5	0.62	80	51.5	624	66.4	67	68.8	0.6	1.8	2.4	435	55	194	978	85.4	68.8	19.8	81.1	65.1	16.3	1.00	3.40	42	1754	79	5.6
12B	2.88	2.36	0.52	82	3.18	2.57	0.61	81	10.4	636	58.4	59	60.8	0.6	1.8	2.4	371	45	118	786	80.3	64.5	16.1	79.2	63.3	15.4	0.25	2.65	10	937	19	2.9
13B	3.5	2.63	0.87	75	3.95	2.79	1.16	71	12.9	790	76.2	76.8	77.5	0.6	0.7	1.3	365	25	80	328	71.3	56.1	14.2	69.7	54.8	13.7	0.20	1.60	15	433	32	1.1
23B	2.76	2.59	0.17	94	2.92	2.74	0.18	94	5.8	584	83.1	83.9	84.9	0.8	1.0	1.8	376	30	190	566	77.3	62.1	15.9	76	60.9	15.5	0.15	1.95	8	636	12	2.2
25B	2.6	2.47	0.13	95	2.78	2.64	0.14	95	6.9	556	76.8	77.7	80	0.9	2.3	3.2	335	30	180	950	81.5	65.8	17.1	80.5	64.8	16.8	0.20	3.40	6	1056	11	3.8
30B	2.09	1.99	0.1	95	2.89	2.75	0.15	95	38.3	578	53.2	53.8	55.5	0.6	1.7	2.3	426	55	192	916	84.8	68.6	17.6	81.1	65.3	15.3	0.80	3.10	35	1508	65	5.2
33B	1.42	1.27	0.15	90	1.67	1.53	0.14	92	17.6	334	56.9	57.8	59	0.9	1.2	2.1	332	25	209	608	86	68.1	21.1	83.3	67.5	19.7	0.35	2.45	17	750	23	4.5
35C	0.97	0.84	0.14	86	1.39	1.27	0.12	91	43.3	278	39.2	40	41	0.8	1.0	1.8	176	30	76	252	81.8	66.9	17.1	76.5	61.1	14.7	0.7	2.50	39	428	70	3.1
38B	1.6	1.38	0.22	86	2.54	2.15	0.4	85	58.8	508	34.7	35.4	36.5	0.7	1.1	1.8	445	33	205	695	87.9	72.1	23.8	83.6	67.7	20.4	0.90	2.70	50	1528	120	6.0

Modifications required to satisfy ARQ pollutant reduction objectives:
TSS=80%, TP=45%, TN=45%

BASIN	CATCHMENT CHARACTERISTICS										BASIN CHARACTERISTICS used in MUSIC modelling									Treatment Effectiveness - Pollutant Reduction						Proposed basin modifications to satisfy required pollutant reduction					
	Existing Conditions				Proposed Widening						Levels			Storage Depths				Volumes		Existing Catchment			Proposed Design			Depth			Volume		
	Total	Imperv.	Perv.	% Imperv.	Total	Imperv.	Perv.	% Imperv.	Increase in total area	Est. Vol recd as 2% of area	Invert	Perm. (TWL)	Max. (MWL)	Perm.	Extend.	Total	average surface area	orifice diameter	Perm.	max basin	TSS	TP	TN	TSS	TP	TN	Additional extended	new total	Increase	New Proposed max	Increase	% of catch area
	[ha]	[ha]	[ha]	[%]	[ha]	[ha]	[ha]	[%]	[%]	[m3]	mAHD	mAHD	mAHD	[m]	[m]	[m]		[mm]	[m3]	[m3]	[%]	[%]	[%]	[%]	[%]	[%]	[m]	[m]	[%]	[m3]	[%]	[%]
8B	2.06	1.44	0.62	70	3.12	2.5	0.62	80	51.5	624	66.4	67	68.8	0.6	1.8	2.4	435	55	194	978	85.4	68.8	19.8	81.1	65.1	16.3	0	2.40	0	978	0	3.1
12B	2.88	2.36	0.52	82	3.18	2.57	0.61	81	10.4	636	58.4	59	60.8	0.6	1.8	2.4	371	45	118	786	80.3	64.5	16.1	79.9	64	15.8	0.20	2.60	8	889	13	2.8
13B	3.5	2.63	0.87	75	3.95	2.79	1.16	71	12.9	790	76.2	76.8	77.5	0.6	0.7	1.3	365	25	80	328	71.3	56.1	14.2	80	64.4	19.2	1.10	2.40	85	1057	222	2.7
23B	2.76	2.59	0.17	94	2.92	2.74	0.18	94	5.8	584	83.1	83.9	84.9	0.8	1.0	1.8	376	30	190	566	77.3	62.1	15.9	80	64.3	17.2	0.50	2.30	28	812	43	2.8
25B	2.6	2.47	0.13	95	2.78	2.64	0.14	95	6.9	556	76.8	77.7	80	0.9	2.3	3.2	335	30	180	950	81.5	65.8	17.1	80.5	64.8	16.8	0	3.20	0	960	0	3.4
30B	2.09	1.99	0.1	95	2.89	2.75	0.15	95	38.3	578	53.2	53.8	55.5	0.6	1.7	2.3	426	55	192	916	84.8	68.6	17.6	81.1	65.3	15.3	0	2.30	0	916	0	3.2
33B	1.42	1.27	0.15	90	1.67	1.53	0.14	92	17.6	334	56.9	57.8	59	0.9	1.2	2.1	332	25	209	608	86	68.1	21.1	83.3	67.5	19.7	0	2.10	0	608	0	3.6
35C	0.97	0.84	0.14	86	1.39	1.27	0.12	91	43.3	278	39.2	40	41	0.8	1.0	1.8	176	30	76	252	81.8	66.9	17.1	80.4	64.5	16.1	0.5	2.30	28	373	48	2.7
38B	1.6	1.38	0.22	86	2.54	2.15	0.4	85	58.8	508	34.7	35.4	36.5	0.7	1.1	1.8	445	33	205	695	87.9	72.1	23.8	83.6	67.7	20.4	0	1.80	0	695	0	2.7

Appendix D

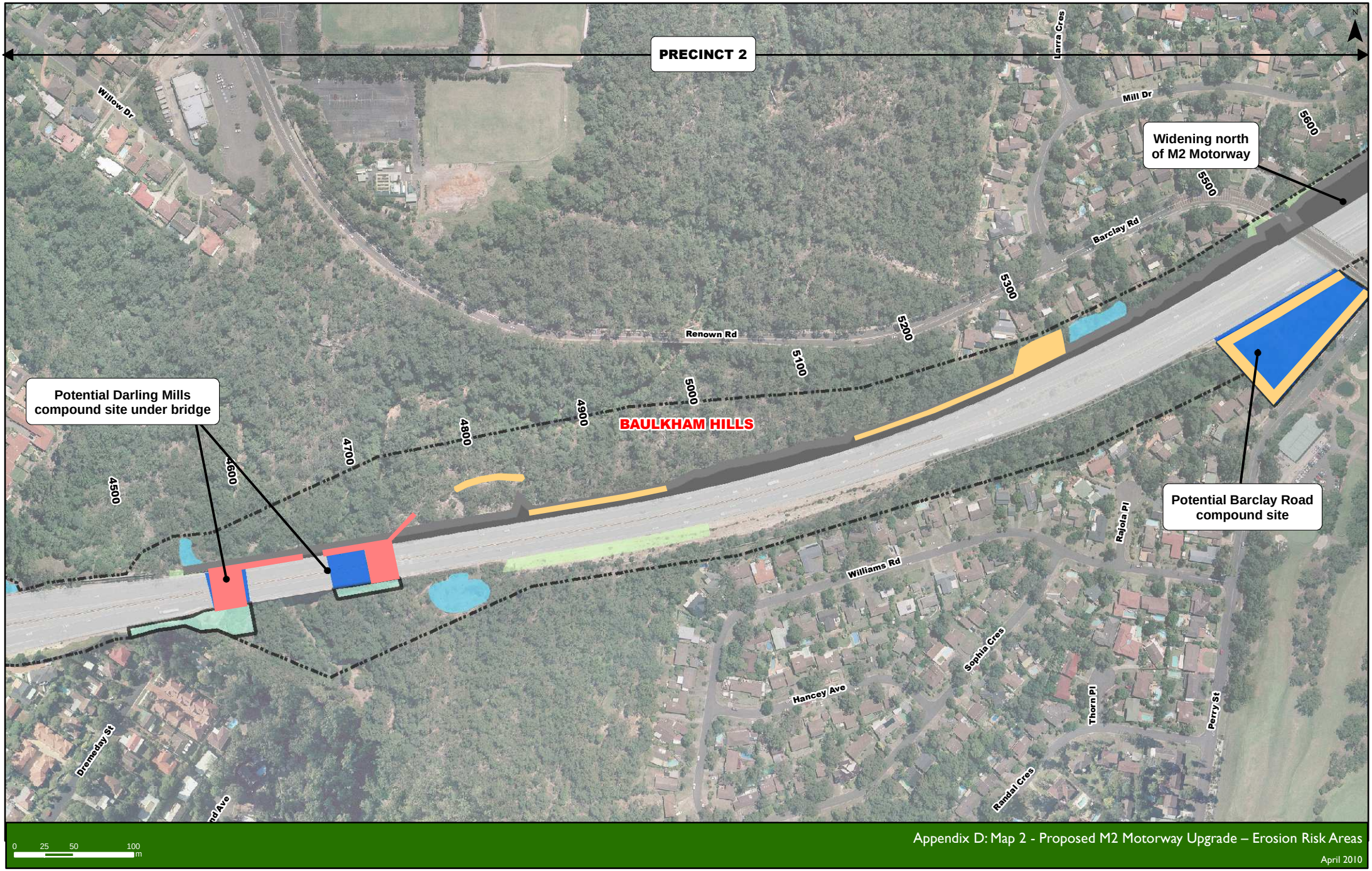
Maps of Erosion Potential



Appendix D: Map 1 - Proposed M2 Motorway Upgrade – Erosion Risk Areas

April 2010

- Existing Motorway Carriageway
- Proposed Upgrade
- M2 Motorway Corridor (Lease Boundary)
- Indicative Cleared Area
- Temporary Clearing
- Indicative Site Compounds
- High Risk Erosion Areas
- Low Risk Erosion Areas
- LGA Boundary
- Existing Basin

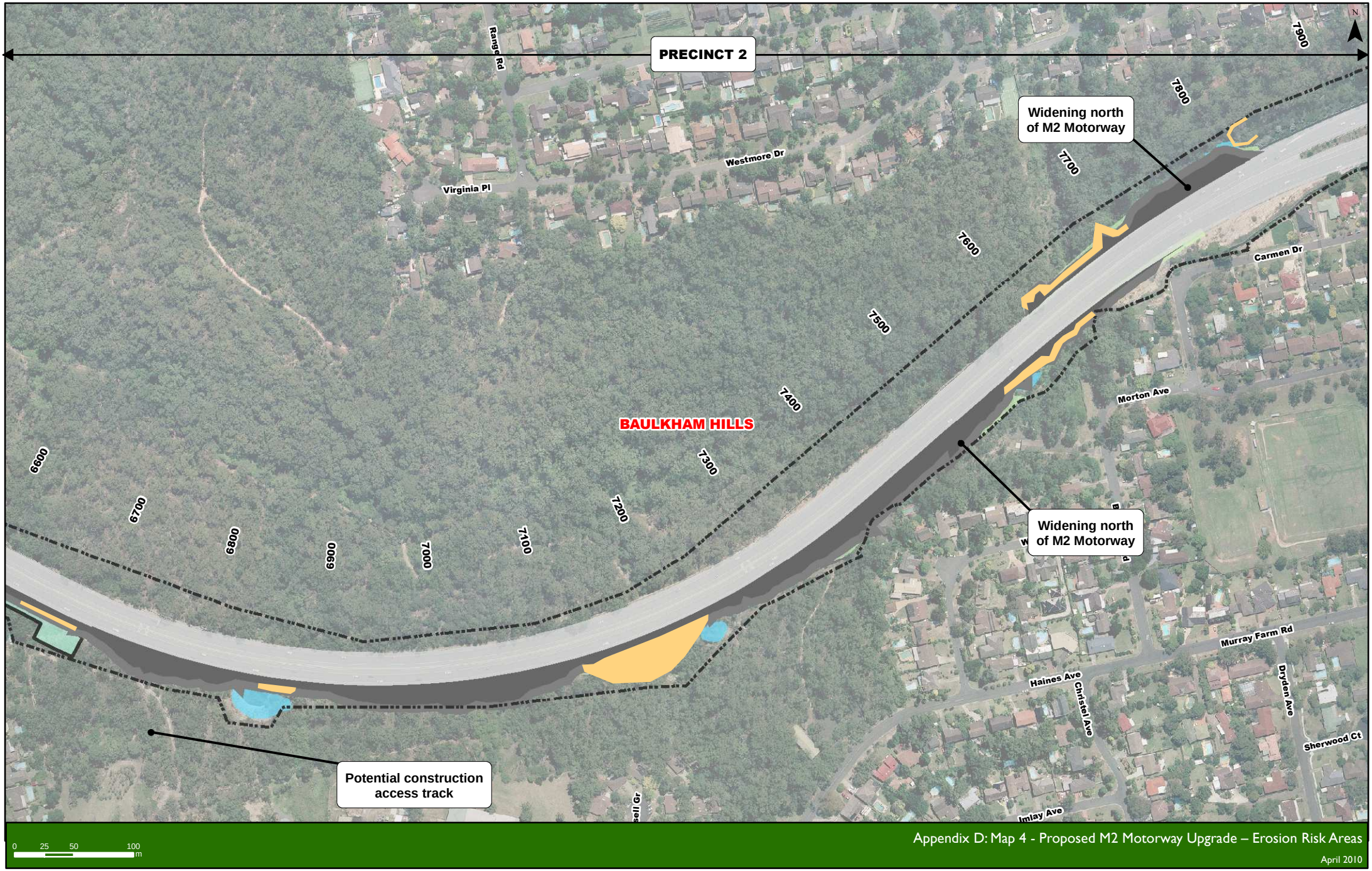


Appendix D: Map 2 - Proposed M2 Motorway Upgrade – Erosion Risk Areas

April 2010

- Existing Motorway Carriageway
- Proposed Upgrade
- M2 Motorway Corridor (Lease Boundary)
- Indicative Cleared Area
- Temporary Clearing
- Indicative Site Compounds
- High Risk Erosion Areas
- Low Risk Erosion Areas
- LGA Boundary
- Existing Basin

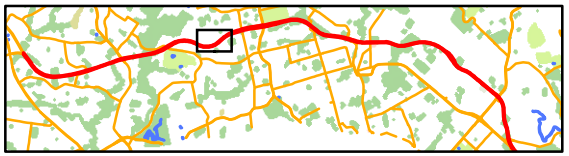

PRECINCT 2
N
Widening north of M2 Motorway
Widening north of M2 Motorway
BAULKHAM HILLS
Potential Darling Mills compound site under bridge
Eather Ave
Alderson Ave
Larra Cres
Raine Ave
Mill Dr
Dale Pl
Carlton Rd
Hepburn Rd
Glenda Pl
Barclay Rd
Perry St
Yale Cl
Arley Pl
5600
5700
5800
5900
6000
6100
6200
6300
6400
6500
6600
0 25 50 100 m
Appendix D: Map 3 - Proposed M2 Motorway Upgrade – Erosion Risk Areas
April 2010
Existing Motorway Carriageway
Proposed Upgrade
M2 Motorway Corridor (Lease Boundary)
Indicative Cleared Area
Temporary Clearing
Indicative Site Compounds
High Risk Erosion Areas
Low Risk Erosion Areas
LGA Boundary
Existing Basin

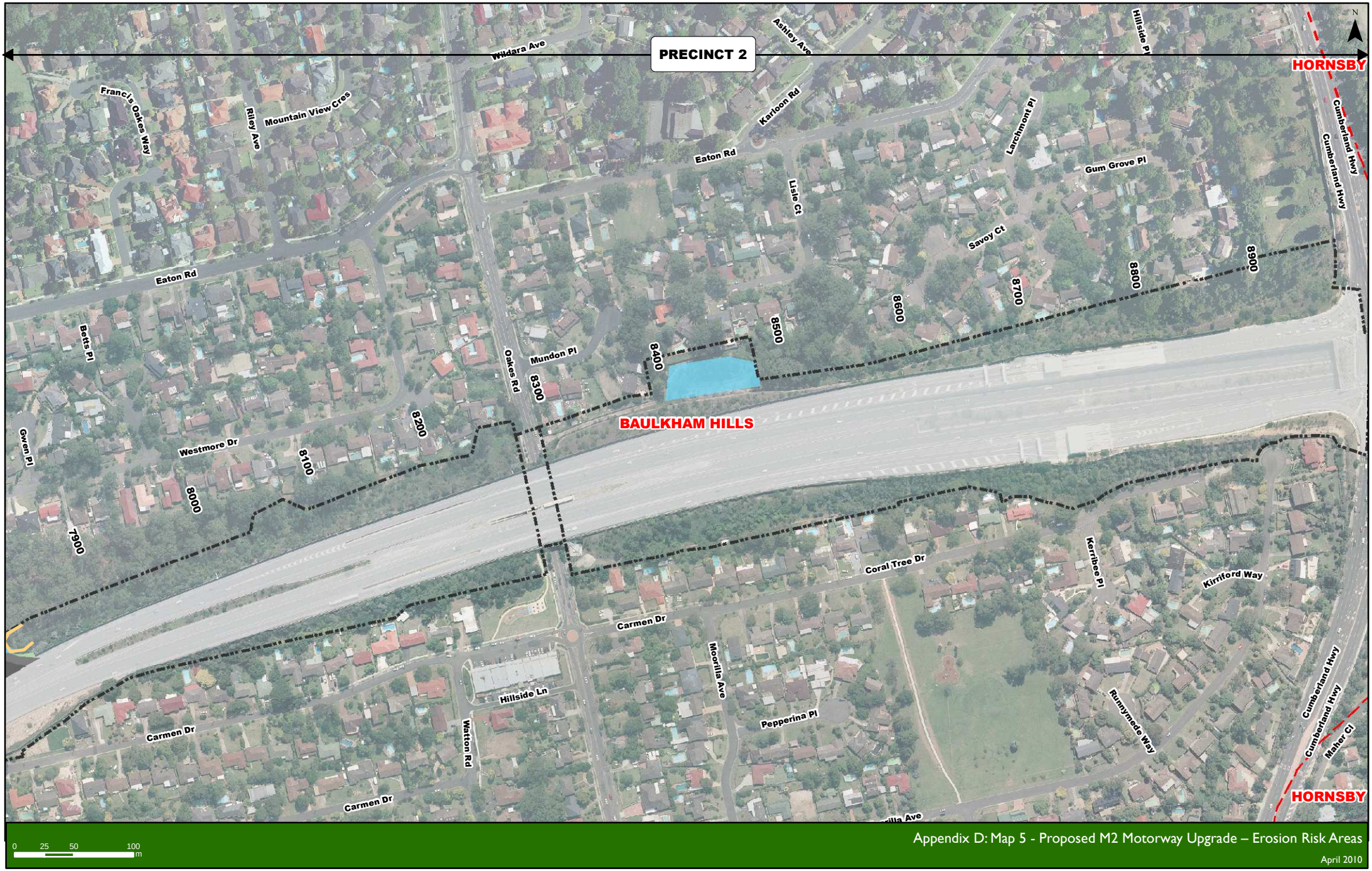


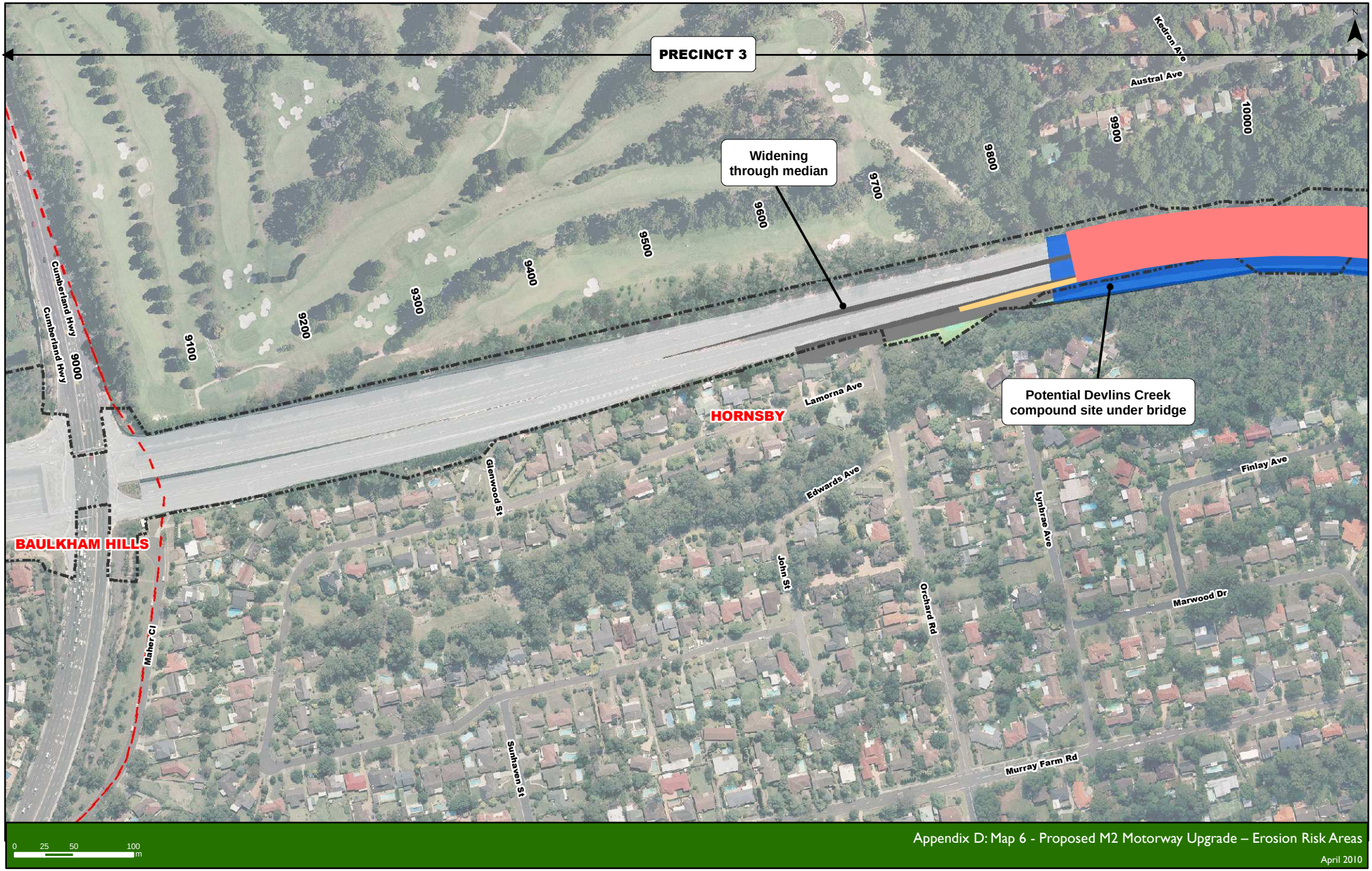
Appendix D: Map 4 - Proposed M2 Motorway Upgrade – Erosion Risk Areas

April 2010

- Existing Motorway Carriageway
- Proposed Upgrade
- M2 Motorway Corridor (Lease Boundary)
- Indicative Cleared Area
- Temporary Clearing
- Indicative Site Compounds
- High Risk Erosion Areas
- Low Risk Erosion Areas
- LGA Boundary
- Existing Basin



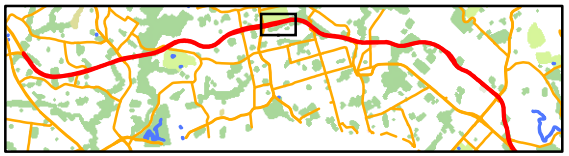

PRECINCT 2
HORNSBY
BAULKHAM HILLS
HORNSBY
N
Wildara Ave
Ashley Ave
Hillside Pl
Francis Oakes Way
Riley Ave
Mountain View Cres
Karloon Rd
Larchmont Pl
Cumberland Hwy
Eaton Rd
Lisle Ct
Gum Grove Pl
Savoy Ct
Betts Pl
Oakes Rd
Mundon Pl
8900
8800
8700
8600
8500
8400
8300
8200
8100
8000
7900
Gwen Pl
Westmore Dr
Coral Tree Dr
Kerribee Pl
Kirriford Way
Carmen Dr
Moorilla Ave
Hillside Ln
Pepperina Pl
Runnymede Way
Watton Rd
Mather Cl
0 25 50 100 m
Appendix D: Map 5 - Proposed M2 Motorway Upgrade – Erosion Risk Areas
April 2010
Existing Motorway Carriageway
Proposed Upgrade
M2 Motorway Corridor (Lease Boundary)
Indicative Cleared Area
Temporary Clearing
Indicative Site Compounds
High Risk Erosion Areas
Low Risk Erosion Areas
LGA Boundary
Existing Basin

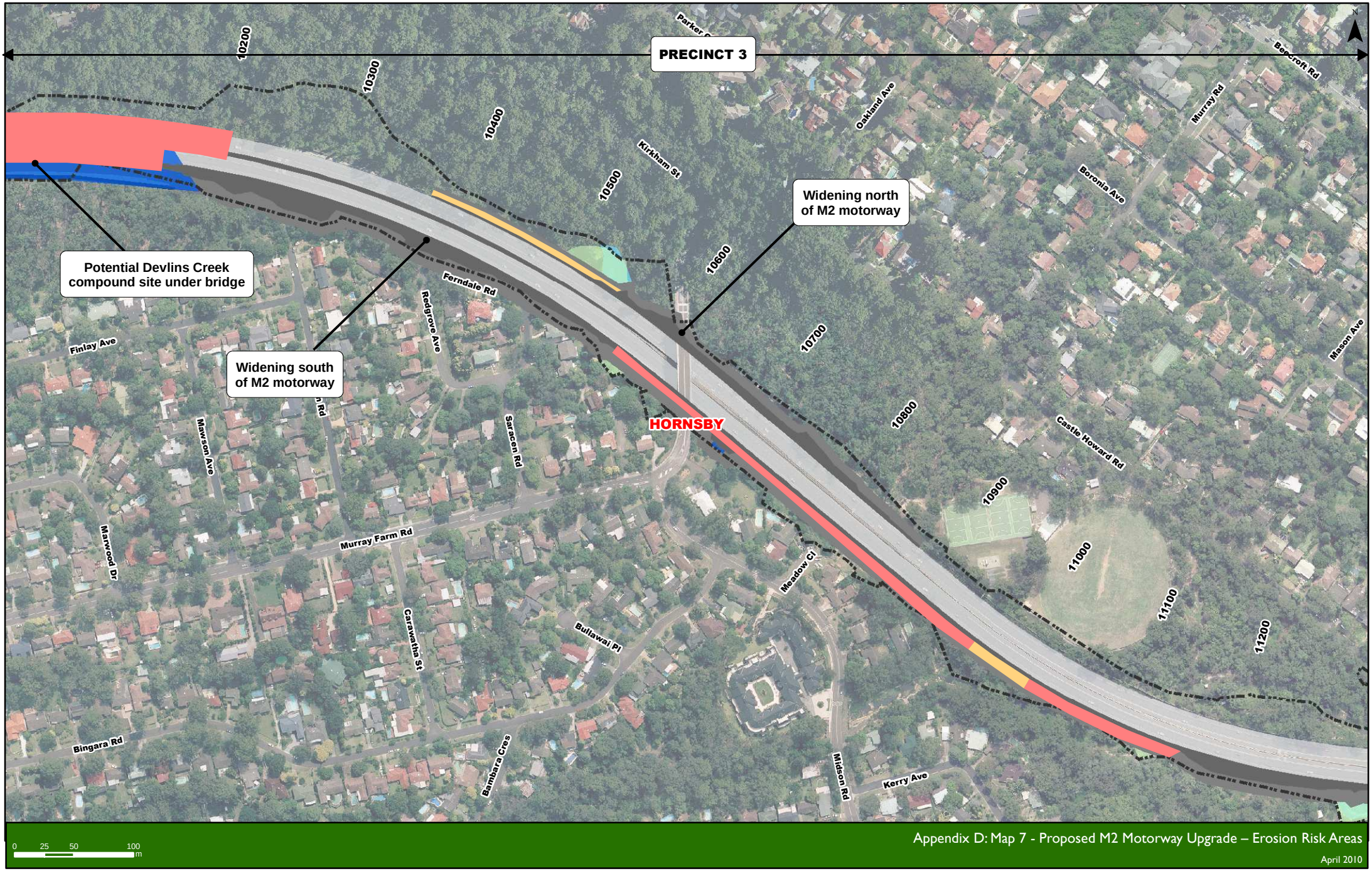


Appendix D: Map 6 - Proposed M2 Motorway Upgrade – Erosion Risk Areas

April 2010

- Existing Motorway Carriageway
- Proposed Upgrade
- M2 Motorway Corridor (Lease Boundary)
- Indicative Cleared Area
- Temporary Clearing
- Indicative Site Compounds
- High Risk Erosion Areas
- Low Risk Erosion Areas
- LGA Boundary
- Existing Basin

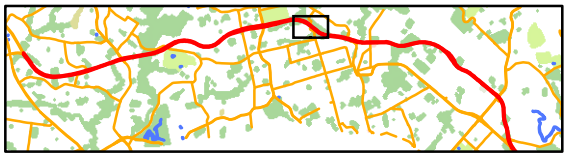




Appendix D: Map 7 - Proposed M2 Motorway Upgrade – Erosion Risk Areas

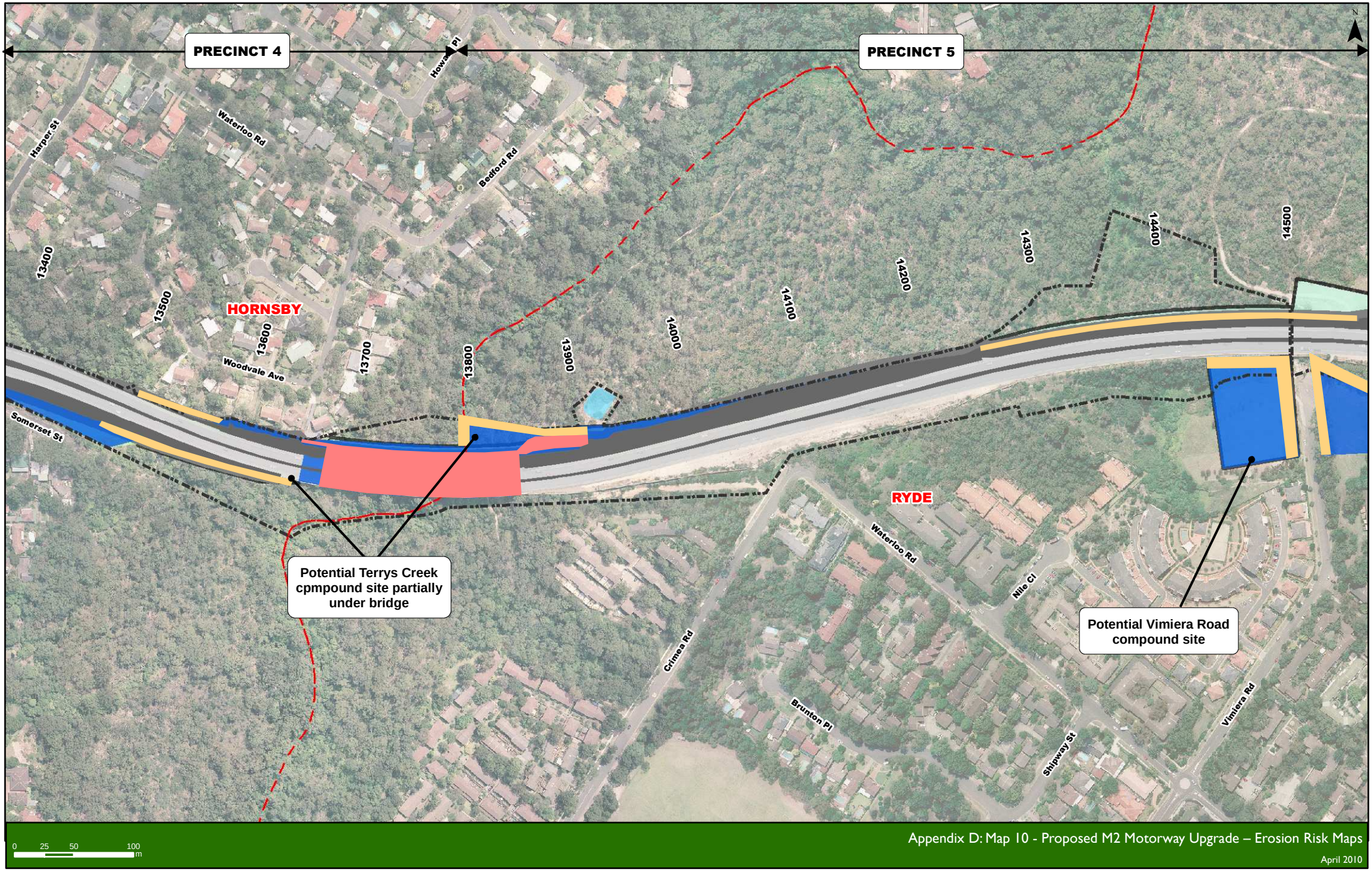
April 2010

- Existing Motorway Carriageway
- Proposed Upgrade
- M2 Motorway Corridor (Lease Boundary)
- Indicative Cleared Area
- Temporary Clearing
- Indicative Site Compounds
- High Risk Erosion Areas
- Low Risk Erosion Areas
- LGA Boundary
- Existing Basin




PRECINCT 3
PRECINCT 4
HORNSBY
Widening through median
Potential Barambah Road compound site
Potential Beecroft Road (old bus ramp) compound site
Redmill Cl
Boronia Ave
Cheltenham Rd
Boronia Pl
Lyne Rd
Sutherland Rd
Castle Howard Rd
Old Beecroft Rd
The Crescent
Overpass
Stewart Cl
Wycombe St
Barambah Rd
Beecroft Rd
Kent St
Windermere Rd
Romford Rd
Dunmore Rd
Treeview Pl
Wingrove Ave
Tarragundi Rd
Kawana Cl
Kandy Ave
Canberra
11400
11500
11600
11700
11800
11900
12000
12100
12200
12300
0 25 50 100 m
Appendix D: Map 8 - Proposed M2 Motorway Upgrade – Erosion Risk Areas
April 2010
Existing Motorway Carriageway
Proposed Upgrade
M2 Motorway Corridor (Lease Boundary)
Indicative Cleared Area
Temporary Clearing
Indicative Site Compounds
High Risk Erosion Areas
Low Risk Erosion Areas
LGA Boundary
Existing Basin

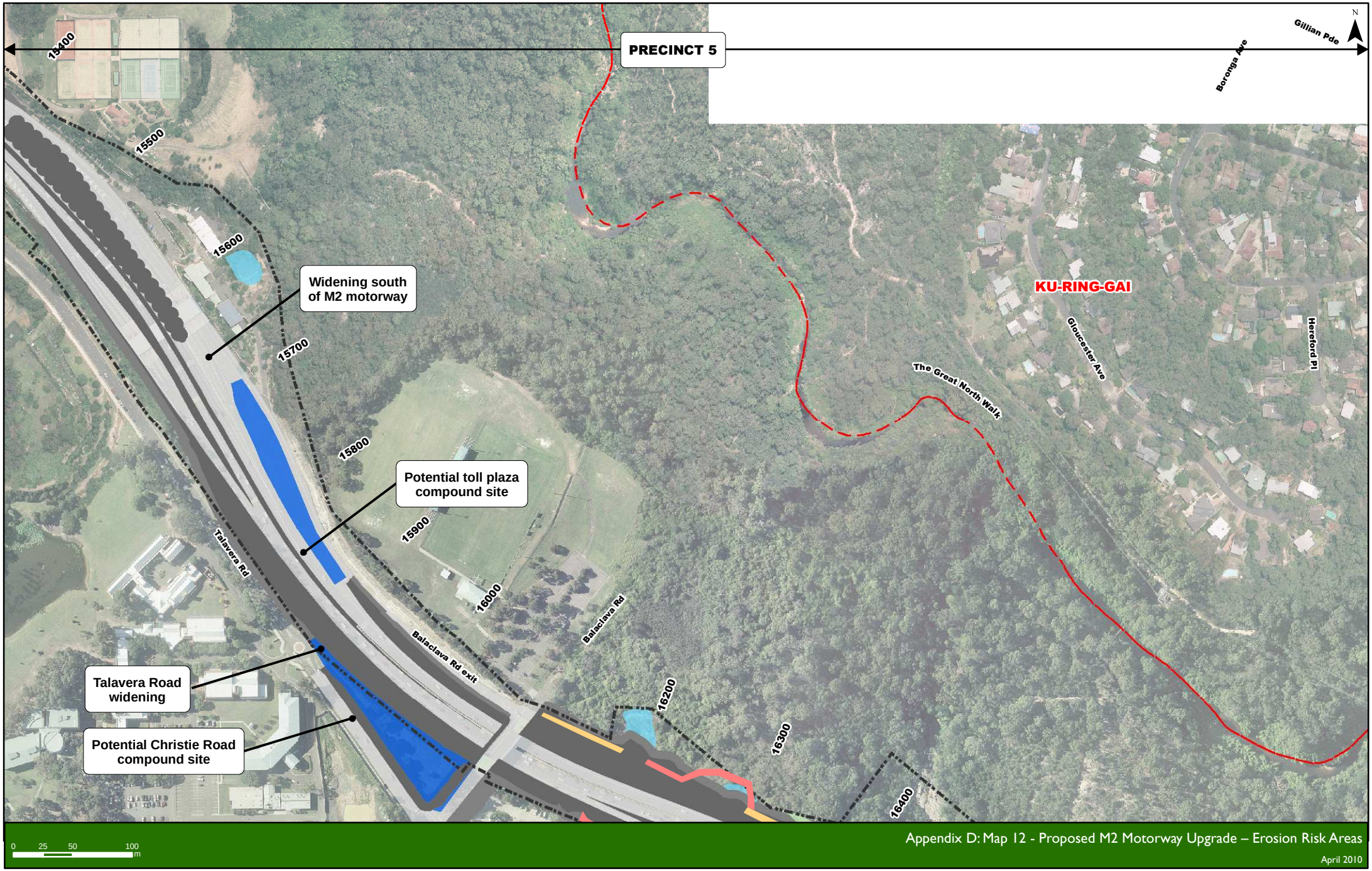

PRECINCT 4
Potential Beecroft Road (old bus ramp) compound site
Widening north of M2 motorway
Widening of Norfolk Tunnel to north and south
Widening south of M2 Motorway
HORNSBY
Kirkwood Ave
Grigg Ave
Holland St
Roma St
Waterloo Rd
Grayson Rd
Devon St
Harper St
Gregory Ave
Sutherland Rd
Callistemon Cl
Constance Cl
Norfolk Rd
Somerset St
Dorset St
Gloucester Rd
Sussex St
Derby St
Oxford St
12500
12600
12700
12800
13000
13100
13200
13300
13400
0 25 50 100 m
Appendix D: Map 9 - Proposed M2 Motorway Upgrade – Erosion Risk Areas
April 2010
Existing Motorway Carriageway
Proposed Upgrade
M2 Motorway Corridor (Lease Boundary)
Indicative Cleared Area
Temporary Clearing
Indicative Site Compounds
High Risk Erosion Areas
Low Risk Erosion Areas
LGA Boundary
Existing Basin


PRECINCT 4
PRECINCT 5
Howard Pl
Harper St
Waterloo Rd
Bedford Rd
13400
13500
HORNSBY
13600
13700
Woodvale Ave
13800
13900
14000
14100
14200
14300
14400
14500
Somerset St
RYDE
Waterloo Rd
Nile Cl
Crimea Rd
Brunton Pl
Shipway St
Vimiera Rd
Potential Terrys Creek cpmpound site partially under bridge
Potential Vimiera Road compound site
0 25 50 100 m
Appendix D: Map 10 - Proposed M2 Motorway Upgrade – Erosion Risk Maps
April 2010
Existing Motorway Carriageway
Proposed Upgrade
M2 Motorway Corridor (Lease Boundary)
Indicative Cleared Area
Temporary Clearing
Indicative Site Compounds
High Risk Erosion Areas
Low Risk Erosion Areas
LGA Boundary
Existing Basin

Appendix D: Map 11 - Proposed M2 Motorway Upgrade – Erosion Risk Areas

April 2010

- Existing Motorway Carriageway
- Proposed Upgrade
- M2 Motorway Corridor (Lease Boundary)
- Indicative Cleared Area
- Temporary Clearing
- Indicative Site Compounds
- High Risk Erosion Areas
- Low Risk Erosion Areas
- LGA Boundary
- Existing Basin



Appendix D: Map 12 - Proposed M2 Motorway Upgrade – Erosion Risk Areas

April 2010

- Existing Motorway Carriageway
- Proposed Upgrade
- M2 Motorway Corridor (Lease Boundary)
- Indicative Cleared Area
- Temporary Clearing
- Indicative Site Compounds
- High Risk Erosion Areas
- Low Risk Erosion Areas
- LGA Boundary
- Existing Basin

Appendix D: Map 13 - Proposed M2 Motorway Upgrade – Erosion Risk Areas

April 2010

- Existing Motorway Carriageway
- Proposed Upgrade
- M2 Motorway Corridor (Lease Boundary)
- Indicative Cleared Area
- Temporary Clearing
- Indicative Site Compounds
- High Risk Erosion Areas
- Low Risk Erosion Areas
- LGA Boundary
- Existing Basin

FINAL

M2 Upgrade
Leighton Contractors
5 May 2010

AECOM

Windsor Road Heritage Items, Baulkham Hills

Statement of Heritage Impact

Windsor Road Heritage Items, Baulkham Hills

Statement of Heritage Impact

Prepared for

Leighton Contractors and the NSW Roads and Traffic Authority

Prepared by

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ABN 20 093 846 925

5 May 2010

60148920.1.01

Quality Information

Document	**Windsor Road Heritage Items, Baulkham Hills**
Ref	Job No60148920.1.01 60148920 1 01_FinalReport_Rev01 + Windsor Road SOHI_Rev03
Date	05 May 2010
Prepared by	Susan Lampard Author Signature S. Lampard.
Reviewed by	Andrew Cook Ruth Baker Technical Peer Reviewer Signature

Distribution

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Revision History

Revision	**Revision Date**	**Details**	**Authorised**	
			Name/Position	**Signature**
REV01	28 April 2010	AECOM QA Review	Ruth Baker	REV01
REV02	30 April 2010	AECOM QA Review	Ruth Baker	REV02
REV03	3 May 2010	RTA Quality Review		REV03

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Executive Summary

The SOHI examines the impact of the excision of land from the front of the property and the upgrading of Windsor Road.

The construction of new west facing on and off-ramps at Windsor Road for access to the M2 is proposed to improve access to the M2 and to plan for future development in the north west region of Sydney. The works will require the excision of 11m from the south-eastern corner expanding to 14m in the north-eastern corner of 266-268 Windsor Road, the equivalent of 370m² and involved upgrades to Windsor Road at this section. Resultant noise levels associated with the construction and operation of the new ramp necessitate that noise abatement measures be taken. This SOHI has considered three options: do nothing, architectural treatments and the erection of a 2.5m high noise wall along a portion of the northern and southern boundaries of 266-268 Windsor Road and along the extent of the eastern boundary, which faces Windsor Road.

The cottage at 266-268 Windsor Road is listed on the Parramatta City Council *Local Environmental Plan (Heritage and Conservation) 1996* (LEP). The heritage significance assessment and statements associated with this listing were determined to be insufficient to undertake the current Statement of Heritage Impact (SOHI). A new assessment was therefore undertaken, which confirmed the cottage to be of historical and representative value to the local Parramatta area and expanded on the basis for identifying it as significant in the LEP listing. The primary significance of the property is identified as being demonstrative of the pattern of settlement in the local area and as representative of a typical 19th century cottage. While elements of Windsor Road are considered to have historical significance, the portion of Windsor Road to be impacted does not possess any significant heritage significance other than being part of the overarching original alignment of the road.

It determines that the excision of land itself would not impact on the significance of the cottage. The cottage's proximity to the new ramp, however, will necessitate noise abatement measures. Three options were investigated for this report. The do nothing option was not considered viable as it would leave the cottage uninhabitable. The introduction of architectural noise abatement such as double glazing and a ventilation system would have substantial impacts on the fabric of the cottage, a key element of the significance of the property. The impacts would be irreversible. The construction of a 2.5m high noise wall, while overshadowing the cottage, will be ameliorated through appropriate context-sensitive design and suitable plantings will be undertaken to screen the wall from the cottage. A list of suggested vegetation has been compiled by Potts (2009), supplied in **Appendix A**. The wall is also the preferred option as it is reversible (should a better solution become available in the future) and is thus in keeping with the Burra Charter.

Likewise the upgrades to Windsor Road are not considered to affect the heritage significance of the road. The Windsor Road alignment is noted for its overarching historical significance as one of Greater Sydney's early examples of a major road and for its contribution to the development of the settlement of Hawkesbury. While some sections of the road are considered to be of a level of significance to warrant listing as heritage precincts, the remainder is principally considered to be of historical importance when assessed within the context of the entire alignment of the road.

The section of Windsor Road in question for this report has previously been heavily impacted by the construction of the M2. The M2 and Windsor Road meet on a natural crest, which has been cut for the creation of the M2. Windsor Road, at this point, is formed by an overpass across the M2. Substantial works have been undertaken in the area during construction of the overpass and the alignment appears to have been altered at that time as sections on either side of the overpass are reasonably sinuous, while the overpass is straight. The upgrades required for improved access to the M2 are sympathetic to the road, as they will not involve substantial change to the historical context of Windsor Road. The on and off-ramps to be built will be constructed using similar materials and methods to the existing road and will not significantly change the character of Windsor Road. Considered by itself, the section of Windsor Road to be impacted by the current M2 upgrades does not exhibit any exceptional significance and has previously been impacted by the construction of the overpass. The proposed upgrade will therefore have minimal impact on the heritage significance of the road.

The following recommendations are proposed in relation to 266-268 Windsor Road and Windsor Road:

- an archival recording of the relationship between the cottage and Windsor Road should be undertaken before and after the removal of the vegetation in the front yard;
- Potts' (2009) list of suggested plants should be consulted during re-vegetation (Appendix A);
- construction of a noise wall to ameliorate noise concerns. This will have the least impact on the heritage significance of the cottage;
- the noise wall should be rendered in an appropriate colour. It is suggested that a cream colour similar to the house be used on the interior of the wall, as this will tone with the house and will not add to the darkening of the area. It is suggested that the exterior section of wall, that which faces Windsor Road, be rendered in a colour in keeping with the surrounds – either brick red, green or two toned brick red and green to blend with the adjacent property; and

1.0 Introduction

The M2 Motorway is the principal transport link connecting Sydney's north west to the lower North Shore, North Sydney and Sydney's CBD. It is currently used for over 1 million vehicle trips per work day (AECOM 2010:11). Since the M2 opened over ten years ago population density in the catchment has increased leading to congestion. There is also the necessity to plan for future increases and changing usage patterns. In order to do this Hills M2 proposes to construct an additional eastbound lane between Windsor Road and Pennant Hills Road and new west facing on and off-ramps at Windsor Road to meet capacity, design and safety requirements. The project is being conducted under Part 3A of the *Environmental Planning and Assessment Act 1979*.

The proposed on-ramp will affect 266-268 Windsor Road, Model Farms, listed on the Parramatta City Council *Local Environment Plan (Heritage and Conservation) 1996* (LEP) as 'Farmhouse Cottage' (**Figure F1**). The proposal will require the acquisition of 11m from the south-eastern corner, expanding to 14m in the north-eastern corner on the Windsor Road boundary of the property. This is equivalent to 370m². The new property boundary will be located approximately three metres from the house and will require the removal of mature plantings along the Windsor Road frontage of the property.

The proposal will also require the construction of additional upgrades to the intersection of the M2 and Windsor Road, including on and off-ramps and the widening of Windsor Road for capacity and safety reasons. Windsor Road is recognised as being historically important as an early major road within New South Wales that opened up the Cumberland Plain to settlement. Although heritage precincts for Windsor Road have been identified along its alignment, no specific heritage issues have been previously identified for this specific section of road which will be impacted by these upgrades.

Noise modelling has determined that the construction and operation of the ramp will bring the property above acceptable levels and mitigation is required (Heggies 2010:106). The property is currently privately owned and the owners have been pro-active in suggesting preferred methods of ameliorating the noise. The owner's preference is for a noise wall to be constructed. It has been determined the height of the wall will need to be 2.5m high to bring noise within acceptable levels. The proposed wall is to be constructed of rendered concrete brick and will be located along a portion of the northern and southern boundaries and along the extent of the eastern boundary, which faces Windsor Road (**Figure F2**). This Statement of Heritage Impact (SOHI) also considers two other options of doing nothing and of undertaking architectural treatments to the cottage to manage the noise.

To address the heritage aspects of the proposal AECOM Pty Ltd (AECOM) was requested to produce this SOHI by Leighton Contractors Pty Ltd (Leighton) to aid in the design process. A SOHI considers a proposed impact to a heritage property in light of its significance, determines whether the proposal will have a negative effect upon its significance and suggest measures to avoid or ameliorate the impacts. This SOHI has subsequently been upgraded for the RTA as a supporting document to the Environmental Assessment for an application under Part 3A of the *Environmental Planning and Assessment Act 1979*.

This SOHI addresses two separate heritage issues. Firstly, the excision of land and three options for noise management as they relate to No. 266-268 Windsor Road and, secondly, the effect of upgrades to Windsor Road. The preparation of this SOHI has been guided by the Heritage Office and Department of Urban Affairs and Planning (now Department of Planning) *Statements of Heritage Impact* published in 1996 and revised 2002.

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2.0 Site Location and Description

The study site is located at No. 266-268 Windsor Road, Model Farms, near Baulkham Hills. Its cadastral description is Lot 5 DP 856623. The house is approximately 100 metres south of the junction of Windsor Road with the M2. The land between the house and the M2 has previously been acquired and the houses demolished. It is currently open space. The allotment has previously been subdivided and 264 Windsor Road sits behind the house on a battle-axe block. A series of six duplexes have been constructed at the address.

The cottage is located opposite the former Baulkham Hills Public School (**Figure F8**). The School, which was opened in 1868, closed in 1999 due to falling enrolments and concerns about safety as usage of Windsor Road increased (HBO+EMTB 2010 Appendix H-15). The school has previously been impacted by Windsor Road and is now less than three metres from the Windsor Road footpath (**Figure F9**).

2.1 Cottage Description

Unfortunately during the writing of this report it was not possible to undertake an internal inspection of the property. However, the property was inspected from the adjoining public space by AECOM archaeologist Susan Lampard on 3 May 2010. Details in the following description of the cottage have therefore been taken from the State Heritage Inventory (SHI) Form and the arborist report (Potts 2009).

The cottage fronts onto, and is orientated towards, Windsor Road and is located approximately 15 metres from the footpath. The curtilage is the allotment boundary. The cottage is of single storey brick construction, currently painted cream, with burgundy shutters (**Figure F5)**. Probably originally a rectangular cottage, it has had two wings extended towards the rear of the property to form a U shaped footprint (**Figure F3**). The front door is set in the middle of the Windsor Road frontage, flanked by two sets of French-style windows. These windows open onto the verandah, which covers the Windsor Road frontage and part of the south-eastern side of the cottage. The SHI form states that the windows are overborne by narrow transom lights, however, this could not be verified due to the shutters. On the northern side of the cottage is a bay window, set approximately halfway along the length of the cottage (**Figure F6**). The verandah floor is paved with grey toned tessellated tiles one metre wide with concrete to verandah posts and slate steps. The verandah is supported by timber posts. The cottage retains the kitchen building with chimneys, which are decorated with steps and stringline. The window sills are of sandstone. The roof is hipped red corrugated iron and it appears, along with the guttering, to have been recently replaced.

The construction date of the house is unclear. The structure appears on an aerial photograph in 1930, but the style suggests it was probably constructed in the mid to late nineteenth century. The cottage is likely to post-date the granting of land to Edward Braddick in 1862. An internal inspection of the cottage has the potential to more closely date the structure, however, during the writing of this report access was not available. Without access to the property it is difficult to determine whether the structure as it stands is wholly original or incorporates later additions. It is suspected, however, that the bay window section on the northern side of the house is a later addition.

On the northern boundary of the property towards the rear of the allotment is an asbestos single car garage, which does not appear to be in good condition. A more detailed inspection of the rear yard was not able to be undertaken, but it is possible the archaeological remains of former service buildings remain in the yard. There is no evidence of any former structures in the front yard and there is unlikely to have been any. The typical layout of cottages relegated service buildings and other structures to the rear of the property and maintained the front as an area of display. It is considered unlikely that there is any archaeological potential in the front yard.

The front yard is planted with an ad hoc mixture of 14 trees plus shrubs and two fruit trees (Potts 2009:3-8 – supplied in **Appendix A**). The effect screens the cottage from Windsor Road almost completely, however it has little impact on noise from Windsor Road (**Figure F7**). The most notable of the trees are a Silky Oak (*Grevillea robusta),* Black Bean (*Castanospermum austral*), Brush Cherry (Syzygium paniculatum). The shrubs include Oleander (*Nerium oleander*), Camellia (*Camellia japonica*) and Hawaiian Hibiscus (*Hibiscus rosa-sinensis*). The rear of the cottage is grassed with a large oak on the southern fence and a Camphor Laurel on the northern fence.

The owners appear to currently be undertaking restoration works. Externally, the cottage appears to be in fair condition.

2.2 Windsor Road Description

Windsor Road is a main road connecting Northmead, near Parramatta, with the north west growth corridor. North of the M2 Windsor Road has been significantly upgraded in recent times and in 2006 it was termed by then Minister for Roads, Carl Scully as “the largest arterial road program undertaken by the State Government” (Leighton Holdings 2004). South of the M2, Windsor Road is a four lane road, although there is a future widening scheme along most of its length. Near the M2, the widening is proposed on its western side. The staging of widening in the overall road works plan has not been determined.

The Windsor Road alignment is noted for its overarching historical significance as one of Greater Sydney’s early examples of a major road and for its contribution to the development of the settlement of Hawkesbury. While some sections of the road are considered to be significant enough to be listed as heritage precincts, the remainder is principally considered to be of historical importance when assessed within the context of the entire alignment of the road.

The section of Windsor Road in question for this report has previously been heavily impacted by the construction of the M2. The M2 and Windsor Road meet on a natural crest, which has been cut for the creation of the M2. Windsor Road, at this point, is formed by an overpass across the M2. Substantial works have been undertaken in the area during construction of the overpass and the alignment appears to have been altered at that time as sections on either side of the overpass are reasonably sinuous, while the overpass is straight. Considered by itself, the section of Windsor Road to be impacted by the current M2 upgrades does not exhibit any exceptional significance and has previously been impacted by the construction of the overpass.

3.0 Historical development

3.1 Windsor Road

In 1794, the first land grants in the Hawkesbury were made, necessitating a track (the future Old Windsor Road) linking the Parramatta settlement with the Green Hill/Hawkesbury area. In 1805 surveyor James Meehan surveyed what was to become the alignment of Windsor Road between Parramatta and Kellyville. In 1810, Governor Macquarie, unhappy with the state of existing road, contracted to have Meehan's alignment constructed (Clive Lucas, Stapleton and Partners 2005). Works were completed in 1813 and included 70 bridges and numerous boundary and alignment stones. Macquarie introduced a toll system in 1816, with toll booths north of Parramatta and south of Rouse Hill.

In 1833 the Road was declared a Major Road and was to be maintained at the public's expense. This was achieved via a convict gang, although lack of experience largely mitigated the time and expense spent on repairs. Minor upgrades continued throughout the rest of the century, with the next large undertaking being the cutting and filling of sections of the road by American military in the 1940s to prepare for the evacuation of Sydney. This was followed in 1948 by the widening of the shoulder to allow for anticipated increases in traffic flow.

The final major upgrade occurred in 2006 when significant works were undertaken along the length of the Road. During the course of the Roads' operation numerous smaller scale works have been undertaken, including patching bitumen, erection of signage, and insertion and upgrade of footpaths.

3.2 No. 266-268 Windsor Road

Construction of the new alignment created the opportunity for grants and land development. However, this section of Windsor Road was not granted until the 31st of December 1862, when Edward Braddick of Parramatta was provided with a Crown Grant of 40 acres known as Portion 165 in the parish of St. John, Cumberland along Windsor Road. Prior to his death in 1876, the land was conveyed to Braddick's son, Edward Braddick Junior in November 1875. The land was subsequently conveyed firstly in four parts in 1887, 3 parts in 1889 before a settlement was made as four parts in 1892 between Ellen Nash Jenner, Sylvanus Mondefiore Charles Black (Orchardist), Mary Elizabeth Jenner and Richard Yeomans (solicitor). In 1913, Charles Henry Rose Jenner (gentleman), Amy Elizabeth Jenner (spinster) and Richard Yeomans (solicitor) argued successfully that they be granted equal individual shares over the entirety of Portion 165 land which was now recorded as being 41 acres, 27 perches in area (approximately 16.3 hectares). Records indicate that in that same year, a 1 acre portion of the land fronting Windsor Road was leased for a term of five years by Charles Jenner to Jimmy Chong for the purposes of a market garden. No specific information regarding the location of this lease was provided in the Land Title document.

Between 1913 and 1915, the three land owners drew up plans to subdivide the original portion of land with the first four allotments being transferred in early 1916. One of these transfers of land was to Herbert Charles Shepherd who purchased Lot 49 and only a part of Lot 48 of the subdivision with the remainder of the title (the study area) being transferred to the control of Charles Jenner. This portion of Lot 48 remained in the Jenner family following Charles' death in 1928 until 1937 when Perpetual Trustee Company (Limited) became the registered proprietors. They subsequently sold the land (now listed as being 1 Acre, 2 roods and 17 ¼ perches) to Amy May Bain, a school teacher from Parramatta, in 1941 who further subdivided the land. The present lot was drawn up in 1959 and was now recorded as being approximately 2 rds, 17 ¼ per. in area). In 1971, the Main Roads Act placed restrictions on a section of the allotment immediately adjacent to Windsor Road. In 1975, Kenneth Bruce Walsh is listed as the Registered Proprietor before the deed was cancelled in February 1980. More recent information is not currently available. For full details of the ownership of the property refer to **Table 1**.

A search of historic maps and aerial photographs was undertaken on the Spatial Information eXchange website (https://six.lands.nsw.gov.au/wps/portal) and Department of Lands parish maps (http://www.lands.nsw.gov.au/survey_and_maps/maps_and_imagery/parish_maps). A 1926 parish map for St Johns shows Braddick's grant, with Woodland Street marked for future creation (http://parishmaps.lands.nsw.gov.au/pmap.html Parish St John Sheet 1, 4th edition). See figure **Figure F4**.

Table 1: Ownership of 266-268 Windsor Road, Model Farms

Date	Owner	Land Title Office Reference
31 Dec 1862	***Crown Grant*** Edward Braddick	Portion 165 - Crown grant of 40/41* acres * earliest dated records are not consistent in recording the number of acres granted to Edward Braddick by the Crown. Subsequent documents refer to 41 acres, 27 perches.
30 Nov 1875	***Conveyance*** Edward Braddick to Edward Braddick Junior	Book 155 No.141
7 May 1884	***Mortgage*** Edward Braddick to George Wigram Allen	Book 288 No.709
28 Nov 1885	***Mortgage*** Edward Braddick to William Charles Hill and William Clark	Book 327 No.667
1 Dec 1887	***Conveyance*** 1st part: Edward Braddick 2nd part: Marian Allen, George Boyce Allen, Reginald Charles Allen, Arthur Wigram Allen 3rd part: William Charles Hill, William Clark 4th part: George Kinnear Clark	Book 379 No. 863
8 Dec 1887	***Mortgage*** George Kinnear Clark to Robert Campbell Close	Book 379 No. 863
26 Feb 1889	***Statutory Declaration*** Edward Braddick	
27 Feb 1889	***Conveyance*** 1st part: George Kinnear Clark 2nd part: Robert Campbell Close 3rd part: Charles Henry Rose Jenner, Amy Elizabeth Jenner, Ellen Nash Jenner	Book 409 No. 659
6 Dec 1892	***Settlement*** 1st part: Ellen Nash Jenner (later married Sylvanius Mondefiore Charles Black) 2nd part: Sylvanius Mondefiore Charles Black (Orchardist) 3rd part: Mary Elizabeth Jenner 4th part: Richard Yeomans	Book 506 No. 737
3 May 1913	Certificate of Title as individuals thirds for Portion 165 granted to Charles Henry Rose Jenner (Gentleman), Amy Elizabeth Jenner (Spinster) and Richard Yeomans (Solicitor). Land valued at £3000. Total costs for Application - £11.	Yeomans – Vol 2469 Fol 64 A. Jenner – Vol 2469 Fol 65 C. Jenner – Vol 2469 Fol 66
14 May 1913	***Lease*** Charles Henry Rose Jenner leases 1 acre of land fronting Windsor Road for the term of five years to Jimmy Chong for the purpose of a market garden.	

Date	Owner	Land Title Office Reference
c.1914	Block subdivided by R. Yeoman, A. Jenner and C. Jenner	
9 Mar 1916	***Transfer*** Lot 49 & part of Lot 48, DP 8256 – Herbert Charles Shepherd	Vol 2672 Fol 187
30 Jun 1916	***Transfer*** Part of Lot 48, DP 8256 to Charles Henry Rose Jenner	Vol 2687 Fol 167
3 Jan 1929	Evelyn Jenner (widow) of Baulkham Hills recognised as proprietor of the land	
29 May 1936	Lease of land to Jimmy Chong (14 Aug 1913) is determined to have expired	
10 Feb 1937	***Application By Transmission*** Perpetual Trustee Company (Limited) becomes the registered proprietors of the remaining land	
22 Jul 1941	***Transfer*** Amy May Bain of Parramatta (School Teacher - Spinster) recognised as proprietor of an Estate in Fee Simple Lot B, Transfer No. G991457 (Area: 1A 2rd. 17 ¼ per.)	Vol 5249 Fol 192
8 Oct 1959	Amy May Bain of Parramatta (Spinster) recognised as proprietor of an Estate in Fee Simple Lot C, Transfer No. G991457 (Area: 2rd. 17 ¼ per.)	Vol 7777 Fol 49
22 Feb 1960 to 25 Mar 1963	**Mortgage** From Amy May Bain to George Edward Eldridge (Farmer)	
12 Mar 1963 to 18 Sep 1979	**Mortgage** Equitable Permanent Building Society	
8 Nov 1971	Restrictions imposed by Main Roads Act on land immediately adjacent to Windsor Road	
19 Sep 1975	**Registered Proprietor** Kenneth Bruce Walsh of Baulkham Hills (Proof Reader)	Application No. P381869
28 Feb 1980	Deed Cancelled	

The subdivision of the property and its subsequent development appears to be typical of the area, based on the parish maps (**Figure F4**). Original grants appear to be in the vicinity of 40 acres, which were over time subdivided into smaller and smaller allotments. The property is representative of this gradual intensification of settlement. The cottage itself also demonstrates the evolution of the area from rural to an urban setting, with the cottage being modified and extended and losing its farm-related outbuildings. The allotment boundary itself is not considered to be significant as previous sub-divisions have impacted on its original form and size so as to alter it beyond the threshold guidelines for inclusion. The plantings surrounding the cottage are not considered to be significant. A report by Consultant Arborist David Potts (2009:11) concluded that “None of the trees or shrubs were rare, endangered, forest remnant or in a heritage context had a direct connection to the original 1860/70s development”.

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4.0 Significance assessment

In order to understand how development will impact on a heritage item it is essential to understand why an item is significant. An assessment of significance is undertaken to explain why a particular site is important and to enable the appropriate site management to be determined. Cultural significance is defined in the *Australia ICOMOS Charter for the Conservation of Places of Cultural Significance* (the *Burra Charter*) as meaning "aesthetic, historic, scientific or social value for past, present or future generations" (Article 1.1). Cultural significance may be derived from the fabric of a place, association with a place, or the research potential of a place. The significance of a place is not fixed for all time, and what is of significance to us now may change as similar items are located, more historical research is undertaken and community tastes change.

The process of linking this assessment with a site's historical context has been developed through the NSW Heritage Management System and is outlined in the guideline *Assessing Heritage Significance,* part of the *NSW Heritage Manual* (Heritage Branch, Department of Planning). The *Assessing Heritage Significance* guidelines establish seven evaluation criteria (which reflect four categories of significance and whether a place is rare or representative) under which a place can be evaluated in the context of State or Local historical themes. Similarly, a heritage item can be significant at a local level (ie to the people living in the vicinity of the item), at a State level (ie to all people living within New South Wales) or be significant to the country as a whole and be of National or Commonwealth significance.

The NSW Heritage significance criteria are:

Criterion (a) – an item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area).

The site must show evidence of significant human activity or maintains or shows the continuity of historical process or activity. An item is excluded if it has been so altered that it can no longer provide evidence of association;

Criterion (b) – an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local to area).

The site must show evidence of significant human occupation. An item is excluded if it has been so altered that it can no longer provide evidence of association;

Criterion (c) – an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).

An item can be excluded on the grounds that it has lost its design or technical integrity or its landmark qualities have been more than temporarily degraded;

Criterion (d) – an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons.

This criterion does not cover importance for reasons of amenity or retention in preference to proposed alternative;

Criterion (e) – an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area). Significance under this criterion must have the potential to yield new or further substantial information.

Guidelines for exclusion include the information would be irrelevant or only contains information available in other sources;

Criterion (f) – an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area).

The site must show evidence of the element/function etc proposed to be rare;

Criterion (g) – an item is important in demonstrating the principal characteristics of a class of NSW's:

- cultural or natural places; or
- cultural or natural environments.

An item is excluded under this criterion if it is a poor example or has lost the range of characteristics of a type.

4.1 Significance of 266-268 Windsor Road

4.1.1 Previous assessments of significance

The property has been assessed as having significance under criteria a (historical) and g (representative) on the SHI Form (http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=2240640). The reasoning for this inclusion is not provided, however, it is surmised that the cottage is representative of previous land-uses, being market gardening and larger land parcels, that are now lost in the area.

HBO + EMTB in their 2010 *Non-Aboriginal Heritage Assessment* for the M2 Upgrade also ascribed the property significance under criteria b (associative), c (aesthetic and technical) and d (social). No demonstration of significance was provided. The report also raised the possibility that the mature plantings along the Windsor Road frontage were of significance. This has been addressed subsequently by a consultant arborist report.

The Statement of Significance is also brief stating "Evidence of history before suburban small lot subdivision" (SHI Form). The HBO + EMTB assessment does not expand upon the SHI form's Statement of Significance.

4.1.2 Assessment against SHR criteria

Criterion a: - historical

Identified NSW historical themes that relate to No. 266 Windsor Road are provided in **Table 2**.

Table 2: Historical themes relevant to 266-268 Windsor Road, Model Farms

National theme	State theme	Demonstrated by
Building settlements, towns and cities	Land tenure	Grant and subsequent 19th century development pattern
Building settlements, towns and cities	Housing	Form and fabric of cottage

The presence of the cottage demonstrates the pattern of development in the area during the mid-19th century. It reflects the pattern of land occupancy in the mid-19th century, when the area was a series of small scale farms and market gardens with modest farmhouse/cottages. The modifications and extensions to the cottage are representative of the evolution of the area from rural to urban setting. The present allotment boundary itself is not considered to be significant as previous sub-divisions have impacted on its original form and size so as to alter it beyond the threshold guidelines for inclusion.

Advice provided to Rhys Jones of Leighton Contractors by Parramatta Heritage Advisor Zoran Popovic (pers. comm. 17 March 2010) states that the subdivision pattern is not significant in its own right.

Criterion b - associative: No. 266 Windsor Road does not meet this criterion as it has no connections with historically important people or events. Edward Braddick does not appear as a notable or consequential local personality.

Criterion c - aesthetic: No. 266 Windsor Road is still recognisable as a modest farm cottage. Although its setting has been heavily modified it still presents a pleasing rural vernacular character and retains a relationship with the original frontage to Windsor Road. The plantings hinder the public's appreciation of the cottage, although the location is not conducive to public viewing, being on a busy, sweeping, section of Windsor Road with limited opportunity to stop and view the cottage. The later modifications and additions to the cottage need to be assessed once access to the property is available to determine how these impact on this element of significance.

Criterion d - social: No. 266-268 Windsor Road does not meet this criterion as it is not associable with an identifiable group. It is also unlikely to be recognised in the community as it is not visible from the street due to the dense vegetation in the front yard.

Criterion e – research potential: No. 266 Windsor Road does not meet this criterion as it holds limited potential to provide substantial archaeological or scientific information that cannot be gained from other sources. While the land was used as a market garden at least from 1913, due to the subsequent use and subdivision of the block there is limited potential for evidence of this activity to remain intact within the area of impact. Evidence of market gardening was more likely to be preserved in the section of land excised for the creation of 264 Windsor Road, which is now dominated by six duplexes. Archaeological potential in the vicinity of the house may include evidence of waste disposal practices in the form of rubbish pit/s or an in-filled well. Given the typical layout of cottages these service buildings were located to the rear of the cottage, while the front yard was usually maintained as a display/garden area. The ability of this potential resource to add substantially to an understanding of the history of Parramatta is limited.

Criterion f - rarity: Further research needs to be undertaken to determine whether the cottage is a rare surviving example of a farm style cottage within the Parramatta LGA. At least one other, Hammer's Cottage, is currently listed. As an internal inspection was not possible, thereby making it difficult to determine a more accurate age for the cottage, it is not possible to undertake the assessment at this time as the rarity will be tied to the date of construction as well as its original function within the farm setting.

Criterion g - representative: No. 266 Windsor Road is of local representative significance as a typical cottage from the mid 19th century. The cottage has the principal characteristics of the class. It represents the presence of farms, but itself is not a good representation of a farm complex, as none of the associated outbuildings are present and its restricted curtilage has lost the ability to demonstrate the layout of a farmstead.

4.1.3 Statement of Significance

No. 266 Windsor Road is of local heritage significance as it demonstrates the pattern of development in the area during the mid-19th century. It reflects the pattern of land occupancy in the mid-19th century, when the area was a series of small scale farms and market gardens with modest farmhouse/cottages. The modifications and extensions to the cottage are representative of the evolution of the area from rural to urban setting. It is a typical cottage from the mid 19th century and representative of its type. The cottage is of local aesthetic significance for its historical appeal and as an exemplar of the farm cottage style within the Parramatta LGA.

Table 3: Summary of assessment against State Heritage Register criteria

Criterion	Level of Significance	Demonstrated by
A – historical	Local	Form and fabric of cottage Position on block
B – event/persons	Does not meet threshold	
C – aesthetic	Local	Form and fabric of cottage
D – social	Does not meet threshold	
E – research potential	Does not meet threshold	
F – rarity	Does not meet threshold	
G - representative	Local	Form and fabric of cottage

The key elements that contribute to the significance of 266-268 Windsor Road are:

- original fabric of the cottage;
- position on block; and
- built form of cottage.

Elements that do not contribute to its significance are:

- current vegetation along the Windsor Road frontage (Potts 2009);
- current sub-division pattern;
- views to the cottage from Windsor Road; and
- views from the cottage towards Windsor Road.

4.2 Significance of Windsor Road Intersection with the M2

4.2.1 Previous assessments of significance

In 2005, the RTA prepared a Conservation Management Plan (CMP) for Windsor Road and Old Windsor Road to manage heritage precincts and items identified on the RTA's Section 170 Register (Clive Lucas, Stapleton and Partners 2005). The CMP assessed the significance of the road itself (alignment, historic associations and location within the landscape), and identified highly significant heritage items and heritage precincts along Windsor Road and Old Windsor Road including specific recommendations relevant to these items and precincts. The items and precincts of high heritage significance identified in the Windsor Road and Old Windsor Road CMP are:

- McGraths Hill Archaeology Site and Cemetery;
- Old Hawkesbury Road;
- Vineyard Alignment;
- First Ponds Creek Alignment;
- Box Hill Vergescape;
- Rouse Hill Road Cutting;
- Caddies Creek Alignment;
- Strangers Creek Alignment;
- Excelsior Way Alignment;
- Stanhope Farm Alignment; and
- Meurants's Lane Alignment.

While the proposed upgrades will impact upon Windsor Road, the project is not within the immediate vicinity of any of these precincts of significance and none of these areas would be directly or indirectly affected by the project. The nearest of these precincts is the Excelsior Way Alignment Precinct, approximately 3.5km north of the M2 Motorway.

This assessment considers the section of Windsor Road directly adjacent to the M2 and no more than 100 metres each side. At the point of intersection with the M2 Windsor Road crests a natural rise and forms an 'S' shaped bend. Any modifications will not be visible beyond 100 metres. Although the section of Windsor Road to be impacted has not been assessed as of significance, given the overall significance of the road the following assessment has been undertaken. The following assessment gives the statement from the CMP for the whole of the road followed by any specific comment on the section of Windsor Road currently in question.

4.2.2 Significance Assessment

Criterion a: - historical: The re-alignment of the Windsor Road in 1812-1813 (after the foundation of the Macquarie Towns in 1810) is historically significant as a component of Governor Macquarie's vision for the orderly settlement of the colony, particularly for the Hawkesbury region and the Governor's Domain at Parramatta. The new alignment's avoidance of the hilly section of the original route provides evidence for the presence and naming of the 'Seven Hills' now known as the Hills District. The Windsor Road is part of the first turnpike system in the colony.

The section of Windsor Road to be impacted by the upgrades of the M2 is not identified as possessing unique historic values. However it is recognised as being part of the original re-alignment of Windsor Road and therefore, when considered in the context of the entire alignment, it is considered to have historical significance.

Criterion b: - associative: Windsor Road is associated with numerous persons and events of historical significance, including the Battle of Vinegar Hill, Governor Macquarie and his vision for the colony, settlers of note such as Richard Rouse, and the bushranger 'Bold' Jack Donohue. Windsor Road is associated with the significant survey work of colonial surveyors James Meehan, Charles Grimes, as well as Lands Department Surveyor Roderick Baylis Mackenzie.

Although Windsor Road is recognised as being associated with a number of historical significant persons and events, there are no records to indicate that the section of road to be impacted possesses any particular historical associations. The 2005 CMP notes that the full alignment of Windsor Road is also associated with the survey work of early colonial surveyors including James Meehan, Charles Grimes and Lands Department Surveyor Roderick Bayliss Mackenzie. Apart from this overarching reference, there are no specific observations in the CMP to historic associations for the section of road to be impacted by the M2 upgrade.

Criterion c: - aesthetic: The roads enable and are an inherent component of the aesthetic experience of the wider cultural landscape of the Cumberland plain. For example, there are strong visual connections between the road and historic homesteads such as Box Hill, Rouse Hill, Bella Vista, and Tebbutt's Observatory, as well as views of Windsor, and views of monuments, such as the Pearce family cemetery and Vinegar Hill. The road contributes to the visual understanding of the aesthetic character of the numerous individual historic places located along it (e.g. the aesthetic appreciation of a colonial-period inn or toll house in part relies upon understanding the buildings relationship to the road. Finally, original sections of the older 'country lane' parts of the roads have aesthetic value of their own as evocative reminders of the earlier rural character of the immediate area.

The section of Windsor Road to be impacted does not possess any of the aesthetic characteristics identified by the 2005 CMP apart from a visual understanding of access to the road for both the cottage (266-268 Windsor Road) and Baulkham Hills Primary School. While the road should be considered significant in this respect, it should be noted that the road was upgraded to a four lane main arterial road in 2006. Therefore any visual understanding of the relationship of historic sites to the road is based on the overall alignment of the road, rather than the road in its present form.

Criterion d: - social: The esteem with which numerous heritage and history interest groups hold the Windsor and Old Windsor Roads is evidenced by the level of interest in preserving the roads, and the heritage listings (statutory and non-statutory) which apply to the roads.

The proposed section of Windsor Road to be impacted does not meet this criterion as it is not readily associable with any identifiable group.

Criterion e: - research potential: The Windsor and Old Windsor Roads are of high significance for their research potential as the location of the only alignment and boundary stones known to exist in NSW. These stones are rare evidence of colonial road making technology, which have potential to reveal more information about their purpose and history. Numerous identified potential archaeological sites along the roadways contribute to the research significance of the roads. The fabric of the Old Windsor and Windsor Roads themselves are of technical and research significance for their ability to demonstrate the development of road-building and improvement technologies over two centuries.

The 2005 CMP notes that Old Windsor and Windsor Roads are of high significance because of their research potential for the study of alignment and boundary stones. There are no alignment or boundary stones identified as occurring within the section of Windsor Road to be impacted, and likewise there are no identified archaeological deposits. The road-building technologies are limited to the last thirty years when this section of road was upgraded as part of the construction of the M2, and it is unlikely that any prior evidence has been preserved within the modern road formation, except by chance. The proposed section of Windsor Road to be impacted does not meet this criterion.

Criterion f - rarity: The 2005 CMP does not provide an assessment under this criterion.

The proposed section of Windsor Road to be impacted does not meet this criterion as it does not possess uncommon, rare or endangered aspects of NSW's cultural or natural history.

Criterion g -representative: The 2005 CMP does not provide an assessment under this criterion.

The proposed section of Windsor Road to be impacted is typical of the many major roads in the Greater Sydney Area and thus, while demonstrating the principal characteristics of this class, is not exceptional. The section of Windsor Road to be impacted does not meet this criterion.

4.2.3 Statement of Significance

The Windsor Road alignment is noted for its historical significance as one of Greater Sydney's early examples of a major road and for its contribution to the development of the settlement of the Hawkesbury farming lands. While some sections of road are considered to retain sufficient fabric and setting to be listed as state-significant heritage precincts, the remainder is principally considered to be historical important when assessed within the context of the entire alignment of the road.

Considered by itself, the section of Windsor Road to be impacted by the M2 upgrades does not exhibit any significance beyond its continuing representation of the original alignment.

5.0 Statement of Heritage Impact

5.1 Requirements for a Statement of Heritage Impact

The objective of a Statement of Heritage Impact (SOHI) is to evaluate and explain how the proposed development, rehabilitation or land use change will affect the value of the heritage item and/or place. A Statement of Heritage Impact should also address how the heritage value of the item/place can be conserved or maintained, or preferably enhanced by the proposed works.

This report has been prepared in accordance with the NSW Heritage Office & DUAP (1996a) *NSW Heritage Manual*, NSW Heritage Office (2002) *Statements of Heritage Impact*. The guidelines pose a series of questions as prompts to aid in the consideration of impacts due to the proposed works. In keeping with the guideline format, questions are posed and addressed.

5.2 Assessment of Impact

The following questions are applied to the proposed works in order to assess the level and nature of the impact to the significance of the cottage at 266-268 Windsor Road, Model Farms, and section of Windsor Road interfacing with the M2. The set of questions that most closely reflect the nature of the proposed works are those relating to subdivision with respect to the noise wall and the addition of access ramps connecting Windsor Road to the M2. Only those questions applicable to the proposed development are applied, and where appropriate have been modified to reflect the nature of the proposed works.

The removal of the mature plantings has not been included in this SOHI as they have been separately assessed as having limited heritage value (Potts 2009). The removal of the plantings would have a positive impact on the significance of the building by re-establishing the connection between the cottage and the road.

The following aspects have been assessed as part of this study:

a) acquisition of a strip of between 11 and 14 metres from the Windsor Road frontage, equivalent to 370m² in which the M2 ramp will be situated;
b) three options to manage noise at the cottage, being:
    1) do nothing;
    2) architectural treatment of the dwelling;
    3) construction of a 2.5m rendered concrete brick noise wall as shown in **Figure F2**;
c) the required upgrades to Windsor Road (on/off ramps).

These impacts are assessed separately below.

5.2.1 Acquisition of Land from Windsor Road Frontage

Have other options been considered?

Yes. Other options to expand traffic capacity from Sydney's north-east to the CBD have been considered in the Environmental Assessment (EA) (AECOM 2010). The construction of an additional eastbound lane on the M2, necessitating the upgrade to the Windsor Road on ramp has been determined to be the most efficient option. Please refer to Chapter 2 of the EA for further discussion.

Options to avoid and minimise impacts to 266-268 Windsor Road were considered during the design phase of the project. However the construction a new M2 Motorway on-ramp necessitates the widening of Windsor Road immediately south of the motorway intersection. The only other possible option for providing access to the new M2 Motorway on ramp at this location was to widen Windsor Road on the opposite(eastern) side of 266-268 Windsor Road. Widening on the eastern side of Windsor Road to allow for the M2 Motorway on ramp would have resulted in direct impacts to the former Baulkham Hills Public School property, potentially requiring the demolition of some buildings. The option chosen to widen on the western side of Windsor Road would result in less overall heritage impacts than the only other alternative option available.

How is the proposed curtilage allowed around the heritage item appropriate?

While the reduction in curtilage and loss of vegetation around the cottage may affect the appearance of the property, it will not impact on aspects of its heritage significance, which is invested in the historical and representative values of the cottage's built fabric. The impacts to the aesthetic aspects of the cottage are discussed below. The current lot on which the dwelling sits has been assessed as being not significant as it has been substantially modified and reduced through previous subdivision, impacting on its heritage significance.

During the design phase minimising the impact to the cottage's curtilage was a design objective. The excision of 370m² from the frontage represents the minimum requirements to create an on ramp that complies with safety guidelines and allows for future increases in usage.

Could future development that results from this subdivision compromise the significance of the heritage item?

The construction of the M2 on ramp is consistent with the current adjacent land use (road). The cottage was constructed on Windsor Road to take advantage of this transportation route and its significance is not incompatible with the Road. The significance of the cottage is not impacted by the loss of curtilage, but, potentially, by noise mitigation measures flowing from the subdivision.

Noise mitigation by erecting a noise wall has the potential to impact the aesthetic significance of the cottage. The new boundary will be located three metres from the front of the cottage and the construction of a 2.5 metre high noise wall would shorten and over-shadow views of the cottage from the north-north east, i.e. the front of the cottage that addresses Windsor Road.

Could future development that results from this subdivision affect views to, and from, the heritage item? How are negative impacts to be minimised?

The construction and operation of the proposed ramp will lead to noise above the recommended levels, One abatement option is the construction of a 2.5m high wall. This impact is addressed in **Section 5.2.3.**

Is there any potential for archaeological deposits/features to be disturbed?

There is unlikely to be any potential for archaeological deposits and other archaeological features, such as wells and rubbish dumps in the area proposed for acquisition. There are no known previous structures on the property and were they to have existed it is more probable they would have been located at the rear of the cottage rather than the front of the cottage which is the area to be effected.

5.2.2 Noise Management – Do nothing

This section considers the option of taking no action, beyond replanting, to manage the noise impacts to 266-268 Windsor Road.

What impact will the 'do nothing' option have on the significance of 266-268 Windsor Road?

Heggies (2010) have identified that noise levels associated with traffic using the on-ramp will be above acceptable levels. The do nothing option is not considered to be viable as the noise levels will potentially make the cottage unliveable. An obligation therefore exists to manage the noise. While this 'do nothing' option will have no impacts on the significance of the cottage there is the potential the noise will force the owners to vacate the cottage and, as a worst case scenario, that the cottage will become vacant or un-tenantable for extended periods and will not be maintained. The dereliction of the cottage will have significant impacts on the heritage significance of the property. It is in the best interests of the property to ensure it retains its liveability. The current owners are aware of the cottage's significance and are currently undertaking sympathetic renovations and maintenance works. It is in the best interests of the cottage's significance that the current course of works be continued.

Have other options been considered?

This SOHI considers architectural treatments (**Section 5.2.3**) and the erection of a noise wall (**Section 5.2.4**) as options to ameliorate the noise.

5.2.3 Noise Management – Architectural Treatment

This section considers noise management through architectural treatments, being the installation of double glazing and/or a ventilation system allowing for windows to be closed while retaining air circulation.

Have other options been considered?

This SOHI also considers the options of doing nothing (**Section 5.2.2**) and construction of a noise wall (**Section 5.2.4**). The noise wall option is the preferred option of the current owners as they have recently completed external restoration works that included the replacement of the windows.

What impact will the installation of double glazing and a ventilation system have on the significance of 266 Windsor Road?

The owners have recently installed new windows in keeping with the heritage significance of the property. Their replacement would not impact on the heritage significance of the cottage as invested in its original fabric subject to the double glazing being of a standard and type that is appropriate to the building's farm cottage aesthetic. The installation of a ventilation system, however, could have significant impacts on the fabric of the cottage. This option could have the greatest impact to the fabric of the cottage and therefore its heritage significance.

How is the impact of the architectural treatments on the heritage significance of the item to be minimised?

To reduce the impact to the cottage, a ventilation system would need to be designed that made minimal changes to the fabric. This may include limiting the number of openings made in ceilings and walls. The location of the services and fan boxes would also need to be carefully located to minimise their visual impact on the cottage.

5.2.4 Noise Management - Construction of a Noise Wall

This section considers noise management through the construction of a noise wall within the residual of the allotment. The wall will be 2.5 metres high and constructed of rendered concrete blocks. Its installation will require the excavation of a footing, removal of the plantings in the front of the cottage and the repositioning of vehicular access to the property. A rendered concrete wall is the preferred form of noise wall, as it is more in keeping with the heritage values of the cottage than other wall material options, such as poured concrete or Perspex.

Have other options been considered?

This SOHI also considers the options of doing nothing (**Section 5.2.2)** and undertaking architectural treatments (**Section 5.2.3**). The noise wall option is the preferred option of the current owners as they have recently completed external restoration works that included the replacement of the windows.

How is the impact of the noise wall on the heritage significance of the item to be minimised?

The cottage is significant as a demonstration of development in the area from rural small farms to an urban area and as a representative of the cottage type. Neither of these values will be impacted by the construction of the wall. Due to the current vegetation, the cottage is currently not visible from the road. The erection of the wall will have limited impact on the public's ability to appreciate the heritage significance of the cottage.

The rendered wall design and colour should be chosen to be in keeping with the general character of the area. The adjacent property has a low red brick fence and the selection of a similar colour would provide continuity along the section of road. The planting of appropriate trees and shrubs will also minimise the visual impact of the wall. Potts (2009) has provided a list of suitable plants.

Will the additions visually dominate the heritage item?

The cottage is currently dominated by the mature plantings and there is only a limited visibility to the cottage from the Windsor Road frontage and vice versa. Therefore the noise wall will not substantially change the current visibility of the heritage item. Context-sensitive landscaping of suitable species will be undertaken within the setback area to screen the wall from the cottage.

Is there any potential for archaeological deposits/features to be disturbed?

There is unlikely to be any potential for archaeological deposits in the proposed wall footprint. There are no known previous structures on the property and were they to have existed it is more probable they would have been located at the rear of the property rather than in the front garden. The same can be said for other archaeological features, such as wells and rubbish dumps.

Are the additions sympathetic to the heritage item?

The wall would sever the visual link between the house and Windsor Road. Currently mature vegetation in the front yard has the same effect but is less dominant. The construction of a noise wall is considered to be the best option available as it has the least impact on the form and fabric of the building, which are identified as the basis for its significance.

Is the wall permanent?

No. The wall can be dismantled in the future, with no lasting impact on the cottage.

5.2.5 Windsor Road – M2 Freeway Interface Upgrades

Have other options been considered?

Yes. Alternative designs for the project are documented in Chapter 3 of the EA. It was ultimately decided that the construction of new on and off-ramps at Windsor Road for access to the M2 are required in this location to improve current traffic access to/from the M2 and to plan for future increased development in the north west region.

How is the impact of the upgrades on the heritage significance of the item to be minimised?

The construction of the required access ramps to the M2 will have minimal impact to the heritage significance of this portion of Windsor Road. Only approximately 2000m^2 of Windsor Road will be impacted, to a depth of 3m. It should be noted that the road has been upgraded many times over the course of its establishment, most recently in 2006 as part of a four lane upgrade of the arterial road. During these upgrades, the original alignment of the road has remained the same although the width has greatly expanded, which will have removed most or all of the original road fabric, and altered the appearance of cuttings and the road setting. During these upgrades, the heritage significance of the road's original alignment will not be substantially impacted any further and the visual appreciation of the road's relationship to identified roadside heritage items: the cottage (266-268 Windsor Road), Baulkham Hills Primary School and the greater Cumberland Plain will not be affected.

Will the additions visually dominate the heritage item?

While the Windsor Road upgrades will involve some visual changes, they will not dominate this portion of the Windsor Road/M2 overpass as it is viewed and understood in the context of its place within the wider regional road network.

Is there any potential for archaeological deposits/features to be disturbed?

There is negligible potential for archaeological deposits/features to be disturbed. No archaeological features were identified during inspection of the area and the assessment of the entire length of Old Windsor and Windsor Road by the RTA did not identify this portion of the road as containing any areas of archaeological significance.

Are the additions sympathetic to the heritage item?

The upgrades required for improved access to the M2 are sympathetic to the heritage item as they will not involve substantial change to the historical context of Windsor Road. The existing alignment of 14km will be maintained and only approximately 2000m^2 will be impacted. The on and off-ramps to be built will be constructed using similar materials and methods to the existing road and will not significantly change the character of Windsor Road.

5.3 Discussion and Summary

The excision of a portion of the Windsor Road frontage of No. 266-268 Windsor Road will have a minor impact on the significance of the cottage. The values of the cottage relate to its ability to demonstrate Parramatta's changing land-use history and as a representative mid 19th century cottage. Nor will the additional upgrades required for the M2's intersection with Windsor Road impact on the significance of Windsor Road as a whole.

This SOHI has examined three possible noise management measures to address elevated noise impacts on No. 266-268 Windsor Road as a result of the construction of the on ramp: the do nothing option, architectural treatments and the erection of a noise wall.

The do nothing option is not considered to be viable as noise will exceed the recommended levels, even with the screening effect of vegetation. It also presents the risk of making the cottage unliveable and subject to gradual decline.

The two remaining options are therefore to undertake architectural treatments or to erect a noise wall. Both these options will impact on elements of the significance of the cottage. The architectural treatments, through the installation of a ventilation system could potentially impact on the original fabric of the cottage, which has been assessed as a component of its significance. Any such works would not be reversible.

The other option is to erect a 2.5m high noise wall. The wall will not impact on the physical fabric of the cottage, but will overshadow the cottage and has the potential to impact the aesthetic significance of the cottage. The new boundary will be located 3 metres from the front of the cottage and the construction of a 2.5m high noise wall would shorten and over-shadow views of the cottage from the north-north east, i.e. from the front of the cottage.

On balance, the lesser impact on significance is afforded by the noise wall. While it will block the view from Windsor Road to the cottage, this is not considered a major aspect of the place's heritage significance and, as previously identified, vegetation in the front of the property currently screens the cottage from Windsor Road. It will, however, have no impact on the cottage's fabric. The wall will have no long term impacts on the cottage as it could be removed in the future if other noise abatement measures become available that do not impact the fabric of the cottage. The noise wall option is the preferred option of the current owners, and this is also considered to be a legitimate consideration in selecting between options.

The upgrades to Windsor Road are not considered to affect the heritage significance of the road. The section of Windsor Road in question has previously been heavily impacted by the construction of the M2. The upgrades required for improved access to the M2 are sympathetic to the heritage item as they will not involve substantial change to the historical context of Windsor Road. The on and off-ramps to be built will be constructed using similar materials and methods to the existing road and will not significantly change the character of Windsor Road.

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6.0 Conclusion and Recommendations

The construction of new west facing on and off-ramps at Windsor Road for access to the M2 is proposed to improve access to the M2 and to plan for future development in the north west region of Sydney. The works will require the excision of 11m from the south-eastern corner (expanding to 14m in the north-eastern corner of 266-268 Windsor Road, the equivalent of 370m² and involve upgrades to Windsor Road at this section.

As a result noise levels associated with the construction and operation of the new ramp require that noise abatement measures be considered to preserve the amenity of the occupants.. This SOHI has considered three options to deal with noise: do nothing, architectural treatments and the erection of a 2.5m high noise wall along a portion of the northern and southern boundaries and along the extent of the eastern boundary, which faces Windsor Road.

The cottage at 266-268 Windsor Road is listed on the Parramatta City Council *Local Environmental Plan (Heritage and Conservation) 1996* (LEP). The heritage significance assessment and statements associated with this listing were determined to be insufficient to undertake the current Statement of Heritage Impact (SOHI). A new assessment was therefore undertaken, which confirmed the cottage to be of historical and representative value to the local Parramatta area and expanded on the LEP listing. While elements of Windsor Road are considered to have historical significance, the portion of Windsor Road to be impacted does not possess any significant heritage issues other than being part of the overarching original alignment of the road.

The SOHI examined the impact of the excision of land from the front of the property and the required upgrades to the immediate section of Windsor Road. It determined that the excision of land itself would not impact on the significance of the cottage, the key elements being the physical form and fabric of the cottage. Likewise the upgrades to Windsor Road would not affect the historical significance of the original alignment of the road.

The resultant increase in noise would necessitate noise abatement measures that would impact on the heritage significance of the cottage. The do nothing option was not considered viable as it risks making the cottage uninhabitable and subject to gradual decline. The introduction of double glazing and a ventilation system could have substantial impacts on the fabric of the cottage, a key element of the significance of the property and installation impacts on fabric would be irreversible. The construction of a 2.5m high noise wall has been assessed as having the least impact to the heritage values of the cottage. The visual impacts can be ameliorated through the selection of suitable wall treatments and selections of plantings. The wall is also the preferred option as its design makes it reversible should a better solution become available in the future.

The upgrades to Windsor Road are not considered to affect the heritage significance of the road. The Windsor Road alignment is noted for its overarching historical significance as one of Greater Sydney's early examples of a major road and for its contribution to the development of the settlement of Hawkesbury. While some sections of the road are considered to be of a level of significance to warrant listing as heritage precincts, the remainder is principally considered to be of historical important when assessed within the context of the entire alignment of the road.

The section of Windsor Road in question for this report has previously been heavily impacted by the construction of the M2. The M2 and Windsor Road meet on a natural crest, which has been cut for the creation of the M2. Windsor Road, at this point, is formed by an overpass across the M2. Substantial works have been undertaken in the area during construction of the overpass and the alignment appears to have been altered at that time as sections on either side of the overpass are reasonably organic and sweeping, while the overpass is straight. The upgrades required for improved access to the M2 are sympathetic to the Road, as they will not involve substantial change to the historical context of Windsor Road. The on and off-ramps to be built will be constructed using similar materials and methods to the existing road and will not significantly change the character of Windsor Road. Considered by itself, the section of Windsor Road to be impacted by the current M2 upgrades does not exhibit any exceptional significance and has previously been impacted by the construction of the overpass. The proposed upgrade will therefore have minimal impact on the heritage significance of the Road.

6.1 Recommendations

The following recommendations are proposed in relation to 266-268 Windsor Road and Windsor Road:

- an archival recording of the relationship between the cottage and Windsor Road should be undertaken before and after the removal of the vegetation in the front yard;
- Potts' (2009) list of suggested plants should be consulted during re-vegetation (Appendix A);
- construction of a noise wall to ameliorate noise concerns. This will have the least impact on the heritage significance of the cottage;
- the noise wall should be rendered in an appropriate colour. It is suggested that a cream colour similar to the house be used on the interior of the wall, as this will tone with the house and will not add to the darkening of the area. It is suggested that the exterior section of wall, that which faces Windsor Road, be rendered in a colour in keeping with the surrounds – either brick red, green or two toned brick red and green to blend with the adjacent property; and

7.0 References

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Figures

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PROJECT ID: 60143257
CREATED BY: TO
LAST MODIFIED: TO 29 04 2010

AECOM
www.aecom.com

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Location of 266 - 268 Windsor Road, Model Farms, Baulkham Hills

NSW Roads and Traffic Authority
Statement of Heritage Impact
266 - 268 Windsor Road
Baulkham Hills NSW 2153

Figure
F1

Map Document: G:\Projects\601\60143257 RTA Statement of Heritage Impact\60143257 F1

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Proposed Windsor Road upgrades

NSW Roads and Traffic Authority
Statement of Heritage Impact
266 – 268 Windsor Road
Baulkham Hills NSW 2153

Figure
F2

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0 5 10 m

Figure F3 – Aerial indicating footprint of 266-268 Windsor Road

NSW Roads and Traffic Authority
Statement of Heritage Impact
266-268 Windsor Road
Baulkham Hills NSW 2153

Figure
F3

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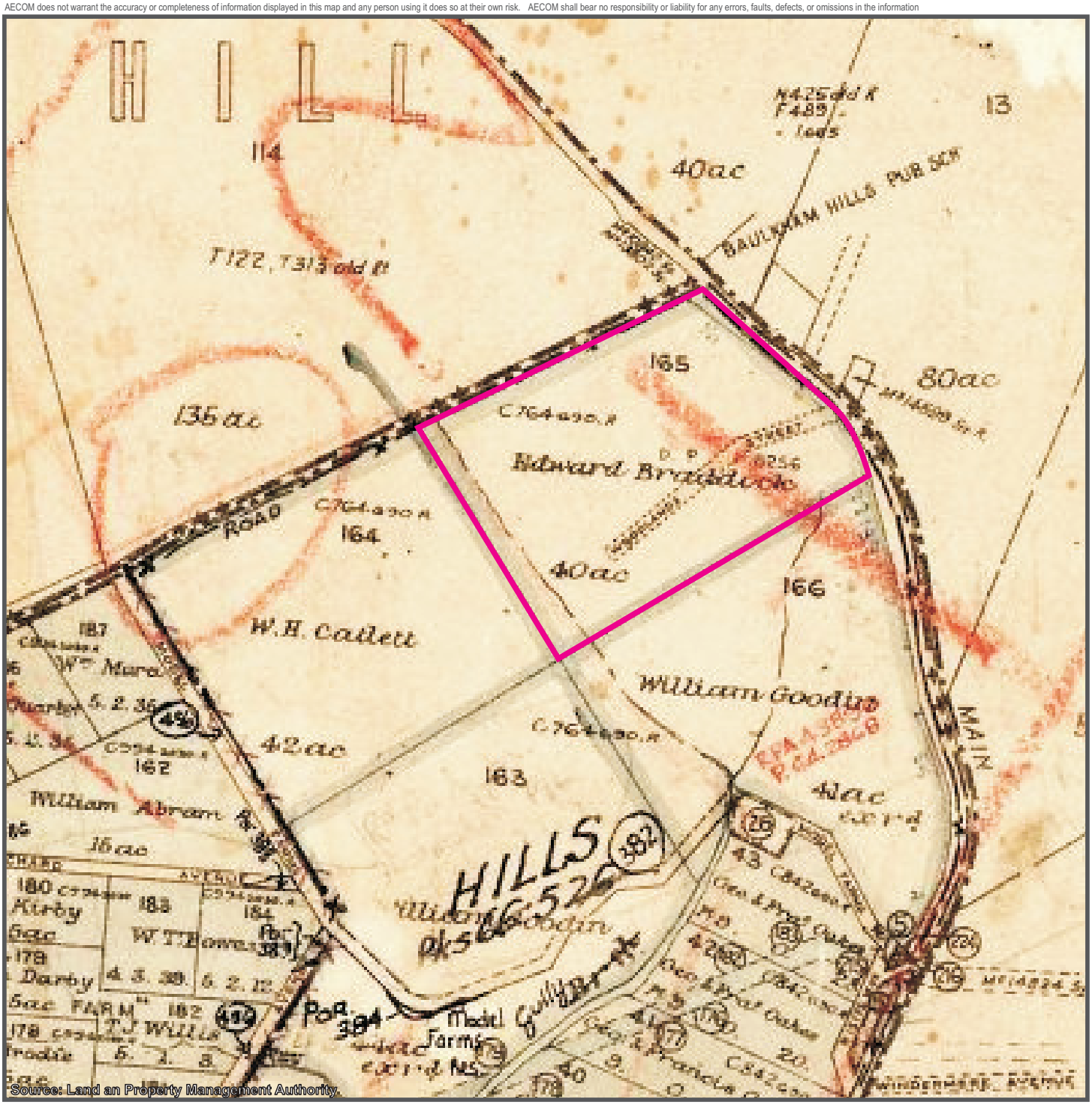

PROJECT ID: 60143257 CREATED BY: TO LAST MODIFIED: TO 03 05 2010 AECOM www.aecom.com		**1926 Parish of St Johns Map Exercpt**
		NSW Roads and Traffic Authority *Statement of Heritage Impact* 266 - 268 Windsor Road Model Farms **Figure F4**

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Figure F5: View of 266-268 Windsor Road from driveway of 264 Windsor Road. View: north west.

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Figure F6: View of 266-268 Windsor Road showing bay window. View south west.

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Figure F7: View of 266-268 Windsor Road showing effect of vegetation screening.

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Figure F8: View from 266-268 Windsor Road showing Baulkham Hills Public School. View north

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Figure F9: View of Baulkham Hills Public School indicating proximity to footpath. View north.

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Appendix A

Arborist's Report

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ARBORISTS REPORT: 266 WINDSOR ROAD, BAULKHAM HILLS

VEGETATION ON PROPERTY FRONTAGE

Prepared for: LEIGHTON CONTRACTORS PTY LIMITED

DECEMBER 2009

Report prepared by David Potts, Consultant Arborist
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CONSULTANT ARBORIST
ARBORISTS REPORTS
TREE SURVEYS & DIAGNOSIS
NSW CHEMCERT CERTIFICATE INSTRUCTOR

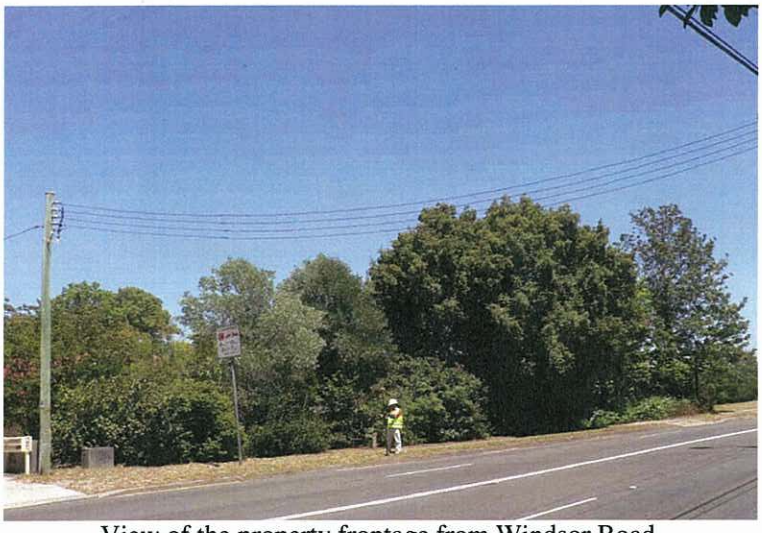
Report date: 8th December 2009

ARBORISTS REPORT: 266 WINDSOR ROAD, BAULKHAM HILLS VEGETATION ON PROPERTY FRONTAGE

INTRODUCTION

The vegetation inspected for this report comprises the trees and shrubs on the subject property located between the heritage-listed brick residence and Windsor Road footpath. Portion of the property frontage is proposed for resumption and incorporation into the new M2 Motorway access ramp, off Windsor Road. The specific area of investigation is shown on the cover page.

REPORT CONTENTS



View of the property frontage from Windsor Road

Report Part 1 follows

PART 1 TREE INSPECTIONS 7th November 2009 14 trees recorded:

Tree inventory / Inspection report: provenance, specifications, observable health & structural condition, and from this the Safe Useful Life Expectancy ("SULE") rating determined using the Barrell 1.4.01 format. (*Note that SULE ratings cannot predict the impact of extreme weather events on the subject trees, or necessarily detect internal defects in trunk or root plate).*

- Approximate tree heights were calculated with a Haglöf electronic clinometer.
- The tree location plan is on page 7

no	Species *provenance	H x R in m	Age, inspection comments Age code: **Y** = Young, **EM** = Early-mature **M** = Mature, **A** = Aged, **S** = Senile	SULE rating
1	*Grevillea robusta* **Silky Oak** * coastal r/f Nth NSW-Qld	11 x 5	EM: canopy healthy, primary trunk has a suspect narrow fork with fissure & sap bleed, (see photo below)	2d
2	*Castanospermum australe* **Black Bean** *coastal, Nth NSW & Qld	8.5 x 4.5	**M**: callused branch stubs, limited small dead wood, healthy	1
3	*Grevillea robusta*	11 x 3.5	**Y**: OK	1
4	*Pittosporum undulatum* **Native Daphne** * native inc. locally	6 x 3	**EM**: OK	2

View of trees 1 to 4 lining the northwest boundary of the property. The tall trees are Silky Oaks 1 & 3, the broad tree on the left is the Black Bean T.2. The right photo shows the suspect trunk fork on Silky Oak T. 1 (location arrowed in left photo).

no	Species *provenance	H x R in m	Age, inspection comments Age code: **Y** = Young, **EM** = Early-mature **M** = Mature, **A** = Aged, **S** = Senile	SULE rating
5	*Syzygium paniculatum* **Brush Cherry** * native inc. regionally (uncommon)	9.5 x 5	**M**: multi-trunked at base, the trunk forks presently sound, tree healthy	2
6	*Acacia binervia* **Coast Myall** * native inc. regionally	6.7 x 2	**M**: leans to NE about 20°, healthy	2
7	*Acacia binervia*	7 x 2	**EM**: twiggy dieback on SW side	2

Southeast view of Trees 5, 6, 7 from Windsor Road. The large tree behind the clearway sign is the Brush Cherry (T. 5). The central blue-grey foliage belongs to Trees 6 & 7 the Coast Myalls. The shrub border in the foreground is hedged Bay Tree (Sweet Bay) *Laurus nobilis.*

no	Species *provenance	H x R in m	Age, inspection comments Age code: **Y** = Young, **EM** = Early-mature **M** = Mature, **A** = Aged, **S** = Senile	SULE rating
8	*Callistemon salignus* **Willow Bottlebrush** * native inc. regionally	5 x 2	**Y**: (shrublike) limited twiggy dieback lower 1.8m of trunks	2
9	*Lagerstroemia indica* **Crepe Myrtle** * Indian subcontinent & sth China	4.5 x 2.2	**M**: lopped at ~ 1.4 m, decay where lopped, upper branches are all watershoots (epicormics) growing from the lopped stubs. Photo next page.	2(3)
10	*Leptospermum petersonii* **Lemon Scented Tea Tree** * border ranges NE NSW-Sth Qld	5 x 2.5	**M**: shrublike, healthy	2

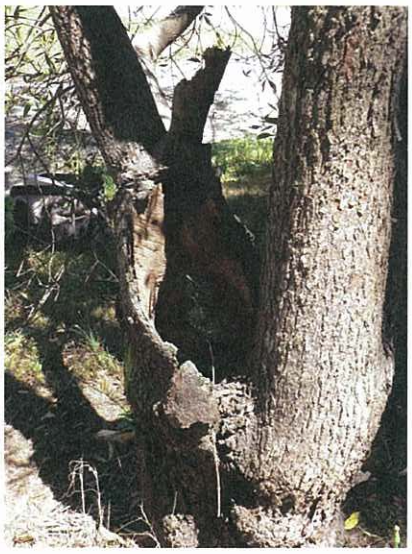
Photos of trees 8-10 follow

Right: View of trees 8, 9, 10 as seen from the verandah. The Lemon Scented Tea Tree (T. 10) is arrowed in the foreground

Left: effect of "lopping" on Crepe Myrtle T. 9

no	Species *provenance	H x R in m	Age, inspection comments Age code: **Y** = Young, **EM** = Early-mature **M** = Mature, **A** = Aged, **S** = Senile	SULE rating
11	*Jacaranda mimosifolia* **Jacaranda** * Brazil	4 x 1.8	**Y:** OK	1
12	*Photinia x fraseri* 'Robusta' **Photinia** * Orient	4.5 x 2	**M**: OK	1
13	*Ceratopetalum gummiferum* **NSW Christmas Bush** * native inc. regionally	6 x 2.5	**M**: large lesion & hollow in base (Photo next page)	2(3 ?)
14	*Grevillea robusta*	9 x 2.5	**Y**: upper half dead, advancing dieback, will die off	4

Photos of Trees 11-14 follow

Left: view including Trees 11-14, in a foliage mix of trees and shrubs. The dying Silky Oak T. 14 can be seen in the left background. The foreground shrub arrowed is a small Macadamia *Macadamia tetraphylla*. Right photo shows the decay and hollow in the base of NSW Christmas Bush T. 13

Inspection nomenclature: explanatory notes

Co-dominant trunks: may occur where a trunk divides with a narrow fork, which tends to wedge apart over time, set up hairline partition and a decay court inside the fork, which may split in time (various indicators if this is occurring).

Deadwood: expected on mature trees – to a degree. Beyond a point, the percentage of deadwood in the overall canopy will downgrade the SULE prognosis. In some cases, may indicate a progressive dieback pattern, or limb death caused by termites.

Epicormic branches: brittle-attached leafy shoots or branches, usually sprout from the trunk or limbs, as response to unsuitable environment ("stress"), fire, "lopping" or natural senility. Beyond a point, the percentage of epicormics in the overall canopy will downgrade the SULE prognosis.

H x R column: (3rd from left) this is the approximate height in metres recorded by the clinometer x the canopy radius (radius = average trunk-to-dripline distance, in metres).

Lesion: (generic) refers to any localised pathology such as decay, disease, infected wound, morbid tissue.

Lopping and topping: a structurally and pathologically destructive method of pruning trees. It is an unacceptable tree working method under *AS 4373-2007 Part 8* "Pruning of Amenity Trees"

"OK": indicates that the tree inspected as satisfactory for its age, location & seasonal conditions

Pre-emptive removal: Trees not expected to fail immediately, but with serious structural fault or disease that give a poor prognosis and foreseeable hazard. In young trees with serious inbuilt fault, pre-emptive removal is advisable before the tree grows larger and removal more difficult and expensive. These trees are flagged in the SULE column as Category 3(4)

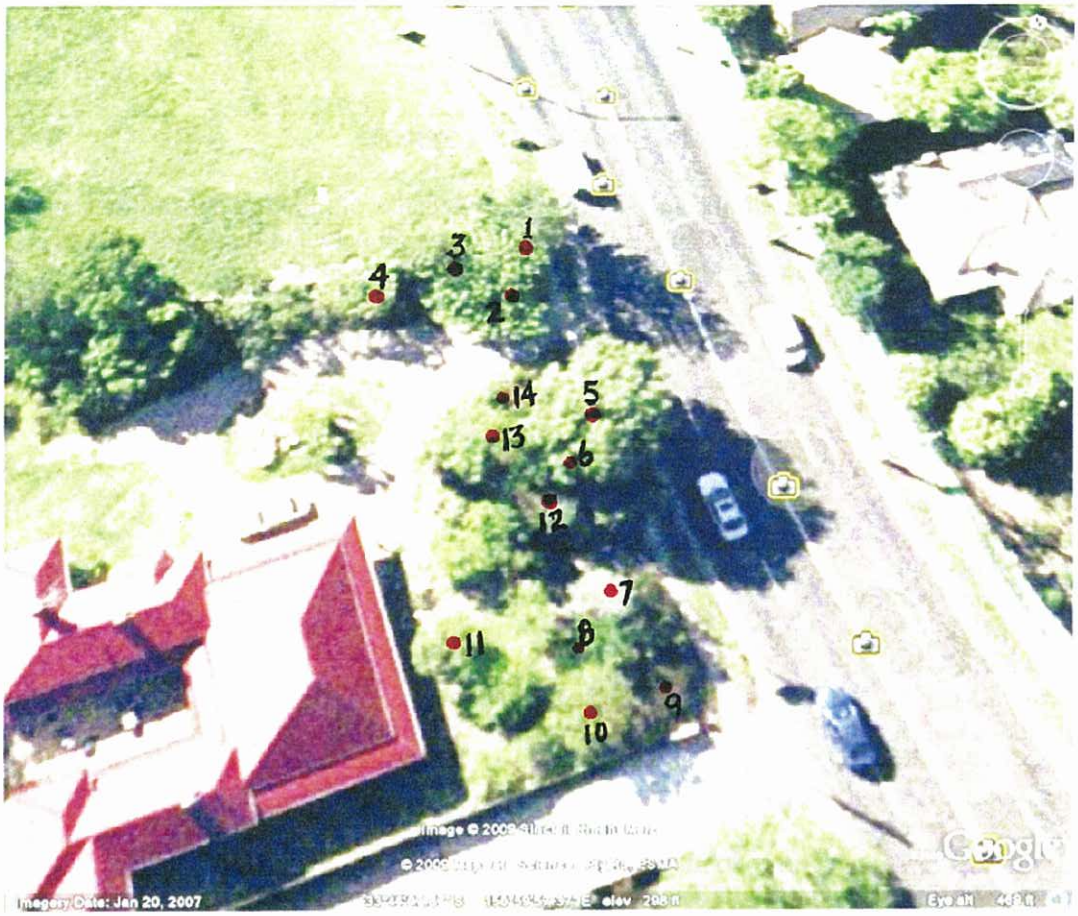
Provenance: Australian or exotic centre-of-origin of the species (in species column).

Safe Useful Life Expectancy "SULE" rating these ratings use the Barrell 2001 format for rating trees: SULE cat.1(40+ yrs), 2(15-40 yrs), 3(5-15yrs), 4(remove), full details page 12.

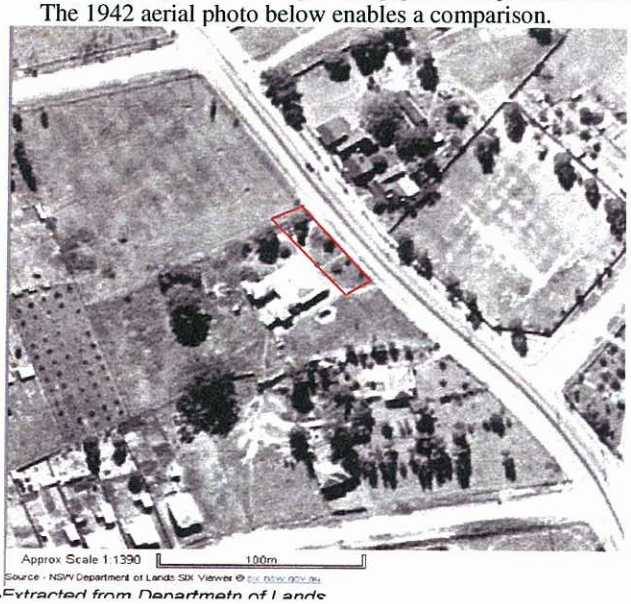
This completes Part 1, inventory and inspection results on the trees in the study area.

The tree location plan follows on page 7

APROXIMATE TREE LOCATIONS



Individual tree locations. The remaining vegetation filling in the gaps in this photo is shrubbery, to be discussed in report Part 2 on page 8. The 1942 aerial photo below enables a comparison.



Extracted from Departmetn of Lands

PART 2 SHRUB UNDERSTORY IN THE INSPECTION ZONE.

These are a mix of large and smaller shrubs and sapling trees. Because of planting density they fill in the gaps between the trees, and form a visual screen 2+ metres high between the residence and the road. Photos on page 2, 5 and 6 give a good impression of the screen effect.

The species forming the shrub understory are all quite common in suburban Sydney, and were identified and listed below:

Shrubs
Nerium oleander **Oleander**
Laurus nobilis **Bay Tree (Sweet Bay), hedged**
Viburnum tinus **Viburnum**
Plumbago auriculata **Plumbago**
Ochna serrulata **Mickey Mouse Plant**
Rosa multiflora **Multiflora Rose**
Callistemon viminalis 'Captain Cook' **Captain Cook bottlebrush**
Camellia japonica **Camellia**
Melaleuca hypericifolia **Red Flowered Honey Myrtle**
Hibiscus rosa-sinensis **Hawaiian Hibiscus**

Saplings of juvenile trees (currently shrub sized)
Macadamia integrifolia **Queensland Nut Tree**
Syzygium paniculatum **Brush Cherry**
Jacaranda mimosifolia **Jacaranda**
Ceratopetalum gummiferum **NSW Christmas Bush**

Fruit trees
Prunus persica **Peach Tree**
Citrus reticulata **Mandarine**

None of these shrubs were of great age. The oldest possibly is the Laurel "hedge" (photo page 4) which was in partial dieback, probably because of periodic infestations *Wax Scale* (sap sucking insect) to which the Sweet Bay is quite susceptible in eastern (coastal) regions.

End of Part 2 - shrub understory

PART 3 THE SITE TREE SUMMARY

The tree species
With the exception of Black Bean (T. 2) and the Brush Cherry (T. 5), the trees recorded in report Part 1 are relatively ubiquitous suburban favourites, of value here in an amenity sense - visual & screen - between the residence and road.
The mature examples here of Black Bean and Brush Cherry are less common in Sydney suburbs. Some of the trees were planted by the present owner for screen enhancement and (wishfully) for traffic noise mitigation.

Age of the trees
The signature trees of 19th century estates, large gardens and cemeteries, such as *Araucaria* spp (Hoop Pine, Bunya), *Quercus* spp (English Oak etc), *Ulmus* spp (Elms), *Cupressus* spp (Monterey Cypress), *Ficus* spp (Moreton Bay & Port Jackson Fig), *Phoenix canariensis* (Phoenix Palm) *Platanus* spp (Plane Tree), *Cinnamomum camphora* (Camphor Laurel) are **absent** from the study area. A large Camphor Laurel however is to be seen behind the residence, but not relevant to this report.

Trees **2** and **5** (Black Bean, Brush Cherry) are the oldest of the trees, but on appraisal were judged under 100 years of age. They easily post-date the brick residence, which is of 1860-70's vintage (pers. com. owner).

The Dept. of Lands 1942 aerial photograph (page 7) shows one tree in the same location as Tree 2, and it may well be the same tree (Black Bean), which would date it older than 70 years.
There are other trees (shrubs ?) in the 1942 photo, but they do not relate to anything in the present inventory.

Inspection prognoses: Safe Useful Life Expectancy ("SULE") ratings
With the exception of Trees 9, 13, 14 (see inspection table), the remaining trees all had satisfactory prognoses, rating SULE Category 1 (40+ years) or Category 2 (15-40 years).

Excepting the Laurel "hedge" with partial dieback (photo page 4), the shrubs were all in satisfactory condition for the exposed location and growing conditions.

A detailed explanation of the *Safe Useful Life Expectancy* categories is on page 12.

This completes Part 3 an overview of the trees in the study area.

PART 4 LANDSCAPE PLAN: RESTRAINTS AND SUITABLE REPLACEMENT SPECIES

Restraints
The concept Landscape Plan supplied by Tract Consultants indicates a "cut" along the resumed frontage of approximately 750mm depth, the vertical (i.e. not battered) level change being accommodated by a masonry wall.

Allowing for working room of another 500mm behind the construction line, I would advise removing any trees within 2.5 metres of the working excavation line, to avoid root truncation or destabilisation of anchorage.

In the bigger picture, it may be appropriate to remove the existing ad hoc mix of vegetation and replant with suitable species, as discussed below.

Potentially suitable trees & shrubs for the situation
Suitable species must be long lived, pollution and wind resistant, hardy to the confined garden area and soils. Very importantly, they must provide screening and privacy by dense branching habit and foliage, with floral display as an enhancement.
Among the selections that fit these specifications are:

***Acmena smithii* 'Minor'** Dense foliage, compact small tree to 6m maximum, flowers and fruits.
***Syzygium* 'Hunchy'** Dense dwarf Brush Cherry type.
***Metrosideros* 'Fiji Fire'** or ***Metrosideros* 'Spring Fire'** Large dense shrub, good floral display.

Part 5 report summary follows on page 11

PART 5 REPORT SUMMARY

- The site inspection recorded 14 trees with associated shrub plantings that provide useful amenity of a visual barrier between the residence and Windsor Road.
- None of the trees or shrubs were rare, endangered, forest remnant or in a heritage context had a direct connection to the original 1860/70's development. One tree (*Castanospermum australe*), whilst not 19th century vintage, appears in the Lands department 1942 aerial photograph.
- Resumption of part of this property frontage for the M2 upgrade and the level change will require removal of many of the trees and shrubs. These are to be replaced with carefully selected species suited to the site: pollution and wind resistant, compact and dense growth habit, visually appealing. Several are listed in Part 4 of this report.

END OF REPORT

Thank you for the opportunity to make this report,
I trust this information is helpful in your planning.

David Potts
December 2009

Following:
Explanatory notes: *Safe Useful Life Expectancy* categories and sub-categories.

SAFE USEFUL LIFE EXPECTANCY "S.U.L.E." CATEGORIES (Barrell Jan 2001 update)

1. LONG SULE (40+ years): *Trees that appeared to be retainable at the time of assessment for more than 40 years with an acceptable level of risk.*
1a) Structurally sound trees located in positions that can accommodate future growth.
1b) Trees that could be made suitable for retention in the long term by remedial tree care.
1c) Trees of special significance for historical, commercial or rarity reasons that would warrant extraordinary efforts to secure their long term retention.

2. MEDIUM SULE (15-40 years) *Trees that appeared to be retainable at the time of assessment for 15-40 years with an acceptable level of risk.*
2a) Trees that may only live between 15 and 40 years.
2b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons.
2c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
2d) Trees that could be made suitable for retention in the medium term by remedial tree care

3. SHORT SULE (5-15 years) *Trees that appeared to be retainable at the time of assessment for 5-15 years with an acceptable level of risk.*
3a) Trees that may only live between 5 and 15 years
3b) Trees that could live for more than15 years but may be removed for safety or nuisance reasons.
3c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
3d) Trees that require substantial remedial care and are only suitable for retention in the short term

4. REMOVE *Trees that should be removed within the next 5 years.*
4a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions.
4b) Dangerous trees because of instability or recent loss of adjacent trees.
4c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds, poor form.
4d) Dangerous trees that are clearly not safe to retain.
4e) Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
4f) Trees that are damaging or may cause damage to existing structures within 5 years.
4g) Trees that will become dangerous after the removal of other trees for the reasons given in a) to f).
4h) Trees in categories a) to g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.

5. SMALL, YOUNG OR REGULARLY PRUNED *Trees that can be reliably moved or replaced.*
5a) Small trees less than 5m in height
5b) Young trees less than 5 years old but over 5m in height
5c) Formal hedges and trees intended for regular pruning to artificially control growth.

Worldwide Locations

Australia	+61-2-8484-8999
Azerbaijan	+994 12 4975881
Belgium	+32-3-540-95-86
Bolivia	+591-3-354-8564
Brazil	+55-21-3526-8160
China	+86-20-8130-3737
England	+44 1928-726006
France	+33(0)1 48 42 59 53
Germany	+49-631-341-13-62
Ireland	+353 1631 9356
Italy	+39-02-3180 77 1
Japan	+813-3541 5926
Malaysia	+603-7725-0380
Netherlands	+31 10 2120 744
Philippines	+632 910 6226
Scotland	+44 (0) 1224-624624
Singapore	+65 6295 5752
Thailand	+662 642 6161
Turkey	+90-312-428-3667
United States	+1 978-589-3200
Venezuela	+58-212-762-63 39

Australian Locations

Adelaide
Brisbane
Canberra
Darwin
Melbourne
Newcastle
Perth
Sydney
Singleton

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NON-ABORIGINAL HERITAGE ASSESSMENT FOR:

Hills M2 UPGRADE

H B O + E M T B

HBO EMTB Heritage Pty Ltd

ABN 58 106 612 140

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Sydney *Hong Kong*
Melbourne *Beijing*
Canberra *Shanghai*
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Brisbane *Seoul*
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MEMBER

Executive Summary

Existing Environment

The existing environment can be described as a 4 lane dual carriageway motorway, 21 kilometres in length, which passes through the Local Government Areas of: City of Ryde, Hornsby, Ku-ring-gai and The Hills. The areas adjacent to the motorway are highly urbanised and the M2 passes closely to or in the vicinity of a number of heritage items identified by local councils. Associated with the motorway are the entry and exit points, some of which will be modified by the proposed widening of the M2.

Impact Assessment

A heritage survey was undertaken to identify significant items located along the Hills M2 upgrade area. The assessment of each item included fabric analysis and historical research related to their settings. The assessment also included investigations by an arborist where required to address landscape issues. This assessment was completed in accordance with the statutory obligations of local government areas of The Hills Shire Council, Hornsby Shire Council, Ku-ring-gai Council and City of Ryde. The provisions of local government planning instruments and heritage controls have been considered in this report. The extent to which impacts occur at each heritage item is described and tabulated.

Mitigation measures

All potential identified impacts are documented in this report. Measures have been recommended to reduce the impacts, where they occur, to significant items located along the Hills M2 Upgrade. Particular consideration was given to the heritage building located at 266-268 Windsor Road, Model Farms. Its Windsor Road setting contributes significantly to the streetscape and is to be retained along with an adequate curtilage as set out by the policy recommendations section of this report.

1 Proposal Details

Description of Proposal

The proposed upgrade would occur along the Hills M2 Motorway from the M7/Abbott Road, Baulkham Hills, to the Lane Cove Tunnel. The proposed upgrade would include the following components:

- Widening and/or provision of a third lane along sections of the eastbound and westbound carriageways between Windsor Road and Lane Cove Road.
- Provision of new on/off ramps at Windsor Road, Christie Road and Herring Road.
- Widening and provision of a third lane eastbound and westbound in the Norfolk Tunnel.
- Restoration of westbound breakdown lane from Beecroft Road to Lane Cove Road.
- Removal of the Beecroft Road bus on/off ramp.
- Improvement and widening of local arterial roads, Windsor Road and Talavera Road.
- Widening of the bridge at Christie Road and provision of new traffic control signals.
- Upgrades to the Motorway's Intelligent Transport Systems.

A full description of the proposed upgrade can be found in Chapter 7 of the main M2 Upgrade Project Environmental Assessment document.

Description of the Study Area

The M2 Motorway is a four lane dual carriageway opened in 1997 which extends 21 kilometres from the intersection of Abbott Road, Baulkham Hills, to the Lane Cove Tunnel. The motorway passes through the City of Ryde, Hornsby Shire and The Hills Shire local government areas (LGAs). Parramatta LGA borders the alignment of the motorway in some sections. A locality plan for the proposed upgrade is presented as Figure 1 in this report and in the main M2 Upgrade Project Environmental Assessment document.

Much of the area within and adjacent to the study area is highly urbanised and consists of residential properties, commercial precincts, parkland and areas of native vegetation of varying quality. Several larger areas of remnant native vegetation exist within and adjacent to the study area, usually associated with the major watercourses crossed by the motorway. The most significant of these include Bidjigal Reserve, vegetation in the vicinity of Devlins Creek, vegetation surrounding Terrys Creek between Lucknow Park, Berriwerri Reserve and Sommerset Park and parts of Lane Cove National Park adjacent to the M2 corridor in Macquarie Park. A full description of the M2 motorway environs can be found in Chapter 1 of the main M2 Upgrade Project Environmental Assessment document.

The M2 motorway corridor is close to a number of heritage items and areas of heritage value including residential buildings, recreation areas, reserves, conservation areas, landscape features and gardens that are listed by a number of local councils, State

agencies and the Commonwealth government. These items are discussed further in this assessment.

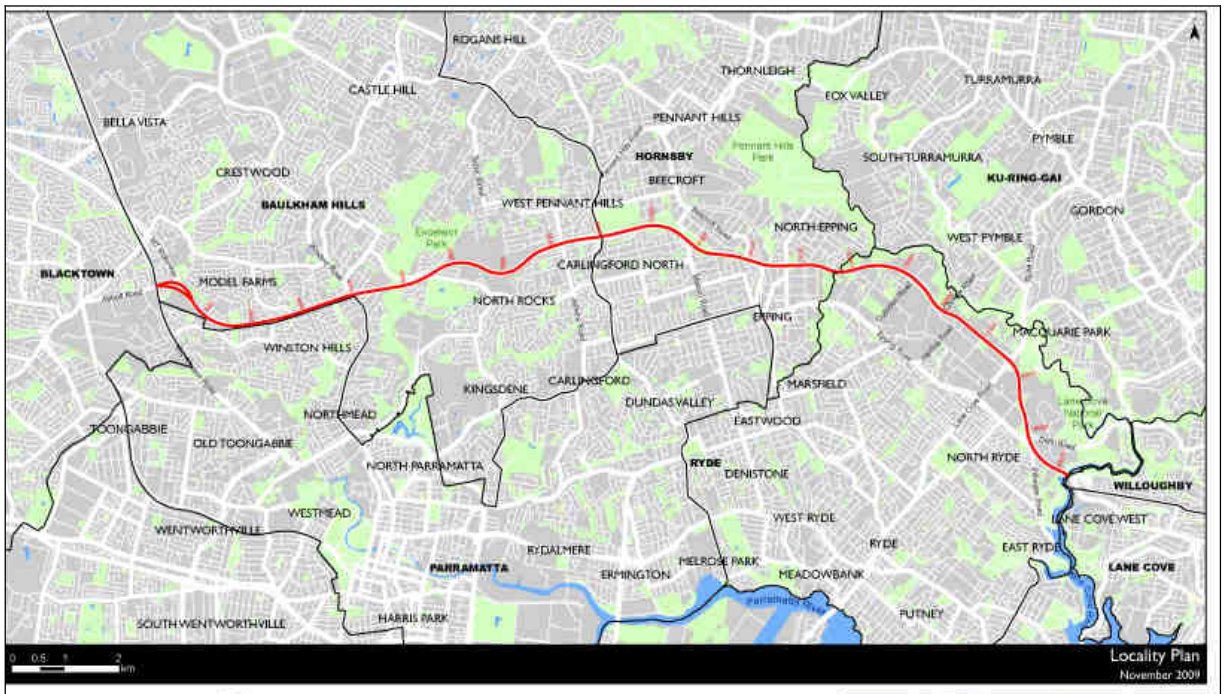


Figure 1: The above map outlines the extent of the study area and the red line indicates the location of the M2 motorway within each Local Government Area. Source: AECOM, January 2010. (Note this figure is taken from the main body of the M2 Upgrade Project Environmental Assessment)

2 Policy Framework and study methodology

Purpose of heritage assessment

This heritage assessment has been carried out for Leighton Contractors Pty Limited to accompany an Environmental Assessment for the M2 Upgrade Project. The report assesses the impact of the proposed M2 Motorway corridor widening as described in Section 1 of this report and Chapter 7 of the M2 Upgrade Project Environmental Assessment.

A Non-Aboriginal heritage assessment has been previously carried out by Conybeare Morrison and Partners in April 1992 identifying heritage items of significance along the M2 route and will be used as a basis for this report. An additional heritage item was identified through consultation with the relevant local council, which has been described in this report. An in-depth field assessment of the all identified items has been undertaken.

The aim of this report is to identify heritage items and values in the vicinity of the proposed upgrade works, establish their current level of significance, identify potential impacts to the heritage items due to the proposed work and identify appropriate mitigations measures and strategies to minimise the potential for adverse impact to those items.

Early in this assessment process consultation occurred with the M2 Upgrade Project Team and potentially affected property owners (266 Windsor Road Model Farms) regarding potential impacts to known items of non-Aboriginal heritage significance. Through this process the proposed design of the upgrade and construction methodology was able to be amended to avoid or lessen potential impacts to the known heritage items. Mitigation measures and strategies were also established to further minimise the potential for adverse impacts to the known non-Aboriginal heritage items in the vicinity of the proposed works.

The assessment reviews and determines the current level of heritage significance of each identified site based on the principles set out in the *Australia ICOMOS, Burra Charter* (November 1999). The assessment defines the importance of the items and their cultural significance.

Information Gathering – Review of Literature and Database

Database searches and literature reviews have been undertaken to:

- Form a clear understanding of the level of significance for each item identified in the study area. This allows the significance levels of each heritage items and heritage values to be reviewed against the new rating criteria set out by the Heritage Branch of the Department of Planning for the State Heritage Register.
- Provide a succinct summary (data sheet) outlining the location of each item and value, associated legal description of each item where known, provide a description of the setting/curtilage of the place, provide a physical description of the item, provide thematic themes (local, state and national site patterns) where relevant and provide a summary statement of significance.

- Database searches and literature reviews were undertaken for previously identified heritage items and values. The information gathered was analysed and assessed prior to carrying out site investigations. This information provided an initial indication of which items and values might be potentially impacted, the heritage significance of those items and values and the likely nature of the potential impact.

Consultation occurred with the local councils. From this process an additional heritage item was identified that could potentially be impacted upon by the proposed works (a sandstone causeway on Devlins Creek between Beecroft Road and the Northern Railway Line). Further database searches and literature reviews were undertaken for this item to allow the significance and potential impacts to be identified and assessed.

From this information gathering and analysis process summary data sheets have been prepared. These data sheets are presented in Section 6 Appendices of this report.

The main sources of information used to assess the heritage items and values are as follows:

- North West Transport Links East, Environmental Impact Statement, Working Paper European Heritage Survey carried out by Conybeare Morrison & Partners, Prepared for Maunsell Pty Ltd on behalf of The Roads and Traffic Authority of NSW Sydney Western Region April 1992.
- Aerial Mapping Systems, sourced from the NSW Department of Lands SIX Viewer at six.nsw.gov.au.

Supporting source material taken from the following registers and schedules

- NSW Roads and Traffic Authority – Section 170 Heritage and Conservation Register, source down from website www.rta.nsw.gov.au March 2009.
- State Rail Authority (Rail Heritage Unit) – Section 170 Heritage and Conservation Register. source downloaded from website www.rta.nsw.gov.au March 2009.
- NSW Heritage Office – The State Heritage Register, source downloaded from website www.heritage.nsw.gov.au April 2009.
- NSW Heritage Office – The State Heritage Inventory, source downloaded from website www.heritage.nsw.gov.au April 2009
- Parramatta City Council – Local Environmental Plan 2001, Schedules 1 (Heritage Items of State and Regional Significance), 2 (Heritage Items of Local Significance) and 3 (Heritage Conservation Areas), source downloaded from website www.parracity.nsw.gov.au March 2009.
- Baulkham Hills City Council – Local Environmental Plan 2005, Schedule 1, Heritage Inventory, and source downloaded from website www.thehills.nsw.gov.au March 2009.
- Ryde City Council – Local Environmental Plan Gazetted 4 August, 2006, Schedule 15 (Heritage Items Clause 84) and Schedule 16 – (Heritage Conservation Areas Clause 84),), source downloaded from website www.ryde.nsw.gov.au March 2009
- Hornsby Shire Council - Local Environmental Plan (HSLEP 1994), Schedule D (Heritage Items) Schedule E (Heritage Conservation Areas), source downloaded from website www.hornsby.nsw.gove.au September 2009

- The Register of the National Estate (Australian Heritage Council), database search March 2009, source downloaded from www.environment.gov.au/cgi-bin/ahdb/search.pl
- The Commonwealth Heritage List (Australian Heritage Council), database search March 2009, source downloaded from www.environment.gov.au/heritage/places/commonwealth/index.html
- The National Heritage list (Australian Heritage Council) database search March 2009, source downloaded from www.environment.gov.au/heritage/about/national/index.html,

Additional source information was taken from North West Transport Link East, Environmental Impact Statement, Working Paper, European Heritage Study, Conybeare Morrison & Partners, Prepared on behalf of The Roads and Traffic Authority of NSW Sydney Western Region April 1992

Consultation

Early in the design development phase, consultation occurred between the Project Team (consisting of Transurban, AECOM, Leighton Contractors Pty Ltd) and HBO+EMTB Heritage Pty Ltd regarding the known items of heritage significance. The heritage items and values potentially impacted by the proposed upgrade works and the nature of the potential impacts were identified. Actions were implemented to mitigate the impacts.

Through this consultation process an additional item of potential heritage significance was identified (the sandstone causeway at Devlins Creek). Further on site investigations confirmed the appearance, location and significance of this item and subsequently it is included in this assessment and illustrated by means of a photograph, location plan and sketch.

Consultation also occurred with the owners of 266-268 Windsor Road, Model Farms. The discussion was centred on the retention of a pedestrian and vehicular access way from Windsor Road and the assessment of the potential significant landscaping presenting to Windsor Road.

Fieldwork

Following the information gathering process and consultation, a site survey was undertaken for each identified heritage item and value. The survey assessed the following:

- the built fabric,
- visual qualities of the items,
- the setting of the items,
- proximity to the proposed works,
- potential impacts to the items.

As a result, a summary of the prescribed measures to mitigate the impacts was prepared (refer to Section 3).

As a result of the field assessment and investigation works, two areas were identified where items of heritage significance may potentially be impacted by the proposed M2 upgrade works. The impacts are outlined in Table 1 in Section 3. Mitigation measures proposed to be developed to reduce the potential for impacts to the heritage items are outlined in Table 2 in Section 4.

Author

This report was written by Christopher Roehrig, Heritage Specialist with HBO+EMTB Heritage Pty Ltd and reviewed by Brian McDonald, Director and Heritage Architect of HBO+EMTB Heritage Pty Ltd in accordance with the HBO+EMTB Pty Ltd quality assurance program.

The fieldwork was carried out by Christopher Roehrig, Heritage Specialist and Rosemarie Canales, Senior Heritage Architect with HBO+EMTB Heritage Pty Ltd.

The photographic report has been compiled in the Data Table section of this report. The data table section of this report was carried out by Rosemarie Canales, Heritage Architect and reviewed by Brian McDonald, Director, HBO+EMTB Heritage Pty Ltd.

3 Heritage Impact Assessment

The assessment of heritage significance of the items that have been identified in this report is based on the criteria A-G established for the State Heritage Register assessment methodology and is also based on the conservation principles set out in the *Burra Charter* (1999 version). The assessment defines the importance of the items and their cultural significance.

The concept of cultural significance, Article 1.1 of the Burra Charter, defines Cultural Significance as "the aesthetic, historical, scientific/technical or social value for past, present or future generation." The general approach to assessing the nature of significance is based on that of *The Conservation Plan* (Kerr 1996) and in the *NSW Heritage Manual* methodology of assessment, an item may be significant for the State or at a local level.

Newly Identified item of heritage significance

The newly identified item (H-12 Stone Causeway over Devlin Creek, Epping) has been described and its heritage significance assessed against the NSW Heritage significance assessment criteria. Relevant information is included in the data summary sheet for this item contained in Section 6 of this report.

Non-Indigenous (European development)

There are 14 items in the vicinity of the M2 motorway that were initially identified as having heritage significance in the early planning stage of the proposed works. With the addition of the additional site referred to above, there are 15 items of heritage significance identified in close proximity to the proposed works.

Non-Indigenous (Natural Areas - Parks)

The 15 identified heritage items in the vicinity of the proposed upgrade works includes seven natural areas (parks) of heritage significance. The potential visual impacts in these areas associated with the proposed upgrade works are unlikely to affect the heritage significance of these items, as the proposed route widening and other works would take place within and immediately adjacent to the existing M2 corridor. The photographic recording and description (as described in Section6 Appendices – Data sheets) outlines the area where any visual impact will occur affecting the setting of the natural landscape and built elements.

Impacts on Significance

Overview

The design process for the proposed upgrades to the M2 has been guided by the objective of minimising adverse impacts upon heritage items or their setting. In general, the following assessment of impacts is generally an account of the success of the planning and design outcomes in achieving that objective. These outcomes are largely due to the early heritage input on the heritage significance and aesthetic values of the items and their settings.

Basis of Approach

The basis for determining the impacts to each identified item in Table 1 follows guidelines established by the NSW Heritage Office for preparation of Statements of Heritage Impact. The approach when assessing visual and physical impacts to significant items has been measured against the principles, articles and guidelines of the Burra Charter.

The following list of impacts is a summary of the impacts to each identified item and as noted in the data sheet table for each item. A map showing the location of these items is provided in Figure 2.

Table 1, Identified Impacts on Significance

ITEM NUMBER	IDENTIFIED ITEM	STATUTORY LISTING	IMPACTS ON SIGNIFICANCE
H-01	Northern Suburbs Cemetery	Ryde Local Environmental Plan 2008. LEP No. 105 (Locally listed heritage item).	Physical impact: No physical impacts. Visual Impact: No visual impacts.
H-02	Lane Cove National Park, Marsfield (see table 2)	Ryde Local Environmental Plan 2008. LEP No. 105 (Locally listed heritage item).	Physical impact: No physical impacts. Visual Impact: No visual impacts.
H-03	Christie Park	Not listed as a heritage item. Located within Ryde City Council.[2]	Physical Impact: No Physical impacts. Visual Impact: No visual impacts.
H-04	266-268 Windsor Road, Model Farms	Parramatta Local Environmental Plan 1996 (Heritage and Conservation) Locally listed item	Physical Impact: Negative physical impact as a result of works will reduce site curtilage, site allotment, and removal of existing mature plantings along eastern site boundaries. Work may also create structural damage due to vibration during works.

[2] Note: This item was originally included in the study brief as potentially a heritage item. The data research established that it is not a listed heritage item and the site inspection revealed no information that would warrant it being a heritage item.

ITEM NUMBER	IDENTIFIED ITEM	STATUTORY LISTING	IMPACTS ON SIGNIFICANCE
H-04 CONT.			Visual Impact: Negative visual impact due to introduction of new on ramp of M2 Motorway.
H-05	Epping Park, North Epping	Hornsby LEP (Locally listed heritage item)	Physical impact: No physical impacts.
			Visual Impact: No visual impacts.
H-06	No. 57 Norfolk Road, North Epping Residence	Hornsby LEP (Locally Listed Heritage item)	Physical impact: No direct physical impacts. However, this item may be subject to vibration associated with tunnel widening.
			Visual Impact: No visual impacts.
H-07	61 Norfolk Road, North Epping Residence	Hornsby LEP (Locally Listed Heritage item)	Physical impact: No direct physical impacts. However, this item may be subject to vibration associated with tunnel widening.
			Visual Impact: No visual impacts.
H-08	Garden – The Poplars, 64-66 Norfolk Road, North Epping	Hornsby LEP (Locally Listed Heritage item)	Physical impact: No physical impacts.
			Visual Impact: No visual impacts.
H-09	No. 70 Norfolk Road, North Epping Residence	Hornsby LEP (Locally Listed Heritage item)	Physical Impact: No direct physical impact. However, this item may be subject to vibration associated with tunnel widening.
			Visual Impact: No visual impacts.
H-10	Beecroft/Cheltenham Conservation Area	Hornsby LEP (Locally Listed Heritage item)	Physical Impact: Physically the works will modify the existing footprint of the overhead lanes introducing additional supporting structure.
			Visual Impact: Negative impact; the new structural columns will add bulk and scale to the existing structure.
H-11	Chilworth Recreation Reserve	Hornsby LEP (Locally Listed Heritage item)	Physical Impact: Physically the works will modify the existing footprint of the overhead lanes introducing additional supporting structure.
			Visual Impact: Negative impact; the new structural columns will add bulk and scale to the existing structure.
H-12	Devlin Creek, Epping Stone Causeway (see table 2)	Hornsby LEP (Locally Listed Heritage item)	Physical Impact: Removal of the M2 bus ramp structure proper will not physically impact the existing causeway, however care should be taken with the process and equipment used which may damage the remnant sandstone causeway located immediately below and the surrounding open stormwater brick

ITEM NUMBER	IDENTIFIED ITEM	STATUTORY LISTING	IMPACTS ON SIGNIFICANCE
H-12 CONT.			channel and brick culverts.
			Visual Impact: No visual impacts will occur. Removal of bus ramp will create a positive visual impact to the immediate area.
H-13	Pennant Hills Golf Course	Hornsby LEP (Locally Listed Heritage item)	Physical impact: No physical impacts.
			Visual Impact: No visual impacts.
H-14	Road Reserve – Street Trees (south end) Sutherland Road, Epping	Hornsby LEP (Locally Listed Heritage item)	Physical impact: No physical impacts.
			Visual Impact: No visual impacts.
H-15	Baulkham Hills Public School Former (see table 2)	Baulkham hills LEP 2005, Schedule 1 – Locally listed heritage item	Physical impact: No physical impacts to the site or the structures of the former Baulkham Hills Public School.
			Visual impact: Marginal negative visual impact to the site of the former Baulkham Hills Public School due to the close proximity of the new on ramp to the M2 Motorway.
Note: Item numbers are noted on the attached data sheets in the Section 6, Appendices, Data Sheets for Listed items.			

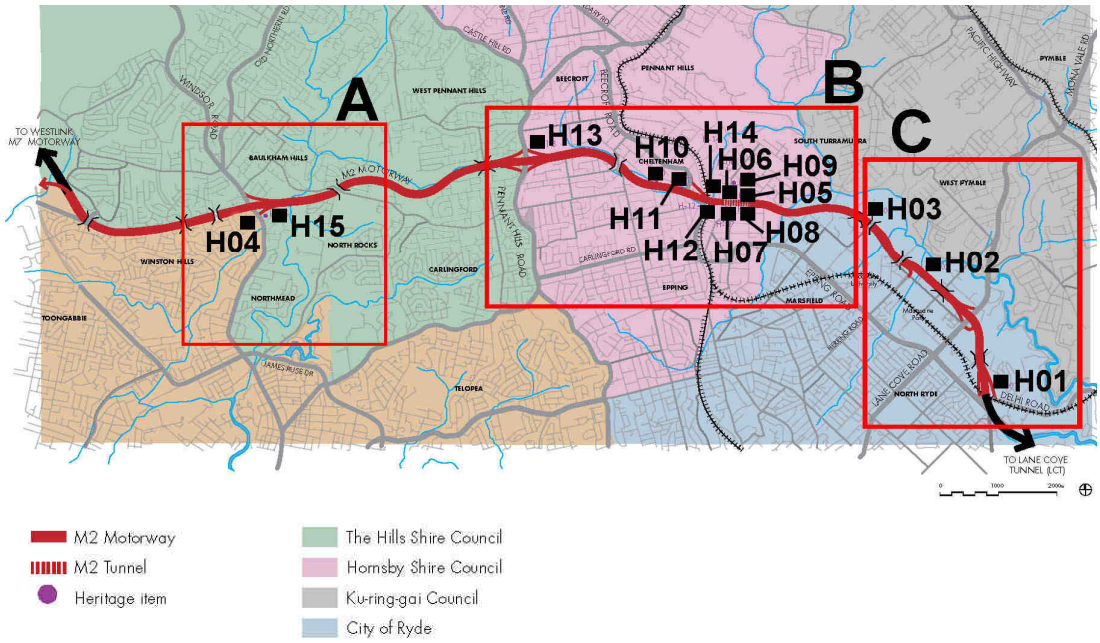


Figure 2: The above map provides locations of each identified item within the study area. The numbers correspond to each item within the Data Table Section 6 Appendices. Source Map supplied by HBO+EMTB Urban Design Landscaping, map overlay provided by Chris Roehrig January 2010.

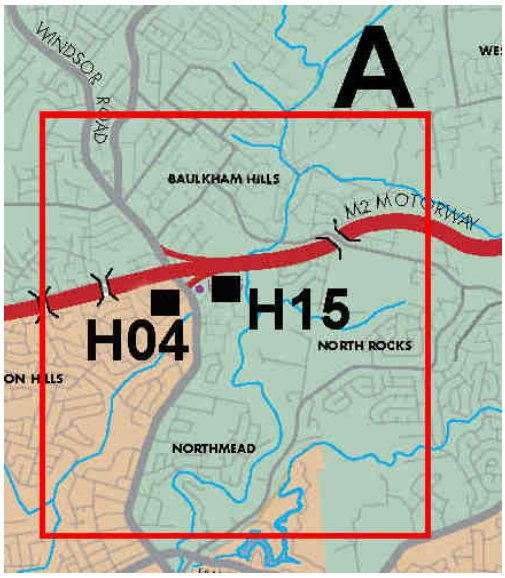


Figure 3: The above map illustrates the approximate location of H04 within Parramatta Local Council and H15 within Baulkham Hills Shire Council. Source Map supplied by HBO+EMTB Urban Design Landscaping, map overlay provided by Chris Roehrig January 2010.

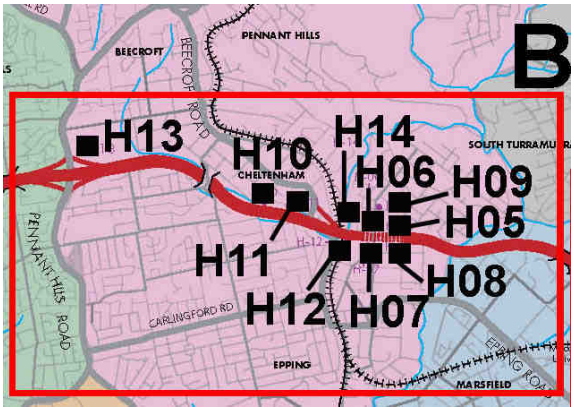


Figure 4: The above map illustrates the approximate location of H05-H14, within Hornsby Shire Council. Source Map supplied by HBO+EMTB Urban Design Landscaping, map overlay provided by Chris Roehrig January 2010.

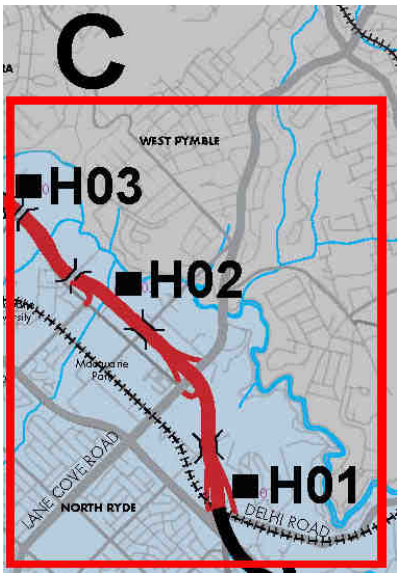
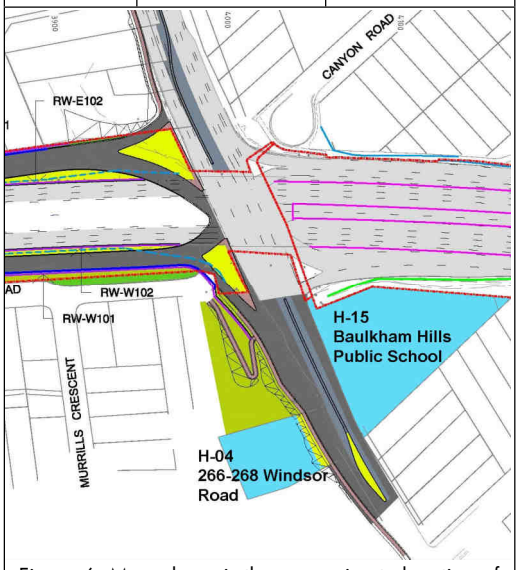


Figure 5: The above map illustrates the approximate location of H01-H03 within the City of Ryde Council. Source Map supplied by HBO+EMTB Urban Design Landscaping, map overlay provided by Chris Roehrig January 2010.

4 Mitigation Measures

Mitigation measures have been developed to address the potential impacts outlined in Table 1. These are presented below in Table 2.

Table 2, Site Specific Mitigation Measures

ITEM NUMBER	IDENTIFIED ITEM	STATUTORY LISTING	IMPACTS ON SIGNIFICANCE	Mitigation Measures
H-04	266-268 Windsor Road, Model Farms Residence	Parramatta Local Environmental Plan 1996 (Heritage and Conservation) Locally listed item	Physical Impact: Negative physical impact as a result of works will reduce site curtilage, site allotment and removal of existing mature plantings along eastern site boundaries. Work may also create structural damage due to vibration during works.	1) During the design stage an alternative solution to reduce the width of the proposed widening, reducing the impact. The alternative solution was put in place. 2) Use of heavy equipment and vibration equipment shall not be permitted within 3 metres of the Farmhouse's front verandah. 3) A detailed dilapidation (condition) survey should be undertaken of the building prior to the commencement of work at this location.
 Figure 6: Map above is the approximate location of H-04 266-268 Windsor Road, Model Farm "Farmhouse" highlighted in blue.				
			Visual Impact: Negative visual impact due to introduction of new onramp of M2 Motorway.	1) Appropriate landscaping shall occur at this location to ameliorate the impacts to visual amenity associated with the resumption o land and loss of existing vegetation. 2) During the design stage obtain specialist advice on the type of retaining wall materials to be utilised in the proposed widening area in front of the farm house to minimise visual impacts.

ITEM NUMBER	IDENTIFIED ITEM	STATUTORY LISTING	IMPACTS ON SIGNIFICANCE	Mitigation Measures
H-04-continued				3) Suitable vehicular and pedestrian access shall be provided during construction and in the final design.
H-06	57 Norfolk Road, North Epping	Hornsby LEP (Locally Listed Heritage item)	Physical impact: No direct physical impacts. , However, this item may be subject to vibration associated with tunnel widening.	1) Obtain specialist advice regarding potential structural impacts due to vibrations associated with proposed construction activities. 2) If specialist advice indicates that structural impacts are possible, carry out dilapidation (condition) survey of the residence outlining the current condition of the remaining significant fabric. 3) Establish a service emergency contact number for occupants to manage and address complaints if impacts might occur from vibration works.
H-07	61 Norfolk Road, North Epping Residence	Hornsby LEP (Locally Listed Heritage item)	Physical impact: No direct physical impacts. , However, this item may be subject to vibration associated with tunnel widening.	1) Obtain specialist advice regarding potential structural impacts due to vibrations associated with proposed construction activities. 2) If specialist advice indicates that structural impacts are possible, carry out dilapidation (condition) survey of the residence outlining the current condition of the remaining significant fabric. 3) Establish a service emergency contact number for occupants to manage and address complaints if impacts might occur from vibration works.

ITEM NUMBER	IDENTIFIED ITEM	STATUTORY LISTING	IMPACTS ON SIGNIFICANCE	Mitigation Measures
H-09	No. 70 Norfolk Road, North Epping Residence	Hornsby LEP (Locally Listed Heritage item)	Physical impact: No direct physical impacts. , However, this item may be subject to vibration associated with tunnel widening.	1) Obtain specialist advice regarding potential structural impacts due to vibrations associated with proposed construction activities. 2) If specialist advice indicates that structural impacts are possible, carry out dilapidation (condition) survey of the residence outlining the current condition of the remaining significant fabric. 3) Establish a service emergency contact number for occupants to manage and address complaints if impacts might occur from vibration works.
H-10	Beecroft/Cheltenham Conservation Area	Hornsby LEP (Locally Listed Heritage item)	Physical Impact: Physically the works will modify the existing footprint of the overhead lanes introducing additional supporting structure.	1) Physical impact will occur as a result of the M2 road widening. Mitigation measures shall be undertaken as suggested by the Flora and Fauna report as set out in the overall Environmental Assessment Report. 2) On a heritage standpoint the overall setting of Beecroft Cheltenham Conservation Area will remain intact with the exception of a few less trees as seen when hiking through the isolated bush. Where the M2 traverses the conservation area, dense native vegetation screens the elevated motorway reducing the visual impact viewed from a distance.
			Visual Impact: Negative impact; the new structural columns will add bulk and scale to the existing structure.	1) If an arborist has not been consulted and the Flora and Fauna report requires an arborist to be consulted, this should be done to assess any potential impacts prior to work commencing.
H-11	Chilworth Recreation	Hornsby LEP (Locally Listed	Physical Impact: Physically the	1) Physical impact will occur as a result of the M2 road

ITEM NUMBER	IDENTIFIED ITEM	STATUTORY LISTING	IMPACTS ON SIGNIFICANCE	Mitigation Measures
	Reserve	Heritage item)	works will modify the existing footprint of the overhead lanes introducing additional supporting structure.	widening. No mitigation measures required.
			Visual Impact: Negative impact; the new structural columns will add bulk and scale to the existing structure.	1) If an arborist has not been consulted and the Flora and Fauna report requires an arborist to be consulted, this should be done to assess any potential impacts prior to work commencing.
H-12	Devlin Creek, Epping Stone Causeway	Hornsby LEP (Locally Listed Heritage item)	Physical Impact: Removal of the M2 bus ramp structure proper will not physically impact the existing causeway, however care should be taken with the process and equipment used which may damage the remnant sandstone causeway located immediately below and the surrounding open stormwater brick channel and brick culverts.	1) Carry out a site survey, recording the extent of the Devlin Street Causeway prior to commencement of work, illustrating the relationship with Devlin Creek, rail culvert and open brick stormwater channel. 2) Protect Devlin Creek Causeway and its curtilage from damage caused by the demolition of M2 bus ramp. Construct and/or cover the extent of sandstone Causeway during demolition of M2 bus ramp. 3) Prepare an access plan to identify the location of the rare causeway. The plan shall be implemented restricting the use of heavy demolition equipment to within 3 metres of the set boundary. 4) Mitigate impacts from

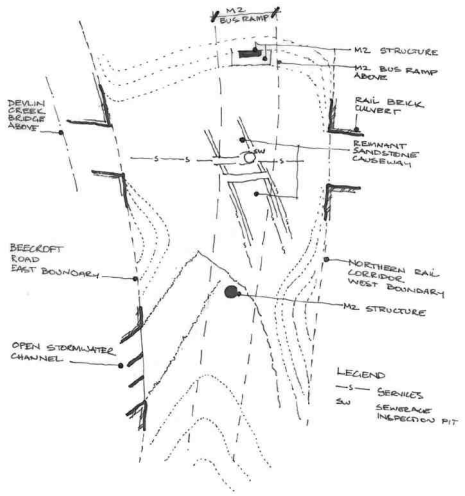


Figure 7: Approximate location of H-12 – Devlin Creek/Epping stone causeway highlighted in blue.

ITEM NUMBER	IDENTIFIED ITEM	STATUTORY LISTING	IMPACTS ON SIGNIFICANCE	Mitigation Measures
			Visual Impact: No visual impacts will occur. Removal of bus ramp will create a positive visual impact to the immediate area.	demolition by utilising existing service road to demolish structure, utilise heavy lifting equipment when removing ramps in segments, heavy equipment to remain minimum 3 metres away from the causeway. 5) Soil and sediment control plan carried out and implemented, reducing the negative impact from the works to the physical features of the causeway.
H-15	Baulkham Hills Public School	Baulkham hills LEP 2005, Schedule 1 – Locally listed heritage item	Visual impact: Marginal negative visual impact to the site of the former Baulkham Hills Public School due to the close proximity of the new on ramp to the M2 Motorway.	1) The impact is marginal and will not detract from the overall setting of the place physically and/or visually. For this reason no mitigation measures are required.

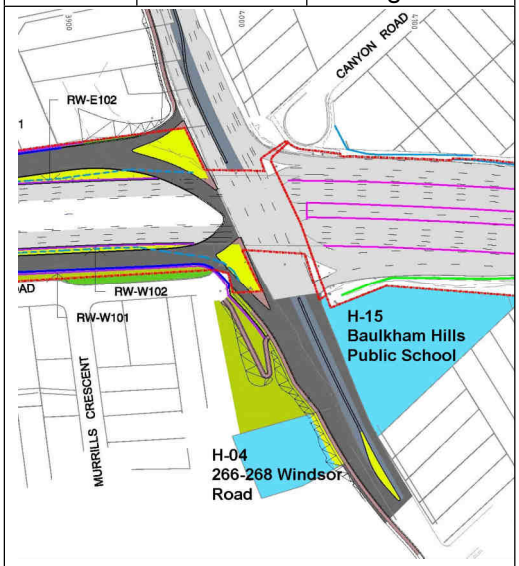


Figure 8: Approximate location of H-15 - Baulkham Hills Public School, 5-13 Russell Street Model Farm highlighted in blue.

5 Summary of Management Measures

All impacts are moderate and can be mitigated to an acceptable level as set out in Table 2, Mitigation Measures, except for one item H-04 266-268 Windsor Road, Model Farms.

Physical impacts to the farmhouse are unlikely. However, the proposed upgrade will have a negative visual effect on the setting of the farmhouse.

Potential impacts have been reduced by recognising the heritage value of the property and factoring that into the design process. One of the measures implemented to reduce the impact was to recommend an inspection, assessment and survey of the landscaped planting presenting to Windsor Road by a certified Arborist with background knowledge in heritage planting.

The negative effects to the visual setting of this item will be mitigated to a degree by the proposed new landscape design see Section 6 appendices. What will be maintained at a reduced level is the visual presence planting/landscape that provides selected view lines to and from the residence, which is important to the setting of the place.

Physical and procedural protection measures will be required to ensure that physical impacts to the farmhouse do not occur due to the proposed upgrade works.

Item H-12, the sandstone causeway at Devlins Creek is within the immediate construction footprint at this location. However, the works at this location involve the removal of an existing bus flyover, rather than construction of new infrastructure. Suitable physical protective measures and procedural controls will be required to ensure that this heritage item is not adversely impacted by the proposed works.

6 Appendices

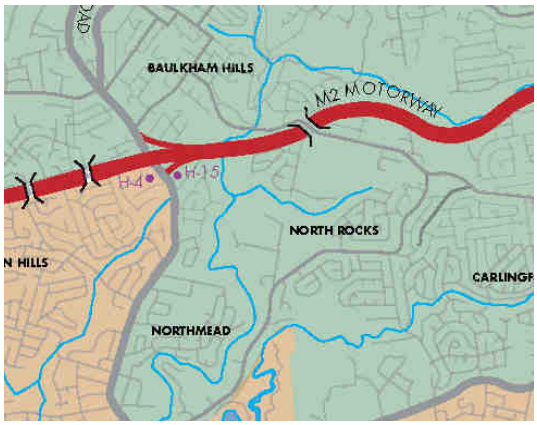
The following information is presented in the appendices to this report:

- Data Sheets for Listed Items
- Landscape design plan – carried out by Tract Consultants, Matthew Easton - Principal
- Arborist Report – carried out by David Potts

M2 UPGRADE PROJECT

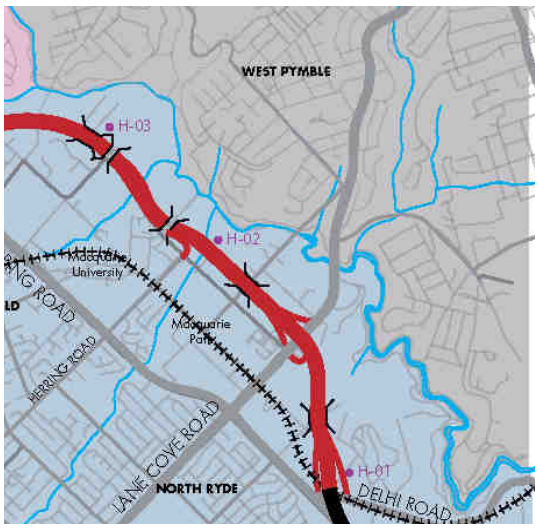
NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

LOCALITY PLAN — *H-00*



ITEM A

ITEM B



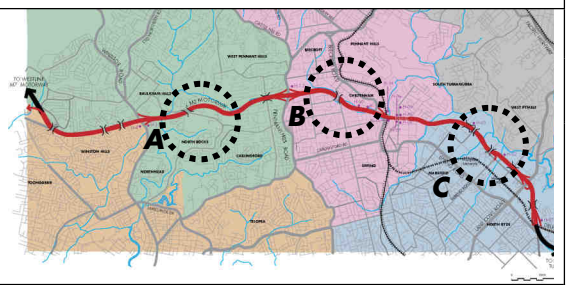
ITEM C

LEGEND

H-xx Heritage Items Number

M2 Motorway
M2 Tunnel
Heritage item

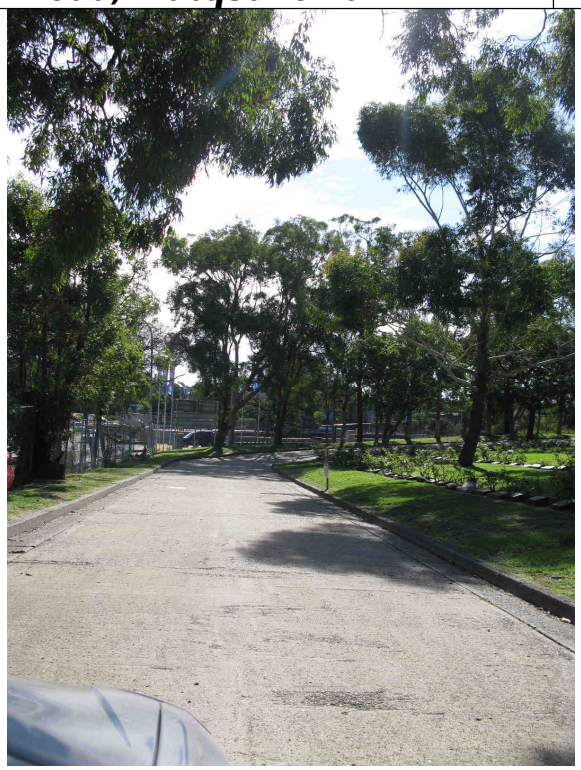
The Hills Shire Council
Hornsby Shire Council
Ku-ring-gai Council
City of Ryde



M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

Northern Suburbs Cemetery 12 Delhi Road, Macquarie Park	***H-01***



Photograph taken on :20 March 2009 by Christopher Roehrig of HBO+EMTB Heritage Pty Ltd.

LOCATION: The Northern Suburbs Cemetery is located at 12 Delhi Road, North Ryde.

CURTILAGE: The site curtilage is defined by the site boundary and the bounding roads. The site is bordered to the east by Plassey Road, to the north by Wicks Road, to the west by the M2 Motorway, and south by Delhi Road.

OWNERSHIP:
The Northern Suburbs Cemetery is owned by the NSW Government and operated under the Trusteeship of Honorary Trust Board members.

LOCAL GOVERNMENT AREA:
Ryde City

LISTING

Statutory	***Non Statutory***
Ryde Local Environment Plan 2008. LEP No. 105 (Locally listed heritage item)	***N/A***

PHYSICAL DESCRIPTION:

Large cemetery established in the Federation period, on gently sloping land, surrounded by open forest, in an industrial area adjoining the Lane Cove River. The cemetery is accessed via dressed stone entry gates on Delhi Road. The gatehouse is of the Inter-war style with hipped tiled roof and face brick and roughcast walls with a dark brick contrast. The building features a central loggia and arched head windows. The site is divided by a series of avenues, the primary one lined with Brush box. Extensive lawns with large plantings of Canary Island palms, Melaleucas, Eucalypts and Angophoras give the site an open parkland character. Recent roadworks have resulted in the closure of the Delhi Road entrance.[1]

HISTORICAL DOCUMENTATION:

In 1902, the NSW Government allocated 65 hectares of Crown land, to be called the Northern Suburban Cemetery. A Board of Trustees was appointed in 1920 and the first burial took place in April 1922. In 2000 the trustees of Macquarie Park established a modern Crematorium and three chapels.[2]

ASSESSMENT CRITERIA:

An item will be considered to be of State or Local heritage significance if it meets one or more of the following criterias.

√	A. EVOLUTIONAL SIGNIFICANCE	√	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL
√	B. ASSOCIATIONAL SIGNIFICANCE	√	F. COMPARATIVE PLACES - RARITY/UNCOMMON
√	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	√	G. COMPARATIVE PLACES - REPRESENTATIVE
√	D. SOCIAL SIGNIFICANCE	***LEGEND***	√ ***Included*** ***n/a*** ***Not included***

SUMMARY STATEMENT OF SIGNIFICANCE:

The Northern Suburbs Cemetery is a listed heritage item in the local area. The item has heritage significance due to its historical, social, aesthetic and technical attributes as a result of the NSW Government's recognition in 1902 for the need of a local cemetery , its continuous use since 1922, and growth of Interwar infrastructure within the cemetery.

PROPOSED WORK:

Proposed M2 Motorway upgrades are confined to the corridor widening at selected locations along the length of the Motorway, extending from Epping through to Windsor Road, and an addition of a third lane between Pennant Hills Road and Windsor Road.

Works will be carried out along the boundary of the Cemetery and the M2. The works will be contained within the current established M2 site boundaries and occur at different ground level to the Cemetery.

IMPACTS:

Physical: No physical impacts to the cemetery as a result of the M2 Motorway road widening.

Visual: No visual impacts to the cemetery as the works will occur at different ground level.

MITIGATE/MANAGEMENT RECOMMENDATIONS:

No mitigation measures and/or recommendations required.

CONCLUSIONS:

The Northern Suburbs Cemetery is an item of local significance which will not be affected by the proposed M2 Motorway Upgrade.

REFERENCES:

Heritage Office, New South Wales , Inventory No. 2340201, accessed 09/04/09
Northern Suburbs Cemetery website. www.maccem.com.au, accessed 09/04/09.

[1] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=2340201, accessed 19/03/09

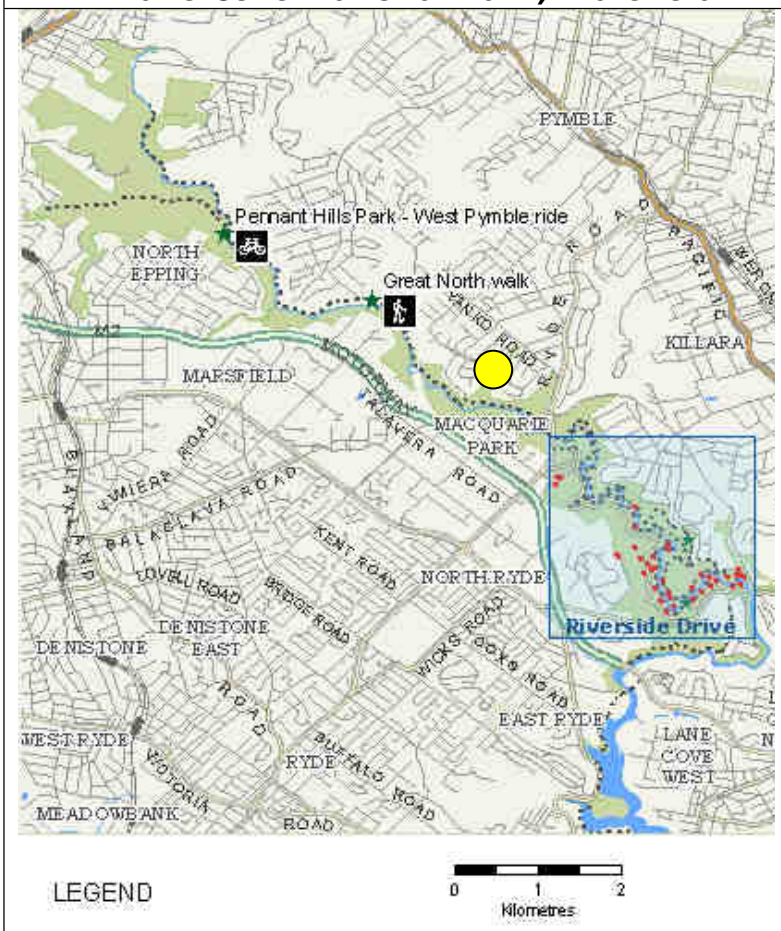
[2] http://www.maccem.com.au/, accessed 09/04/09.

M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

Open Space
Lane Cove National Park, Marsfield

H-02



LOCATION PLAN
Item Location

Figure extracted from www.environment.nsw.gov.au/NationalParks/parkHome.aspx?ID=N0083, accessed 09/04/2009.

LOCATION: The Lane Cove National Park runs through from Lane Cove/East Ryde to Wahroonga/Pennant Hills, following the Lane Cove River.

CURTILAGE: The park curtilage is defined to the north by urban development and Lady Game Drive to the east by urban areas of Chatswood, to the south partially by the M2 Motorway and otherwise by urban developments

OWNERSHIP:
The Lane Cove National Park is owned by the Crown, and managed by the National Parks and Wildlife Service, Department of Environment, Climate Change and Water.

LOCAL GOVERNMENT AREA:
Ryde City

LISTING

Statutory	***Non Statutory***
Ryde City Council Local Environment Plan LEP No.105 (Locally listed heritage item)	N/A

PHYSICAL DESCRIPTION:

The Lane Cove National Park is a national park located in the northern suburbs of Sydney, containing native flora and fauna.

HISTORICAL DOCUMENTATION:

In 1938 the Lane Cove National Park a 125 hectare area was officially opened. In 1967 an Act of Parliament changed the park's name to Lane Cover River Park, and in 1976 it was proclaimed a State Recreation Area. In 1992 the Park regained the title of national park, now with over 300 hectares of land, including Sugarloaf and parts of Pennant Hills.

Lane Cove National Park was first explored in 1788 when Governor Phillip lead an expedition into the Lane Cove River Valley. Then in 1805 botanist George Caley set out from Macarthur's farm at Pennant Hills and found Blackbutt and Blue gums at Gordon and Pymble. Many timber getters were attracted to the area and began illegal operations. In 1821 logging in the area became legal following Joseph Fidden's declaration of a mandate to establish a reserve where by no timber could be cut out, allowing the preservation of Blackbutt which still remains today. Once the sawyers left, the orchardists moved in [1]

ASSESSMENT CRITERIA:

An item will be considered to be of State or Local heritage significance if it meets one or more of the following criterias.

√	A. EVOLUTIONAL SIGNIFICANCE	√	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL
√	B. ASSOCIATIONAL SIGNIFICANCE	***na***	F. COMPARATIVE PLACES - RARITY/UNCOMMON
√	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	√	G. COMPARATIVE PLACES - REPRESENTATIVE
√	D. SOCIAL SIGNIFICANCE	***LEGEND***	√ ***Included*** ***n/a*** ***Not included***

SUMMARY STATEMENT OF SIGNIFICANCE:

Lane Cove National Park is a listed heritage item in the local area. The item has heritage significance due to its historical, social, and aesthetic attributes as a result of its early associations with George Caley and acknowledged by the community the importance of retaining native bushland. The park has been identified and used as a national park continuously since 1938.

PROPOSED WORKS:

Proposed M2 Motorway upgrades are confined to the corridor widening at selected locations along the length of the Motorway, extending from Epping through to Windsor Road, and an addition of a third lane between Pennant Hills Road and Windsor Road.

New works are proposed along the boundary of the Lane Cove National Park and the M2 Motorway. The works will be contained with the M2 site boundaries and occur at lower ground level to the National Park.

IMPACTS:

Physical: No physical impacts to the Lane Cove National Park as works contained within site boundary of M2 Motorway.

Visual: No visual impact as the M2 works will occur at a lower ground level.

MITIGATE/MANAGEMENT RECOMMENDATIONS:

No mitigatation measures and/or recommendations required.

CONCLUSIONS:

The Lane Cove National Park is an item of local significance which will not be affected by the proposed M2 Motorway Upgrade.

REFERENCES:

http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=2340183, accessed 29/10/09

[1] http://www.environment.nsw.gov.au/NationalParks/parkHeritage.aspx?id=N0083, accessed 01/04 2009.

M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

Christie Park, 1 Christie Road, Macquarie Park

H-03

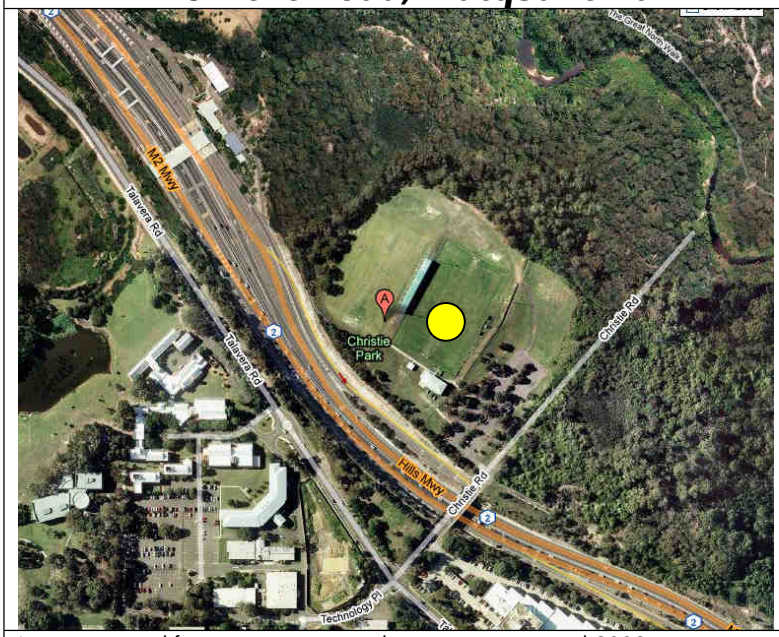


Image extracted from www.maps.google.com.au. - accessed 2009

LOCATION PLAN

Item Location

LOCATION: Christie Park is located at 1 Christie Road, Macquarie Park.

CURTILAGE:
The Park's site curtilage is contained by bushland to the north, and Christie Road to the east, M2 Motorway to the south and west.

OWNERSHIP:
The Park is owned by the Gladesville - Hornsby Football Association (GHFA).

LOCAL GOVERNMENT AREA:
Ryde City

LISTING

Statutory	***Non Statutory***
Ryde City Council (Not listed heritage item)	***na***

PHYSICAL DESCRIPTION:
Christie Park is a sports ground located in the Northern Suburbs of Sydney. The grounds are open grassed sports fields.

HISTORICAL DOCUMENTATION:
The park was once the home of the now defunct Northern Spirit FC.

ASSESSMENT CRITERIA							
na	A. EVOLUTIONAL SIGNIFICANCE	***na***	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL				
na	B. ASSOCIATIONAL SIGNIFICANCE	***na***	F. COMPARATIVE PLACES - RARITY/UNCOMMON				
na	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	***na***	G. COMPARATIVE PLACES - REPRESENTATIVE				
na	D. SOCIAL SIGNIFICANCE	***LEGEND***	√	***Included***	***na***	***Not include***	

SUMMARY STATEMENT OF SIGNIFICANCE
Christie Park is not an item of heritage significance, however the park is an important recreational space for the local community.
PROPOSED WORKS: M2 Motorway is proposed to be upgraded. The works are confined to the corridor widening at selected locations along the length of the freeway, from the eastern entrance at Epping to Windsor Road, and an addition of a third lane between Pennant Hills Road and Windsor Road.
IMPACTS: Physical: No physical impacts.   Visual: No visual impacts.
MITIGATE/MANAGEMENT RECOMMENDATIONS: No mitigated measures and/or recommendations required.
CONCLUSIONS: ***The site of Christie Park is not an item of local heritage significance.***   ***The impact of the new work from the M2 Motorway does not affect the Park.***
REFERENCES: Ryde City Council

M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

266-268 Windsor Road, Model Farms Lot 5/ DP 856623	***H-04***

Photograph taken on :1 April 2009 by: Christopher Roehrig of HBO+EMTB Heritage Pty Ltd.

LOCATION: The subject address is 266-268 Windsor Road, Baulkham Hills.

CURTILAGE: The site curtilage is defined by the site boundary allotment. The site is bordered to the east by Windsor Road, to the south and west by 264 Windsor Road and the north by 270 Windsor Road.

The M2 Motorway is located to the north.

OWNERSHIP:	***LOCAL GOVERNMENT AREA:***	
No. 266-268 Windsor Road is currently privately owned.	Parramatta City Council.	
	LISTING	
	Statutory	***Non Statutory***
	Parramatta Local Environmental Plan 1996 (Heritage and Conservation) (Locally listed heritage item)	na

PHYSICAL DESCRIPTION: *Single storey brick cottage, with corrugated clad iron hipped roof. Front verandah roofed with corrugated iron. French doors open onto verandah. Retains kitchen building with chimneys. Mature garden suggest early pathway and driveway[1]. Roof Construction: Steep hip with several small attached hip roof buildings at rear. Chimneys: Tall speckled brick chimneys with steps and stringline. Verandah: Across front and return to north side, aluminium ribbed slight skillion roof. Verandah Floor: One metre wide grey tonings in tessellated tiles along front of cottage with concrete to verandah posts and slate steps. Verandah Supports: Timber posts. Verandah Decoration: Side verandahs have been badly enclosed with casement windows on fibro walls. Window Sill: Sandstone. Exterior Doors: Narrow transom lights over French doors with bolection mould panels below and glazed panels above flank front door. Garden: Heavily shrubbed front yard. Huge Camphor Laurel in back yard. Additions: Side verandahs have been badly enclosed with casement windows on fibro walls. Archit Style: Victorian Vernacular single-storey cottage. Front Door: Transom light above Victorian timber four panel door. Awning: Curved arches.[2]*

HISTORICAL DOCUMENTATION:

Farmhouse probably built in late nineteenth century on land granted to Edward Braddock. In May 1913 land leased to Jimmy Chong as a market garden for 5 years. Visible in aerial photo of 1930.[3]

ASSESSMENT CRITERIA:

An item will be considered to be of State or Local heritage significance if it meets one or more of the following criteria.

√	A. EVOLUTIONAL SIGNIFICANCE	***na***	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL
√	B. ASSOCIATIONAL SIGNIFICANCE	***na***	F. COMPARATIVE PLACES - RARITY/UNCOMMON
√	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	√	G. COMPARATIVE PLACES - REPRESENTATIVE
√	D. SOCIAL SIGNIFICANCE	***LEGEND***	√ ***Included*** ***n/a*** ***Not included***

SUMMARY STATEMENT OF SIGNIFICANCE:

Evidence of early history before subdivision of small suburban allotments.[4]

PROPOSED WORK:

Proposed M2 Motorway upgrade is confined to the corridor widening at selected locations along the length of the freeway, extending from Epping through to Windsor Road, and an addition of a third lane between Pennant Hills Road and Windsor Road. A ramp onto the M2 heading west is proposed to begin on the eastern boundary of 266 Windsor Road, Model Farms and head north and left onto the motorway.

IMPACTS:

No evidence has been sighted during database searches and literature reviews to indicate that there are specific relics present in the portion of the property that will be resumed/affected by the proposed works.

Physical: Negative physical impact as a result of works. Will reduce site curtilage, site allotment, and removal of existing mature plantings along eastern site boundaries. Work may also create structural damage due to vibration during works.

Visual: Negative visual impact due to introduction of new on ramp of M2 Motorway.

MITIGATE/MANAGEMENT RECOMMENDATIONS:

Physical impacts: Reduction of site curtilage to be minimised -reduce width of ramp. - During the design stage an alternative solution was developed and implemented into proposal. (minimising impact of curtilage). Prior to works commencing consult with a noise and vibration specialist, limit use of heavy equipment within 3 metres of Farmhouse building footprint to ensuring the significant fabric is protected.

Visual impacts: During the design stage, carry out an Arborist's assessment and report to assess extent of significant plantings, including illustrative survey of their location. The report is to include; key objectives, methodology, observations, observation, photographic catalogue keyed to survey location, rating of significance and plan of management for the remaining and new plantings. Results from the report to be implemented into proposed landscape plan for the site.

During the design stage obtain specialist advice on the type of retaining wall materials to be utilised in the proposed widening area in front of the farm house. Carrry out a photographic and illustrated dilapidation survey of the residence, including the external footprint of the residence, outlining the current condition of the remaining significant fabric. Prepare Landscape Plan of Management for the site, to management pedestrian and vehicular access to public spaces on and from the site, and new and existing plantings between public land on Windsor Road and the residence. Prepare Interpretative Strategy, design and install along Farmhouse entrance.

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[1] 1943 Sydney Suburb - Ausimage - Department of Lands - Spatial Information Exchange (http://imagery.maps.nsw.gov.au/ accessed 14/01/2010)

[2] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=2240640, accessed 19/03/09

[3] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=2240640, accessed 19/03/09

[4] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=2240640, accessed 19/03/09

CONCLUSIONS:
The subject site, as one of the early farms in the area has historic and representative local significance .

The work for the M2 Motorway will negatively impact the heritage significance of this item, further compromising the significance of the site that has resulted of earlier subdivisions.

Recommendations should be carried out prior to the works commencing on site.

REFERENCES:

Heritage Branch, New South Wales, Land Title Office, New South Wales, Mitchell Library.

M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

EPPING PARK

66X Norfolk Road, Epping[1]

Lots 11 & 12, DP 842167, Lots 439 and 440, DP 752028

H-05

Photograph taken on:20 March 2009 by: Christopher Roehrig of HBO+EMTB Heritage Pty Ltd.

LOCATION: Epping Park is located at 66X Norfolk Road, Epping.

CURTILAGE: The site curtilage is defined by the site allotment and by the trees along its boundary.
The park is contained to the north by No. 68 Norfolk Road, Norfolk Road to the east, and Somerset Street to the south.

The M2 Motorway is located immediately under and along the southern edge of the park.

OWNERSHIP:
Epping Park is owned by the Hornsby Shire (Local Government.

LOCAL GOVERNMENT AREA:
Hornsby Shire

LISTING

Statutory	***Non Statutory***
Hornsby LEP (Locally listed heritage item)	***n/a***

PHYSICAL DESCRIPTION:
Epping Park contains an oval (with turf wicket) and dressing pavilion with mature trees and indigenous plantings.

Park is notable for some cultural planting particularly mature trees in south west corner including Radiata Pines (4) to 20m high (in apparent good condition) from c1920 along with fine dark Cypress from same era also mature Camphor laurels to 16m from c1930/40#s. A row of New England Peppermints along west boundary (north end) to 12m high are characteristic selections from c1960/70s park. Also conserves an area of indigenous vegetation or remnant bushland on eastern side of oval though it is contaminated by considerable weed. The indigenous species include

[1] Address 66X Norfolk Road, North Epping - identified as noted in Hornsby Shire LEP.

Smooth Bark Angophora to 18m Stringybark and Black Casuarina to 15m as well as Pittosporum and patches of small native plants. Including Lomandra Lomatia, Acacia Kunzea, Smoke bush, Dianella Dillwynia and some native grasses. Weed includes Lantana Privet Camphor laurels etc). Tracks through bushland generally overgrown.[2]

HISTORICAL DOCUMENTATION:

Epping Park is part of the original Field of Mars reserved from subdivision c1900. Many of the cultural planting date from *c1901, with dressing pavilion dating from c1930's.* [3]

ASSESSMENT CRITERIA:

An item will be considered to be of State or Local heritage significance if it meets one or more of the following criteria.

√	A. EVOLUTIONAL SIGNIFICANCE	√	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL
na	B. ASSOCIATIONAL SIGNIFICANCE	***na***	F. COMPARATIVE PLACES - RARITY/UNCOMMON
√	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	√	G. COMPARATIVE PLACES - REPRESENTATIVE
√	D. SOCIAL SIGNIFICANCE	***LEGEND***	√ ***Included*** ***n/a*** ***Not included***

SUMMARY STATEMENT OF SIGNIFICANCE: *Park dedicated c1900 with period trees from c1910 set around recreational oval and conserving area of remnant bushland. Period trees notable in streetscape. Of local significance.*[4]

PROPOSED WORKS:

M2 Motorway is proposed to be upgraded. The works are confined to the corridor widening at selected locations along the length of the Motorway, from the eastern entrance at Epping to Windsor Road, and the addition of a third lane between Pennant Hills Road and Windsor Road. The M2 motorway tunnel located at the southern fringes of the Park is immediately below and is proposed to be widened along both northern and southern edges.

IMPACTS:

Physical: No physical impacts.
Visual: No visual impacts.

MITIGATE/MANAGEMENT RECOMMENDATIONS:

No mitigation measures and/or recommendations required.

CONCLUSIONS:

Epping Park, No. 66X Norfolk Road, Epping is an item of local heritage significance.

The impact of the new work from the M2 Motorway does not affect the assessed significance of the Park.

REFERENCES:

New South Wales Heritage Branch Inventory, accessed 19/03/2009.

[2] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=1780756, accessed 19/03/09
[3] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=1780756, accessed 19/03/09
[4] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=1780756, accessed 19/03/09

M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

No. 57 Norfolk Road, North Epping Lot 7/DP1046298

H-06

Photograph taken on:20 March 2009 by: Christopher Roehrig of HBO+EMTB Heritage Pty Ltd.

LOCATION: The subject site is No. 57 Norfolk Road, North Epping.

CURTILAGE: The site curtilage is defined by the site boundary allotment. The site is bound by No 59 Norfolk Road to the north, No. 29 Somerset Street to the west, Norfolk Road to the east, and Somerset Street to the south.

The M2 Motorway is located to the north and below No 55 Norfolk Road.

OWNERSHIP:
No. 57 Norfolk Road, North Epping is privately owned.

LOCAL GOVERNMENT AREA:
Hornsby Shire

LISTING

Statutory	***Non Statutory***
Hornsby Shire LEP (Locally listed as heritage item)	***NA***

PHYSICAL DESCRIPTION:
No. 57 Norfolk Road is a single storey federation brick residence with face brick chimneys and terracotta tile roof. The residence is located on a corner block, contained behind a timber fence. The residence is set back with a manicured front garden with a dense low hedge along its boundary. The residence's principal entrance addresses the street, located centrally with windows to either side. The structure has a street facing timber framed verandah which wraps around to face Somerset Street. The residence has a room protruding to the south with a brick gable end and a number of later additions attached to the west.

HISTORICAL DOCUMENTATION:

Given the recognised heritage status of the item it is not considered necessary to undertake historical research for the purposes of this report. The impact assessment is therefore based on an examination of the physical evidence of the building and its setting and the available secondary documentary evidence.

ASSESSMENT CRITERIA:

An item will be considered to be of State or Local heritage significance if it meets one or more of the following criteria.

√	A. EVOLUTIONAL SIGNIFICANCE	***na***	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL
na	B. ASSOCIATIONAL SIGNIFICANCE	***na***	F. COMPARATIVE PLACES - RARITY/UNCOMMON
√	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	√	G. COMPARATIVE PLACES - REPRESENTATIVE
na	D. SOCIAL SIGNIFICANCE	***LEGEND***	√ ***Included*** ***n/a*** ***Not included***

SUMMARY STATEMENT OF SIGNIFICANCE: No 57 Norfolk Road, Epping has local significance as it contributes to the cultural landscape of Norfolk Street and the heritage items in the vicinity.

PROPOSED WORK: M2 Motorway is proposed to be upgraded. The works are confined to the corridor widening at selected locations along the length of the Motorway, from the eastern entrance at Epping to Windsor Road, and an additional third lane between Pennant Hills Road and Windsor Road. The works will widen the M2 tunnel located to the north and below No 55 Norfolk Road and Epping Park.

IMPACTS:

Physical: No direct physical impacts. However, this item may be subject to vibration associated with tunnel widening. Further assessment by a specialist is required

Visual: No visual impact as the M2 Motorway is located below ground.

MITIGATE/MANAGEMENT RECOMMENDATIONS:

To reduce the negative impacts that might occur to the significant fabric the following recommendations should be adopted:

Physical impacts: Carryout a photographic and illustrated dilapidation survey of the residence outlining the current condition of the remaining significant fabric. Establish a service emergency contact number for occupants to manage and address complaints if impacts might occur from vibration works.

CONCLUSIONS:

No. 57 Norfolk road is an item of local heritage significance in the local area.

The impact of the new work from the M2 Motorway does not impact directly alter the assessed significance of the residence and its setting, however the vibration mitigation recommendations should be carried out prior to the works commencing.

REFERENCES:

New South Wales Heritage Branch Inventory accessed 01/11/2009.

M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

No. 61 Norfolk Road, North Epping
Lot 4/DP1046298

H-07

Photograph taken on:20 March 2009 by: Christopher Roehrig of HBO+EMTB Heritage Pty Ltd.

LOCATION:
The subject site is No 61 Norfolk Road, North Epping.

CURTILAGE:
The site curtilage for No. 61 Norfolk Road, North Epping is confined to the site allotment identified as Lot 4, DP1046298. The site is located on the south west corner of Norfolk Road and Callistemon Close, with Norfolk Road to the east, Callistemon Close to the north, No.4 Callistemon Close to the west, and No. 59 Norfolk Road to the south.

The M2 Motorway is located immediately north and below No. 55 Norfolk Road.

OWNERSHIP:	***LOCAL GOVERNMENT AREA:***	
No. 61 Norfolk Road, North Epping is privately owned.	Hornsby Shire	
	LISTING	
	Statutory	***Non Statutory***
	Local - Hornsby Shire LEP (Locally listed heritage item)	***na***

PHYSICAL DESCRIPTION:
No. 61 Norfolk Road is a single storey Federation period brick residence with a slate roof with terracotta ridge capping and rough cast chimneys. The structure is set back from the street with a manicured garden defined at the boundary by a timber picket fence with hedging immediately behind. The structure addresses the street with a principal entrance addressing the street and windows to either side. The structure has a street facing timber framed verandah with a small gable defining the entrance with timber posts resting on low brick piers. To the north and south, rooms protrude with a gable end roof to the north and a hip roof to the south. The structure has a number of additions to the rear facing west.

HISTORICAL DOCUMENTATION:

Given the recognised heritage status of the item it is not considered necessary to undertake further historical research for the purposes of this report. The impact assessment is therefore based on an examination of the physical evidence of the building and its setting and the available secondary documentary evidence.

ASSESSMENT CRITERIA:

An item will be considered to be of State or Local heritage significance if it meets one or more of the following criteria.

√	A. EVOLUTIONAL SIGNIFICANCE	***na***	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL
na	B. ASSOCIATIONAL SIGNIFICANCE	***na***	F. COMPARATIVE PLACES - RARITY/UNCOMMON
√	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	√	G. COMPARATIVE PLACES - REPRESENTATIVE
na	D. SOCIAL SIGNIFICANCE	***LEGEND***	√ ***Included*** ***n/a*** ***Not included***

SUMMARY STATEMENT OF SIGNIFICANCE: Well preserved Federation period house with original detail of interest including tile ridge capping casement windows and verandah. Little altered.[1]

PROPOSED WORK: M2 Motorway is proposed to be upgraded. The works are confined to the corridor widening at selected locations along the length of the Motorway, from the eastern entrance at Epping to Windsor Road, and an additional third lane between Pennant Hills Road and Windsor Road. The works will widen the M2 tunnel located to the north and below No 55 Norfolk Road and Epping Park.

IMPACTS:

Physical: No direct physical impacts. However, this item may be subject to vibration associated with tunnel widening. Further assessment by a specialist is required

Visual: No visual impact as the M2 Motorway is located below ground.

MITIGATE/MANAGEMENT RECOMMENDATIONS:

To reduce the negative impacts that might occur to the significant fabric the following recommendations should be adopted:

Physical impacts: Carryout a photographic and illustrated dilapidation survey of the residence outlining the current condition of the remaining significant fabric. Establish a service emergency contact number for occupants to manage and address complaints if impacts might occur from vibration works.

CONCLUSIONS:

No. 61 Norfolk Road is an item of local heritage significance in the local area.

The impact of the new work from the M2 Motorway does not impact directly alter the assessed significance of the residence and its setting, however the vibration mitigation recommendations should be carried out prior to the works commencing.

REFERENCES:

New South Wales Heritage Branch Inventory, accessed 1/04/2009

[1] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=1780118, accessed 01/04/2009.

M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

Garden - The Poplars
64- 66 Norfolk Road, Epping
Lot 3/DP 828636

H-08

Photograph taken on:20 March 2009 by: Christopher Roehrig of HBO+EMTB Heritage Pty Ltd.

LOCATION: The subject site is located at No. 64-66 Norfolk Road, Epping.

CURTILAGE:

The curtilage for No. 64-66 Norfolk Road, is confined by the site allotment identified as Lot 3/DP 828636.

No. 64-66 Norfolk Road, Epping is located on the south east junction of Norfolk Road and Somerset Street, with Somerset Street to the north, Norfolk Road to the east, No. 20 Somerset Street to the west, and No. 62 Norfolk Road to the south.

The M2 Motorway is located immediately to the north of Somerset Street below Epping Park.

OWNERSHIP:

The subject site is privately owned

LOCAL GOVERNMENT AREA:

Hornsby Shire

LISTING

Statutory	***Non Statutory***
Hornsby LEP (Locally listed heritage item)	***na***

PHYSICAL DESCRIPTION:

The site is comprised of buildings formerly occupied by *The Poplars Private Hospital*. The buildings include:

Kirkwood House: *The single storey building has frontage to Norfolk Road and is set back approximately 22 metres from the street. The building includes a portico serviced by a circular driveway and presents as the main entrance to the hospital site. Part of this wing contains wards, the Diagnostic Unit and various utilities. The diagnostic unit, which includes a separate admission room, procedures room and recovery room, was built in 1991.*

Somerset House (1951) *This is a single storey brick and tile building built in 1951 and set back approximately 6 metres from the Somerset Road street frontage. The ground floor level of the existing building is raised above the street level.*

Gordon Young Wing (circa 1980) *Built in approximately 1980, the Gordon Young Wing is a part single storey and a part two-storey building sited to the rear of Kirkwood House. The building is sited with its long axis oriented to the north and appears as a continuation of Kirkwood House. The building accommodates wards with direct access to the Donald M. Tulloch building located at its rear, and stores surgical utilities and medical records on the lower level.*

Donald M Tulloch Wing (1993) *The newest building on the site built in 1993 is sited at the rear of the property on the Somerset Street frontage. The building is of concrete slab construction and includes an open lower ground floor parking level beneath the operating theatres, pathology unit and recovery room.*

Vehicular access to the site is at two locations from Somerset Street and at one point on Norfolk Road. A driveway provides access to the existing car park beneath the Donald M. Tulloch building at the north-eastern corner and a secondary driveway access located midway on the Somerset Street frontage. A shared driveway (ROC) provides access from the Norfolk Road frontage at the location of the common boundary between the subject site and the adjoining property at No. 62 Norfolk Road.

Parking for the existing hospital is provided by means of hard paved areas located on the southern and western portions of the site and beneath the Donald M Tulloch Wing.[1]

The Norfolk Road and Somerset Street frontages are densely vegetated with *large Camphor Laurel and Lombardy 'Poplar' trees. The trees form part of the garden which is a listed heritage item of local significance in Hornsby Shire's Local Environmental Plan 1994. The plantings are dominated by Camphor laurels to 15m high (approx 12 trees) and Lombardy Poplars to 25m from c1940/50's prominent in streetscape of Norfolk Road.*[2]

HISTORICAL DOCUMENTATION:

The site was acquired in the 1920s for use as a hospital which has operated continuously until its closure on 22 April 2008.

ASSESSMENT CRITERIA:

An item will be considered to be of State or Local heritage significance if it meets one or more of the following criteria.

√	A. EVOLUTIONAL SIGNIFICANCE	***na***	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL
na	B. ASSOCIATIONAL SIGNIFICANCE	***na***	F. COMPARATIVE PLACES - RARITY/UNCOMMON
√	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	√	G. COMPARATIVE PLACES - REPRESENTATIVE
na	D. SOCIAL SIGNIFICANCE	***LEGEND***	√ ***Included*** ***na*** ***Not included***

SUMMARY STATEMENT OF SIGNIFICANCE:

The site of the former Poplars Private Hospital has local significance due particularly due to the cultural plantings from c1940 period that have matured and have become very prominent in the streetscape now a major thoroughfare.[3]

PROPOSED WORK:

M2 Motorway is proposed to be upgraded. The works are contained to the corridor widening at selected locations along the length of the freeway, from the eastern entrance at Epping to Windsor Road, and an addition of a third lane between Pennant Hills Road and Windsor Road. The works will widen the M2 tunnel located to the north of the site, formerly Poplars Private Hospital.

IMPACTS:

Physical: No physical impacts.
Visual: No visual impacts.

MITIGATE/MANAGEMENT RECOMMENDATIONS:

No mitigation measures and/or recommendations required.

CONCLUSIONS:

The site of the No. 64-66 Norfolk Road is an item of local heritage significance.
The impact of the new work from the M2 Motorway do not affect the assessed significance of the residence.

REFERENCES:

New South Wales Heritage Inventory.

[1] http://www2.hornsby.nsw.gov.au/ebp/ebp2003.nsf/bb43e613b7cc52adca256cbc0011e27b/6641267054014cb3ca256d3c000f403e?OpenDocument, accessed 09/11/09

[2] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=1780757, accessed 19/03/09

[3] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=1780757, accessed 1 April 2009

M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

No. 70 Norfolk Road, North Epping Lot 1, DP540890

H-09

Photograph taken on:20 March 2009 by: Christopher Roehrig of HBO+EMTB Heritage Pty Ltd.

LOCATION: The site is located at No. 70 Norfolk Road, North Epping.

CURTILAGE: The site curtliage for No. 70 Norfolk Road, North Epping is confined to the site allotment identified as Lot 1/DP540890. The site is contained by No 72 Norfolk Road to the north, Norfolk Road to the west, vehicle access for No. 68A and 68 Norfolk Road to the south, Epping Park beyond) and No. 68A Norfolk Road to the east.

The M2 Motorway is located immediately under and at the southern edge of Epping park.

OWNERSHIP:	***LOCAL GOVERNMENT AREA:*** ***Hornsby Shire***	
No 70 Norfolk Road is privately owned.	***LISTING***	
	Statutory	***Non Statutory***
	Hornsby Shire LEP (Locally listed heritage item)	***na***

PHYSICAL DESCRIPTION:

Fine Federation period house set in large well planted grounds. Symmetrical design. Polychrome face brick with dominant low eaves terracotta tiled roof slightly bellcast over verandah. Ventilated gablet *at peak. Exposed rafters Verandah returns to sides. Turned timber posts with carved brackets. Double-hung windows with small upper panes. Shutters.*[1]

HISTORICAL DOCUMENTATION:

Given the recognised heritage status of the item it is not considered necessary to undertake further research for the purposes of this report. The impact assessment is therefore based on an examination of the physical evidence of the

[1] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=1780119, accessed 1 April 2009.

building and its setting and the available secondary documentary evidence.

ASSESSMENT CRITERIA:

An item will be considered to be of State or Local heritage significance if it meets one or more of the following criteria.

√	A. EVOLUTIONAL SIGNIFICANCE	√	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL
na	B. ASSOCIATIONAL SIGNIFICANCE	***na***	F. COMPARATIVE PLACES - RARITY/UNCOMMON
√	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	√	G. COMPARATIVE PLACES - REPRESENTATIVE
√	D. SOCIAL SIGNIFICANCE	***LEGEND***	√ ***Included*** ***n/a*** ***Not included***

SUMMARY STATEMENT OF SIGNIFICANCE:

Federation period house in good condition and with much distinctive detail including turned timber verandah posts and fretwork brackets. Little altered.[2]

PROPOSED WORK:

M2 Motorway is proposed to be upgraded. The works are confined to the corridor widening at selected locations along the length of the freeway, from the eastern entrance at Epping to Windsor Road, and an addition of a third lane between Pennant Hills Road and Windsor Road. The works will widen the M2 tunnel located to the south of the property running along and below the southern boundary of Epping Park.

IMPACTS:

Physical: No direct physical impacts. However, this item may be subject to vibration associated with tunnel widening. Further assessment by a specialist is required

Visual: No visual impact as the M2 Motorway is located below ground.

MITIGATE/MANAGEMENT RECOMMENDATIONS:

To reduce the negative impacts that might occur to the significant fabric the following recommendations should be adopted:

Physical impacts: Carryout a photographic and illustrated dilapidation survey of the residence outlining the current condition of the remaining significant fabric. Establish a service emergency contact number for occupants to manage and address complaints if impacts might occur from vibration works.

CONCLUSIONS:

No. 70 Norfolk Road is an identified item of local heritage significance.

The impact of the new work from the M2 Motorway does not directly affect the assessed significance of the residence, however the recommendations for vibration monitoring should be carried out prior to the works commencing.

REFERENCES:

New South Wales Heritage branch, Inventory accessed 1/04/2009

[2] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=1780119, accessed 1 April 2009.

M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

Beecroft/Cheltenham Conservation Area — *H-10*

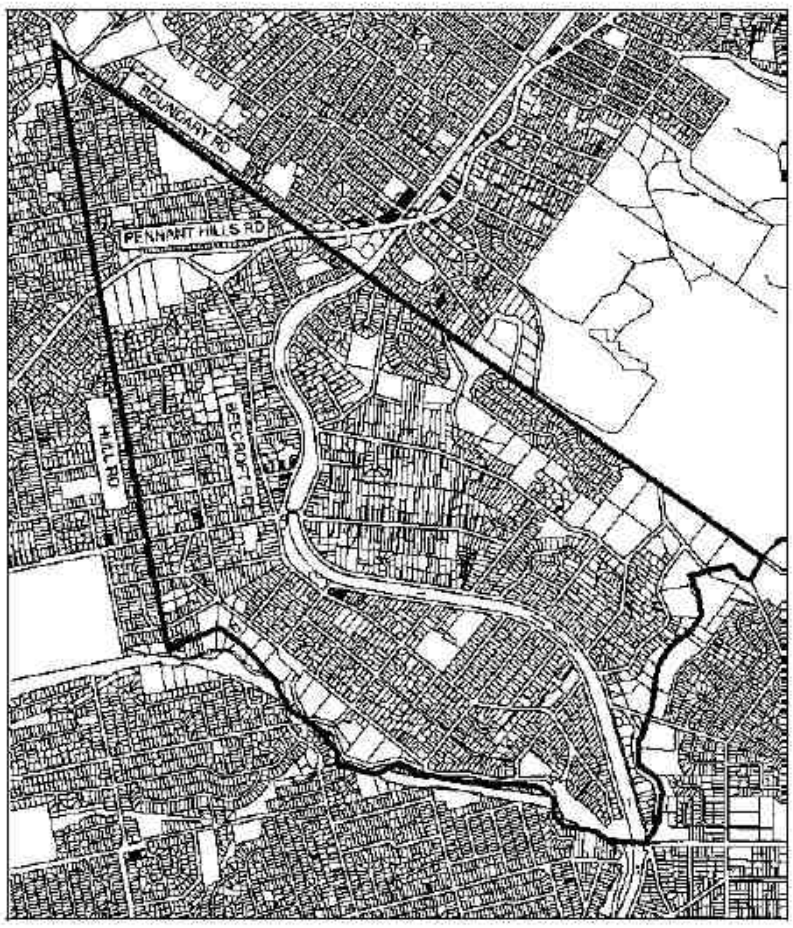


Figure extracted from Hornsby Shire LEP

LOCATION: The Beecroft/Cheltenham Conservation Area is located within the Hornsby Shire Local Government Area. The area is contained by Boundary Road to the north, Hull Road to the west, M2 Motorway to the south and Pennant Hills Park to the east.

CURTILAGE: The sites curtilage is contained by the site boundaries of the conservation area defined by Boundary Road to the north, Hull Road to the west, M2 Motorway to the south and Pennant Hills Park to the east.

OWNERSHIP:
The area is predominantly owned by private individuals, however there are a number of State and Federal owned infrastructure items including parklands.

LOCAL GOVERNMENT AREA:
Hornsby Shire

LISTING

Statutory	***Non Statutory***
Local - Hornsby Shire LEP (Locally listed heritage area)	

PHYSICAL DESCRIPTION:
The conservation area is located in the suburbs of Beecroft and Cheltenham, 22 kilometres north-west of Sydney. The area has a number of areas of native bushland and numerous early residences set within garden settings.

The M2 motorway runs near the southern fringes of Beecroft Conservation Area and through the Chilworth reserve. The motorway is elevated and supported on large circular columns located within native vegetation and a heavily treed reserve.

HISTORICAL DOCUMENTATION:

The area developed as early as 1799 following a number of land grants. However the suburb grew rapidly shortly after 1886 following the construction of the railway from Hornsby to Strathfield and the subdivision of the area for residential development. The suburb was named Beecroft by Sir Henry Copeland, the Minister of Lands at the time, after the maiden name of his wives, Hannah and Mary (two sisters whom he married in succession). The suburb of Cheltenham was named by William Chorley, a Sydney tailor and men's outfitter, who acquired the land when it was released from the Field of Mars Reserve. He named the house after his birthplace of Cheltenham, Gloucestershire, England. Chorley is known to have asked the government to build a station and asked to name it after his property when it opened in 1898. Sutherland Road was named for John Sutherland, Minister for Public Works 1887-1889

In the 1890s part of the area was further subdivided with lush with gardens. Today Beecroft retains its residential character, although modern shopping arcades and boutiques have been built.[1]

ASSESSMENT CRITERIA:

An item will be considered to be of State or Local heritage significance if it meets one or more of the following criteria

√	A. EVOLUTIONAL SIGNIFICANCE	√	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL
√	B. ASSOCIATIONAL SIGNIFICANCE	***na***	F. COMPARATIVE PLACES - RARITY/UNCOMMON
√	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	√	G. COMPARATIVE PLACES - REPRESENTATIVE
na	D. SOCIAL SIGNIFICANCE	***LEGEND***	√ ***Included*** ***na*** ***Not included***

SUMMARY STATEMENT OF SIGNIFICANCE:

The Beecroft/Cheltenham Heritage Conservation Area has local significance due to its distinct visual identity as a Federation garden suburb, and is based on the historical boundaries of the Field of Mars Common.[2]

PROPOSED WORK:

M2 Motorway is proposed to be upgraded. The works are confined to the corridor widening at selected locations along the length of the freeway, from the eastern entrance at Epping to Windsor Road, and an addition of a third lane between Pennant Hills Road and Windsor Road which will run along the southern boundary of the Beecroft/Cheltenham Conservation Area. The works will require alterations and additions to an existing overhead structure within the native reserve of the Chilworth reserve located in Beecroft/Cheltenham Conservation Area.

IMPACTS:

Physical: Negative impact. Physically the works will modify the existing footprint of the overhead lanes introducing additional supporting structure.

Visual: Negative impact. The new structural columns will add bulk and scale to the existing structure.

MITIGATE/MANAGEMENT RECOMMENDATIONS:

Physical impacts: will occur as a result of the M2 road widening. Mitigation measures should be undertaken as suggested by the Flora and Fauna report as set out in the overall Environmental Assessment Report. The overall setting of Beecroft Cheltenham Conservation Area will remain intact with the exception of a few less trees when seen when hiking through the bush. Where the M2 transverses the conservation area, dense native vegetation screens the elevated motorway reducing the impact from a distance.

Visual impacts: An Arborist report is required prior to works commencing.

CONCLUSIONS:

The Beecroft/Cheltenham Conservation Area is an item of local heritage significance.

The impact of the new work from the M2 Motorway will marginally increase the existing negative affect on the area.

REFERENCES:

New South Wales Heritage Branch Inventory, accessed 9/11/09

[1] http://en.wikipedia.org/wiki/Beecroft,_New_South_Wales#Location, accessed 09/11/10

[2] http://www.hornsby.nsw.gov.au/environment/index.cfm?NAVIGATIONID=919&print=1, accessed 9/11/09

M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

Chilworth Recreation Reserve 11-14X Mary Street, Beecroft.	***H-11***

Photograph taken on:20 March 2009 by: Christopher Roehrig of HBO+EMTB Heritage Pty Ltd.

LOCATION: Chilworth Recreational Reserve is located within the Hornsby Local Government Area.

CURTILAGE: Chilworth Recreational Reserve has a site cutilage defined by the site allotment. The site is contained to the east by Castle Howard Road, Austral Avenue to the north, Burns Road to the west and M2 motorway to the south.

OWNERSHIP:	***LOCAL GOVERNMENT AREA:*** ***Hornsby Shire***	
The Reserve is owned by the crown and managed by Hornsby Shire Council.	***LISTING***	
	Statutory	***Non Statutory***
	Hornsby Shire LEP (Locally listed heritage item)	***na***

PHYSICAL DESCRIPTION:

Reserve conserving mature remnant Bluegum and Blackbutt forest to 28m high with Turpentine, Smooth Bark Angophora, Forest Sheoak, Pittosporum, Blueberry Ash and ground cover of soft local ferns and indigenous shrubs. Area being restored by local bush regeneration effort.[1]

HISTORICAL DOCUMENTATION:

Given the recognised heritage status of the item it is not considered necessary to undertake further documentary research for the purposes of this report. The impact assessment is therefore based on an examination of the physical evidence of setting and the available secondary documentary evidence.

[1] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=1780968, access 01 April 2009.

ASSESSMENT CRITERIA:
An item will be considered to be of State or Local heritage significance if it meets one or more of the following criteria.

ASSESSMENT CRITERIA						
√	A. EVOLUTIONAL SIGNIFICANCE	***na***	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL			
na	B. ASSOCIATIONAL SIGNIFICANCE	***na***	F COMPARATIVE PLACES - RARITY/UNCOMMON			
√	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	√	G. COMPARATIVE PLACES - REPRESENTATIVE			
√	D. SOCIAL SIGNIFICANCE	***LEGEND***	√	***Included***	***na***	***Not included***

SUMMARY STATEMENT OF SIGNIFICANCE
Reserve conserving indigenous bushland giving local Australian identity to landscape and notable as streetscape element. Of high local significance.[2]

PROPOSED WORKS:
M2 Motorway is proposed to be upgraded. The works are confined to the corridor widening at selected locations along the length of the Motorway, from the eastern entrance at Epping to Windsor Road, and an addition of a third lane between Pennant Hills Road and Windsor Road which runs along the southern boundary of Chilworth Recreational Reserve. The works will require additional overhead lanes with support structure located within the recreational reserve.

IMPACTS:
Physical: Negative impact. Physically the works will modify the existing footprint of the overhead lanes introducing additional supporting structure.

Visual: Negative impact. The new structural columns will add bulk and scale to the existing structure.

MITIGATE/MANAGEMENT RECOMMENDATIONS:
Physical impacts: will occur as a result of the M2 road widening. Mitigation measures shall be undertaken as suggested by the Flora and Fauna report as set out in the overall Environmental Assessment Report. The overall setting of Chilworth Recreational Reserve will remain intact with the exception of a few less trees when seen when hiking through the bush. Where the M2 transverses the conservation area, dense native vegetation screens the elevated motorway reducing the impact from a distance.

Visual impacts: Arborist to assess the visual impacts prior to works commencing.

CONCLUSIONS:
The impact of the new work from the M2 widening will only marginally increase the negative affect on the assessed significance.

REFERENCES:
NSW Heritage Branch Inventory, accessed 1 /04/2009

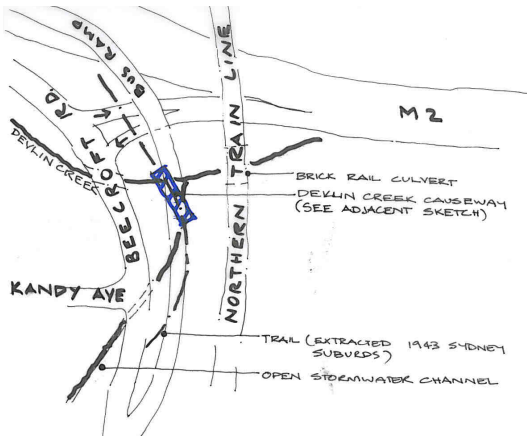
[2] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=1780968, access on April 2009.

M2 UPGRADE PROJECT

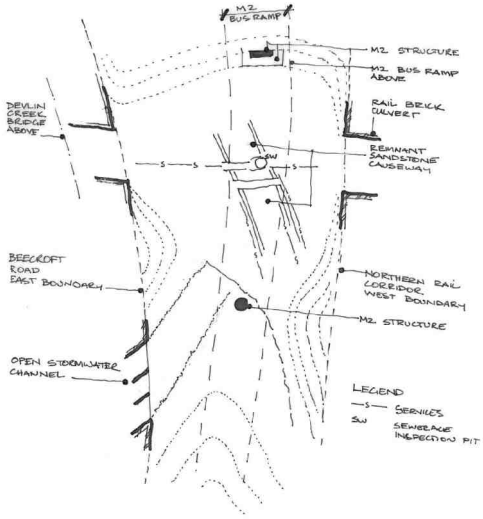
NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

Stone Causeway over Devlin Creek, Epping	***H-12***

Photograph taken on: 13 January 2010 by: Rosemarie Canales of HBO+EMTB Heritage Pty Ltd.



Location Plan: Devlin Creek Causeway



Key Plan: Devlin Creek Causeway

LOCATION: The Devlin Creek Causeway is located in the reserve immediately to the east of Beecroft Road at the junction with Kandy Avenue, Epping. The site is bound to the east by the Northern Rail Line, west by Beecroft Road and north by the M2.

CURTILAGE: The Devlin Creek Causeway curtilage is defined the Devlin Creek Bridge to the north west, M2 to the north, Northern rail line and brick culvert to the east, access trail to the south and Beecroft Road and open brick storm water channel to the east.

OWNERSHIP:	***LOCAL GOVERNMENT AREA:*** Hornsby Shire	
The Devlin Creek Causeway is owned by Hornsby Shire Council.	***LISTING***	
	Statutory	***Non Statutory***
	Hornsby Shire LEP (Locally listed heritage item)	NSW National Trust.

PHYSICAL DESCRIPTION:

The Devlin Creek Causeway is approximately 3m wide spanning over 20m, transverse by Devlin Creek proper and disappearing at either end beneath introduced fill. The causeway runs north south, constructed from ashlar sandstone blocks with a sandstone edging. The causeway is substantially degraded, altered unsympathetically as a result of number of services cut through and located within the footprint of the causeway. The causeway is intersected by a sewerage inspection pit with the pipe running east west covered with a concrete aggregate topping, and a number of cast iron pipes running north south, one along the upstream and one to either side of the downstream exterior edge with sections with concrete aggregate partially concealing the pipes.

HISTORICAL DOCUMENTATION:

The Devlin Creek Causeway is part of the "New Line Road Way" constructed in c1832 by the Road Gang. The New Line Road formed part of the shorter route developed by Surveyor General Major Sir Thomas Mitchell. The Great Northern Road branched off Parramatta Road at Five Dock crossing the Parramatta River at Abbotsford to Bedlam Point, continuing to Ryde, through to Epping, Beecroft, Pennant Hills, Cherrybrook, and then Dural. The works were completed in 1831. Following the construction of the Northern Railway line the New Line Road was interrupted and redirected over Devlin Creek.[1]

ASSESSMENT CRITERIA:

An item will be considered to be of State or Local heritage significance if it meets one or more of the following criteria.

√	A. EVOLUTIONAL SIGNIFICANCE	√	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL
√	B. ASSOCIATIONAL SIGNIFICANCE	√	F COMPARATIVE PLACES - RARITY/UNCOMMON
na	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	***na***	G. COMPARATIVE PLACES - REPRESENTATIVE
na	D. SOCIAL SIGNIFICANCE	***LEGEND***	√ ***Included*** ***na*** ***Not included***

SUMMARY STATEMENT OF SIGNIFICANCE:

The Devlin Creek Causeway c1831 is an item of cultural heritage significance in the local area associated with historical and technical development of the colony, through the exploration and subsequent and expansion of the settlement north lead by the growth of the road infrastructure utilising convict labour.

A significant remnant of the Great North Road which the area to the north of Sydney to settlement and development. This is one of the few remnants left within the Metropolitan area. [2]

PROPOSED WORK:

M2 Motorway is proposed to be upgraded. The works are confined to the corridor widening at selected locations along the length of the motorway, from the eastern entrance at Epping to Windsor Road, and an addition of a third lane between Pennant Hills Road and Windsor Road. The existing M2 Bus ramp at Beecroft is proposed to be demolished and the area returned to a nature reserve.

IMPACTS:

Physical impacts: Removal of the M2 bus ramp structure proper will not physically impact the existing causeway, however care should be taken with the process and equipment used which may damage the remnant sandstone causeway located immediately below and the surrounding open stormwater brick channel and brick rail culverts.

Visual impacts: No visual impacts will occur. Removal of bus ramp will create a positive visual impact to the immediate area.

MITIGATE/MANAGEMENT RECOMMENDATIONS:

Physical impacts:

Carryout a site survey, recording the extend of the Devlin Street Causeway prior to commencement of work, illustrating the relationship with Devlin Creek, rail brick culvert and open brick stormwater channel.

Protect Devlin Creek Causeway and its curtilage from damage caused from the demolition of M2 bus ramp. Construct and or cover extent of sandstone Causeway during demolition of M2 bus ramp.

Prepare an access plan to identify the location of the rare causeway. The plan shall be implemented restricting the use of heavy equipment to within 3 metres of the set boundary.

Minimise access to heavy equipment on the Causeway during demolition, which may dislodge remnant sandstone.

Prepare and implement Soil and sediment control plan carried out and implemented, to minimise to reduce negative impact from the works to the physical features of the causeway.

[1] Conybeare Morrison & Partners - North West Transport Links- East Environmental Impact Statement 1992.

[2] Conybeare Morrison & Partners - North West Transport Links- East Environmental Impact Statement 1992.

Mitigation measures shall be undertaken as suggested by the Flora and Fauna report as set out in the overall Environmental Assessment Report.

CONCLUSIONS:

The Devlin Creek Causeway has local significance as is a rare item within the local cultural landscape.

The removal of the bus ramp in the immediate vicinity will aid to reinstate the area back to its natural environs.

REFERENCES:

Bronze interpretative plaque located at the junction of Kandy Avenue and Beecroft Road, east side, at the entrance to the nature reserve.

Northwest Transport Links East, Environmental Impact Statement, European Heritage Survey, Conneybeare Morrison and Partners, 1992.

Heritage Branch, Heritage Inventory number 1780075, Heritage Inventory, accessed 13/01/2010.

1943 Sydney Suburb - Ausimage - Department of Lands - Spatial Information Exchange (http://imagery.maps.nsw.gov.au/ accessed 14/01/2010)

M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

Pennant Hills Golf Course — *H-13*

Photograph taken on:20 March 2009 by: Christopher Roehrig of HBO+EMTB Heritage Pty Ltd.

LOCATION: Pennant Hills Golf Course is located within the Hornsby Local Government Area

CURTILAGE: The Pennant Hills Golf Course curtilage is defined by Copeland Road to the north, Burns Road to the East, Cumberland Highway (Pennant Hills Road) to the west and M2 Motorway to the south.

OWNERSHIP:	***LOCAL GOVERNMENT AREA:*** ***Hornsby Shire***	
The Pennant Hills Golf Club Limited	***LISTING***	
	Statutory	***Non Statutory***
	Hornsby Shire LEP (Locally listed heritage item)	***na***

PHYSICAL DESCRIPTION:

Golf course sited on undulating topography above Devlin's Creek which runs through site. Conserving large stands of mature indigenous Eucalypts particularly Blackbutts Bluegums and Stringybarks (to 30 metres) between fairways. Also indigenous trees around boundary and on nature strips including Blackbutt, Smoothbark, Angophora Stringybarks and Turpentines to 25m high. Clubhouse and entry area developed c1950/60. Entry stonework of yellow sandstone in rough-face and capped style intact from this period including Pencil and Golden Cypresses in car park zone with characteristic low plants such as Fish Fern Strelitzias and Annuals as border plants and extending to edge of course. More recently a line of Brush Box Trees to 14m on north boundary exists from c1960. Additional ornamental tree planting has been added to fairways since c1960s. Course is generally well maintained but parking could be controlled along eastern nature strip to protect indigenous trees. Weed in bushland zones not assessed but probably require regeneration by qualified workers. Landscape on course could be simplified and enhanced if more emphasis was placed on indigenous Eucalypt forest and its regeneration and replanting rather than on additional introduction of

exotic species. However the exotic planting around the parking area has significance as an important period landscape.[1]

HISTORICAL DOCUMENTATION:

The area of land currently occupied by the Pennant Hills Golf Course was once part of a 100 acre land grant issued by Governor John Hunter to Rowland Hassall in 1799. Rowland, a carpenter by trade and lay preacher, arrived from England on 1798. In 1861 the land was sold to James Smith and then to his son Edwin who then subsequently sold the land known as Smith Bush in 1906 to a group of five businessmen.

The Beecroft Golf Club was officially formed in May 1906 with the first official competition held in October 1906 on a nine hole course along the north-eastern corner of the site known as Smith Bush.

The area used originally for farming and cattle grazing. However shortly after the land owners withdrew the Club's permissive occupancy of the land. After the Club attempted to re-establish on another site they totally disbanded before 1914. In 1922 the idea of re-establishing a golf club in the area was initiated by Dr Holt who formed a committee with Dr Lidwill and Robert Vicars. A section of land that was originally part of the Hassall Grant became available in 1922 and was purchased and was part of the original Beecroft Club founded in 1906. The layout of the course was initially a nine hole, later designed by Tom E. Howard as a 18 hole course opening up in 1924.

ASSESSMENT CRITERIA:

An item will be considered to be of State or Local heritage significance if it meets one or more of the following criteria.

√	A. EVOLUTIONAL SIGNIFICANCE	***na***	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL
na	B. ASSOCIATIONAL SIGNIFICANCE	***na***	F COMPARATIVE PLACES - RARITY/UNCOMMON
√	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	√	G. COMPARATIVE PLACES - REPRESENTATIVE
√	D. SOCIAL SIGNIFICANCE	***LEGEND***	√ ***Included*** ***na*** ***Not Included***

SUMMARY STATEMENT OF SIGNIFICANCE:

The Pennant Hills Golf Course is of local cultural significance as one of the earliest established golf courses with much of the early landscape elements and plantings intact.

PROPOSED WORK:

M2 Motorway is proposed to be upgraded. The works are contained to the corridor widening at selected locations along the length of the motorway, from the eastern entrance at Epping to Windsor Road, and an addition of a third lane between Pennant Hills Road and Windsor Road is clear of the Golf Course southern boundary.

IMPACTS:

Physical impacts : No physical impact

Visual impacts: No visual impact.

MITIGATE/MANAGEMENT RECOMMENDATIONS:

No mitigation measures and/or recommendations required.

CONCLUSIONS:

The Pennant Hills Golf Course is an identified item of local heritage significance.

The M2 Motorway works will not alter the assessed significance of the site.

REFERENCES:

Pennant Hills Golf Course web page accessed 1/04/2009
NSW Heritage Branch Inventory, accessed 1/04/2009

[1] http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=1780736, accessed 1 April 2009, accessed 1 April 2009.

M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

Road Reserve - Street Trees(south end) Sutherland Road, Epping	***H-14***

Photograph illustrated from www.maps.google.com.au, accessed 10/11/09

LOCATION: The street trees are located at the southern end of Sutherland Road, Epping.

CURTILAGE: The street trees are located in the Road reserve along the southern end of Sutherland Road.

OWNERSHIP:	***LOCAL GOVERNMENT AREA:***	
Hornsby Shire Council	Hornsby Shire	
	LISTING	
	Statutory	***Non Statutory***
	Hornsby Shire LEP (Locally listed heritage item)	***na***

PHYSICAL DESCRIPTION:
Native bushland on Road Reserve.

HISTORICAL DOCUMENTATION:
Given the recognised heritage status of the item it is not considered necessary to undertake further documentary research for the purposes of this report. The impact assessment is therefore based on an examination of the physical evidence of the building and its setting and the available secondary documentary evidence.

ASSESSMENT CRITERIA: An item will be considered to be of State or Local heritage significance if it meets one or more of the following							
ASSESSMENT CRITERIA							
na	A. EVOLUTIONAL SIGNIFICANCE	***na***	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL				
na	B. ASSOCIATIONAL SIGNIFICANCE	***na***	F COMPARATIVE PLACES - RARITY/UNCOMMON				
√	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	***na***	G. COMPARATIVE PLACES - REPRESENTATIVE				
na	D. SOCIAL SIGNIFICANCE	***LEGEND***		***√***	***Included***	***na***	***Not included***
SUMMARY STATEMENT OF SIGNIFICANCE: The trees in the road reserve have local significance.							
PROPOSED WORK: M2 Motorway is proposed to be upgraded. The works are confined to the corridor widening at selected locations along the length of the motorway, from the eastern entrance at Epping to Windsor Road, and an addition of a third lane between Pennant Hills Road and Windsor Road.							
IMPACTS: Physical: No physical impacts Visual: No visual impacts							
MITIGATE/MANAGEMENT RECOMMENDATIONS: No mitigated measures and/or recommendations required.							
CONCLUSIONS: The street trees are identified items of local heritage significance. The M2 Motorway works will not alter the assessed significance of the site or item.							
REFERENCES: NSW Heritage Branch Inventory.							

M2 UPGRADE PROJECT

NON ABORIGINAL HERITAGE - HERITAGE ASSESMENT

Former Baulkham Hills Public School

5-13 Russell Street, Baulkham Hills, NSW 2153
Lot 1-5/DP201089, Lot 17-22/DP201089, Lot 27/DP201089.

H-15

Photograph taken on:20 March 2009 by: Christopher Roehrig of HBO+EMTB Heritage Pty Ltd.

LOCATION: The site has a street address of 5-13 Russell Street Baulkham Hills.

CURTILAGE: The site curtilage for former Baulkham Hills Public School is defined by the site allotments Lot 1-5/DP201089, Lot 17-22/DP201089, Lot 27/DP201089. The site is bounded by Russell Street to the south, the M2 Motorway to the north and Windsor Road to the west.

OWNERSHIP:
Previously owned by the crown and managed by the NSW Department of Education. The site was disposed of in 1998.

LOCAL GOVERNMENT AREA:
Baulkham Hills

LISTING

Statutory	***Non Statutory***
Baulkham Hills LEP 2005 schedule 1 (Locally listed heritage item)	***na***

PHYSICAL DESCRIPTION:
The site is occupied by a number of single storey brick structures with gable roofs clad with corrugated metal sheeting.

HISTORICAL DOCUMENTATION:
The school opened in 1868 and closed in 1999. A number of proposals have been submitted to council; however at the time of this report the site remains vacant. The school was closed due to falling enrolments and concerns for safety due to the increasing traffic congestion as a result of the M2 Motorway immediately to the north.

ASSESSMENT CRITERIA: An item will be considered to be of State or Local heritage significance if it meets one or more of the following criteria.							
√	A. EVOLUTIONAL SIGNIFICANCE	***na***	E. ARCHAEOLOGICAL/ RESEARCH POTENTIAL				
na	B. ASSOCIATIONAL SIGNIFICANCE	***na***	F COMPARATIVE PLACES - RARITY/UNCOMMON				
√	C. AESTHETIC AND TECHNICAL SIGNIFICANCE	√	G. COMPARATIVE PLACES - REPRESENTATIVE				
√	D. SOCIAL SIGNIFICANCE	***LEGEND***		√	***Included***	***n/a***	***Not included***

SUMMARY STATEMENT OF SIGNIFICANCE:

The site and buildings of the former Baulkham Hills Public School has local significance due to the relatively intact collection of early school structures ranging from the mid 1868.

PROPOSED WORK: M2 Motorway is proposed to be upgraded. The works are confined to the corridor widening at selected locations along the length of the Motorway, from the eastern entrance at Epping to Windsor Road, and an additional third lane constructed immediately in front of the former Baulkham Hills Public School along Windsor Road heading north.

IMPACT:

Physical impacts: No physical impacts will occur to the former Baulkham Hills Public School.

Visual impacts: Marginal negative visual impact to the site of the former Baulkham Hills Public School due to the close proximity of the new on-ramp to the M2 Motorway.

MITIGATE/MANAGEMENT RECOMMENDATIONS:

The impact is marginal and will not detract from the overall setting of the place physically and/or visually. For this reason no mitigation is required.

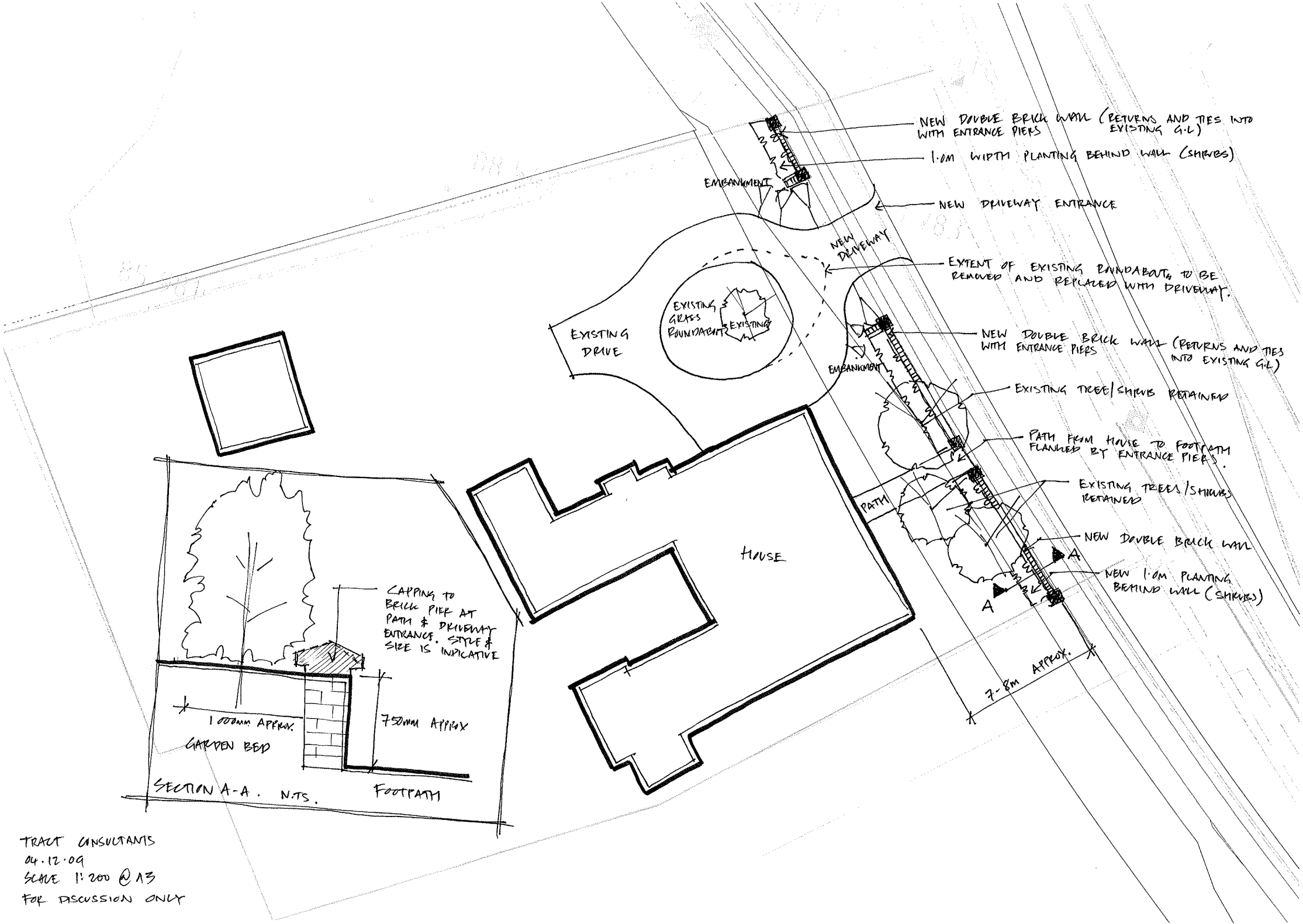
CONCLUSIONS:

The site of the former Baulkham Hills Public School is an identified item of local heritage significance.

The M2 Motorway works will not alter the assessed significance of the site nor structures.

REFERENCES:

Websites:
http://www.heritage.nsw.gov.au/07_subnav_01_2.cfm?itemid=1090076, accessed (18/03/09)



TRACT CONSULTANTS
04.12.09
SCALE 1:200 @ A3
FOR DISCUSSION ONLY

ARBORISTS REPORT: 266 WINDSOR ROAD, BAULKHAM HILLS

VEGETATION ON PROPERTY FRONTAGE

Prepared for: LEIGHTON CONTRACTORS PTY LIMITED

DECEMBER 2009

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TREE SURVEYS & DIAGNOSIS
NSW CHEMCERT CERTIFICATE INSTRUCTOR

Report date: 8th December 2009

ARBORISTS REPORT: 266 WINDSOR ROAD, BAULKHAM HILLS VEGETATION ON PROPERTY FRONTAGE

INTRODUCTION

The vegetation inspected for this report comprises the trees and shrubs on the subject property located between the heritage-listed brick residence and Windsor Road footpath. Portion of the property frontage is proposed for resumption and incorporation into the new M2 Motorway access ramp, off Windsor Road. The specific area of investigation is shown on the cover page.

REPORT CONTENTS

View of the property frontage from Windsor Road

Report Part 1 follows

PART 1 TREE INSPECTIONS 7th November 2009 14 trees recorded:

Tree inventory / Inspection report: provenance, specifications, observable health & structural condition, and from this the Safe Useful Life Expectancy ("SULE") rating determined using the Barrell 1.4.01 format. (*Note that SULE ratings cannot predict the impact of extreme weather events on the subject trees, or necessarily detect internal defects in trunk or root plate).*

- Approximate tree heights were calculated with a Haglöf electronic clinometer.
- The tree location plan is on page 7

no	Species *provenance	H x R in m	Age, inspection comments **Age code: Y =** Young, **EM =** Early-mature **M =** Mature, **A =** Aged, **S =** Senile	SULE rating
1	*Grevillea robusta* **Silky Oak** * coastal r/f Nth NSW-Qld	11 x 5	EM: canopy healthy, primary trunk has a suspect narrow fork with fissure & sap bleed, (see photo below)	2d
2	*Castanospermum australe* **Black Bean** *coastal, Nth NSW & Qld	8.5 x 4.5	**M**: callused branch stubs, limited small dead wood, healthy	1
3	*Grevillea robusta*	11 x 3.5	**Y**: OK	1
4	*Pittosporum undulatum* **Native Daphne** * native inc. locally	6 x 3	**EM**: OK	2

View of trees 1 to 4 lining the northwest boundary of the property. The tall trees are Silky Oaks 1 & 3, the broad tree on the left is the Black Bean T.2. The right photo shows the suspect trunk fork on Silky Oak T. 1 (location arrowed in left photo).

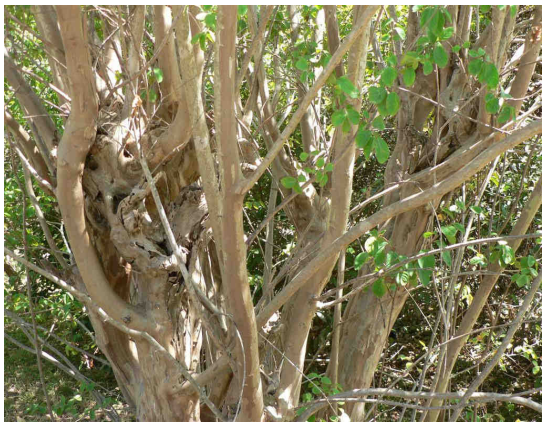
no	Species *provenance	H x R in m	Age, inspection comments **Age code: Y =** Young, **EM =** Early-mature **M =** Mature, **A =** Aged, **S =** Senile	SULE rating
5	*Syzygium paniculatum* **Brush Cherry** * native inc. regionally (uncommon)	9.5 x 5	**M**: multi-trunked at base, the trunk forks presently sound, tree healthy	2
6	*Acacia binervia* **Coast Myall** * native inc. regionally	6.7 x 2	**M**: leans to NE about 20°, healthy	2
7	*Acacia binervia*	7 x 2	**EM**: twiggy dieback on SW side	2

Southeast view of Trees 5, 6, 7 from Windsor Road. The large tree behind the clearway sign is the Brush Cherry (T. 5). The central blue-grey foliage belongs to Trees 6 & 7 the Coast Myalls. The shrub border in the foreground is hedged Bay Tree (Sweet Bay) *Laurus nobilis.*

no	Species *provenance	H x R in m	Age, inspection comments **Age code: Y =** Young, **EM =** Early-mature **M =** Mature, **A =** Aged, **S =** Senile	SULE rating
8	*Callistemon salignus* **Willow Bottlebrush** * native inc. regionally	5 x 2	**Y**: (shrublike) limited twiggy dieback lower 1.8m of trunks	2
9	*Lagerstroemia indica* **Crepe Myrtle** * Indian subcontinent & sth China	4.5 x 2.2	**M**: lopped at ~ 1.4 m, decay where lopped, upper branches are all watershoots (epicormics) growing from the lopped stubs. Photo next page.	2(3)
10	*Leptospermum petersonii* **Lemon Scented Tea Tree** * border ranges NE NSW-Sth Qld	5 x 2.5	**M**: shrublike, healthy	2

Photos of trees 8-10 follow

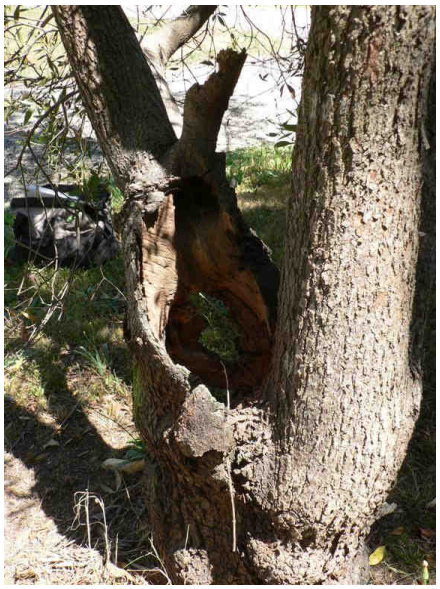
Right: View of trees 8, 9, 10 as seen from the verandah. The Lemon Scented Tea Tree (T. 10) is arrowed in the foreground



Left: effect of "lopping" on Crepe Myrtle T. 9

no	Species *provenance	H x R in m	Age, inspection comments **Age code: Y =** Young, **EM =** Early-mature **M =** Mature, **A =** Aged, **S =** Senile	SULE rating
11	*Jacaranda mimosifolia* **Jacaranda** * Brazil	4 x 1.8	**Y:** OK	1
12	*Photinia x fraseri* 'Robusta' **Photinia** * Orient	4.5 x 2	**M**: OK	1
13	*Ceratopetalum gummiferum* **NSW Christmas Bush** * native inc. regionally	6 x 2.5	**M**: large lesion & hollow in base (Photo next page)	2(3 ?)
14	*Grevillea robusta*	9 x 2.5	**Y**: upper half dead, advancing dieback, will die off	4

Photos of Trees 11-14 follow

Left: view including Trees 11-14, in a foliage mix of trees and shrubs. The dying Silky Oak T. 14 can be seen in the left background. The foreground shrub arrowed is a small Macadamia *Macadamia tetraphylla*. Right photo shows the decay and hollow in the base of NSW Christmas Bush T. 13

Inspection nomenclature: explanatory notes

Co-dominant trunks: may occur where a trunk divides with a narrow fork, which tends to wedge apart over time, set up hairline partition and a decay court inside the fork, which may split in time (various indicators if this is occurring).

Deadwood: expected on mature trees – to a degree. Beyond a point, the percentage of deadwood in the overall canopy will downgrade the SULE prognosis. In some cases, may indicate a progressive dieback pattern, or limb death caused by termites.

Epicormic branches: brittle-attached leafy shoots or branches, usually sprout from the trunk or limbs, as response to unsuitable environment ("stress"), fire, "lopping" or natural senility. Beyond a point, the percentage of epicormics in the overall canopy will downgrade the SULE prognosis.

H x R column: (3rd from left) this is the approximate height in metres recorded by the clinometer x the canopy radius (radius = average trunk-to-dripline distance, in metres).

Lesion: (generic) refers to any localised pathology such as decay, disease, infected wound, morbid tissue.

Lopping and topping: a structurally and pathologically destructive method of pruning trees. It is an unacceptable tree working method under *AS 4373-2007 Part 8* "Pruning of Amenity Trees"

"OK": indicates that the tree inspected as satisfactory for its age, location & seasonal conditions

Pre-emptive removal: Trees not expected to fail immediately, but with serious structural fault or disease that give a poor prognosis and foreseeable hazard. In young trees with serious inbuilt fault, pre-emptive removal is advisable before the tree grows larger and removal more difficult and expensive. These trees are flagged in the SULE column as Category 3(4)

Provenance: Australian or exotic centre-of-origin of the species (in species column).

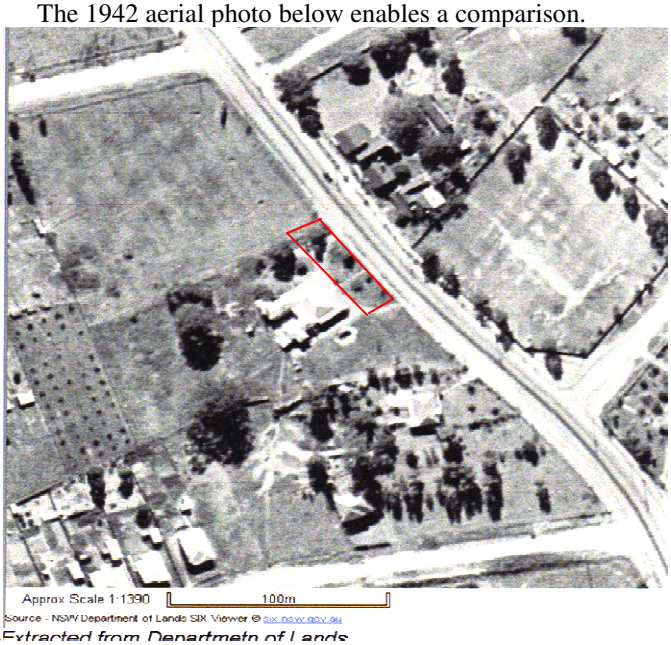
Safe Useful Life Expectancy "SULE" rating these ratings use the Barrell 2001 format for rating trees: SULE cat.1(40+ yrs), 2(15-40 yrs), 3(5-15yrs), 4(remove), full details page 12.

This completes Part 1, inventory and inspection results on the trees in the study area.

The tree location plan follows on page 7

APROXIMATE TREE LOCATIONS

Individual tree locations. The remaining vegetation filling in the gaps in this photo is shrubbery, to be discussed in report Part 2 on page 8. The 1942 aerial photo below enables a comparison.



Extracted from Departmetn of Lands

PART 2 SHRUB UNDERSTORY IN THE INSPECTION ZONE.

These are a mix of large and smaller shrubs and sapling trees. Because of planting density they fill in the gaps between the trees, and form a visual screen 2+ metres high between the residence and the road. Photos on page 2, 5 and 6 give a good impression of the screen effect.

The species forming the shrub understory are all quite common in suburban Sydney, and were identified and listed below:

Shrubs
Nerium oleander **Oleander**
Laurus nobilis **Bay Tree (Sweet Bay), hedged**
Viburnum tinus **Viburnum**
Plumbago auriculata **Plumbago**
Ochna serrulata **Mickey Mouse Plant**
Rosa multiflora **Multiflora Rose**
Callistemon viminalis 'Captain Cook' **Captain Cook bottlebrush**
Camellia japonica **Camellia**
Melaleuca hypericifolia **Red Flowered Honey Myrtle**
Hibiscus rosa-sinensis **Hawaiian Hibiscus**

Saplings of juvenile trees (currently shrub sized)
Macadamia integrifolia **Queensland Nut Tree**
Syzygium paniculatum **Brush Cherry**
Jacaranda mimosifolia **Jacaranda**
Ceratopetalum gummiferum **NSW Christmas Bush**

Fruit trees
Prunus persica **Peach Tree**
Citrus reticulata **Mandarine**

None of these shrubs were of great age. The oldest possibly is the Laurel "hedge" (photo page 4) which was in partial dieback, probably because of periodic infestations *Wax Scale* (sap sucking insect) to which the Sweet Bay is quite susceptible in eastern (coastal) regions.

End of Part 2 - shrub understory

PART 3 THE SITE TREE SUMMARY

The tree species
With the exception of Black Bean (T. 2) and the Brush Cherry (T. 5), the trees recorded in report Part 1 are relatively ubiquitous suburban favourites, of value here in an amenity sense - visual & screen - between the residence and road.
The mature examples here of Black Bean and Brush Cherry are less common in Sydney suburbs. Some of the trees were planted by the present owner for screen enhancement and (wishfully) for traffic noise mitigation.

Age of the trees
The signature trees of 19th century estates, large gardens and cemeteries, such as *Araucaria* spp (Hoop Pine, Bunya), *Quercus* spp (English Oak etc), *Ulmus* spp (Elms), *Cupressus* spp (Monterey Cypress), *Ficus* spp (Moreton Bay & Port Jackson Fig), *Phoenix canariensis* (Phoenix Palm) *Platanus* spp (Plane Tree), *Cinnamomum camphora* (Camphor Laurel) are **absent** from the study area. A large Camphor Laurel however is to be seen behind the residence, but not relevant to this report.

Trees **2** and **5** (Black Bean, Brush Cherry) are the oldest of the trees, but on appraisal were judged under 100 years of age. They easily post-date the brick residence, which is of 1860-70's vintage (pers. com. owner).

The Dept. of Lands 1942 aerial photograph (page 7) shows one tree in the same location as Tree 2, and it may well be the same tree (Black Bean), which would date it older than 70 years.
There are other trees (shrubs ?) in the 1942 photo, but they do not relate to anything in the present inventory.

Inspection prognoses: Safe Useful Life Expectancy ("SULE") ratings
With the exception of Trees 9, 13, 14 (see inspection table), the remaining trees all had satisfactory prognoses, rating SULE Category 1 (40+ years) or Category 2 (15-40 years).

Excepting the Laurel "hedge" with partial dieback (photo page 4), the shrubs were all in satisfactory condition for the exposed location and growing conditions.

A detailed explanation of the *Safe Useful Life Expectancy* categories is on page 12.

This completes Part 3 an overview of the trees in the study area.

PART 4 LANDSCAPE PLAN: RESTRAINTS AND SUITABLE REPLACEMENT SPECIES

Restraints
The concept Landscape Plan supplied by Tract Consultants indicates a "cut" along the resumed frontage of approximately 750mm depth, the vertical (i.e. not battered) level change being accommodated by a masonry wall.

Allowing for working room of another 500mm behind the construction line, I would advise removing any trees within 2.5 metres of the working excavation line, to avoid root truncation or destabilisation of anchorage.

In the bigger picture, it may be appropriate to remove the existing ad hoc mix of vegetation and replant with suitable species, as discussed below.

Potentially suitable trees & shrubs for the situation
Suitable species must be long lived, pollution and wind resistant, hardy to the confined garden area and soils. Very importantly, they must provide screening and privacy by dense branching habit and foliage, with floral display as an enhancement.
Among the selections that fit these specifications are:

***Acmena smithii* 'Minor'** Dense foliage, compact small tree to 6m maximum, flowers and fruits.
***Syzygium* 'Hunchy'** Dense dwarf Brush Cherry type.
***Metrosideros* 'Fiji Fire'** or ***Metrosideros* 'Spring Fire'** Large dense shrub, good floral display.

Part 5 report summary follows on page 11

PART 5 REPORT SUMMARY

- The site inspection recorded 14 trees with associated shrub plantings that provide useful amenity of a visual barrier between the residence and Windsor Road.
- None of the trees or shrubs were rare, endangered, forest remnant or in a heritage context had a direct connection to the original 1860/70's development. One tree (*Castanospermum australe*), whilst not 19th century vintage, appears in the Lands department 1942 aerial photograph.
- Resumption of part of this property frontage for the M2 upgrade and the level change will require removal of many of the trees and shrubs. These are to be replaced with carefully selected species suited to the site: pollution and wind resistant, compact and dense growth habit, visually appealing. Several are listed in Part 4 of this report.

END OF REPORT

Thank you for the opportunity to make this report,
I trust this information is helpful in your planning.

David Potts
December 2009

Following:
Explanatory notes: *Safe Useful Life Expectancy* categories and sub-categories.

SAFE USEFUL LIFE EXPECTANCY "S.U.L.E." CATEGORIES (Barrell Jan 2001 update)

1. LONG SULE (40+ years): *Trees that appeared to be retainable at the time of assessment for more than 40 years with an acceptable level of risk.*
1a) Structurally sound trees located in positions that can accommodate future growth.
1b) Trees that could be made suitable for retention in the long term by remedial tree care.
1c) Trees of special significance for historical, commercial or rarity reasons that would warrant extraordinary efforts to secure their long term retention.

2. MEDIUM SULE (15-40 years) *Trees that appeared to be retainable at the time of assessment for 15-40 years with an acceptable level of risk.*
2a) Trees that may only live between 15 and 40 years.
2b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons.
2c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
2d) Trees that could be made suitable for retention in the medium term by remedial tree care

3. SHORT SULE (5-15 years) *Trees that appeared to be retainable at the time of assessment for 5-15 years with an acceptable level of risk.*
3a) Trees that may only live between 5 and 15 years
3b) Trees that could live for more than15 years but may be removed for safety or nuisance reasons.
3c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
3d) Trees that require substantial remedial care and are only suitable for retention in the short term

4. REMOVE *Trees that should be removed within the next 5 years.*
4a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions.
4b) Dangerous trees because of instability or recent loss of adjacent trees.
4c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds, poor form.
4d) Dangerous trees that are clearly not safe to retain.
4e) Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
4f) Trees that are damaging or may cause damage to existing structures within 5 years.
4g) Trees that will become dangerous after the removal of other trees for the reasons given in a) to f).
4h) Trees in categories a) to g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.

5. SMALL, YOUNG OR REGULARLY PRUNED *Trees that can be reliably moved or replaced.*
5a) Small trees less than 5m in height
5b) Young trees less than 5 years old but over 5m in height
5c) Formal hedges and trees intended for regular pruning to artificially control growth.